

Risks for Knowledge-Uptake in Dutch Marine Spatial Planning: Incompatibilities Between Research and Policy-Making

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Abstract: The rapid increase of Offshore Wind Farm (OWF) development in the North-Sea occurs under serious uncertainty, partly due to knowledge gaps concerning the North-Sea's socio-ecological system. The situation is particularly urgent in the Netherlands due to the intense use of its maritime zone and related conflicts among stakeholders. Optimising the placement of OWFs requires the uptake of multidisciplinary knowledge in Marine Spatial Planning (MSP) policy through ongoing adaptation of policies to new knowledge. Currently, knowledge-uptake from research into policy is widely mentioned as a challenge for MSP, but knowledge management theory has hardly been applied to it. To be useful in the multidisciplinary environment of MSP, a common language about knowledge is needed to allow for cooperation between scientific disciplines and policy sectors. However, many risks exist that may hinder knowledge-uptake between research and policy-making. This thinking-gap between research and policy-making is recognised in many fields. However, MSP and relevant knowledge about the North-Sea is rapidly developing and understudied. This results in a high pressure and dynamic situation in a developing field which can be an insightful case to apply knowledge-management theory and provide new insights for scholars of MSP. This study focuses on risks for knowledge uptake that derive from incompatibilities between researchers and policy-makers in the use and development of knowledge within the context of OWF development and MSP. These incompatibilities range from differing timeframes and uses of data to more fundamental differences in roles between researchers desiring to understand the world, and policy-makers desiring to change it. Characteristics of MSP, such as the high political pressure and relative pioneering practice of MSP may exacerbate the impact of such incompatibilities. Notably, MSP may suffer from a focus on short-term policy-making, limited cumulative understanding and fragmentation in policy. The aim of this article is to consider the effect of incompatibilities between systems of research and policy-making on knowledge-uptake in Dutch MSP and how these may be exacerbated by characteristics of MSP. Using knowledge-management literature, a list of potential incompatibilities between systems of research and policy-making is drawn. Data was collected by means of document analysis, in-depth interviews with researchers and policy-makers, and observations of policy workshops, consortium meetings, and focus groups. Findings suggest that risks to knowledge-uptake are partially caused by the incompatibilities between research and policy-making and that the context of MSP exacerbates these incompatibilities in most instances. Simultaneously, some instances were found where MSP can actually help to decrease differences between researchers and policy-makers. However, the incompatibilities between researchers and policy-makers are so enduring that risks to knowledge-uptake still persist. Better joint understanding and recognition of differences between research and policy-making are required to limit the negative effect of incompatibilities between research and policy-making on knowledge uptake.

Keywords: Knowledge management, Knowledge uptake, Marine spatial planning (MSP), Science-policy interface, Offshore wind farm governance (OWFs)

1. Introduction

Sustainable energy and energy security goals are increasingly important to European countries following the Paris climate agreement and the invasion of Ukraine (European Commission, 2022). In many countries bordering the North-Sea, a principle means of attaining energy goals is the construction of Offshore Wind Farms (OWFs). Regionwide plans aim to increase North-Sea OWF capacity from 25GW to 260GW by 2050 (Netherlands enterprise agency, 2021; WindEurope, 2021). In the Netherlands, OWF capacity is planned to double by 2030 (Rijksoverheid, 2022). However, an array of interests lays claim to marine space, including rising ecological targets, traditional uses like shipping, fishing, and sand-mining, and technical innovation increasing the feasibility of new users such as aquaculture and other forms of maritime energy production (Ehler et al. 2018). The subsequent conflict for space in the Dutch part of the North-Sea urges for careful Marine Spatial Planning (MSP) (European Commission, 2014).

