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Stakeholder Analysis for Climate Change Adaptation: A Case Study from the Living Lab Schouwen-Duiveland, The Netherlands

Monika Suškevičs [1], Joost Swiers [2], Julia Prakofjewa [3], Renata Sõukand [3,*] and Baiba Prūse [4,*]

[1] Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Fr. R. Kreutzwaldi 5, 51006 Tartu, Estonia; monika.suskevics@emu.ee
[2] &flux B.V., Goudsesingel 66, 3011 KD Rotterdam, The Netherlands; joost_swiers@hotmail.com
[3] Biocultural Diversity Lab, Department of Environmental Sciences, Informatics & Statistics, Ca' Foscari University of Venice, Via Torino 155, Mestre, 30172 Venice, Italy; yuliya.prakofyeva@unive.it
[4] MaREI, The Research Ireland Centre for Energy, Climate, and Marine, Environmental Research Institute, University College Cork, P43 C573 Ringaskiddy, Cork, Ireland
* Correspondence: renata.soukand@unive.it (R.S.); bpruse@ucc.ie (B.P.)

Abstract

Extreme climate events like droughts and floods are creating urgent challenges for sectors such as Agriculture or water management. Effective adaptation requires stakeholder collaboration, supported by stakeholder analysis (SA) methods, which are still evolving in environmental management. We briefly reviewed examples of recent existing systematic evidence syntheses on SA across different domains. This highlighted several SA challenges, including the lack of transparent, common methods—particularly for climate-induced extreme events—and weak links between SA results and policy or practice. We then present a case study that illustrates these challenges and suggests ways to address them. Cooperating with a local network organisation, the Living Lab Schouwen-Duiveland (LAB), we conducted a case study on the island of Schouwen-Duiveland (NL), which is trying to adapt to drought. Applying a novel stakeholder analysis method, the "Rings of involvement", which enables the visualisation of stakeholders' levels of affectedness regarding the issue, we were able to identify and categorise the stakeholder network in a systematic manner. We identified stakeholder groups, such as "Implementers", who are not yet in the network but likely hold key practical knowledge to address local-regional climate adaptation. This calls for a better institutionalisation of and a more dynamic approach to SA in the local climate change adaptation practices. Based on our case study, we suggest that future studies could explore under which conditions a network organisation (such as the LAB) acts as a dynamic platform for facilitating stakeholder knowledge co-production.

Keywords: stakeholder analysis; climate change; drought; vulnerability; decision-support tool; living lab

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1. Introduction

Climate change increasingly brings about biophysical complexities, with climate extremes (e.g., droughts and floods) being among them [1]. Social complexity adds to this, with diverse stakeholders and their interests and perspectives associated. Stakeholder participation in environmental management is a widely acknowledged approach, for normative reasons (e.g., human rights), instrumental reasons (e.g., legitimacy of decision-making), and substantive reasons (e.g., knowledge co-production) [2,3]. The concept of

"stakeholders" originates from business administration [4] but has gradually been integrated into many fields, including environmental management [5,6], typically referring to individuals, groups, or organisations who are affected by or can affect a decision under question [3]. Related to the term, stakeholder analysis (SA) has emerged: denoting processes that identify stakeholders and prioritise these individuals and groups for involvement in the decision-making process [3]. SA is foremost a practical decision-support tool helping to manage participatory processes, but its background also includes a theoretical concept (stakeholder theory) [7,8], enabling one to understand the parties concerned by an environmental issue and the related decision-making processes.

SA methods have been adapted in the environmental management domain for some time [5,9,10] and have been applied in many empirical studies across several fields, foremost being nature conservation [11–13], but also in marine spatial planning [14], forest management [15], and waste management [16]. A few examples of SA applications for climate change adaptation [17,18] and extreme events management (e.g., flood risk management [19–21] and agricultural water management [22]) also exist. The studies identify key stakeholder groups and their perspectives, with policy implications, e.g., marginalised groups [21], deficiencies in agricultural water governance [22], or the need to target specific groups for awareness-raising [12]. SA applications at the local level indicate that SA is a useful tool for revealing conflicting relationships between key actors and managing them accordingly by promoting more fruitful collaborations [12,23]. This seems to be especially useful in managing situations such as extreme events, where impacts are often unpredictable, the potential for conflicting perspectives and preferences for management is high, and coordination between different sectors is urgently needed [17,18]. However, beyond the studies mentioned above, the applications of SA in climate adaptation and extreme events management are still rather rare.

SA methods can range from more "top-down" approaches, utilising foremost expert assessments, and "bottom-up" approaches, including stakeholders themselves in the SA process [3,24]. Both approaches have certain downsides, e.g., a top-down approach may miss local knowledge, and a bottom-up approach is often resource-demanding [24]. Yet, the bottom-up approach is increasingly highlighted as a more preferred one, as it enables the direct identification of the perspectives of the concerned parties, also paving a potentially smoother way for collaboration as stakeholders' concerns are being incorporated earlier on (ibid.).

Our study provides an empirical stakeholder analysis in a case study of managing droughts as an example of extreme events. We focus on the local level, as local actors are often excluded from developments that directly affect them, which creates power imbalances and marginalisation when compared to more influential stakeholders (e.g., private actors, governments) [25]. Our case concerns a stakeholder network on Schouwen-Duiveland (NL), which must cope with summer droughts. The network organisation "Living Lab Schouwen-Duiveland" aims to address the drought issue. We employ case study [26] and action research [27] principles, aiming to understand the stakeholder network and promote a focused stakeholder collaboration in a place-based approach, i.e., a long-term collaborative approach in one location [28]. The case area provides an interesting context, as the Netherlands has historically mostly dealt with superfluous water but does not have much experience with drought. We followed three steps—identifying, categorising, and interlinking stakeholders—of which the categorising step employed a novel approach ("Rings of involvement"). The term "stakeholder" here is understood as "any group or individual who can affect or is affected by a local climate change issue (in this case: drought) and the mitigation and adaptation strategies applied to it". We are aware of the recent debates on the stakeholder terminology (e.g., the implications of using the word "stakeholder" on

equity) [29]; however, it is still a widely used umbrella term, and we do not intend to lessen the importance of the groups we refer to when using it.

We aim to address two research gaps, which are often outlined in existing literature (see details in Section 2). First, we provide a worked example of SA in the context of extreme events management, where SA studies are rare, despite the growing relevance of this field because of the multiple risks, urgency, and wide range of stakeholders associated [1,20,23], which necessitates the need for real-life case studies that demonstrate the usefulness of SA for promoting collaborations. Second, our analysis contributes to insights into the stakeholder theory, which is developing in the environmental management field, with calls for methodological clarity and guidelines [6]. We contribute to the theory by focusing on the drought issue, where there is often a disconnect between top-down and bottom-up SA approaches [30,31], and by testing a novel stakeholder categorization method. In doing so, we acknowledge the typical limitations of case study research, for instance, their limited generalizability, replicability, and researcher bias or subjectivity [26]. However, we also applied several approaches that help to increase the validity of cases, notably methods' triangulation (interviews, written questionnaires, and workshops; Section 3), providing a detailed description of the results (Section 4), as well as a reflection on the limitations and benefits of the case (Section 5). The case aptly illustrates several of the key challenges of SA outlined in the recent literature; thus, we believe that the case study makes an important contribution to the empirical research on SA methods and may potentially inspire future studies and practical applications in the extreme events field.

