

Translating participation principles into participatory practice in the Belgian blue innovation landscape

G. Couvreur · E. Vazquez  · C. Koedooder · I. Withouck · V. Cauberghe · S. Vandamme · L. I. Devriese

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Abstract

In today's research and innovation landscape, international frameworks such as the United Nations and the European Union promote stakeholder participation as a cornerstone of a sustainable development. While these policies highlight the need for structured approaches, empirical evidence on best practices remains limited, and concrete methodologies are scarce. This challenge is particularly relevant in the Belgian Blue Economy, where competing activities must share a confined marine space, creating pressure for processes that can mitigate conflict and enhance sustainability. This study examines participation processes within initiatives operating in the Belgian part of the North Sea and coastal area, using a mixed-method design combining a landscape analysis of 60 projects with semi-structured interviews ($n = 16$) from 14 shortlisted cases. Findings reveal uneven participation levels with higher involvement in projects where participation is required by design or rooted in local communities, and weaker in market-driven or privately led Blue Economy initiatives. Interviews highlight barriers to implementing participatory approaches and include resource constraints (budget, time, staff), lack of preparatory steps, and compressed timelines. Identified best practices include early stakeholder mapping, bilateral consultations, and scenario thinking are identified as best practices to support alignment and adaptive design, alongside systematic documentation, monitoring-, and evaluation strategies to enhance transparency and engagement. These insights underscore the need for policy frameworks and funding programs to embed participation criteria, allocate resources for facilitation and capacity building, and institutionalise iterative monitoring to strengthen stakeholder participation under practical constraints.

Keywords Blue economy · Stakeholder participation · Stakeholder participation framework · Blue innovation

1 Introduction

In recent decades, the acceleration of a sustainable Blue Economy has continued to build momentum, encompassing a diverse range of maritime activities that harness the economic potential of available ocean resources and their ecosystem functioning [1, 2]. Fundamentally rooted within the principles of ecologically sustainable

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development [3–5], the concept was incorporated in the United Nations (UN) 2030 Agenda for Sustainable Development where its sustainable transition corresponds to several of the 17 Sustainable Development Goals (SDGs). Most notably, it relates to SDG 14 which aims to ‘conserve and sustainably use the oceans, seas and marine resources for sustainable development’ [1, 6]. In the European Union (EU), the active pursuit of a sustainable Blue Economy is primarily reflected in its Sustainable Blue Economy Strategy (COM/2021/0240) which aligns its marine activities with the goals of the UN 2030 Agenda and contributes to the ambitions the European Green Deal (COM/2019/0640). This EU ambition is further articulated through recent initiatives such as the EU Ocean Pact (COM/2025/281). At regional level, Belgium has also formalised its approach to stakeholder participation, formally anchored in the Decree on Local Government (Title 6; 01/01/2019, Vlaamse Overheid), which requires each municipality to establish internal rules to shape the local participation policy. Together, these policy developments are expected to further increase the demand for participatory approaches in sustainable and innovation projects. More broadly, they reaffirm the central role of participation in achieving the ambitions of the sustainable Blue Economy, the European Green Deal, and policy instruments such as SDG 14 and Marine Spatial Plan (MSP) [7].

Balancing economic development with the sustainable use and conservation of resources remains a major challenge [1–3]. The large diversity of continuously evolving sectors that make up the Blue Economy must collectively interact and compete for limiting resources and space. The wide range of economic activities and the influence they have to society and on the marine environment can quickly result in conflicting interests in how ocean resources should be used or valued [5, 8]. Negotiation between sectors is central to avoid opposition and conflict when coordinating the allocation of resources and space to different activities, as is the case in the development of a MSP. Stakeholder participation hereby plays a central role in resolving these conflicts by promoting dialogue, sharing knowledge, fostering mutual understanding, and identifying potential solutions [9].

Stakeholder participation has become a cornerstone of sustainability and innovation governance [10–14] and plays an essential role in determining the success and legitimacy of an initiative [4, 15, 16]. When effectively implemented, participation improves decision quality and legitimacy by incorporating diverse perspectives and context-specific knowledge [10, 16–20], provided that processes remain transparent and accountable [21, 22]. Beyond these instrumental benefits, participation fosters inclusivity and builds trust with local and regional communities [10, 16–18], strengthens legal compliance, raises awareness (e.g., ocean literacy), enables capacity building, clarifies stakeholder interests, perceptions and expectations, and promotes social learning to build collective understanding and cooperation [11]. However, if not carefully managed, participation processes risk falling into forms of co-optation, disempowerment, or tokenism, which can inadvertently reinforce existing inequalities [3, 23, 24]. Recognising these limitations helps ensure that a participation trajectory remains genuine rather than merely symbolic. Together, these rationales underscore the normative and pragmatic value of stakeholder participation and justify the need for structured approaches to design and evaluation [16].

In this paper, stakeholder participation is defined as an iterative, evidence-informed process of meaningfully involving individuals, groups, or organisations that affect or are affected by decisions, with the aims of co-producing knowledge, deliberating options, and shaping outcomes under conditions of inclusion, equity, transparency, and accountability [9, 10, 20, 25]. Stakeholder hereby refer to any individual, group, or organisation that affect or is affected, directly or indirectly, by an initiative’s decisions, actions, or outcomes; including those with interests in or have influence over these outcomes [26–29].

To be effective, the concept of stakeholder participation must be translated into practice [23, 30], resulting in a rising need for coherent user-driven participation frameworks. However, there is still limited empirical evidence when engaging with stakeholders that can associate the participation quality and quantity present within an initiative and its overall impact [31–34]. This evidence gap results in ambiguity over what constitutes an “adequate” participation trajectory, including who should be involved, how actively, and with what degree of decision authority. As a result, the implementation of a participation trajectory often diverges markedly across projects [21]. Causing further confusion, initiatives may interchangeably utilise the term stakeholder participation with

public participation (for a review see van Hee et al. [35]), the latter focusing on the involvement of the broader public rather than organised stakeholder representation. While the public can also be considered a stakeholder in a broad sense; this study adopts a narrower, project-oriented interpretation of stakeholders as actors with a defined role, interest, or capacity to influence decision-making within specific Blue Economy initiatives. This distinction reflects the empirical focus on participation embedded in project governance and management structures, rather than a normative exclusion of public involvement [31, 36]. In this study, the effectiveness of stakeholder participation is not assessed against externally defined outcome metrics (e.g. policy impacts or behavioural change) but is understood in relational and procedural terms. Based on how organisers and experts involved in participatory processes evaluate the functionality and perceived quality of engagement trajectories; such as their ability to structure dialogue, manage expectations, align interests, and support informed decision-making.

To better situate the empirical analysis, the following introductory sections draw on selected insights from the stakeholder participation literature; providing a framework for understanding the conditions under which participation succeeds or falters. These guiding principles are especially pertinent in contexts like the Belgian part of the North Sea (BNS) and its coastal area, where diverse activities must coexist within a constrained marine space. This conceptual grounding supports the later examination of participation dynamics in the context of Belgian blue innovation processes (see Sect. 1.3).