MSP is a novel approach to maritime governance and widely accepted as the principal concept for maritime governance (Ehler, 2018). MSP aims to develop policy frameworks which balance the various offshore claims to space in a socially acceptable and ecologically responsible manner. To develop such frameworks, MSP requires intricate knowledge of the socio-ecological systems of the North-Sea, which, until recently, was relatively limited (Ehler et al. 2018). In response, there are increasing efforts to improve fundamental and

practical understanding of the North-Sea ecosystem and the effect of human activities (Noordzeeloket, 2016; 2021: Dutch Research Council, 2020). The development of OWFs is the prime challenge of MSP due to the high political pressure to produce more green energy. As such, most research projects concerning the North-Sea currently investigate the effect of OWFs. The rapid increase of existing knowledge requires a strong science-policy interface to ensure the uptake of newly developed knowledge. However, scholars and practitioners indicate that knowledge-uptake from researchers to policy-makers constitutes an increasingly urgent constraint in MSP (Rekola and Paloniemi, 2022; Paez et al. 2020). If knowledge-uptake in MSP remains constrained, decision-making on OWFs may have severe ecological and societal consequences (Dutch Research Council, 2020) which may hinder energy transition on the long-term. Additionally, a degree of certainty on which to base policy is often legally required due to, for example, the precautionary principle (European Commission, 2014).

Knowledge-uptake concerns *the acquisition and comprehension of diffuse information and its subsequent integration, interpretation, valuation, and application into policy* (Ryneveld and Sproule, 2006). Knowledge management research, which considers the use and uptake of knowledge, receives increasing attention in academic communities and practice (Dutch National Scientific Agenda, 2020). Knowledge management literature mentions that incompatibilities between politics and research may impede successful knowledge-uptake (Derksen, 2014, p14). Incompatibilities are implied to form risks to knowledge-uptake, but their effect on knowledge-uptake remains understudied (Paez et al. 2020; Rekola and Paloniemi, 2022). These incompatibilities derive from differences between systems of research and policy-making, and could potentially provide an explanation for the difficulties surrounding knowledge-uptake in MSP. This thinking-gap is recognized in many different fields (Christensen, 2021). However, there is reason to believe that characteristics of MSP, such as the high political pressure to produce sustainable energy, MSP being understudied, the limited knowledge and quick development of knowledge of the North-Sea's biophysical system, and MSPs early development may increase the effects of these fundamental differences, leading to heightened risks for knowledge-uptake (Keijser et al. 2020; Paez et al. 2020). As such, MSP makes for a suitable case-study to consider potential incompatibilities between research and policy-making as risks for knowledge-uptake.

This paper explores the effect of incompatibilities between systems of research and policy-making on knowledge-uptake in Dutch MSP and how these may be exacerbated by characteristics of MSP. The paper presents a framework for analysing these incompatibilities and considers how they are expressed in the specific MSP context. The framework is based on differences between the roles of politics and research mentioned in knowledge management literature (Böcher and Krott, 2016, p53; Derksen, 2014, p10-43; Oliver et al, 2014; Spaapen and van Drooge, 2011). The framework is described in section 2. Section 3 explains the methods, including document analysis, interviews with researchers and policy-makers working on the Dutch North-Sea, and observations of workshops and focus groups. In section 4, the results of the analysis are described and discussed with a focus on patterns demonstrating risks to knowledge-uptake. Section 5 provides a conclusion.

2. Theory

Böcher and Krott (2016), indicate that the ideal roles of research and policy-making as public domain tasks are much discussed and clear but can lead to incompatibilities between research and policy-making. The ideal role of researchers is to produce a (fundamental) understanding of the world or human behaviour, with the main source of efficacy being empirical proof and logic. Researchers work according to effective and efficient scientific methodologies, look for appropriate data to analyse, include and critique the findings of peers and live up to stringent codes of conduct (Böcher and Krott, 2014; Derksen, 2014). The role of policy-makers is to solve societal problems through political means, shaping and steering the world according to an agenda, with the main source of efficacy being power. This involves public participation and discourse for agenda-setting and democratic procedures for scrutiny with the ideal goal of mobilizing society behind a decision (Oliver et al. 2014; Böcher and Krott 2016).