The remainder of the manuscript is structured as follows. Section 2 provides a brief literature review, based on existing empirical studies on SA, but also meta-studies on SA from selected key domains that have applied SA, pointing out the knowledge gaps they identified. Section 3 introduces our case study, i.e., a stakeholder network dealing with drought on the island of Schouwen-Duiveland (NL). Then, in Section 4, we outline the main results of stakeholder analysis from the case. Section 5 elaborates on the significance of the findings and discusses its limitations, while Section 6 concludes with a summary outlook of the case study, giving recommendations for practice and future research.

2. Literature Review

2.1. Overview of Recent Reviews on SA

Stakeholder theory, as initially proposed in the business management literature [32,33] and related methods (stakeholder analysis and social network analysis), has benefited from several (systematic) reviews. Systematic evidence syntheses, such as systematic reviews or scoping reviews, represent robust, comprehensive, and transparent ways to summarise existing scientific knowledge, thus providing an important basis for empirical research as well as policy-making [34]. In the following, we give a brief overview of selected examples of such recent reviews across different domains (Table 1). We do not aim to comprehensively review all of them, but rather give examples to illustrate key discussion points, emerging topics, and research gaps. This would also help to set up a more systematic background for our case study.

Based on the example reviews (Table 1), SA has been applied in several domains, notably business administration, project planning, education, health policy, as well as environmental management. A common knowledge gap identified in the literature includes the limited linkage between SA research and relevant policy processes or real-world decision-making [8,35,36]. Methodological uncertainty, including the use of single methods (such as interviews only), is also referred to in several reviews [6,36,37]. Additionally, SA approaches have been criticised (see a more elaborated overview in Section 2.2) for being

overly static [6], and when they are poorly designed or fail to consider issue-specific contexts, they risk reinforcing existing power imbalances and marginalising certain groups [36].

2.2. Critique of SA

SA has long faced criticism regarding its conceptual and practical foundations. A central concern relates to the conceptual ambiguity of the term "stakeholder", which lacks a universally accepted definition and therefore complicates decisions about who should be included in an analysis [38]. This ambiguity is further compounded by the absence of transparent criteria for stakeholder prioritisation [39], often resulting in an overly broad and unmanageable set of identified actors [40]. Additionally, scholars have argued that SA is frequently employed in an instrumental manner—primarily as a tool for legitimising decisions rather than for genuinely informing and improving them—which can undermine its effectiveness and transformative potential [41].

More recent critiques extend these concerns by questioning the anthropocentric and present-focused assumptions embedded in traditional SA approaches. One challenge relates to the meaningful inclusion of stakeholders who cannot represent themselves, such as future generations [10]. Similarly, growing recognition of ecological interdependencies has led to calls for acknowledging non-human entities, including ecosystems, species, and other environmental actors, as legitimate stakeholders [42,43]. These debates highlight the need for expanded ethical and methodological frameworks that move beyond conventional human-centred decision-making.

Furthermore, critical scholars have emphasised that the terminology and framing associated with SA may inadvertently reproduce existing power hierarchies and marginalise diverse identities and perspectives [29]. By embedding assumptions about whose interests count and how they should be categorised, SA risks perpetuating inequities rather than challenging them. These critiques point to the need for more reflexive, inclusive, and ethically grounded approaches to SA that address these issues [6,10].

2.3. SA in the Environmental Management Domain

The environmental management domain started to acknowledge SA methods already from the 1990s [9]. However, more intensive method developments and methodological discussions commenced later, during the 2000s [3,5,44], with attempts to situate and adapt SA methods explicitly within the environmental management context. Indeed, especially recently, explicit challenges have been identified, such as how SA in environmental management differs from the traditional business-management-centred approach. A key point is the thought that the concept of stakeholders in environmental management is much broader (e.g., indirectly influenced parties, future generations, or even non-human entities), as are the related time and spatial boundaries (e.g., decades and generations) [6,10,29]. Thus, SA in environmental management needs a broader, issue-centric approach to acknowledge the complexity of environmental problems [10]. Also, a wide diversity of viewpoints on an environmental issue and power dynamics is often more complex and can make it difficult to categorise stakeholders based on traditional categorization methods used in business management (e.g., customer and manager) (ibid.).

Empirical research on SA emerges mostly during the 2000s onwards, with diverse fields being represented, ranging from protected area management [11,12,45,46], forest conservation [47], waste management [16], infrastructure project management [48,49], and city planning [50] to a few examples pertaining to SA in climate disasters' management, e.g., flooding or drought cases [17,18,20]. The studies applying SA in the extreme events domain point to the fact that SA reveals a wide range of different stakeholders who are affected by climate change extremes and suggest collaboration among them as one way

to manage (potential) conflicts over the use of resources (e.g., water) and managing the disaster situations [17,18]. Certain stakeholder groups (e.g., governmental stakeholders) are more active in climate adaptation, which leaves an untapped potential for other groups (e.g., NGOs, farmers) [20].

Table 1. Examples from recent systematic evidence syntheses on stakeholder analysis across six key domains that have applied SA.