1.1 Foundations for participation: stakeholder identification and mapping

Improving participation quality requires an explicit understanding of the stakeholder landscape, including the identification of individuals, groups, and organisations; their potential interactions and how these stakeholders are affected by or affect outcomes to formulate a customised engagement plan [20, 37]. Ensuring representation of all relevant stakeholders is pivotal, since participant selection shapes both process and results of stakeholder participation [29]. Additionally, interests and motivations can vary substantially within a stakeholder group, influenced by factors such as the geographical scale of decisions and resource availability [29]. To support transparency and adaptivity, many guides recommend compiling and maintaining a stakeholder repository across the project lifecycle to track changes in roles, interests, and availability [26, 27]. A coherent scope for identification includes distinguishing between different societal sectors such as: research, industry, governance, and the public (e.g., the often-used quadruple-helix theory) [27].

A range of stakeholder identification and mapping approaches are commonly used. For instance, in marine spatial planning practice, Quesada-Silva et al. [11] summarise six widely cited methods offering concise rationales for when each is informative (for other comprehensive reviews on stakeholder typology see [10, 38]). Power-interest grids [39] assist in prioritising participatory strategies, where stakeholders are grouped according to a matrix, dividing stakeholders into four quadrants according to two dimensions that represent two predetermined attributes (e.g. expertise, influence) [10, 25, 26, 40]. Other matrix-based approaches, such as potential-influence, commitment, and impact indices; extend prioritisation by incorporating capacity, predictability, and salience dynamics [41–44]. Nonetheless, it is important to note that these approaches may under-represent highly affected stakeholders with low formal power.

To address such blind spots, models such as Mitchel et al. [45] stakeholder salience model categorises stakeholders based on three dynamic attributes: power, legitimacy, and urgency; arguing that managerial attention should reflect not only influence but also normative and temporal considerations. This framework helps anticipate emerging stakeholders (e.g., urgent claimants) and encourages reflexivity about who is deemed “legitimate,” which is critical for equity and procedural justice. However, because these attributes are socially constructed, uncritical application can reproduce asymmetries. To address relational complexity, social network analysis [46] maps formal and informal ties to reveal central actors and brokers, which is critical for understanding influence beyond hierarchy. Empirical studies suggest that combining salience-based prioritisation with participatory validation improves representation and reduces conflict risks in multi-actor governance [11, 16, 47].

These mapping exercises can help reveal potential imbalances, such as the absence or presence of few stakeholders in a specific quadrant. Mapping exercises of stakeholder attributes hereby help visualise how representative participants are engaged with and whether a sufficient selection of stakeholders has been made. Characterisation and mapping typically assess attributes such as interest, technical expertise, influence/power, and resources [40, 48–50]; differentiating stakeholders for tailored engagement [19]. When selecting stakeholders, the organising entity determines which of their attributes such as expertise [26] (skills, knowledge, experience) and potential influence [27, 48] (formal or relational) help determine stakeholder roles, while tools such as SNA refine this judgement by mapping relationships [49, 50]. Beyond power and expertise, stakeholder analysis is concerned with the implementation chain and with identifying gaps in participation, so that strategies include those most affected by decisions, not only those with formal influence or technical knowledge [19, 51].

Because influence is multidimensional and socially constructed, typologies often distinguish coercive, legitimate, induced, and competent power [52]. Analytical categorisation performed solely by the organising entity can become a “top-down” exercise with risks of mis-specifying attributes for particular contexts [16]. Complementary “top-down” approaches such as bilateral exploration meetings and expert interviews can help validate assumptions, build trustful relationships and produce richer, triangulated stakeholder understandings [10, 16, 29]. While ideally all identified stakeholders would participate, practical constraints mean that participation focuses on a smaller core group, and the list evolves iteratively as projects progress [53]. Gap analysis can further identify missing voices and ensure inclusion of highly affected stakeholders [54].

In practical terms, identification and mapping are not merely technical diagnostics, they shape who is at the table, which modalities are selected, and what counts as evidence, with direct implications for equity, legitimacy, and effectiveness [16]. Bringing these strands together, systematic (matrices, SNA), participatory validation, and gap analysis, creates a more robust basis for engagement planning and evaluation in complex Blue Economy settings where stakes, values, and power relations are diverse and dynamic.

1.2 Stakeholder participation approaches: methods, levels, and challenges

Stakeholder participation is widely recognised as a structured process through which relevant actors (i.e., industry, government, research, and civil society) are informed, consulted, or involved in shaping decisions and implementation [16, 55, 56]. Foundational debates about participation have long centred on questions of influence and power, most notably articulated in Arnstein’s [56] “Ladder of Citizen Participation,” which conceptualises participation as a continuum from nonparticipation to citizen power. This model remains influential for highlighting how different forms of participation redistribute influence among actors.

The assumption that higher participation levels are always preferable has, nonetheless, been put into question. In practice, the extent of engagement must fit objectives, constraints, and stakeholder capacities [57–59]. Participation is increasingly understood as dynamic and context-dependent rather than linear. Rowe and Frewer [60] distinguish interaction types based on the type of communication: one-way “communication” (inform), one-way “consultation” (gathering input), and two-way “participation” (dialogue/negotiation), mapping modalities to different process aims. Complementing these typologies, the International Association for Public Participation (IAP2 [55]) spectrum distinguishes inform, consult, involve, collaborate, and empower as pragmatic levels aligned to intended public influence [29, 55]. In practice, inform is one-way transparency (websites, newsletters, dashboards), consultation introduces feedback (surveys, hearings, comment periods, focus groups), involve sustains iterative participation (codesign workshops, bilateral meetings), collaborate/cocreate moves toward shared decision making (roundtables, living labs, citizen juries), and empower transfers authority (e.g., delegated powers) [16, 55, 56]. Effectiveness depends on context, capacity, sequencing, and the quality of facilitation [16, 55].

A recurrent critique is that labels can disguise tokenism when processes lack clear objectives, early involvement, skilled facilitation, feedback loops, and transparent articulation of how inputs affect outcomes [16, 55, 56, 61]. Attempts to “maximise” participation without fit to purpose can strain resources, raise unrealistic expectations, and amplify power imbalances [57, 58]. The design of participation must therefore begin with a contextual

assessment, including organisational motivations, stakeholder interests, and relevant external influences (policy drivers, socio political sensitivities, legacies of past initiatives) [62–64]. Representativeness is key as unidentified stakeholders may surface later, potentially disrupting or negatively impacting the project. Fit to context selection should therefore combine stakeholder mapping while acknowledging power, knowledge, interests, and influence, alongside attention to inclusion and potential exclusion [16, 60, 61, 65]. Designing appropriate participation starts with clear objectives and boundaries [16, 66]. Once objectives are articulated, methods should be tailored to the decision context and type of engagement sought [56–58, 60, 67]. The IAP2 [55] spectrum provides a common language for aligning modalities and intended influence, while sector-specific frameworks such as the Stakeholder Participation Assessment Framework (SPAF) in marine/coastal planning offer criteria for inclusiveness, transparency, costs, and perceived consequences [11].

Literature highlights practical enablers, particularly skilled facilitation and capacity building, as critical for effective implementation. Skilled facilitation helps manage diverse perspectives, balance power dynamics, support dialogue and enforce norms of interaction [14, 29]. Capacity building complements this by equipping facilitators with technical and social competencies to guide discussions, resolve conflicts, and build trust; key factors for empowerment and sustained engagement [29]. These insights align with empirical findings showing that facilitation and capacity development are among the most significant enablers of effective participatory implementation [16, 58]. Integrating these practical considerations alongside design frameworks ensures stakeholder participation moves from concept to credible, context-sensitive action.