These different ideal roles may result in important incompatibilities between systems of research and policy-making upon what constitutes knowledge, and how to use it. To explain the world around them, scientists want to consider all possible data, accumulate it and analyse it according to theoretical logic. In science it is valuable to clearly indicate where uncertainties persist and interpretations might change due to new data. In this process there is little room for wishful thinking, and it takes significant amounts of time due to the reliance on empirical proof, the need for reversibility of answers, and the cumulative assessment of knowledge

(Derksen, 2014). Policy-makers on the other hand want to solve an issue while it is still prominent in the political agenda, this requires a convincing argument for their decisions where best estimates or even wishful thinking can contribute. In such an argument there is limited space to consider all possibilities and available information, let alone to consider all accumulated knowledge. In policy-making, indications of uncertainty may undermine the argument and instead power, persuasion, and new ideas are used to gather support. Often, the possibilities for this change are restricted to short-term windows of opportunity, and political preferences. These differences have the potential to threaten knowledge-uptake between research and policy (Böcher and Krott, 2016; Derksen, 2014). The different tendencies towards knowledge and its use between research and policy in table 1 demonstrate that significant incompatibilities may exist between researchers and policy-makers.

Table 1: An Overview of Different Tendencies Between Systems of Research and Policy-Making.

Topic	Research, produces knowledge scientifically	Policy, solves problems politically	Sources
Timeframe	Take the time needed: long period necessary to observe and analyse.	Time restricted by window of opportunity: short periods to solve pressing societal problems.	Böcher and Krott, 2016. Derksen, 2014. Janssen et al. 2014.
Focus	Describing and explaining the world.	Influencing and changing the world.	Böcher and Krott, 2016. Derksen, 2014.
Value of data	All data for empirical testing of hypothesis.	Selective and supportive to build argumentative discourse.	Böcher and Krott, 2016.
Questions	Need to be critical.	Need to be relevant.	Christensen, 2021. Böcher and Krott, 2016. Derksen, 2014.
answers	Need to be reversible.	Need to be convincing.	Böcher and Krott, 2016. Derksen, 2014.
Attitude on wishful thinking	Needs to be avoided.	Needs to be encouraged.	Böcher and Krott, 2016.
Rely on	theoretical logic and empirical proof.	Persuasion and agreement.	Böcher and Krott, 2016. Derksen, 2014.
Power use	To describe and explain the world.	to influence and change the world.	Böcher and Krott, 2016.
Use of knowledge	Accumulate, to get closer to truth.	New ideas, relabelling the world, to support mobilization.	Böcher and Krott, 2016. Derksen, 2014. Janssen et al. 2014.
Attitude on uncertainty	Needs to be admitted staying close to the truth.	Needs to be shrouded to prevent loss of confidence.	Derksen, 2014.
What constitutes a problem	Objective/fundamental lack of understanding.	Subjective problem in society/policy which can have its roots in a fundamental lack of understanding but does not have to.	Derksen, 2014. Keijser et al. 2020. Paez et al. 2020.

2.1 The Context of MSP

Marine Spatial Planning is a process of spatial policy formation, which relies on many different scientific disciplines, and public and private sectors for its information and management (Cormier et al. 2016). Since 2014, European Union member states, have to adhere to the European Marine Spatial Planning Directive, transposing MSP principles and goals into national law and thus putting it on the political agenda (European Commission, 2014). MSP aims to manage human activity at sea, which becomes increasingly complex due to the rising interest in marine space. In the case of OWF development, this interest in marine space is highly politicized due to the translation of climate ambitions to high OWF targets. As a result, the OWF sector has become powerful and hard to balance with other maritime uses in MSP (Spijkerboer et al. 2020). Literature indicates that the mentioned incompatibilities between researchers and policy makers are particularly apparent in MSP. For example, in goals (Keijser et al. 2020), in the conflicting understanding of concepts and language between parties (Paez et al. 2020), and the limited understanding of the biophysical system (Gazzola et al. 2015; Paramana et al. 2021). Additionally, there are indications that various characteristics of MSP can exacerbate differences between policy-making and research. For example, Kusters et al (2023) indicate that the mentioned political pressure leads to a short-term focus in policy, which can increase incompatibilities in timeframes. Gusatu et al (2021) demonstrate limited knowledge bases of the North-Sea's biophysical system and limited understanding of cumulative effects, which can affect the value of data and the (non)use of knowledge. Spijkerboer et al. (2020) show how limited experience with MSP and integrated policy-making also leads to fragmentation in policy, which can influence what constitutes a problem, or how questions are asked. This fragmentation may imply selective and partial knowledge-uptake based on sectoral interests. Therefore, these characteristics of MSP combined with high OWF targets may exacerbate the possible incompatibilities between research and policy-making, increasing risks to knowledge-uptake in MSP.

