Review

Barriers to, and Enablers for, Stakeholder Collaboration in Risk-Sensitive Urban Planning: A Systematised Literature Review

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Abstract: The lack of stakeholder collaboration has been recognised as a prominent hindrance in implementing risk-sensitive urban planning for creating resilient environments for communities against climate-induced risks. This study presents the outcome of a systematised literature review that was conducted to identify the barriers to stakeholder collaboration, as well as the enablers that assist stakeholder collaboration in risk-sensitive urban planning. The study identified thirty-three barriers which were classified under thirteen themes and four major categories (external barriers, inter-organisational barriers, intra-organisational barriers, and personal barriers). The review also identified forty-five enablers which can be used in surmounting the identified barriers. The dependency analysis of the barriers, conducted by adopting the interpretive structural modelling approach, shows that the barriers with a high driving power are external barriers, which are political barriers, policies and legislation-related barriers, and governance-related barriers that are beyond the organisational boundary and control. The research found that the enablers to overcome those high driving barriers are gaining political support for implementing inter-organisational collaboration or adapting the apolitical approach for the collaboration process, strengthening the laws and forming adaptive policies to support collaboration, and establishing transparent and accountable collaborative governance.

Keywords: barriers; enablers; stakeholder collaboration; urban planning; interpretive structural modelling; systematised literature review

1. Introduction

The population that lives in urban areas is expected to rise from 55% to 68% by 2050 [1]. Urban sprawl causes unplanned rapid development projects in many cities [2] and has the potential to exacerbate disaster risks leading to surface runoff and flash floods [3,4], high-density settlements and infrastructure developments in risk-prone areas [2,5], and a high level of greenhouse gas emissions that contribute to climate change [6]. On the other hand, climate change also exacerbates the intensity and frequency of natural disasters such as floods, heatwaves, and storms, posing serious challenges to sustainable urban development [6–8]. Dempsey and Jenks (2010) argue that the impact of natural disasters can be exacerbated due to poor quality urban development [9]. Therefore, environmental impact assessments should be a crucial part of the urban development planning process in order to make sure that disaster risks are not increased as a consequence of new developments [10]. However, Thomalla and Boyland [11] note that the decision-making processes with respect to urban development, disaster risk reduction (DRR), and climate change adaptation (CCA) occur in silos, conducted by different agencies, institutions, and other actors with differing priorities and perspectives. Therefore, harmonisation among urban development, DRR, and CCA is crucial for sustainable and risk-sensitive urban development [11,12].

The study conducted by Dwirahmadi and Rutherford [13] identifies the need for a collaborative governance approach that can transform the current silo-based approach into a collaborative decision-making approach involving public and private stakeholders [14]. They argue that a collaborative governance approach can facilitate an effective partnership

between the actors involved in urban development, DRR, and CCA [13]. However, the implementation of collaborative governance that embraces DRR and CCA as crucial aspects of urban development processes is considered challenging due to the lack of cooperation and collaboration between different agencies [15–17]. Furthermore, recent studies [10,18,19] have highlighted that stakeholder engagement is a key challenge in creating resilient built environments against disasters. Therefore, the identification of the barriers to stakeholder collaboration alongside enabling solutions is key for the successful implementation of risk-sensitive urban planning. Even though current studies have investigated challenges in DRR and CCA in a specific context (e.g., region or country), they do not address the stakeholder collaboration issues in detail. Hence, existing studies lack a comprehensive understanding of the barriers to, and enablers for, stakeholder collaboration in a global context. Therefore, this research aims to conduct a comprehensive systematised literature review to understand the barriers to, and enablers for, stakeholder collaboration in risk-sensitive urban planning. Furthermore, this study aims to conduct a thorough analysis of the findings to understand the interdependencies among the barriers in order to identify the key driving barrier and, additionally, the dependent barriers that are influenced by the driving barriers. Such an understanding will highlight where efforts need to be concentrated in order to promote stakeholder collaboration in risk-sensitive urban planning.