1.3 Belgian blue innovation case: the complexity of the blue economy ecosystem

Stakeholder participation is central to Blue Economy initiatives that integrate diverse and often conflicting activities and objectives, as exemplified in the BNS [68]. With its 67 km of coastline and sea surface of 3454 km², it encompasses a diverse range of maritime sectors that must coexist within a limited and often contested space [7, 68–71]. With the acceleration of the Belgian Blue Economy in recent years, the competing demand for space in the BNS has continued to grow in order to accommodate emerging sectors (e.g. offshore renewable energy, aquaculture) with the already present traditional sectors (e.g. fisheries, shipping, sand extraction) [68, 69]. The relevance of stakeholder participation in the densely used BNS was recognised early on during the establishment of Belgium's marine spatial plan, formalised through successive Royal Decrees (FOD, 2014, Royal Decree of 8 November 2023 [72]), designed to prevent conflict and overlap amongst the diverse Blue Economy sectors while aligning with the national objectives of the European Green Deal and specifically aligned with requirements of the Marine Strategy Framework Directive (MSFD, 2008/56/EC). In Belgium, the MSFD has been implemented with stakeholder input to integrate environmental objectives with multiple Blue Economy activities, supported by formal advisory bodies and iterative consultations [73, 74]. For instance, Belgium's MSP processes included extensive bilateral meetings and sectoral consultations, public consultations as well as a six-month period of continuous interviews to gather spatial data and stakeholder expectations [14, 72]. This approach also supports the implementation of the MSFD in Belgium, where stakeholder participation has helped integrate environmental objectives with the diverse activities of the Blue Economy. This strong participatory tradition is also reflected under the EU Water Framework Directive (WFD, 2000/60/EC) where Belgium consistently ranks high in the provision of information and proactive involvement of stakeholders [71]. While the government has been a forerunner in stakeholder participation for the development of MSP and the implementation of the environmental directives, the Belgian blue innovation landscape extends beyond this framework. In this manuscript, we focus on participation processes carried out within this broader landscape, in close collaboration with actors from the Blue Economy.

The literature underscores that stakeholder participation is context-dependent, shaped by design choices, facilitation, and capacity building. Yet empirical evidence on how these principles translate into practice remains uneven, particularly in marine and coastal governance. To address this gap, this study examines stakeholder participation within the Belgian blue innovation context, asking: (i) How is participation currently implemented

across funded projects? (ii) What factors enable or constrain effective participation? A two-step approach is adopted: first, a landscape analysis of initiatives and their participation levels; second, semi-structured interviews with coordinators of selected projects where participation appeared effective. This mixed-method design links observed patterns to experiential insights, providing evidence-informed lessons for designing credible, context-sensitive participation processes.

2 Methods

A mixed method approach using data triangulation [75] was adopted to address the research questions combining (i) a landscape analysis of participatory initiatives in the BNS and its coastal area and (ii) semi-structured expert interviews to capture experiential insights from practitioners.

2.1 Landscape analysis

2.1.1 Sample and materials

A systematic approach was adopted to assess the degree of stakeholder participation in the Blue Economy of the BNS. To achieve this, a comprehensive data matrix was developed to consolidate initiatives including research and innovation projects relevant to coastal and marine activities in the region. The pool of projects was established through a structured screening of Blue Economy research and innovation initiatives in the BNS, the initial dataset was obtained from the Compendium for Coast and Sea—Knowledge Guide Coast and Sea 2022 [76]. This was complemented by a desktop review of multiple project databases, including ‘Projectendatabank’ (Provincie West-Vlaanderen), the Community Research and Development Information Service (CORDIS), Interreg 2 Seas Approved Projects, the Interreg North Sea Region Project Database, ‘MOW Vlaanderen—Havenprojecten’, and Cordis Europa. Expert input was subsequently incorporated from the Policy and Innovation Department of the Flanders Marine Institute (VLIZ), the Province of West-Flanders, and the BLUE BALANCE Consortium. Eligible initiatives were identified based on five criteria: (i) launched from 2015 onward, (ii) government-funded or private projects with participatory trajectories, (iii) geographic link to the Flemish coastal zone (binary coding YES/NO) which comprises ten coastal municipalities and nine hinterland municipalities [76], (iv) explicit sustainability objectives, and (v) multi-stakeholder methodology. A total of 141 initiatives were included in the stakeholder participation matrix following the application of the selection criteria (cf. Supplementary Table 2). These comprised 104 projects (74%), 19 stakeholder platforms (13%), 13 organisations (9%), and 5 events (4%).

2.1.2 Procedure

The matrix was organised into four categories (projects, stakeholder platforms, organisations, events). Screening applied the five inclusion criteria above. Participation level and contextual attributes were coded for each initiative. To evaluate the relevance and usability of the entries, projects were assessed against two criteria: (i) its sustainability objectives, as defined by the 2020 EU Taxonomy Regulation (EU/2020/852) and (ii) its participation level, using the participation spectrum presented by the IAP2 [55]; where stakeholder participation was coded from informing (1, when is considered one-way communication), consult (2, two-way communication obtaining feedback), involve (3, two-way communication but involving stakeholders throughout the process to ensure concerns are considered), and collaborate/empower (4, deliberate communication with active decision-making from different stakeholders). Participation coding was conducted by the authors, where ambiguous cases were jointly reviewed by the authors and resolved through discussion until consensus was reached. Projects were retained if they contained a clear sustainability objective and demonstrated a high level of participation from stakeholders ("co-create" and "collaborate"). To determine participation levels, the requirements specified in the

original project calls and tenders were first examined, with particular attention to stated expectations regarding stakeholder engagement. Subsequently, all available documentation related to participatory processes within the identified projects and initiatives was systematically reviewed. This assessment was validated through consultation with the project coordinator or the individual responsible for the participation process. Participation levels were classified based on implemented practices rather than stated intentions in project documentation. For instance, in some cases, activities described as co-creation were, upon verification, more accurately characterised as collaboration or consultation.