3. Methods

This study employs a qualitative case study, using 4 methods of data collection to triangulate and verify findings on the effect of incompatibilities between systems of research and policy-making on knowledge-uptake in Dutch MSP. The study focuses on the case of the Dutch part of the North-Sea since it has a comparatively long marine spatial planning tradition since 2004 and is one of the busiest sea-areas in the world. Furthermore, it is subject to various large ecological research programs to improve understanding of the influence of OWF on marine ecology, and relatively detailed MSP (Ministry of Infrastructure and Water management et al, 2021; Ministry of economic affairs, 2015; Overlegorgaan Fysieke Leefomgeving 2020). As such, there is a large amount of new knowledge to potentially take up in Dutch MSP policy. Additionally, the aggravating characteristics of high political pressure for OWF development, limited space, policy fragmentation, and short-term focus are present in the Dutch context (Spijkerboer et al. 2020; Kusters et al, 2023; Gusatu et al, 2021). As such, the case of Dutch MSP is particularly suitable for considering the risk of potential incompatibilities between research and policy-making on knowledge-uptake and the aggravation of these risks in MSP.

Data collection and analysis in this study consisted of 4 steps: (1) Official documents concerning Dutch MSP and related knowledge programs in the last decade were selected from public websites and analysed to gain insight in recognized knowledge (gaps) and risks to its uptake; (2) observation of consortium meetings (n=5) and focus groups (n=2) regarding knowledge use in Dutch OWF development; (3) Based on findings from observations and document research, in-depth interviews were held with scientists (n=13) ranging from hydrologist to marine governance experts, and policy-makers (n=7) from different public sectors relevant for MSP; (4) Transcripts and policy documents were analysed in Atlas ti, based on coding guides developed with insights from the theoretical framework, and findings from observations and interviews with researchers and policy-makers. Outcomes were validated with participants, and full anonymity was guaranteed.

4. Results and Discussion

Findings from the analysis of documents and participant's experiences demonstrate that the incompatibilities between research and policy-making can constitute risks for knowledge-uptake in MSP, see table 2. From table 2, four patterns emerge which demonstrate the effect of incompatibilities between systems of research and policy-making on knowledge-uptake in Dutch MSP and how some of these effects can be exacerbated by characteristics of MSP.

The first pattern shows that risks for knowledge-uptake arise from the manner in which uncertainty is dealt with in decision-making in MSP. This risk stems from the different attitudes on uncertainty between

policy-makers and researchers. Researchers want uncertainty to be admitted, see figure 1. However, due to this uncertainty, policy-makers lack the certainty needed for legitimate political arguments, or do not have the capacity to develop fitting policy-measures in the light of this uncertainty and thus decide to shroud uncertainties, see table 2. Secondly, uncertainties in knowledge may cause policy-makers to ignore it completely. Thirdly, the thinking gap between researchers and policy-makers may cause misunderstanding concerning the level of certainty, potentially increasing the inclusion of uncertain knowledge. The inclusion of uncertain knowledge, lack of transparency of the degree of uncertainty, and the exclusion of other uncertain knowledge diminishing the quality and completeness of knowledge taken up, and thus constitutes a risk to knowledge-uptake. Additionally, this characteristic increases differences in timeframes since scientists need more time to find certain answers due to a lack of existing knowledge. Finally, the high amount of uncertainty also influences the other patterns as explained below. As mentioned by Kusters et al (2023), apart from a risk for knowledge-uptake, this constitutes a strategic deficit in policy, since shrouded uncertainty in decisions made today can lead to long-term problems in the socio-ecological system.