Domain	Review Reference	Focus	Methodological Approach and Evidence Base (Database/Search Engine; Period; Final Included N of Studies)	Key Findings	Identified Knowledge Gaps Regarding SA
Business administration	Mahajan et al. (2023) [8]	Assess stakeholder theory (ST) in business ethics and organisational management	Systematic literature review: Scopus: searches up to 2021; N = 988 publications included	– ST established as a recognised theory in business ethics and organisational management Four major research streams identified: – ST and sustainability – ST and organisational performance – ST and strategic management – ST and stakeholder management	– Underexplored topics include the following (examples): sustainability (e.g., climate change, disaster response); organisational performance (e.g., role of SA in ESG); strategic stakeholder management (e.g., moral responsibility), and the role of virtual platforms in stakeholder engagement. – Call for studies that connect stakeholder theory with actionable public policy and governance frameworks.
Project management	Achterkamp & Vos (2008) [37]	How the stakeholder notion and SA methods are used and applied in project management literature	Literature search and meta-analysis within two project management journals: International Journal of Project Management (IJPM) and Project Management Journal (PMJ); 1995–2006 N = 42 articles included	– Project management literature does not profoundly conceptualise the stakeholder concept – The identification of stakeholders is not recognised as a significant issue in at least half of the analysed articles	– No clear definition of what constitutes a stakeholder. – Lack of methodological clarity in how stakeholders are identified.
Education	Syed et al. (2024) [35]	Discover interfaces between the concept of higher education institutions (HEIs) and stakeholder analysis	Bibliometric and content analysis: Scopus: last 25 years, 1996–2020; N = 469 publications included	Four topical clusters identified: – stakeholder engagement – stakeholder management – stakeholder relationship – stakeholder perspective	– Lack of studies assessing how diverse stakeholder groups influence and are influenced by HEIs. – Interests and conflicts among different stakeholder groups in higher education have not been explored. – More research is needed that connects academic insights with policy-making and institutional strategy.
Construction industry	Agyemang et al. (2025) [51]	Systematically review stakeholder and shareholder theories in construction studies	Systematic scoping review and thematic analysis: Scopus and Google Scholar, 2000–2024; N = 31 publications included	– 12 themes identified, e.g., stakeholder management, influence, collaboration, engagement, and salience	– Limited use of qualitative and mixed-method approaches. – Relative scarcity of research that is specifically concerned with productivity in the construction industry.
Health innovation	Franco-Trigo et al. (2020) [36]	To provide an overview of the use and reporting of stakeholder analyses in health innovation planning processes	Systematic scoping review: PubMed, Scopus, and DOAJ (+Google), searches up to 2017; N = 51 publications included	– Steps, methods, and attributes used in SA vary widely – 41 studies identified stakeholders, 50 categorised them, and 25 analysed stakeholder relationships	– Lack of common reporting standards of SA. – Few studies reflect the dynamic nature of stakeholder constellations and their interrelationships. – Only a few studies proposed future actions based on their SA findings.
Environmental management	Bendtsen et al. (2021) [6]	State of the art of SA within environmental management and regulation	Systematic literature review: Scopus and WoS: no time limits; N = 48 publications included	– SA is a versatile tool used in diverse contexts, from water management to biodiversity and climate policy – Common methods used included interviews and snowball sampling – SA focused mostly on analysing stakeholders' interests and influence	– Inclusion and representation gaps: marginalised groups are often overlooked; focus on interests and influence means that other dimensions like values, relationships, and temporal dynamics are less explored. – Transparency in terminology, methodology, and stakeholder selection is often lacking. – Lacking self-reflexivity by authors using SA approaches.

3. Materials and Methods

3.1. Case Study of Stakeholder Analysis of Drought on the Island of Schouwen-Duiveland

3.1.1. Case Study Area and Methodology

The study area encompasses Schouwen-Duiveland, an island in the Netherlands (Figure 1). Being an island, it is especially susceptible to the impacts of climate change, particularly drought [52,53]. As the drought in this study, we understand "water scarcity"—the term used by the Dutch Waterboard [54].

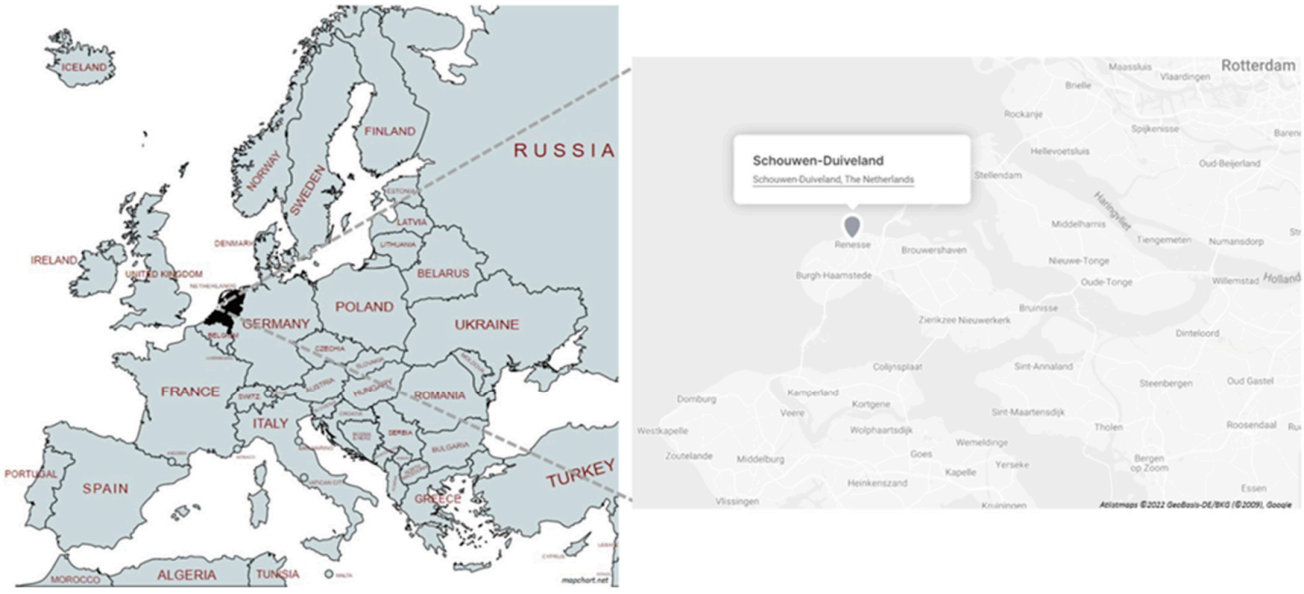

Figure 1. Location of Schouwen-Duiveland Island (NL). Created by the authors.

This region has experienced the effects of drought (e.g., water scarcity and salinization) over the past years. It is a small island that covers 22,965 km^2 and is surrounded by several water bodies: the North Sea, the Oosterschelde estuary, and the Grevelingen lake. Its economy is dominated by agriculture and tourism. Yearly rainfall in the Netherlands increased from 692 mm (1910) to 873 mm (2019) [55]. Due to significant variations in rainfall and evaporation across different seasons and years, the island experiences a surplus of fresh water in the winter but faces a shortage during the summer months [56]. Overall, summers see more extreme rainfall, causing soil degradation, while winters see more steady rainfall. This climatic trend will impact nature, as well as society [57]. Although winter days receive more steady rainfall, excess water is artificially discharged into the sea by pumps, lest the island become inundated, leading to soil erosion. As a result, the groundwater level in summer is lower than normal, and the land is more prone to drought. This means that various sectors' (e.g., Agriculture and Urban Use) need for fresh water is less prioritised, potentially leading to a disconnect from the water supply during a severe drought entirely.

We worked with the network organisation "Living Lab Schouwen-Duiveland" (hereafter: the LAB) [58]. In the Netherlands, Living Labs are an upcoming initiative in which citizens, knowledge institutions, companies, and governments jointly seek innovations for complex social issues, such as climate change and social inequity [59], which can be applied to various fields, e.g., the food sector [60,61].

We used case study methodology, which is a suitable and frequently used approach to study real-life phenomena in their contexts [26]. A case study is typically defined as an "empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context" (ibid. p. 15). In this article, the case is the exploration of stakeholders and their constellations (i.e., the phenomenon) around the drought issue

in a given location (i.e., Schouwen-Duiveland Island) and stakeholder network mediated by a living lab (i.e., the Schouwen-Duiveland LAB). It is a critical explorative single case study [26,62], aiming to provide a narrative of stakeholders, their stakes in the drought issue, and relationships between the stakeholders, as well as to reflect on the SA method. The critical case study type [62] also reflects the idea that the case was selected strategically to support the transferability of the results into other contexts. Case studies typically make use of various types of data collection (e.g., interviews) and analysis methods (e.g., qualitative textual content analysis) (ibid.). We also employed principles of action research, i.e., parallelly conducting research (studying the stakeholder networks) and facilitation discussion and actions (promoting place-based collaboration with the LAB) [27].