2. Research Method

A systematised literature review has been selected as the methodology for this study. This method adopts a structural approach to the searching and analysing process to make the literature review process as transparent as possible to enhance the quality of the study [20]. The search and selection process adopted in this systemised literature review is presented below (Figure 1).
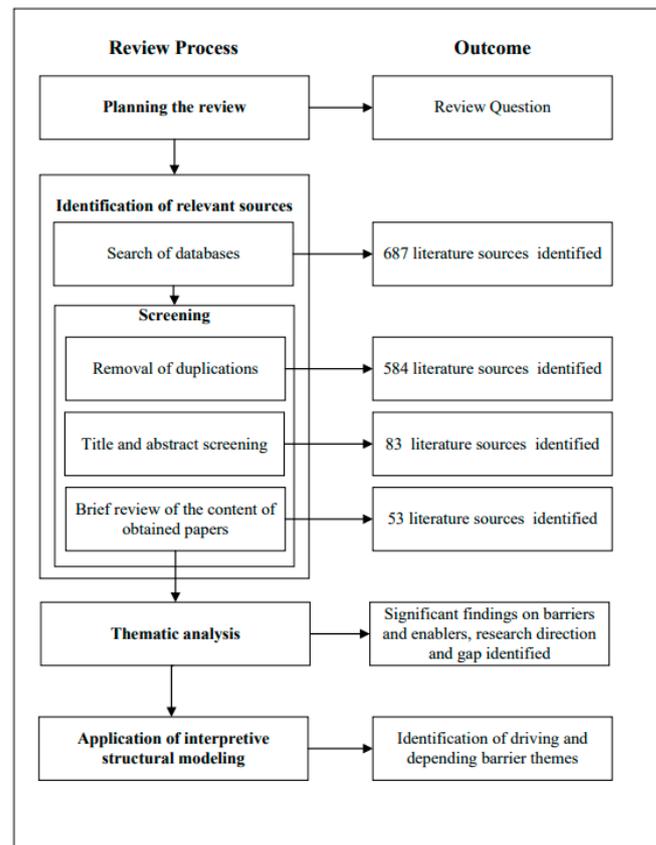

Figure 1. The research method of the study.

The databases used for the literature survey are Scopus, Web of Science, Emerald, Science Direct, Taylor and Francis, Sage Publication, and Google Scholar in order to capture as much as possible all the relevant literature sources. The research question "What are the barriers to, and enablers for, stakeholder collaboration in risk-sensitive urban planning?" was used as the basis for formulating the search terms in this study. The basic search terms captured from the research question were: "stakeholder", "risk-sensitive", "urban planning", "collaboration", "decision making", "barriers", and "enablers". These terms were expanded using relevant synonyms of the key terms to capture all the relevant research papers (see Appendix A). All the selected databases allowed Boolean operators apart from Google Scholar. A manual search was conducted on Google scholar using the selected key terms. The articles derived from the Google Scholar database search were sorted based on publication year and relevancy. Then, they were selected manually by reading the title according to the study requirement.

Selection Criteria and Process

Derived literature sources from the key terms were filtered using the following exclusion criteria: articles that are not in the English language; articles published before the year 2010. Only document types such as journal papers, conference papers, published theses, book chapters, books, and reports were included in this study to ensure the quality of the literature. These processes resulted in altogether 687 articles. These papers were screened to eliminate the duplications, and this resulted in 584 articles. The preliminary title and abstract screening eliminated 501 articles that have no relevance to stakeholder collaboration and urban planning. Further screening by brief full-text review further eliminated 30 articles since they did not discuss stakeholder collaboration barriers or enabling solutions for stakeholder collaboration in urban planning that integrates CCA and/or DRR. Finally, 53 articles were selected for in-depth analysis.

These selected literature sources were analysed to identify the barriers and the enablers to overcome these identified barriers. Additionally, this study adopted the interpretive structural modelling approach to identify the high driving barriers by establishing dependency among the barriers. These findings are discussed in the following sections. The review process and the outcomes of the study are presented in Figure 1.

3. Results and Discussions

This study identified 53 articles that discussed the barriers to stakeholder collaboration in risk-sensitive urban planning in the context of various developed and developing countries all over the world; these countries are shown in Figure 2. Therefore, this paper provides a global view of the barriers to, and enablers for, stakeholder collaboration in risk-sensitive urban planning.