A second pattern is how a risk to knowledge-uptake arises from the marginalization of knowledge, with certain knowledge being actively excluded from policy. As can be seen in table 2, such marginalization partially results from the legal constraints on the formulation of questions. As mentioned, certain levels of uncertainty can cause knowledge to be marginalized. Findings show instances where knowledge which contradicts political interests may be dismissed through wishful thinking, e.g., despite research indicating the devastating effect of mixing water layers which can be a result of OWF development, this is limitedly considered in policy documents. The focus on legally relevant and 'fitting' knowledge also results in an underuse of other types of knowledge and a simplistic framing of what constitutes a problem in MSP. Additionally, policy-makers indicate that they lack the time and expertise to process often complex research reports, causing them to selectively include knowledge with political and legal relevance. E.g., knowledge concerning protected species like birds, seals, and porpoises was included, while unprotected species were largely left out (Ministry of Economic Affairs, 2015; Ministry of Agriculture Nature and Food-quality and Ministry of Infrastructure and Water Management, 2022; Odinga et al. 2021). This marginalization also demonstrates that despite the appreciation of fundamental data in MSP, the incompatibilities in data valuation between research and policy are so persistent that this appreciation only has effect when backed up in legal obligations. Subsequently, this pattern limits the objectivity and thus quality of knowledge uptake.

A third pattern shows how a lack of trust between researchers and policy-makers can form a risk for knowledge-uptake. As indicated strong relations improve knowledge uptake. According to participants, a lack of trust could lead to the stagnation of interaction, diminishing relations, and thus knowledge uptake. Moreover, it can cause individuals or organisations to purposefully ignore the knowledge needs of other groups. Table 2 demonstrates that policy-makers may no longer trust researchers to come with timely and clear answers to their questions (focus), resulting in the marginalization of knowledge and researchers losing trust in policy-makers. This is also visible in how answers to scientific and societal questions are used in systems of science and policy-making. Examples from the analysis demonstrate that policy-makers want scientists to focus on policy-relevant knowledge like protected species, but in some cases receive little useful information and very limited updates, which diminishes trust in research organizations.

Finally, differences in understanding, interpretation and valuation of knowledge also create a pattern of risk for knowledge-uptake. This is related to the topics 'focus', 'answers', and 'power uses' in table 2. These differences can constitute a risk for knowledge-uptake when the same knowledge is interpreted in a different way by scientists and policy-makers, causing policy to be based on potentially faulty assumptions. An example is that policy-makers can be more positive about the effect of OWFs on native benthic communities than indicated by scientists due to a lack of understanding of the ecological system and the particularities of species. This can cause researchers and policy-makers to assume entirely different characteristics about the North-Sea, causing misunderstandings to seep into processes of knowledge uptake which constitutes a serious risk for its quality.

A couple of the risks we find are in line with other research regarding threats for knowledge uptake (Bocher and Krott, 2016). However, in the case of uncertainty we see a specific link between characteristics of MSP and increased risk for knowledge-uptake. Additionally in table 2 we see how the characteristics of MSP exacerbate other risks for knowledge uptakes discussed above. Examples of such characteristics are high political pressure, limited understanding of the North-Sea, short-term tendencies in MSP, the fragmentation of policy, and limited cumulative knowledge of the North-Sea's biophysical-system. Despite the challenges MSP poses, it may also have certain benefits. For example, fundamental understanding being included in policy goals has a

balancing effect on the valuation of data and problem definitions by researchers and policymakers. We see evidence that researchers and policy makers come closer together in some cases, see table 2. Regardless of some of the characteristics of MSP helping to bridge the science-policy interface, the fundamental incompatibilities between research and policy-making are severe to a degree where the risk for knowledge-uptake persists.