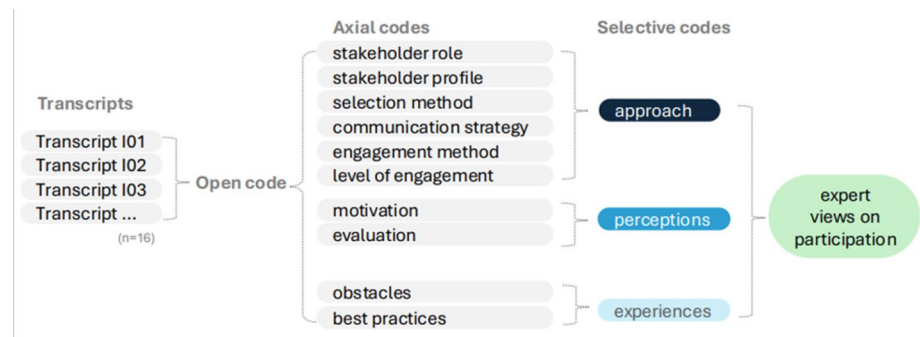
2.2 Expert interviews

2.2.1 Sample and materials

Insights and experiences with participation trajectories in Blue Economy initiatives were gathered through expert interviews [32]. The stakeholders were operationalised as organised actors involved in, or formally engaged by, Blue Economy initiatives, such as public authorities, industry representatives and research organisations with identifiable roles within project governance or implementation structures. The interviews capture the perspectives of organisers and experts responsible for designing or coordinating participatory processes, rather than those of participating stakeholders themselves. Interviewees were selected from the pool of projects retained if they contained a clear sustainability objective and demonstrated a high level of participation from stakeholders ("co-create" and "collaborate"). This filtering criteria resulted in a final short-list of 14 projects. Two target groups of experts were defined, (i) experts that can share operational knowledge and (ii) experts that can contribute to contextual knowledge about participative processes in the BNS [77]. Operational knowledge refers to the provision of experience-based expertise in the day-to-day functioning of participative processes, while contextual knowledge refers to a broad systematic understanding of the overarching landscape in which a participatory process is taking place [78]. Operational knowledge was collected by contacting the coordinators of 14 selected blue innovation projects for an interview (Supplementary Table 1). Additional contextual knowledge was obtained from selected individuals that were invited and could provide an outlook on future needs of participatory processes for sustainability transitions in the BNS. When interviewed experts recommended the inclusion of these experts, the initial purposive sampling [77] was combined with snowball sampling [79]. Contextual knowledge was subsequently obtained from invited individuals ($n = 2$) that could provide an outlook on future needs of participatory processes for sustainability transitions in the BNS. In total, 16 experts were interviewed to gain an understanding of practices and needs related to participatory processes in Belgian Blue Economy projects: 7 came from policy, 5 from research, and 4 from industry. While the number of industry experts was small, this reflects the current situation in the BNS, where industry-led initiatives rarely include participatory processes beyond informing stakeholders.

2.2.2 Procedure

Semi-structured interviews using an interview guide were used to capture the different insights into participatory trajectories of marine and coastal projects in the BNS (Supplementary Note 1). As opposed to questionnaires, semi-structured interviews are not limited to a fixed list of questions and can be used to gain a more in-depth understanding of motivations and attitudes. Experts were invited for an interview between the 2nd of October 2023 and the 30th of November 2023 and lasted approximately 1 h. After informed consent (following the General Data Protection Regulation, GDPR) the respondent's personal information was collected, processed, and managed. All interviews were anonymised (I01–I016) and transcribed by the authors. The data collected through the interviews was analysed using a qualitative analytical approach³⁶. Transcripts underwent a three-stage coding approach (open, axial and selective codes) based on Grounded Theory analysis as proposed by Corbin and Strauss [80] (cf. Fig. 1). Briefly, transcripts were broken down into open codes and clustered into coherent categories of axial coding, and selective coding to assign a central role to one or several categories (Supplementary Note 2).

Fig. 1 Coding approach of the transcripts

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Table 1 Distribution of stakeholder participation levels across thematic clusters of the blue innovation initiatives

Thematic cluster	Participation level					
	No participation	Inform	Consult	Involve	Collaborate	Co-creation
Environmental quality & ecosystem services	5	8	2	6	2	2
Renewable energy	1	0	4	3	0	3
Blue food	6	0	4	2	0	2
Climate change adaptation	6	2	6	1	2	5
Sustainable port and transportation	4	0	2	1	2	1
Tourism	2	4	1	1	0	0
Blue valley	1	5	2	1	1	0
Literacy & citizen science	0	2	1	7	1	2
Spatial planning and policy	1	0	12	6	2	6
Human health	0	0	0	0	1	0

3 Results

3.1 Belgian blue economy participatory landscape

Across thematic clusters, the distribution of participation levels in initiatives (Table 1) showed that “no participation” ($n = 26$) and the lower-participation categories “inform” ($n = 21$) and “consult” ($n = 34$) together accounted for more than half of all observations, whereas higher-participation categories (“involve”, $n = 28$; “collaborate”, $n = 11$; and “co-creation”, $n = 21$) represented 43% of the observations. High-participation shares varied substantially per thematic cluster: the clusters “literacy & citizen science” (77%), “renewable energy” (55%), and “spatial planning & policy” (52%) exhibited the highest proportions of “involve/collaborate/co-creation,” whereas “tourism” (13%), “blue valley” (20%), and “blue food” (29%) were comparatively underrepresented. These patterns indicate that participation practice is uneven across thematic domains. To assess whether these distributions reflect a more than random variation, chi-square tests of independence were conducted. Chi-square tests indicated moderate, significant associations between thematic cluster and participation ($X^2 = 89.72$, $df = 45$, $p < 0.001$). Together, these deviations reflect systematic differences in how participation is operationalised across clusters (Table 1).

Funding and administrative levels displayed variation in the distribution of participation types (cf. Fig. 2). These associations are based on the dominant participation mode documented for each initiative and are intended to illustrate broad patterns rather than discrete or fixed engagement trajectories. Local public authorities, particularly city and provincial administrations, were frequently associated with higher-participation modes such as “involve,” “collaborate,” and “co-creation,” although sample sizes were small. Among regional and national instruments, Flanders-funded projects exhibited a broad spread across participation categories, including several

Fig. 2 Participation level distribution across administrative and funding categories

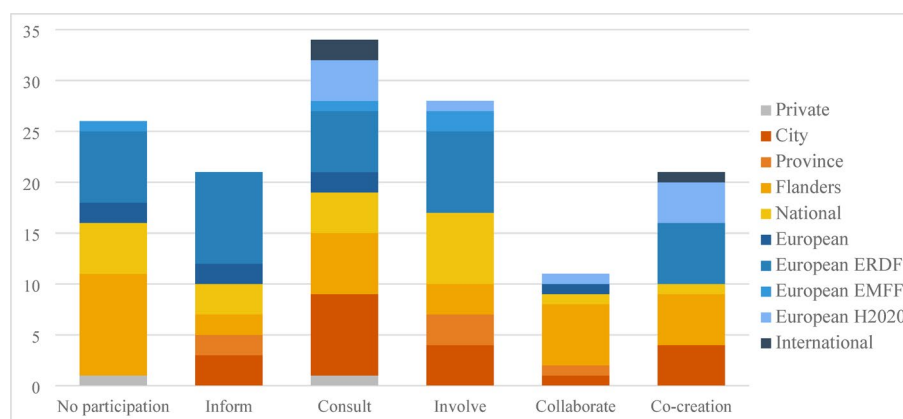


Table 2 Interview-derived factors influencing stakeholder participation: frequency by group

SH group	Policy (n = 7)	Research (n = 5)	Industry (n = 4)	Total iterations (n = 16)
Lack of knowledge	3	1	2	6
High costs	3	2	1	6
Timeframe	2	1	0	3
Facilitator	4	2	2	8
Technical expertise	1	2	3	6
Bilateral exploration	2	1	2	5
Process reports	1	1	2	4
Scenario thinking	4	1	2	7
Limit of online meetings	1	3	0	4
Communication plan	3	1	2	6

Factors reflect recurring themes identified through interview coding and may function as barriers or enablers depending on context and implementation

examples of collaborative and co-creative approaches, while nationally funded projects appeared more evenly distributed across lower and higher participation levels. European research programmes, most notably EU H2020, were strongly represented in the higher-participation categories, with several instances of co-creation and involvement, whereas EU ERDF and EU EMFF projects tended to combine informational, consultative, and involvement-based activities. Private initiatives in this sample were limited in number and appeared exclusively in the lower-participation categories. Overall, the distribution suggests that administratively anchored local projects and research-oriented European programmes are more frequently associated with intensive forms of engagement, whereas other funding streams show more mixed or predominantly consultative patterns. Chi-square tests indicated significant associations between administrative funding source and participation ($X^2 = 60.70$, $df = 45$, $p = 0.048$).