3.1. Barriers to Stakeholder Collaboration

This section presents the barriers to stakeholder collaboration in risk-sensitive urban planning that were identified through the systematised literature review. The identified barriers have been broadly categorised under four main headings: external barriers, inter-organisational barriers, intra-organisational barriers, and personal barriers. A discussion on each category is presented in the following subsections.

3.1.1. External Barriers to Stakeholder Collaboration

The external barriers that hinder stakeholder collaboration include administrative aspects such as policies and legislation, governance, and the political environment, as shown in Table 1.

Figure 2. Map-based visualisation of locations discussed in the selected articles.

Table 1. External barriers in stakeholder collaboration.

Theme	Barriers	Source
Policies and legislation	Absence or lack of policies that promote collaboration	[21–27]
	Lack of coherence in government policies and legal instruments	[28,29]
	Lack of legislation support, legislative authority to delegate stakeholders' responsibilities and duties	[10,18,30,31]
	Lack of defined financial plans and implementation roles	[32]
Governance	Lack of clear-cut responsibilities and overlapping responsibilities among stakeholders making the system ineffective and less accountable	[10,18,27,28,31–36]
	Rigid formal governance structures	[5,37]
	Lack of a coordination mechanism in governance arrangements	[18,23,34,38]
Politics	Lack of political guidance/support/leadership/willpower for planning and implementation	[18,22,33,35,38–41]
	Political interference	[10,22,31,36]
	Competing interests and visions among politicians	[36]
	Thematically structured political committees	[42]

Our review shows that current contemporary policies and legislation that set the legal environment do not mandate stakeholder collaboration in risk-sensitive urban planning, hindering inter-organisational linkages and the development of innovative solutions [22,24,25]. The lack of policies that promote collaboration [21–27] has inevitably led to weak inter-organisational links among relevant organisations, disharmonised visions, and silo-based working. In addition, incoherent government policies and legal instruments create separate mandates for different ministries [28–31] that influence different visions and interests in individual organisations [43,44], as well as seeming to contribute to the lack of clarity in roles and responsibilities in decision-making [28]. Shrestha and Dhakal [23] have found that weak coordination among ministries acts as a political barrier and leads to policies and activities that promote silo-based working in each ministry. This situation is fuelled by the deficiency in legislation and legislative authorities to delegate stakeholder

responsibilities and duties in a coherent manner to support collaboration [10,18,30,31], and the ineffective mainstreaming of legal instruments and strategies [29]. This condition implies that, even though some stakeholders have an interest and desire to implement collaborative initiatives, they are not able to fulfil their aspirations since their responsibilities are not adequately delegated by laws [10]. Moreover, the lack of well-defined financial plans or their implementation in policies hinders effective collaboration processes due to a lack of funds [32]. Therefore, there is a need for clear policies and legislation to enforce risk-sensitive urban planning involving relevant stakeholders from various sectors and disciplines [10].

The presence of overlapping responsibilities among stakeholders is recognised as a prominent barrier in governance [10,18,28,31–36]. These studies emphasise that the current governance structures do not provide clarity for roles, hence leading to ill-defined responsibilities, fragmentation, and overlapping responsibilities among government ministries and organisations. This condition creates difficulties for various stakeholders to implement complex and broad interventions and creates less accountable governance arrangements [27]. Such ambiguity in roles and responsibilities impacts risk-sensitive urban planning, requiring stakeholder collaboration across jurisdictional and organisational boundaries [28]. Moreover, Forino, Meding, and Graham [31] state that senior government staff are experiencing vagueness in governance procedures and their responsibilities, having no authority in decision-making, thus leading to uncertainty and a standstill [31]. Furthermore, the rigidness of formal governance structures has been identified as a barrier to progress [5,37]. Munene, Swartling, and Thomalla [5] state that stringent mandates, standard operating procedures, and red tape within complex government systems offer little flexibility, hindering informal collaborative actions [18]. Another key barrier that is evident due to weak governance is the hierarchical governance with top-down coordination [38] that oversees horizontal and vertical integration among stakeholders [18,34,39]. This situation causes a lack of coordination in governance arrangements [18,23,34] and results in poor feedback from subordinate units to the central authority in terms of existing problems with respect to collaboration practices [38]. Among these barriers, a lack of coordination in governance arrangements is identified only in developing countries due to the existence of separate mandates.