3.1.2. Data Collection

The research was carried out in several steps: (1) identify stakeholders affected by or affecting the local drought issue, consulting the LAB's network; (2) gather data from these stakeholders through a questionnaire and follow-up interview regarding the relation and contact identification towards the drought issue; and (3) attend a workshop with the core partners of the LAB to assess their views on the proposed stakeholder method. Per the express wishes of the LAB, we did not contact potential stakeholders from the Industry and Energy and Tourism and Recreation sectors, because at that time, only preliminary steps were taken by the LAB to integrate them into their network. The authors acknowledge this may have caused selection bias and network-based sampling. There are gaps in the data collection due to the specific focus on the LAB and their network, intending to obtain a fuller understanding of the drought impact; more research needs to be conducted (see recommendations below; Section 5, Discussion). Next, we briefly explain these steps.

Early Stakeholder Identification

The first step was to identify stakeholders on the LAB's website and retrieve contacts by speaking with the LAB's communication officer, who then shared an initial MS Excel file of all known stakeholders.

Survey Questionnaire

Second, following qualitative survey design principles [63], a questionnaire was created. Qualitative surveys aim to exploratively capture the diversity of viewpoints in a given population and in the context of the study object (ibid.). The questionnaire was forwarded by email to key partners and other contacts of the LAB (ultimately to 42 contacts), with approval from the LAB coordinator and with instructions. This approach was taken to provide stakeholders with an initial look at the questions and prepare properly before proceeding to the next phase (semi-structured interviews). Of the 42 contacts, 8 indicated they were not closely related to the drought issue, 3 expressed no interest in the research, and 5 did not respond. Ultimately, 24 completed questionnaires were received, representing a 57% response rate. The questionnaire (see Supplementary Materials) included five main topics: (a) respondent's function or role in addressing drought issues on Schouwen-Duiveland and outside Schouwen-Duiveland; (b) identification of contacts involved in drought-related work; (c) awareness of the LAB and other relevant organisations or individuals; (d) personal and organisational objectives and proposed strategies for addressing drought in Schouwen-Duiveland; and (e) an evaluation of current network effectiveness (as perceived by the respondent) and needs for improvement.

Interviews

As a way of validation, a set of follow-up semi-structured interviews was conducted where the previously sent survey questions were further elaborated, to discuss them in

more depth or to come to any potential new insights. The aim was also a chance to gain a more comprehensive picture and reach the maximum number of stakeholders, as several stakeholders had not responded to the survey call or had not completed all survey questions. In total, 15 of the 24 respondents who filled out the questionnaire participated in interviews conducted via phone or video call (Google Meet or Zoom). The interviews lasted on average 20–25 min, with durations ranging from 15 to 45 min. All interviews were audio-recorded and transcribed afterward.

Workshop

The second author joined several meetings with the LAB core partners (members who give direct input into the functioning of the network), as well as organised one meeting and a workshop with them. The workshop aimed to assess their views on the proposed SA method. Other SA methods (e.g., the power-legitimacy-urgency method [64]) were also presented, and discussions were held to find an appropriate SA method for the case study. This workshop was conducted online in early December 2020 with 16 core partners of the LAB. During the session, the research was presented, preliminary results of the SA were discussed and validated, and an interactive part was facilitated using the Miro platform. This workshop lasted for 1.5 h, and the outcome is explained in Section 6.

3.2. Data Analysis

The stakeholder analysis, informed by the interview data, was carried out in three phases: (1) stakeholder identification, (2) stakeholder categorisation, and (3) stakeholder interrelationships.

Stakeholder identification was performed on parties affected by and/or interested in addressing drought in the case area. We use the terms "primary stakeholders" (initially approached stakeholders/core partners (individuals/organisations within the LAB) and "secondary stakeholder" (contacts provided by the primary stakeholder). These terms are based on the level of communication and say nothing yet about the level of interest in addressing or being affected by drought. The data on both stakeholder groups, their organisations, and sectors were organised in MS Excel files (see Supplementary Materials). A histogram was then used to illustrate the distribution of primary and secondary stakeholders, as well as the sectors that had been engaged and those that remained unreached.

The identified stakeholders were categorised using the "Rings of Involvement" stakeholder categorisation method developed specifically for this research and adapted from the Dutch national government's [65] "Rings of influence" and Chevalier & Buckles' (2008) Rainbow Diagram [66]. Stakeholders were differentiated based on their type of involvement regarding drought on the island. It consists of three layers ("rings") and four quadrants (Figure 2). This method enables the visualisation of stakeholders' levels of affectedness regarding the issue, i.e., drought. The method categorises stakeholders by dividing them into the four quadrants: Policy-Making, Executive Power, Advice and Consultancy, and Implementation and Suppliers. Furthermore, the three layers indicate, respectively, whether a stakeholder is impacted by drought, their level of interest in addressing drought, and the network of contacts (secondary stakeholders) connected to the primary stakeholders. This approach allows for the visualisation of aspects commonly addressed in existing SA methods, such as urgency and interest. The peripheral layer (Figure 2) is the broadest and includes all the secondary stakeholders. The stakeholders were further subdivided into four quadrants, which enables one to see the stakeholders' position regarding the drought issue. The method can also be updated periodically by incorporating arrows to show stakeholders moving inward or outward across the rings, reflecting changes in their level of impact or engagement with drought-related issues.