Table 2: Findings Concerning the Risk of Potential Incompatibilities for Knowledge-Uptake Between Researchers and Policy-Makers in MSP and the Implications of the MSP Context on These Incompatibilities

Topic	Findings
Timeframe	The high political priority of OWF development demands quick results and thus limits the available time for research. Conversely, limited knowledge of the North-Sea increases the required time to find acceptable levels of certainty in research. As such, the timeframes of researchers and policy-makers are pushed further apart resulting in policy based on incomplete and uncertain knowledge.
Focus	MSP and the understanding of the North-Sea's biophysical system are in their infancy, increasing the pressure for their development. Analysis demonstrates that the rapid development anthropogenic use of the North-Sea incurs changes in the system, complicating the development of system-understanding by scientists. Conflicting goals between systems of research and policy-making lead to a lack of trust and differences in the understanding, valuation, and interpretation of knowledge.
Value of data	The need to balance accumulated data in MSP leads to better understanding of multidisciplinary insights among stakeholders. Since fundamental understanding is more often included in political goals, differences in data valuation are reduced. This incentivizes trust and direct contact. However, the fragmentation of policy makes it hard to include complex data from various fields.
Questions	Due to the array of interests, disciplines, and sectors involved, there are more questions relevant for policy-making. Therefore, the amount of relevant knowledge can surpass the capacity of policy-makers to take up knowledge, particularly since the fragmentation of policy-process reduces experience with multi-disciplinary knowledge. This increases the workload for policy-makers.
Answers	The long operation time of OWFs (30-40 years) limits the reversibility of decisions. This increases the need to convince parties about OWF goals in the policy arena, which often creates a short-term window of opportunity. Thus, increasing the gap with long-term research interests. Additionally, scientists prefer to publish results instead of presenting them in panels or discussions, limiting direct connections to policy makers.
Attitude on wishful thinking	The high uncertainty in MSP encourages wishful thinking. Especially the short-term policy focus, desired in OWF targets leads to the dismissal of long-term negative effects. Wishful thinking often ignores contradictory evidence and uncertainties, possibly leading to the marginalization of knowledge, more decision-making under uncertainty, and diminishing the trust of researchers in the policy-process.
Rely on	The lack of knowledge about the North-Sea increases uncertainty. The development of OWFs therefore relies on persuasion and agreement. Similar, to wishful thinking, this reliance on persuasion may limit the inclusion of contradictory evidence and thus cause marginalization of knowledge, decision-making under uncertainty, and distrust.
Power use	Policy-makers indicate that in MSP their focus lies on high priority political goals, which are mostly short-term. This is partially due to the limited capacity to take up knowledge. This leaves less time to consider the fundamental understanding of the North-Sea, increasing the differences in understanding, interpretation and valuation between researchers and policy-makers.
Use of knowledge	The thorough use of accumulated, multidisciplinary, and complex knowledge fits with the research system and is necessary for decision-making in MSP. The inclusion of this knowledge use legal requirements should lead to more thorough use of knowledge by policy-makers. However, in practice this only occurs in particular topics with high political priority. As such this difference can lead to the marginalization of knowledge.

Topic	Findings
Attitude on uncertainty	The many different sectoral and disciplinary interests vying for limited space led to a rise in relevant factors for policy-making in MSP. This complicates predictions and increases uncertainties. As such, it becomes increasingly important to admit uncertainties but these uncertainties are pushed aside by high political pressures. This causes a rise in the level of decision-making under uncertainty.
What constitutes a problem	The fragmentation in MSP policy and other parties involved in MSP limits the joint formulation of problems. While the inclusion of fundamental understanding in policy-goals does bring researchers and policy-makers closer together in formulating problems, these goals are often still restricted to legally protected species, causing the marginalisation of knowledge.