Our research uncovered four critical barriers under the theme of politics, such as lack of political guidance, support, leadership, and willpower; political interference; competing interests and visions among politicians; and thematically structured political committees. Weakness in political guidance, support, leadership, and the willpower to plan and implement risk-sensitive urban planning [18,22,33,35,38–41] was found to be the prominent barrier in this theme. The impact of weak leadership is further exacerbated due to the existence of political interference in the decision-making process in urban planning [10,22,31,36]. As a result, politically motivated development objectives tend to force stakeholders to disregard the quality of outputs or equity in development projects [22,36]. Other barriers that come under the theme of politics are competing interests and visions among politicians [36], and thematically structured political committees which are not designed to take a holistic approach to development [42].

3.1.2. Inter-Organisational Barriers in Stakeholder Collaboration

The inter-organisational barriers that hinder stakeholder collaboration can be classified into four themes: leadership, conflict of interest, communication and coordination, and collaboration process, as shown in Table 2.

Table 2. Inter-organisational barriers.

Theme	Barriers	Source
Leadership	Lack of leadership among stakeholders	[26,27,33,39,41]
	Disagreement in the selection of key leading organisations for collaboration	[22]
Organisational interests	Competing interests	[23,31,32,35,41,45]
	Different sectoral needs, interests, and issues	[16,29,44,46]
	Unrecognised common interests	[22]
Communication and coordination	Limited coordination and breakdown in communication among many fragmented actors at different levels	[34,47]
	Lack of information-sharing between stakeholders	[16,45]
	Communication breakdowns due to scepticism, use of jargon, and different official languages	[31,46]
	Lack of knowledge-sharing	[36,47]
Collaboration processes	Involvement of a large number of organisations	[26,33]
	Long-term and inelastic collaborative process	[22]

Many researchers have recognised the lack of inter-organisational leadership among stakeholders as a key barrier [26,27,33,39,41]. Furthermore, disagreements regarding which leading organisation should be collaborating to implement risk-sensitive urban planning bring uncertainty to the multi-stakeholder collaboration process [22]. Moreover, with the existence of competing interests, objectives, and mandates, organisations tend to focus mainly on improving their own sector over others [23,31,32,35,41,45]. Different sectoral needs and interests tend to generate contradicting opinions and priorities [16,22,29,44,46], hence weakening the need for collaboration which is required to achieve long-term goals that cross different sectorial boundaries [32].

The deficiencies in communication and coordination among the key organisations are vital areas that need addressing to strengthen collaboration in risk-sensitive urban planning. Some of the major symptoms of these deficiencies include inefficient internal and external communication among stakeholders [22,23,25,32] due to limited coordination [34] and breakdowns in communication [47] among a large number of fragmented actors at the national and local government levels; a lack of information-sharing between stakeholders [16,45] due to insufficient specification and identification of information needs (due to the heterogeneity of the information requirements); communication breakdowns due to scepticism and use of jargon [31], and usage of different languages which creates misunderstandings among actors [46]. Such a lack of communication and coordination can further strengthen the silo-based approach and hinder knowledge-sharing in addressing complex social and environmental problems [36,47].

Due to weak policies and governance, as discussed in Section 3.2, efficient collaboration processes to tackle collaborative initiatives that focus on long-term planning are not well-established [36]. As a result, the execution of complex urban development projects requiring the involvement of many stakeholders that consider equity, disaster risks, and climate change are difficult to materialise [26,33]. Furthermore, organisations are reluctant to participate in collaborative initiatives due to the need for long-term commitment and flexibility on their part [22]. As a result, conventional urban planning that focuses on silo-based practices seems to be the norm.

3.1.3. Intra-Organisational Barriers to Stakeholder Collaboration

The barriers that exist within organisations can be categorised under organisational structure, organisational culture, and organisational capacities, as shown in Table 3.

Table 3. Intra-organisational collaborative barriers.