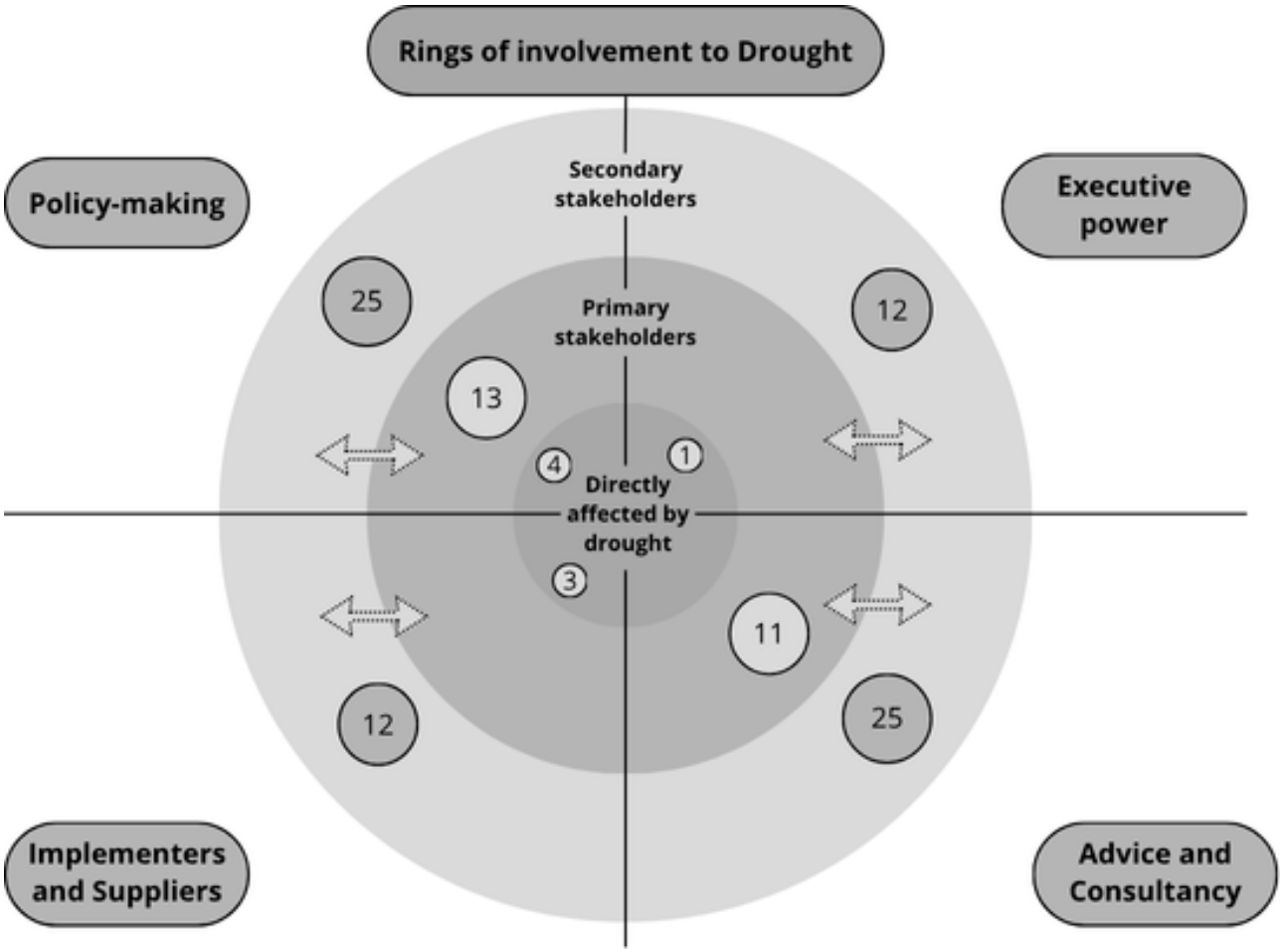

Figure 2. "Rings of involvement", adapted from the Dutch national government [65]'s "Rings of influence" and Rainbow Diagram [66]. The numbers represent the quantity of primary stakeholders, secondary stakeholders, and stakeholders directly affected by drought present in that quadrant. The arrows indicate the possibility a living network where stakeholders can move between primary and secondary as time progresses. Created by the authors.

Stakeholder interrelationships were subsequently visualised, using social network analysis (SNA) based on questionnaire and interview data (Figures 3 and 4, detailed data overview in Supplementary Materials). This helps to detect relationships and commonalities between the stakeholders. The individual stakeholders within these organisations are visualised in circles with numbers. The analysis of stakeholder interrelationships was conducted in two key steps: first, all primary and secondary stakeholders were documented in an Excel file; second, their relationships were visualised through a social network analysis (SNA) using Palladio.

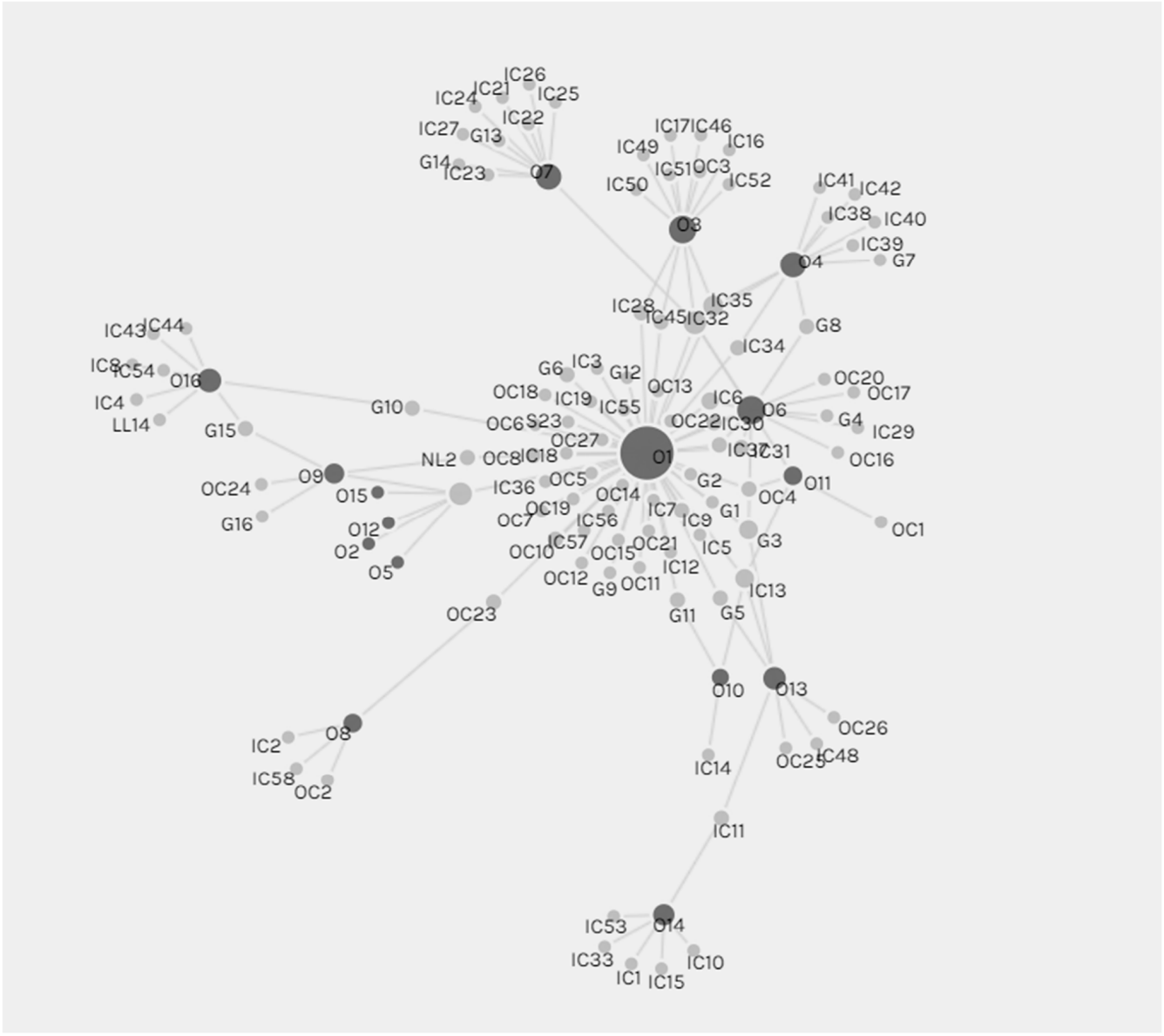

Figure 3. Stakeholder interrelationships between primary and secondary stakeholders regarding drought on Schouwen-Duiveland (made in Palladio and edited by the authors). O [no] = organisation of the primary stakeholder; LL [no] = primary stakeholder part of Living Lab; NL [no] = primary stakeholder not part of Living Lab; ICs = individual contacts (where a name and organisation were provided); OCs = organisational contacts (where only an organisation, and no name or function was provided); Gs = groups, consortia, programmes and projects (that do not fit neatly into the other two categories). The number of connections (degree of connectivity) for each stakeholder or sector is shown by the size of the dots in both figures. Larger dots show actors or sectors that have more connections, which means they are more central and influential in the stakeholder network. Smaller dots indicate actors or sectors with fewer connections, reflecting a more peripheral position in the network.