5. Conclusions

This paper reinforces the initial insights by Paez et al (2020) and Keijser et al (2020) on how knowledge-uptake within MSP faces important risks due to incompatibilities between research and policy-making. It furthers these insights, in showing why and how such incompatibilities are expressed in the context of MSP. Notably, the need for timely, clear and policy-relevant information as desired by policy-makers cannot reasonably be expected from researchers in the dynamic and understudied context of OWF and MSP. The result is a mismatch and a – sometimes-purposeful – underutilization of available knowledge. This conclusion emphasizes a need for direct efforts to improve understanding and acknowledgement of the differences between scientists and policy-makers to improve knowledge-uptake in MSP. Apart from a risk to knowledge-uptake, the incompatibilities found between research and policy-making lead to patterns that hinder knowledge-uptake. However, as mentioned in MSP literature they also constitute a strategic deficit in policy which needs to be overcome. This conclusion also points to the necessity of investments in a better science-policy interface within MSP to diminish the identified risks to knowledge-uptake, notably regarding the ecological impact of a swift roll-out of OWFs. Central in such attempts should be attention for how policies may better anticipate and handle uncertainties and how a bias to legally relevant information can be avoided. Likely, such attempts will require investments in a) the collaboration between policy-makers and researchers in developing knowledge sharing, and practical decision support tools, b) the interfaces where knowledge needs are matched with both existing research activities and forms of reporting, and c) the increased awareness of how differences between researchers and policy makers may influence knowledge sharing to develop a better understanding of the situation partners find themselves in.

References

- Böcher, M. and Krott, M. (2016) *Science makes the world go round: Successful scientific knowledge transfer for the environment*, Springer International Publishing, New York.
- Böcher, M., & Krott, M. (2014) "The RIU model as an analytical framework for scientific knowledge transfer: the case of the decision support system forest and climate change", *Biodiversity and Conservation*, Vol 23. pp 3641-3656.
- Ehler, C.N. (2018) "Marine spatial planning: an idea whose time has come" *Offshore Energy Marine Spatial Planning*, Routledge, Oxon, pp 6–17.
- Christensen, J. (2021) "Expert knowledge and policymaking: a multi-disciplinary research agenda" *Policy & Politics*, Vol 49, No 3. pp 455-471.
- Cormier, R. Kannen, A. Austen, M. and Therriault, T. (2016) Cooperative Research Report 333: Multidisciplinary perspectives in the use (and misuse) of science and scientific advice in marine spatial planning. Copenhagen, International Council for the Exploration of the Sea.
- Derksen, W. (2014) *Kennis en beleid verbinden*, Boom Lemma, Den Haag.
- Dutch National Scientific Agenda. (2020) 'The impact plan approach', Available at: <https://www.Dutch Research Council.nl/impact-plan-benadering> (Accessed: 16/12/2022).
- Dutch Research Council. (2020) Effects of windfarms on the marine ecosystem, and implications for governance. available at: <https://www.Dutch Research Council.nl/en/projects/nwa123618001>. (Accessed: 01/11/2022).
- European Commission. (2022) REPowerEU: Joint European action for more affordable, secure and sustainable energy. Available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1511. (Accessed: 22/01/2023).
- European Commission., (2014). Directive of the European parliament and council establishing a framework for marine spatial planning (Marine spatial planning directive). European Commission. Directive 2014/89/EU, OJ L 257/135
- Gazzola, P. Roe, M. and Cowie, P. (2015) "Marine spatial planning and terrestrial spatial planning: reflecting on new agendas", *Environment and Planning C: Government and Policy*, Vol 33, No 5. pp. 1156–1172.
- Gusatu, L. Menegon, S. Depellegrin, D. Zuidema, C. Faaij, A.P.C. and Yamu, C. (2021) "Spatial and temporal analysis of cumulative environmental effects of offshore wind farms in the North Sea basin". *Scientific Reports*. Vol 11.