3.2 Identified barriers and best practices

To provide additional nuance to the stakeholder participation landscape, semi-structured interviews were conducted with stakeholders involved in coastal and marine initiatives. Interview data were analysed using open and axial coding, through which recurring themes related to participation challenges, enabling conditions, and design choices were identified. These themes are referred to as “interview-derived factors” in the analysis and reflect how interviewees perceived elements that either constrained or supported participation in practice. Importantly, factors listed in Table 2 should not be interpreted as inherently positive or negative. Rather, they capture recurring topics raised by interviewees in response to questions concerning obstacles, perceived successes and shortcomings, and lessons learned from participation processes (see interview guide, Supplementary Note 1.a and 1.b). Depending on context and implementation, the same factor (e.g. timeframe, scenario thinking, or facilitation) was

described as either enabling or constraining participation later in this section. Table 2 summarises the distribution of reported factors by stakeholder group.

The most frequently mentioned factors were the presence of a facilitator ($n = 8$) and scenario thinking ($n = 7$), both associated with early phases of participation. Differences across stakeholder groups were observed, with policy actors emphasising facilitators and scenario thinking, while industry representatives highlighted technical expertise. Taken together, these patterns indicate that early-phase resourcing (i.e., lack of knowledge, high costs, timeframe, facilitator and technical expertise; representing the highest cumulative frequency, $n = 29$) and methodological support (i.e., bilateral exploration, process reports, scenario thinking, limit of online meetings, $n = 20$) are considered essential for successful participation, while later phases receive comparatively less attention in practice. A factor reported as important but reiterated to a lower extent compared to other factors was the communication planning ($n = 6$).

Specifically, several factors were identified as critical during the preparation phase (cf. Table 3 for overview). Namely, cost was framed broadly, encompassing financial (I09), time, and organisational effort. Organizational effort and mismatched capacities were highlighted: *Everyone is expected to give the same input, without considering the capabilities of individual stakeholders*” (I12). and *“Labor-intensive and time-consuming, especially considering that this is not the ‘core business’ of my duties”* (I16). Time and effort were repeatedly mentioned: *“[They would] take participation on top of their daily work or even on top of their regular job... We therefore need to take into account the possibilities and availability of this group if we want to achieve support from this group as well”* (I08). These constraints were particularly deterrent for small and medium-sized enterprises (SMEs) compared to larger players such as multi-nationals or government bodies: *“Participation creates a deterrent effect for some SMEs. Numerous meetings are set up, from which there are few tangible short-term benefits for commercial companies.”* (I12).

Timeframe pressures were reported across public and private contexts, often compressing preparation activities and prompting reliance on quick, less effective methods. (I03, I10, I11). This limitation was linked to project cycles (I04) and political mandates: *“Politicians embrace the participatory way of thinking until it is in executive phase. Then the realisation grows that it takes more time. They then become nervous and increase the pressure to deliver results. So, there is a clear conflict between the outcome of a participative process and the political mandate (I11).*

A lack of knowledge regarding stakeholder roles and expectations was frequently mentioned, creating uncertainty in early planning stages. High costs emerged as a significant barrier, not only in terms of financial resources but also in time and effort required for coordination. Interviewees emphasised that short project timeframes often constrained meaningful engagement, limiting opportunities for trust-building. Further, interviewees frequently described knowledge gaps on social innovation as a barrier to structuring participation, noting for instance *“no one has yet been trained in so-called ‘social engineering’”(I14)* or *“We lack the expertise within our department to manage such a participation project from A to Z”* (I11). Which in certain projects was reported to be addressed by externalising to professionals (I11). The presence of a skilled facilitator was considered essential for bridging gaps between diverse actors, while technical expertise was highlighted as a prerequisite for informed decision-making.

Cost barriers were often intertwined with knowledge gaps, particularly when organising entities lacked awareness that participation is inherently time-consuming and resource intensive. This disconnect frequently led to tension between long-term participation objectives and short-term project or political mandates (I11). Moreover, neutral facilitators were seen as essential for balancing interests and reducing bias, though their appointment was often constrained by financial limitations. Namely, interviewees facilitation consistently characterised as a stabilising function during preparation, despite its resource intensity. Interviewees (I01, I03, I08, I09, I10, I11, I13, I16) mentioned that such a role greatly reduces the workload of the organising entity and ensures progress by handling meeting preparations, drafting reports, managing communication, and, where necessary, conducting meetings to develop the evaluation framework: *“We did not want to act as a facilitator because for some sensitive issues it is better to appoint a neutral actor. This is a lesson we have learned over time, sometimes it has*

Table 3 Overarching barriers and corresponding best practices identified in Belgian blue innovation initiatives

Barriers	Lack of knowledge	Limited expertise or experience in participatory design and social innovation within the organising entity, leading to ad-hoc approaches, unclear objectives, and reliance on existing networks
	High implementation costs	The inherent cost of implementing a participatory process in terms of personnel, time, and finances (etc.) for both the organising entity and the invited participants, creating disincentives for higher intensity participation
	Stakeholder identification	Often conducted in an unstructured approach, relying on existing networks or snowballing techniques. Incorporating structured stakeholder involvement can help prevent unintended disempowerment and should be addressed in the design of the engagement plan
	Conflicting timeframes	The mismatch between the short-term cycles of the organising entity and the longitudinal and iterative process for meaningful engagement. E.g., Where actors holding political mandates are tied to specific terms and face pressure to deliver results quickly or companies seek a swift return on investment, intensifying pressure to deliver promptly Resulting in a participation trajectory operating under a compressed preparation
	Best practices and tools	Bilateral exploration meetings
		One-on-one meetings between the organising entity and individual partners prior to the implementation of the initiative with the purpose clarifying expectations, limitations, capabilities, and ambitions. As well as refining stakeholder selection and engagement planning. This process also revealed to be useful as intermediate check-ins
		Process report with evaluation criteria
		Living documentation framework collecting decisions, assumptions, objectives and measurable evaluation criteria (e.g. check list) to support transparency, shared understanding and help assess the progress of the implemented participatory process
		Evidenced-based scenario thinking (feasibility study)
		Clear articulation of these conditions can influence stakeholder willingness and motivation to participate
		Scenario thinking encourages exploration of plausible alternatives that help stakeholders consider trade-offs, risks, and opportunities while ensuring each viewpoint is valued, especially in the presence of conflicting interest and expectations
		Translation of stakeholder expectations into plausible scenarios and assessment of feasibility using agreed criteria scientific evidence and the capabilities of the initiative. Useful for alignment where interests diverge, providing common understanding and mutual agreement
	Neutral facilitator or moderator	An independent actor who keeps the participatory process balanced, reduces power imbalances, manages communication, structures meetings and keeps track of the progress. This will also reduce the workload for the stakeholders involved as a facilitator alleviates burden on preparations for meetings and events, drafts report and manages communication
	Technical expertise	Incorporating technical expertise within the stakeholder network to strengthen evidence-based decision-making, which will enhance the internal and external credibility of the decision-making process
	Tailor-made engagement plan	Tailored communication and engagement strategy that takes the needs and interest of the stakeholders' group, translating this into adapted communication products to maximise the reach and impact of the initiative
	Limit online meetings	Online formats implemented for lower levels of participation (e.g., informing). Prioritising in-person meetings for higher levels of participation (involvement, collaboration and co-creation) to maintain balanced dialogue and reduce dominance risks