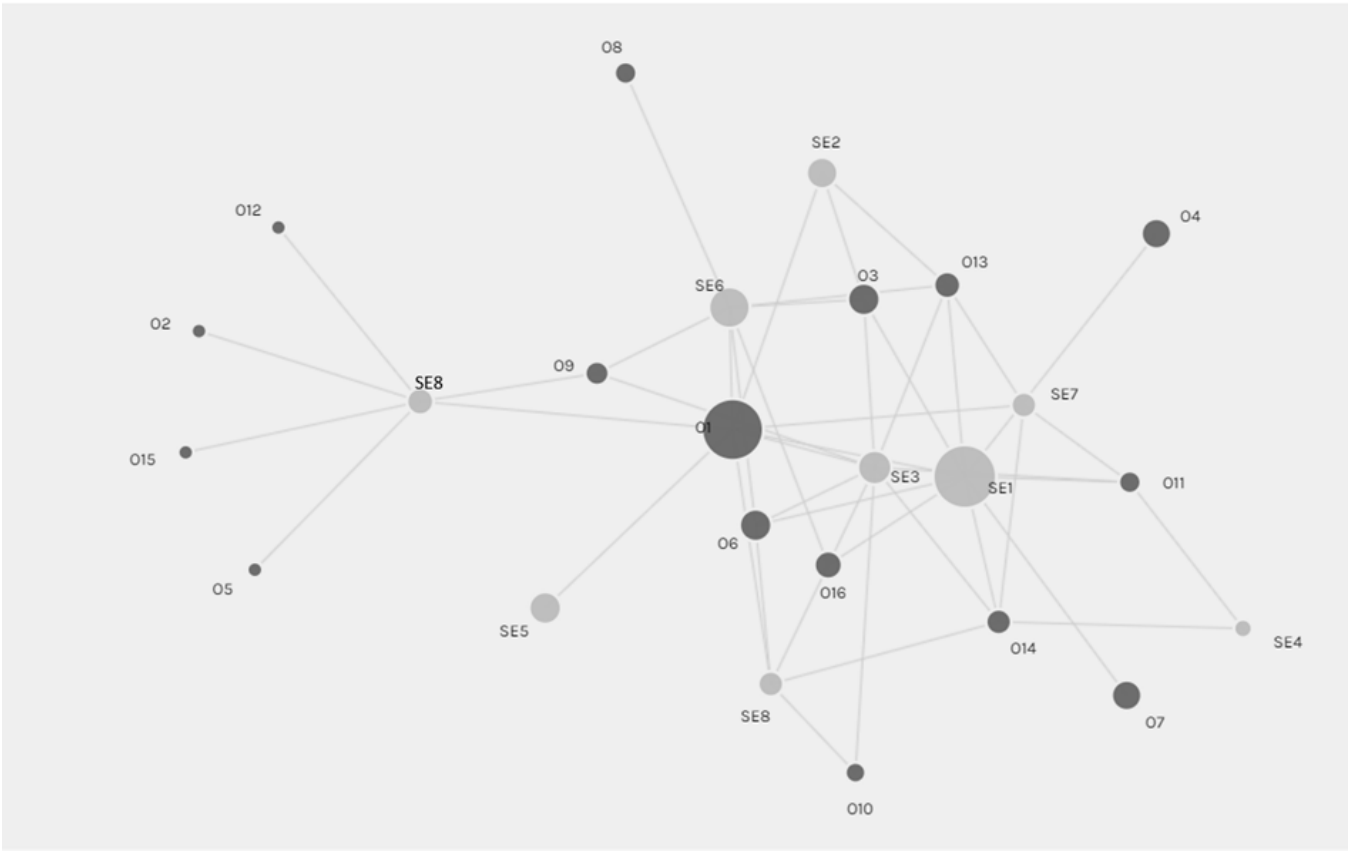

Figure 4. Stakeholder interconnections between stakeholder organisations and sectors of contact regarding drought on Schouwen-Duiveland (made in Palladio, edited by the authors). O [no] = organisation of primary stakeholder; SE [no] = sector involved in drought (SE1 = Governance and Management, SE2 = Public Research; SE3 = Private Research; SE4 = Drinking Water; SE5 = Urban Use; SE6 = Agriculture; SE7 = Nature Management; SE8 = Independent Consultancy and Advisory). The number of connections (degree of connectivity) for each stakeholder or sector is shown by the size of the dots in both figures. Larger dots show actors or sectors that have more connections, which means they are more central and influential in the stakeholder network. Smaller dots indicate actors or sectors with fewer connections, reflecting a more peripheral position in the network.

4. Results

Next, the results of the SA are presented in three stages: stakeholder identification, categorisation, and interrelationships.

4.1. Stakeholder Identification

The 24 primary stakeholders gave 58 contacts with an organisation, a name and function, 27 contacts with an organisation but no name and function, and 16 groups, consortia, programmes, and projects which do not fall into either of these categories. These contacts became our secondary stakeholders. During the survey and interviews, the same names and organisations were mentioned multiple times, indicating some stakeholders were well-connected. Thus, out of the 139 contacts provided by the 24 primary stakeholders, only 101 were unique secondary stakeholders. The stakeholders were then subdivided into the following sectors (Figure 2): Governance and Management; Urban Use; Nature Management; Agriculture; Public Research; Private Research; Independent Consultancy and Advice; Recreation and Tourism; Drinking Water; and Industry and Energy. The identification showed that most primary stakeholders were from the Governance and Management, Public Research, and Private Research sectors. Sectors with fewer primary

stakeholders were Agriculture, Urban Use, and Independent Consultancy. The sectors where most secondary stakeholders were identified included Private Research, Urban Use, Agriculture, Governance and Management, and Public Research. Sectors with fewer secondary stakeholders identified included Drinking Water, Nature Conservation, and Independent Consultancy and Advice. There were no primary or secondary stakeholders identified in the Recreation and Tourism and Industry and Energy sectors.

4.2. Stakeholder Analysis: Categorisation

A categorisation method, "Rings of Involvement", was developed, which consists of three layers ("rings") and four quadrants (Figure 2), based on the information gained from the stakeholder workshop. The numbers in the figure indicate the number of organisations and individuals within those organisations that were identified in this research. Most stakeholders and their contacts were spread out over the Policy-Making (i.e., all the government agencies, policy officers, and government projects and consortia) and Advice and Consultancy (i.e., public and private research institutes, advice bureaus, and aligned projects) quadrants. Executive Power stands for the directors and other decision-makers who have the authority and power to drive change. The last quadrant is Implementation and Suppliers, and represents all the companies that possess practical expertise in solving the drought issue.