Theme	Barriers	Source
Organisational structure	Unsupportive organisational structure for collaboration	[38,41]
	Existing roles and responsibilities which do not allow or support collaboration activities	[48]
Organisational culture	Traditional silo-based organisational capabilities and thinking	[22,37,44,48]
	Following old routine practices	[44]
Organisational resource capacity	Lack of financial and human resources	[10,18,22,23,28,32,35,40,42,48]
	Inadequate technical capacity to collaborate	[16,32]

The weak and unsupportive existing organisational structures which do not prioritise collaborative initiatives are recognised as a key barrier [38,41]. This barrier exists due to the strict allocation of routines to the existing roles and responsibilities which does not allow for collaborative tasks, practices, or initiatives [41,48]. This situation provides opportunities for departments to dismiss collaborative tasks as something outside their remit [41]. The current entrenched organisational culture and practices that strongly lead to silo-based working arrangements and routines create a significant barrier to collaborative initiatives and stifle innovation, collaboration, and learning [22,37,44,48]. Since stakeholders have been habituated to silo-based practices for a long time, changing this silo-based working culture is challenging and prolonged [32]. Moreover, stakeholders build their expectations upon their current routines which do not allow for the changing of their preferences and responding to the expectations of others [48]. This condition remains the same without any progress due to traditional silo-based organisational capabilities and thinking [22,37], old routines and practices [44], and unsupportive organisational structures [48]. Stakeholders are reluctant to take on collaborative responsibilities due to a lack of resources, such as inadequate finance, limited time, and insufficiently skilled and experienced staff in the organisations [10,18,22,23,28,32,35,40,42,48]. In addition, organisations tend to struggle with their technical capacity to generate and share relevant information according to collaborative needs [16,32].

3.1.4. Personal Barriers to Stakeholder Collaboration

Personal barriers that hinder stakeholder collaboration in risk-sensitive urban planning can be categorised as intrinsic barriers, professional-related barriers, and knowledge-related barriers, as shown in Table 4.

Table 4. Personal barriers to stakeholder collaboration.

Theme	Barriers	Source
Intrinsic barriers	Lack of enthusiasm and commitment to collaborative initiatives	[22,23,32,41]
Profession-related barriers	Conflicting interest and competition	[22,44]
	Fear of losing power	[22]
Knowledge-related barriers	Lack of knowledge of stakeholders	[10,26,36]
	Stakeholders' reluctance for exploratory learning	[48]

The lack of enthusiasm and commitment to collaborative initiatives [22,23,32,41] is a fundamental barrier which is further exacerbated by misperceptions and the lack of understanding of the benefits of collaboration [32,40]. Due to conflicting interests resulting from

incompatible business models or competitive cultures, stakeholders are more likely to influence planning processes that favour their own interests rather than collaboration [22]. This bias creates conflicts among stakeholders, hence disrupting the collaboration process [22]. In addition, the fear of losing power or degradation of power due to the need for new inter- and intra-organisational structures and rearrangements of collaborative planning procedures (that could potentially lead to changes and overlaps in existing job positions, authority, and organisational functions) can bring resistance to collaboration [22]. As a result, stakeholders tend to believe that collaborative initiatives may create competition among their professions and cause them to lose their power. This belief can easily provoke an obstructive attitude among stakeholders [22,44]. Hence, the demonstration of the personal benefits and the elimination of job insecurity concerns are fundamental to ensuring stakeholder buy-in for collaboration in risk-sensitive urban planning.

The knowledge gap that exists among stakeholders poses another barrier to stakeholder collaboration in risk-sensitive urban planning [10,26,36]. This incompetence creates many challenges, such as a lack of awareness of the common interests of other organisations [36]; the urgency of collaboration needs [22,41,49]; and a misperception and a lack of understanding of risks, cost, and non-monetary benefits associated with collaborative initiatives [22,32,36,40]. This situation is worsened due to the stakeholders' reluctance to participate in the exploratory learning processes involving pilot projects to gain experience and knowledge [48]. These different views and understandings create disparate visions among stakeholders, resulting in negative influences on collaborative initiatives [5,29]. This knowledge deficiency is further exacerbated due to the lack of knowledge-sharing among stakeholders [36,47].