to be a third party that organises the process.” (I11). Moreover, bilateral exploration was viewed as a valuable approach for fostering mutual understanding before formal participation. Interviewees emphasised its role as an effective mechanism for understanding stakeholders' expectations and capabilities (I01, I05, I10, I12, I13): “By bilaterally identifying the needs and aspirations of our involved stakeholders, we were able to identify a lot of ‘low hanging fruit’ that benefited us throughout the process” (I05). These meetings were also seen as critical for inclusion and depth: “Bilateral exploration and consultation make all involved stakeholder feel more included and heard. It also provides an opportunity to explain a perspective or alternative in depth and ensure a deeper

understanding of plans and ambitions” (I10). Although considered time and labour intensive, bilateral consultations were described as indispensable for aligning expectations and capabilities, not only at the start of the process but also as intermediate check-ins to gather feedback and evaluate satisfaction throughout the process.

Scenario thinking emerged as a key method for co-creation and decision-making (I02, I06, I09, I10, I11, I14, I15), particularly for complex projects. In a participatory process, stakeholders from diverse fields often have conflicting interests and expectations, making alignment challenging, especially for long-term or complex projects as is often the case in the BNS (I14). Interviewees further described its role in building consensus: *“We decided to start a co-creative process in which all stakeholders were involved and in which all their alternatives were evaluated based on thorough research. As a result, far fewer scenarios remained in the further rollout and there was consensus on these as well”* (I10). Scenario thinking was identified as a useful tool for anticipating future challenges and aligning expectations, whereas absence of a clear reference framework was perceived as a barrier, as stakeholders lacked common ground for discussions.

Technical expertise was considered integral to this participatory process, ensuring that scenarios were evidence-based and decisions grounded in scientific knowledge (I04, I07, I09, I12, I14, I16): *“There was a clear need for the inclusion of technical, scientific and substantiated knowledge within the consortium in order to acquire a more supported decision”* (I06). Due to the multi-disciplinary nature of the Belgian Blue Economy, the presence of sufficient expertise within an initiative can help ensure that scenario-thinking is evidence-based and that decisions are grounded in scientific and technical knowledge (I09): *“We gathered a group of stakeholders based on experience and expertise. Given the complex subject matter, this was most appropriate in order to arrive at evidence-based alternatives that are effectively rooted in social realities and science”* (I09). The inclusion of these participatory approaches is also expected to enhance the project's credibility both internally and externally.

Another identified best practice, was the creation of a written process report with evaluation criteria (I05, I07, I09, I10, I13). Interviewees emphasised that documentation of the participation trajectory enables transparency and accountability when communicating with stakeholders. This written report captures each partner's ambitions and capabilities presented from meetings and translates them into quantitative and qualitative evaluation criteria⁴. In turn, the resulting process report can guide discussions and help manage expectations: *“The reason for defining ambitions is to be able to assess the entire participation process against these defined checks. These can be transformed into evaluation criteria to which the alternatives for a complex problem developed within our project can then be evaluated throughout the project”* (I09). Others stressed the role of predefined ambitions and evaluation criteria: *“The reason for defining ambitions is to be able to assess the entire participation process against these defined checks”* (I09). However, limited participation opportunities sometimes constrained evaluation planning: *“Evaluation was not planned because the engagement moments are already limited, and the scarce opportunities were used to further work on outcomes of the project”* (I10). Overall, documentation was considered essential for maintaining clarity and accountability throughout the trajectory.

The use of stakeholder mapping theory^{40–42} to build a tailor-made communication plan was recognised as a best practice that considers stakeholder attributes to strengthen its participatory trajectory (I02, I04, I07, I13, I14, I15). Interviewees emphasised that each stakeholder has their own unique needs and interests, requiring an adaptive approach opposed to a one-size-fits-all strategy. A flexible and tailored communication plan groups stakeholders according to the most relevant participation approach based on a stakeholder assessment: *“The communications we drafted during our process were really tailored to the type of stakeholder group and the type of engagement partner. There were several separate types of communication products each time with a customised tone of voice to demonstrate the specific urgency”* (I13). This adaptive approach was seen as critical for sustaining engagement and ensuring that communication strategies reflect the diversity of stakeholder roles and expectations.

Finally, reliance on online meetings was widely regarded as limiting for interactive participation (I04, I05, I06, I08). They were considered unsuitable for dialogue and consensus-building: *“We deliberately avoided online meeting methods as there is always a certain group of stakeholders more present and dominant there. As a moderator, it is very difficult to keep the balance* (I05).” Interviewees recommended physical roundtable discussions

or workshops for active participation, reserving online meetings for broad updates or non-participatory levels of involvement (I04, I05, I06, I08).

4 Discussion

Stakeholder participation is increasingly recognised as vital for cross sectoral collaboration in sustainability and innovation initiatives [81]. In the present study, focusing on Belgian Blue Economy initiatives, the landscape analysis shows that participation intensity varies substantially across thematic domains and funding instruments. Using the IAP2 participation spectrum [55] as an analytical framework, higher-participation modes (“involve”, “collaborate”, and “co-creation”) were more frequently observed in clusters such as spatial planning and policy, as well as literacy and citizen science projects. These associations are consistent with findings from the MSP and stakeholder engagement literature, these domains are characterised by high interdependence, uncertainty, and legitimacy requirements. In such contexts, deliberation, co-production, or iterative justification are often integral conditions, making collaborative participation formats more suitable than information-based approaches alone [14, 29]. By contrast, initiatives in sectors such as tourism and blue food, were more commonly characterised by the lower-participation IAP2 categories of “inform/consult”. These observed associations may reflect sector-specific pressures reported by the interviewees, including shorter return on investment horizons, supply chain sensitivities, or confidentiality constraints that limit more intensive engagement formats [16, 29]. Similarly, differences across funding and administrative arrangements observed in this study indicate an association between participation practices and institutional context. Competitive research and innovation programmes (e.g., EU H2020 or Horizon Europe) were more frequently associated with higher participation levels. This observation is consistent with programme requirements that explicitly emphasise participation and impact pathways in their design. Locally anchored projects, in contrast, were described as benefiting from proximity, lower transaction costs, and shorter feedback loops, facilitating more iterative forms of engagement [14, 29].