We observe that those directly affected by drought are the smallest group and consist of farmers and other land management organisations (e.g., forestry management). Primary stakeholders are those who are interested in solving the drought issue and are mainly in the Policy-Making and Advice and Consultancy quadrants. Last, the ring of secondary stakeholders contains contacts of the primary stakeholders, which contains organisations and individuals of all quadrants.

4.3. Stakeholder Analysis: Interrelationships

Figures 3 and 4 visualise the stakeholder network related to drought on Schouwen-Duiveland. The interrelationships between primary and secondary stakeholders are presented in Figure 3. The circles with the code "O" are stakeholder organisations, and the size of the circles indicates the number of primary stakeholders present in those organisations. The secondary stakeholders are visible on the outer edges, connected to the primary stakeholders' organisations.

On analysing the data from Figures 3 and 4, it became clear that 9 out of 24 primary stakeholders had contacts largely in their own sector. In this respect, predominantly governmental agencies and the Agriculture sector had the tendency to provide contacts in their own sector. A total of 8 out of 24 primary stakeholders had a mixed network, where mostly the Public Research, Private Research, and Consultancy and Advice sectors were represented. In total, 7 out of 24 primary stakeholders provided no contacts. Stakeholders with the code LL (Living Lab) still maintain contact with the other LL stakeholders, even if not displayed. A total of 139 stakeholders are displayed in Figure 3, as several contacts were mentioned multiple times in interviews and on the questionnaire.

5. Discussion

As stakeholder analyses from local levels, climate adaptation and extreme events' management contexts are still rare [17,18,23], we set out to study the stakeholder network around the drought issue in the NL, by testing out an SA method to promote a more place-based collaboration in this network. We will now elaborate on the significance of the findings and give recommendations for practice and future research.

5.1. Role of Intermediaries in SA

It was important to identify the stakeholder network surrounding the drought issue for the following reasons: (a) valuable local knowledge by individuals, communities, and organisations, which the LAB hoped to coordinate to enhance decision-making efficiency related to drought, (b) discover what motivates the stakeholders to address the drought problem, and (c) connect stakeholders to increase their voice being heard in decision-making.

Our findings pointed to an aspect which is not often discussed in the SA literature: the role of intermediaries, i.e., people who or organisations that facilitate knowledge transfer and exchange between different domains (e.g., science and policy) [67]. The LAB presents itself and acts as a network organisation dedicated to integrating knowledge from diverse disciplines. Being responsible for bringing that knowledge together, the governmental and research sectors took the centre stage in this process. The primary stakeholders from other sectors contributed local knowledge and facilitated communication between local and municipal levels to ensure a broader range of voices were heard. As the Governance and Management sector had numerous contacts, it suggests that multiple levels of government in the Netherlands are addressing the drought issue in Schouwen-Duiveland and other municipalities in Zeeland province. The LAB is continuing to enlarge its network; thus, it has not yet approached and included distinct stakeholder groups (e.g., Agriculture and Urban Use sectors, Drinking Water, and Nature Conservation). Our data also indicated that the LAB was not yet prepared to widen its network into specific sectors (e.g., Industry and Energy, Recreation and Tourism) at the time of the workshop (7 December 2020), partly because those were perceived to be operating at the national level; however, these were still mentioned as being directly concerned with the drought issue. The findings indicate that the role of intermediary organisations such as the LAB could potentially facilitate SA and stakeholder collaborations but can also be biassed, e.g., towards existing contacts. It points to the problem of "usual suspects" in the SA literature, which is normally suggested to be avoided, as this may reinforce the marginalisations even more [3].

However, intermediary organisations have also been criticised for several reasons. For instance, they are often not neutral entities, but actively shape the outcomes (e.g., which actions or knowledge get prioritised) [68]. Also, they can lack legitimacy in the view of certain stakeholders and might marginalise or exclude some stakeholders [69,70]: a phenomenon we also observed to some extent in our case study. Additionally, there is a debate, to the extent to which the experiences of intermediary work can be transferable across contexts, for instance, across different administrative or spatial scales: as for example, are regionally functional solutions also working at the local level? [71]. Collaborative governance models and transparent decision-making rules are suggested as one major strategy to address such issues [68].

5.2. Methodological Reflections

Stakeholder identification. Stakeholder identification results were generally in line with similar studies [17,18,23]; for instance, a wide range of stakeholder groups were identified, but not equally represented in managing climate adaptation. As outlined in [12], our study enabled the detailing of a previously unexplored stakeholder network, and applied similar methods [17], and the findings resembled ours: vulnerable groups such as smallholder farmers are often overlooked, and it is essential to align the interests and influence of stakeholders. The stakeholders involved in the drought issue on Schouwen-Duiveland are diverse, necessitating the identification of specific sectors. Thus, broad identification methods, i.e., identification based on three typical sectors—governmental, private, NGOs [15]—fit better in wider spatial contexts than local.

As noted above, SA identification methods are divided across top-down and bottom-up approaches [3]. Also, as existing reviews on SA [6,51] often criticise SA as too rigid, empirical research relying on single methods, which results in a "snapshot" view of the situation, and hence may not fully reflect reality accurately. We took a different approach by employing various data collection methods, but also participatory action research, which is not common in existing SA empirical studies. The action research allowed us to observe and reflect upon the activities of the living lab, but also to test new ideas in collaboration with them. Notably, the participatory action research employed pushed the LAB to adopt a mix of top-down and bottom-up approaches (in the past, they relied mostly on top-down approaches, according to our data). This transition has aided them greatly in identifying and connecting their stakeholders, indicating that a disconnection between the two approaches is unfavourable. However, it is not known whether this transition will continue, or the LAB will return to "business as usual".

As mentioned before, two sectors were not included in the research (Industry and Energy and Tourism and Recreation). We can only speculate how the results would have changed if these had been approached. It is possible that including them would have created a more holistic picture of the drought issue on the island. For instance, the two above-mentioned sectors have a high consumption of water, potentially leading to conflict with other sectors over who can use it in extreme conditions. On the other hand, these sectors have considerable influence and funds to potentially aid in drought measures.

Stakeholder categorisation. Common SA categorisation methods include power-interest matrices and gradients like power–legitimacy–urgency [14,39] or power–interest–salience [13]. However, we considered these tools to be inappropriate for our context. The urgency to solve the drought issue is implied by the need for a network organisation such as the LAB and its stakeholders, all of whom want to find solutions soon. In our case, since all stakeholders aim to address the drought problem, the legitimacy of stakeholders' claims to the drought issue is irrelevant. Moreover, stakeholders' power to address the drought issue may be challenged, as governmental agencies and local communities are collaborating.