- ulme, M. (2009) Why we disagree about climate change: Understanding controversy, inaction and opportunity. Cambridge. Cambridge University Press.
- Janssen, S. Mol, A. Van Tatenhove, J. and Otter, H. (2014) "The role of knowledge in greening flood protection. Lessons from the Dutch case study future Afsluitdijk". *Ocean & Coastal Management*, Vol 95. pp. 219-232.
- Keijser, X. Toonen, H. and van Tatenhove, J. (2020) "a "learning paradox" in maritime spatial planning". *Maritime Studies*, Vol, 19 No, 3. pp. 333–346.
- Kidd, S. Calado, H. Gee, K. Gilek, M. and Saunders, F. (2020) "Marine Spatial Planning and sustainability: Examining the roles of integration-Scale, policies, stakeholders and knowledge". *Ocean & Coastal Management*, Vol 191, pp 105182.
- Kusters, J. E. H., van Kann, F. M. G., & Zuidema, C. (2023) Exploring agenda-setting of offshore energy innovations: Niche-regime interactions in Dutch Marine Spatial Planning processes. *Environmental Innovation and Societal Transitions*, Vol. 47, pp. 100705.
- Ministry of economic affairs. (2015). Uitvoeringsregeling Wet windenergie op zee. nr. WJZ/15083277. Available at: <https://wetten.overheid.nl/BWBR0036786/2017-04-01#SlotformulierEnOndertekening> (accessed: 19/02/2023).
- Ministry of Infrastructure and Water management, Ministry of economic affairs, Ministry of agriculture, nature, and food quality, and Ministry of internal affairs. (2021) Marien strategie voor het Nederlandse deel van de Noordzee 2022-2027. *Programma Noordzee: 2022-2027*. The Hague.
- Netherlands enterprise agency. (2021) Offshore wind energy 2040: developing approach and routemap. available at: <https://offshorewind.Netherlands enterprise agency.nl/file/download/57655be3-22f0-49cc-a01c> (Accessed: 24/02/2023).
- Noordzeeloket. (2016) Wind Op Zee Ecologisch Programma. Available at: <https://www.noordzeeloket.nl/functiesgebruik/windenergie/ecologie/wind-zee-ecologisch-programma-wozep/>. (Accessed: 01/09/2022).
- Noordzeeloket. (2021) Kader Ecologie en Cumulatie. Available at: <https://www.noordzeeloket.nl/functiesgebruik/windenergie/ecologie/cumulatie/kader-ecologie/>. (Accessed: 23/11/2022).
- Odinga, J. Barbe, D. van Mastrigt, A. Berg, and J. Mulder, S. (2021) "WOZEP midterm evaluation", Royal Haskoning DHV, Amersfoort.
- Oliver, K. Lorenc, T. and Innvær, S. (2014) "New directions in evidence-based policy research: a critical analysis of the literature". *Health research policy and systems*, Vol 12 No1. Pp. 1-11.
- Overlegorgaan Fysieke Leefomgeving. (2020) Het akkoord voor de Noordzee. Den Haag. Available at: <https://www.overlegorgaanfysiekeleefomgeving.nl/actuele+projecten/actuele+projecten+overzicht/noordzeeoverleg/doc>
- umenten+noordzeeakkoord/handlerdownloadfiles.ashx?idnv=1901025. (Accessed: 03/11/2022)
- Páez, D. P. Bojórquez-Tapia, L. A. Ramos, G. C. D. & Chavero, E. L. (2020) "Understanding translation: Co-production of knowledge in marine spatial planning". *Ocean & Coastal Management*, Vol 190. Pp 105163.
- Rekola, A. and Paloniemi, R. (2022) "Politics of knowledge use: epistemic governance in marine spatial planning", *Journal of Environmental Policy & Planning*, Vol 24, No 6. pp 807-821.
- Rijksoverheid. (2022) Kabinet verdubbelt productie windenergie op zee. Available at: <https://www.rijksoverheid.nl/actueel/nieuws/2022/03/18/kabinet-verdubbelt-productie-windenergie-op-zee>. (Accessed: 20/02/2023).
- Spaapen, J. And Van Drooge, L. (2011) "Introducing 'productive interactions' in social impact assessment". *Research evaluation*, Vol 20, No. 3. pp 211-218.
- Spijkerboer, R. Zuidema, C, Buscher. and Arts, J. (2020) "The performance of marine spatial planning in coordinating offshore wind energy with other sea-uses: The case of the Dutch North Sea". *Marine Policy*. Elsevier Ltd, Vol 115, pp. 103860
- Trouillet, B. and Said, A. (2019,) "Towards Deep Knowledge: A critical assessment of fisheries knowledge used in marine spatial planning". MARE Conference Masterdam, Netherlands, July.
- WindEurope. (2021) "2050 vision", Available at: <https://windeurope.org/about-wind/reports/our-energy-our-future/> (Accessed: 10/05/2023)