Importantly, when interpreting visible forms of participation (such as public facing literacy events) should not be mistaken for genuine multi stakeholder depth [16, 55]. In the current study, interview findings highlight structural boundary conditions: short timeframes, staff turnover, and political or resource-driven pressures compress preparation and push organisers toward lighter, less effective participation approaches. The policy environment further complicates participation efforts. While recent EU recommendations and national rules have raised expectations for participation, implementation remains constrained by factors such as cross-sector coordination, resource limits, and shifting priorities. Similar constraints have been reported in MSP and related governance contexts [12, 14]. In practice, achieving a balance between innovation goals and the sustainable use and conservation of available resources is constrained by boundary conditions attached to most initiatives. In the present study, most of the participation trajectories identified occur within government funded contexts (national/EU) characterised by strict timeframes and frequent staff shifts.

4.1 Barriers hindering implementation of participation trajectories

Across the initiatives examined, four overarching barriers consistently constrained the depth and quality of stakeholder participation: lack of expertise, high implementation costs, stakeholder identification and conflicting timeframes (cf. Table 3). Together, these factors created structural hurdles that forced organisers into simplified or truncated participation processes. The lack of expertise in participatory design meant that many organising entities relied on ad-hoc methods such as existing networks or snowballing, which the literature warns can reinforce bias and exclude critical voices [16, 82]. Interviewees described uncertainty around how to scope participation trajectories, identify relevant actors, or translate objectives into tailored modalities, issues well-documented as drivers of tokenistic or low-impact participation [16, 29].

Another barrier identified across interviews concerned the early implementation of stakeholder identification and mapping. Despite being emphasised in the literature as a foundational step for inclusive and effective engagement [16, 29, 82], interviewees noted that this phase was often rushed, ad hoc, or constrained by limited resources. These shortcomings resulted in incomplete or unbalanced stakeholder lists, reinforcing many of the structural challenges observed in the Belgian context. Further challenging the effectiveness of stakeholder participation. Moreover, as these assessments reflect organiser perspectives, it cannot be excluded that omissions in stakeholder mapping remained unrecognised, despite deliberate efforts to mitigate such biases, particularly for indirect, less visible, or weakly organised actors.

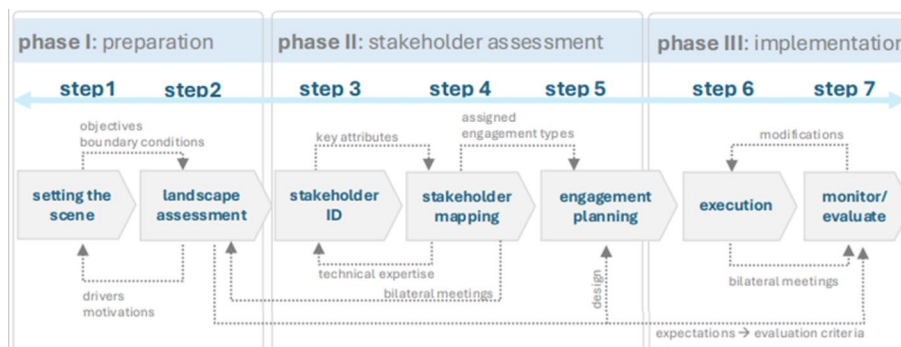
High implementation costs further reinforced these challenges. Participation requires considerable investments in resources including staff time, coordination effort, and financial resources for both organisers and participants. Interviewees highlighted that these costs escalate with higher participation intensity, with SMEs in particular struggling to allocate personnel or attend repeated meetings, reflecting broader concerns about uneven capacity and participation fatigue [14, 58]. Finally, interviewees repeatedly highlighted conflicting timeframes: political cycles, funding deadlines, and return-on-investment pressures push projects toward rapid deliverables. In contrast, meaningful stakeholder involvement requires iterative preparation, deliberation, and feedback [16, 83, 84]. Such temporal misalignment has been noted across marine and coastal governance as a key cause of underdeveloped or rushed participation [12, 16]. Collectively, these barriers often led to a “one-size-fits-all” approach that compromised representativeness, reduced inclusiveness, and limited opportunities for higher-participation IAP2 approaches such as collaboration and co-creation.

4.2 Best practices strengthening participation trajectories.

Despite the above-mentioned structural barriers, interviewees consistently identified a set of practices they associated with higher-quality participation quality when implemented deliberately (cf. Table 3). Bilateral exploration meetings were highlighted as particularly valuable for creating shared understanding early in the process. Interviewees described bilateral meetings as valuable for surfacing expectations, identifying sensitivities, clarifying motivations, and preventing misalignment; functions well supported in the literature emphasising early involvement as a determinant of trust and credibility [16, 29]. They were described by interviewees as a bottom-up validation mechanism, ensuring that participant lists do not rely exclusively on top-down assumptions. While such approaches offer important benefits, they are also more prone to bias, which can result in the exclusion of certain stakeholders [36]. To mitigate these risks, the literature emphasises that systematic stakeholder identification and classification are essential for inclusive and effective participation processes [82]. Insufficiently developed stakeholder involvement processes remain a major concern; in particular, the omission of stakeholder and institutional mappings during the initiation phase frequently resulted in imbalanced stakeholder groups [14, 29, 85].

A second enabling practice was evidence-based scenario thinking, which interviewees described as a powerful tool for aligning diverse interests in contexts where long-term impacts and trade-offs must be evaluated. Scenario analysis was described as supporting structured deliberation and helping to manage perceived conflict by translating stakeholder expectations into plausible alternatives and assessing feasibility using scientific evidence and agreed criteria; This findings are consistent with its established role in planning under uncertainty, where scenario thinking can facilitate the exploration of trade-offs and support informed decision-making [14, 16, 86]. Neutral facilitation emerged as a third cornerstone practice. Interviewees stressed that neutral facilitators reduce power imbalances, guide constructive dialogue, prepare meeting materials, and alleviate workload for project leads. Literature similarly identifies skilled facilitation as one of the strongest predictors of meaningful engagement, especially in heterogeneous multisector contexts [87, 88]. As stakeholders from diverse sectors in the blue economy often have differing interests and resources, interacting with a neutral actor was seen as reducing the risk of conflict. Investing or outsourcing the facilitation and capacity building, through training, mentorship, and co-facilitation, was described in the interviews as contributing to a more durable community of practice (i.e., building trust and bridging gaps). Participants further noted that these efforts can help maintain participation

Fig. 3 Stakeholder participation blueprint, compiled of 7 iterative stepping stones, to facilitate and guide participatory processes that can be taken up by sustainable blue innovation initiatives



quality over time and reduce stakeholder disengagement. These observations are consistent with previous studies emphasising the importance of skilled facilitation and capacity development for sustaining meaningful participation processes [14, 16, 29, 58, 87, 88]. The literature similarly emphasises that skilled facilitation is critical for managing diverse values, balancing power, and enforcing interaction norms [14, 29, 87, 88].

Finally, the use of process reports for clear documentation and monitoring (in the form of process reports, evaluation criteria, and feedback loops) was repeatedly linked to transparency, accountability, and adaptive course correction. These tools enable adjustments when stakeholder interests evolve and help consolidate lessons learned, thereby reducing barriers related to cost, time, and knowledge in future projects [15, 26, 27, 71, 89, 90]. In particular, monitoring strategies were described as important for identifying any (unintended) negative impacts that may occur during the participation trajectory such as a potential power imbalance or the dominance of a particular stakeholder. This finding aligns with the literature, which emphasises continuous monitoring and evaluation as important mechanisms for adapting participation trajectories and improving process outcomes over time such approaches [5, 11, 24, 54]. Nonetheless, despite its importance, interviewees noted evaluation processes are rarely established early.