Instead, the categorisation method, "Rings of involvement", enabled us to visualise how the key (i.e., primary) stakeholders, as well as their contacts, are related to the drought issue in this case. It revealed four main quadrants of stakeholder groups: (1) the "Policy-making" quadrant (heavy governmental influence from all levels, e.g., national, provincial, municipal, on solutions to the drought problem); (2) the "Advice & Consultancy" quadrant (a broad foundation for Public and Private Research, which also gives guidance on addressing the drought issue); (3) the "Executive Power" quadrant (stakeholders carrying influential positions with the authority to lead efforts in dealing with the drought problem); and 4) the "Implementation & Suppliers" quadrant (practical knowledge holders who are working on solving the drought issue). The Schouwen-Duiveland case shows that the "Policymaking" and "Advice and Consultancy" quadrants make up most of the stakeholder network. This somewhat contradicts the results of [21], who revealed that policy-makers and researchers are not closely engaged in flood risk management.

Stakeholder theory and methods have often been criticised for being too static, depicting only a snapshot of the situation, despite the problem being biophysically and socially dynamic [24,72]. To address this problem, SA is suggested to be conducted reiteratively during several phases of the project [3]. Our analysis addressed this by introducing arrows in the "Rings of involvement" stakeholder categorisation phase, to reflect the idea that stakeholders can be regrouped into different sectors when conditions change. The LAB network is still growing, stakeholders can change over time as positions are filled by new people, and even the drought issue can evolve. Therefore, attention should be paid to novel dynamic stakeholder models that can complement existing static models.

We observe that there is a lack of stakeholders representing the "Implementation & Suppliers" quadrant in the ring of primary stakeholders. This is a gap in the LAB's network, yet it could prove crucial if the ambition to solve drought is to be implemented. Furthermore, we observe a lack of stakeholders in the "Executive power" quadrant in the ring of primary stakeholders—this could suggest that addressing the drought issue is not yet as urgent with decision-makers. It may also be due to the LAB's nature as an advisory organisation and its desire to avoid actively participating in public policy discourse. However, to make more substantial claims on the reasons would require exploring the stakeholders' viewpoints in more detail, which is outside of the scope of this case study.

Stakeholder relationships. In conducting the network analysis, we visualised links between stakeholders and their contacts based on communication frequency and identified the most central stakeholders in that network (similar to Refs. [12,44]). Thus, stakeholder categorisation may not be necessary for conducting an SNA, depending on the research context. The use of stakeholder identification for mapping interrelationships, rather than categorisation, supports this idea. Examples of other common interrelationship analysis methods include fuzzy cognitive mapping [73] and a mixed SNA method [74]. These methods, by taking a more quantitative approach to visualise the links between stakeholders, are useful for even more complex systems, but not necessarily for this research, as the relationships are still manageable.

5.3. Limitations and Recommendations for Future Research

First, we acknowledge that the network-based identification of stakeholders may have affected the results, in terms of which stakeholders were identified, or the perceived centrality by some of the stakeholders may have been biassed. Some of these issues are also noted in previous empirical studies on intermediaries [68,70]. In our case, most of the primary stakeholders already knew who was involved in the drought issue. This was evident at one of the first meetings with the LAB's core team. The stakeholder network surrounding drought was so large that the LAB and other institutions found it difficult to grasp, as it was not clear who exactly was working on what issues regarding drought and in which projects, consortia, or working groups stakeholders were involved. It became evident that the existing network was formed haphazardly, which makes the stakeholders involved in LAB activities uneasy. The LAB stated that clear documentation and/or a stakeholder database would reduce this unease. Also, reaching out to all relevant stakeholders was challenging, often due to their busy schedules. This is an often-encountered problem in the bottom-up approaches of SA [3,6]. Furthermore, we purposefully did not include several identified stakeholders and sectors in this study, e.g., farmers, foremost due to pragmatic reasons (tight timeline due to the harvesting season and the COVID-19 pandemic preventing in-person interviews). If local farmers had been included in our study, the distribution of the sectors might be different (the Agriculture sector would have been larger). However, national and regional farmer associations (which we did include) still indirectly represent local farmers. Also, certain other sectors were not considered (e.g., "Industry and Energy", "Recreation & Tourism" sector), since the LAB was not yet ready (by the time of the study) to expand its network in those directions, and requested the researchers not to contact them before they did. Also, because of this, we addressed the "Nature Conservation" sector only briefly in this study. For a more detailed insight, future research could more directly explore the stakeholder network, for instance, methodologically (in-person interviews and trying to reach out to the not-considered sectors) and employing more flexible timelines that respect the schedules of all targeted stakeholder groups better.

Second, the SA literature points to the rapidly changing nature of stakeholders' position and perceptions as the social and environmental systems change [6,11,24]. We did

not study the long-term efficacy of the network, which leaves room for further research. Longitudinal research on SA is very rare [11] but could aid the practice of facilitating stakeholder collaborations and revealing trends. Also, we currently employ only three SAs, while there are many more, e.g., to analyse the network structure quantitatively [73], which could highlight different aspects of the stakeholder network.

Third, we identified that the LAB is a good example of an organisation that brings stakeholders together, but it also aims to collect and share knowledge. However, knowledge co-creation is typically a long-term process that can be explored further, with, e.g., a Communities of Practice concept [61,75], which would allow for the study of how learning occurs in local/regional networks and what the impacts are on local adaptation to extreme events.

Lastly, we surmise that this SA method is applicable to more climate change issues than just drought (floods, inundation, heat risk, soil subsidence, and biodiversity loss). The stakeholders are different, but the structures of the organisations (see quadrants) would remain the same.

6. Conclusions

Via a case study on the island of Schouwen-Duiveland (NL) that has experienced droughts, we aimed to understand a stakeholder network and to promote a more focused stakeholder collaboration on local climate change issues, in particular drought. In doing so, we tested out a stakeholder analysis (SA) method in three steps: identifying, categorising, and interlinking stakeholders. Our novel stakeholder categorisation method ("Rings of involvement") allowed us to look at the drought issue from a new angle, i.e., a perspective based on the level of involvement in the drought issue, the quantity, and the sector of stakeholders involved. The action research encouraged the LAB to try out bottom-up SA, in addition to top-down SA. This transition aided the LAB greatly in identifying and connecting its stakeholders. Additionally, the findings indicated the interconnections between various sectors through the same stakeholders on certain occasions; thus, it shows the importance of analysing the diversity within stakeholder sectors when performing SA. However, as stakeholder networks typically are continuously expanding and co-evolving along with the environmental issues (e.g., drought), future research could explore under which conditions a network organisation (such as the LAB) acts as a dynamic platform for facilitating stakeholder interactions and knowledge co-production. This is necessary because addressing the impacts of extreme events induced by climate change often requires continuous stakeholder collaboration on the ground. Nevertheless, as it is a single case study, the findings are inherently affected by the local socio-political context, and our research design and sampling strategy may have omitted certain groups; further research could conduct comparative living lab cases' analyses across different contexts (e.g., countries, extreme events' types). This would help to gain a more comprehensive understanding of how such living labs function in aiding place-based collaboration on extreme events.

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Informed Consent Statement: The participants gave informed written consent. The collected data were treated confidentially.

Data Availability Statement: Upon reasonable request, the data will be available from the corresponding author. We also include the supplementary file of the data.

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