To ensure adaptability, participation trajectories should remain flexible enough to accommodate evolving needs, such as involving additional stakeholders or adjusting engagement methods [11, 53]. Avoiding rigid structures and incorporating adaptive mechanisms allows context-related modifications during implementation. Translating the evaluated criteria into best practices and lessons learned further strengthens institutional memory, lowering barriers of cost, time, and knowledge for subsequent projects [15, 26, 27, 71, 89, 90]. These insights are summarised in Table 3, which provides a consolidated overview of these insights, intended as a preparatory tool for practitioners designing or refining participatory trajectories. Reported statistical relationships should be interpreted as associative patterns, with explanations informed by qualitative interview data rather than implying causality.

While these barriers and best practices are presented as practical enablers, it is important to note that the interview data reflect the perspectives of organisers and experts responsible for designing and coordinating participation processes. As such, the findings primarily capture how participation quality and effectiveness are interpreted from an organisational standpoint, rather than how participation was experienced by stakeholders themselves (e.g. affected communities, SMEs, or civil society actors). Stakeholder perceptions of inclusivity, influence, and outcome legitimacy may therefore differ from organiser assessments. This delineation is important for interpreting the findings, and future research would benefit from explicitly integrating participant-level perspectives to complement organiser-focused analyses.

4.3 Future participation design

Building on these findings from a blue innovation participation context, this section proposes a conceptual participation blueprint intended as a heuristic guiding framework rather than a tested or prescriptive model (Fig. 3). The

proposed blueprint synthesises recurring design conditions, barriers, and enabling practices identified across the landscape analysis and expert interviews. Its purpose is to provide an integrated and sequential overview of participation design considerations. The blueprint consists of four interconnected elements: (i) a preparatory phase (Phase I; steps 1, 2) in which the organising entity sets the scene (objectives, boundary conditions, resources) and conducts a landscape assessment, supported by early bilateral exploration and evidence-based scenario thinking, with all decisions captured in a living process report; (ii) a systematic stakeholder assessment (Phase II; steps 3–5) comprising stakeholder identification (e.g., quadruple helix), attribute-based mapping (e.g., technical expertise, potential influence, interest/resistance) and clustering to assign fit-for-purpose participation types (e.g. the IAP2 categories of inform, consult, involve, collaborate, or co-create) and a tailored communication strategy; and (iii) the implementation (Phase III; steps 6, 7) in which the engagement plan is executed with planned feedback moments, mid-course adjustments, and a monitoring–evaluation that feeds lessons learned back into the process report. As shown in Fig. 3, the blueprint is iterative and non-linear: steps inform each other, bilateral meetings may prompt revisions to scope, stakeholder selection, or evaluation criteria, and documentation maintains transparency and accountability throughout. Further, the blueprint emphasises the role of resourced, neutral facilitation and targeted capacity support (cross-cutting across phases) to structure participation, bridge knowledge gaps, and manage power asymmetries. While the individual elements of the blueprint (e.g. stakeholder mapping, facilitation, scenario thinking) are well established in the literature [11, 14, 16, 29], its contribution lies in their configuration, sequencing, and explicit integration within a single heuristic that is grounded in observed practices from a Blue Economy innovation setting. The current blueprint remains conceptual and requires testing in practice. As such, the blueprint should be understood as a heuristic device that supports reflexive design rather than a validated model. It has not been empirically tested as an intervention within this study and therefore requires further application and evaluation in practice. Nonetheless, the blueprint offers a structured starting point for practitioners seeking to reflect on or design participatory trajectories in research and innovation contexts, for example in the context of Horizon Europe projects or other R&I initiatives. Since the completion of our expert interviews, the European Commission has published two recommendations (EU 2024/736; EU 2024/774) emphasising the importance of stakeholder participation in accelerating and implementing innovative technologies to address societal challenges.

4.4 Conclusion

Stakeholder participation is increasingly recognised as critical to advancing sustainable initiatives through cross-sectoral and multi-level collaboration [81]. Collectively, the findings show that the depth and quality of stakeholder participation depend less on normative aspirations than on early preparation, clarity of scope, resource allocation, and the suitability of chosen methods. The Belgian context illustrates that even where policy expectations for participation are strong, engagement quality can be limited when preparation is rushed, when stakeholder mapping lacks structure, or when facilitation capacity is missing. While the analysis focuses on participation processes within Belgian initiatives, these dynamics unfold in a broader marine setting that is socially, economically, and institutionally interconnected with neighbouring North Sea jurisdictions. Transboundary and cross-cultural influences may therefore shape participation practices and expectations. Within this scope, the landscape assessment shows higher participation; as classified using the IAP2 [55] participation categories (“involve”, “collaborate”, and “co-creation”); in clusters with procedural mandates and proximity (e.g., spatial planning & policy; literacy & citizen science), while lower participation elsewhere is plausibly linked to compressed timelines, confidentiality pressures, and the absence of exogenous participation requirements [16, 29]. By demonstrating how these practical conditions shape implementation in a dense and multi-use marine setting, this study contributes empirical insight into how stakeholder participation principles translate into practice within the sustainable transition and blue innovation processes. Integrating the practices highlighted by interviewees (neutral facilitation, bilateral exploration meetings, evidence-based scenario thinking and process reports) offers a practical pathway to more inclusive and credible participation processes.

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Author contributions LD, SVD, and VC designed the study. GC conducted the interviews with SVD and analysed them with support from LD and IW. EV performed the literature review with input from CK and LD. EV carried out the data analysis and reporting. EV, CK, and GC drafted the manuscript, with feedback and revisions from LD.

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Data availability The complete interview data are not publicly available to protect participant anonymity, but de-identified materials may be made available from the corresponding author upon reasonable request, subject to institutional approval and participant consent.

Declarations

Ethics approval and consent to participate The study involved non-sensitive interviews and complied with institutional guidelines for research involving human participants as well as following GDPR guidelines. All participants were informed about the purpose of the study and provided informed consent to participate and for their data to be collected, processed, and used for research purposes.

Consent for publication All data are fully anonymized, and no identifiable information or attributable quotations are included in the manuscript. Consent for data to be collected, processed and used for the research was provided by all participants.

Clinical trial number Not applicable.

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Authors and Affiliations

G. Couvreur¹ · E. Vazquez¹  · C. Koedooder¹ · I. Withouck¹ · V. Cauberghe² · S. Vandamme³ · L. I. Devriese¹

✉ E. Vazquez
estefanya.vazquez@vliz.be

¹ VLIZ - Department Valorisation and Innovation, Flanders Marine Institute, InnovOcean Campus, Jacobsenstraat 1, 8400 Ostend, Belgium

² UGent - Department of Communication Sciences, Faculty of Political and Social Science, Ghent University, 9000 Gent, Belgium

³ UGent - Blue Growth Research Lab, Ghent University, Wetenschapspark 1, 8400 Bluebridge, Ostend, Belgium