3.2. Analysis of the Dependency of Barriers through Interpretive Structural Modelling

Although the discussion on the barriers to stakeholder collaboration in risk-sensitive urban planning was presented under four categories (external, inter-organisational, intra-organisational, and personal) in the previous section, many interdependencies exist among the barriers in those categories. For example, the lack of "policies and legislation" identified under the external barriers can influence a deficiency in the collaboration processes identified under the inter-organisational barriers. Therefore, this section has adopted the interpretive structural modelling approach proposed by Attri and Dev [50] to identify such dependencies among the barriers to stakeholder collaboration and to identify the most dominant barriers with high driving power, using the four steps presented in Figure 3.
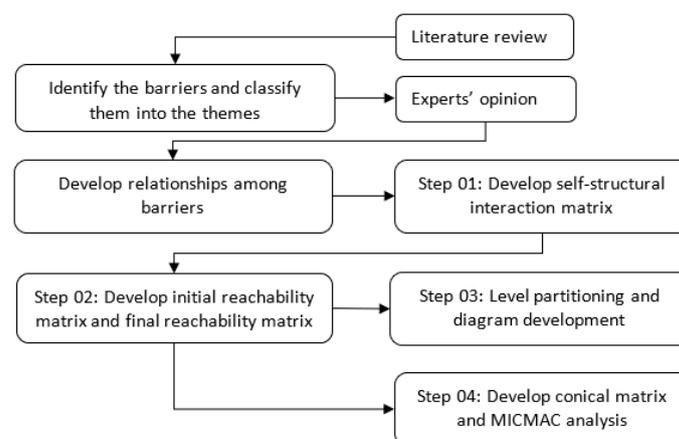

Figure 3. An interpretive structural modelling approach.

Step 01: Structural Self-Interaction Matrix (SSIM): In this step, the interrelationship of each pair of variables is established in the structural self-interaction matrix. This matrix is used to represent one of the following relationships of a variable: leads/drives another

variable; or led/driven by another; or leads/drives each other, or no influential relationship. These relationships can be denoted as follows:

V: Variable i leads variable j (variable i will influence variable j).
A: Variable j leads variable i (variable i will be influenced by variable j).
X: Variables lead each other (variable i and j will influence each other).
O: no relationship between the variables.

Step 02: Initial and final reachability matrix development: During this step, the SSIM is transferred to a reachability matrix using 1 and 0 by replacing the indicators V, A, X, and O, as shown in Table 5. This initial reachability matrix is further processed to establish the final reachability matrix by including transitivity links among the variables. A transitivity link is considered as a link that influences a variable indirectly via another variable (See Section 3.2.1).

Table 5. Binary indication of the relationship between the variables.

Connection between Variables	Transformation in the Reachability Matrix	
	i → j	j → i
V	1	0
A	0	1
X	1	1
O	0	0

Step 03: level partitioning: Level partitioning is performed at this stage to establish a hierarchical relationship between the variables by further processing the final reachability matrix. In this step, two sets of variables are developed against each variable: (1) the reachability set consists of the variable itself and the other variables that are being influenced by this variable, and (2) the antecedent set consists of the variable itself and the other variables which are influencing this variable. Then, the intersection between each set is identified. A variable with the same reachability set and intersection set will be identified as a level 1 variable and removed from the list in the next step. The same process is iterated until it reaches the final top-level variable. Based on these levels, a diagram is developed to show the dependent relationships among the variables.

In addition to these steps, by using the calculated driving powers and dependent powers, a MICMAC (cross-impact matrix multiplication applied to classification) analysis is performed. The purpose of the MICMAC analysis is to analyse the drive power and dependence power of the factors to identify the key factors that drive the system in various categories. Based on their driving power and dependence power, the variables are classified into four categories, namely autonomous factors, linkage factors, dependent factors, and independent factors.

Step 04: MICMAC Analysis: During this analysis, a conical chart that represents the variable's total driving power and dependent power is produced. The total number of the driving power is equal to how many variables are led by this variable, including itself. Similarly, the total dependence power is calculated on how many variables influence this variable, including itself. Based on the calculation, variables are divided into four clusters, respectively: autonomous variables, dependent variables, linkage variables, and independent variables.

3.2.1. Establishment of Structural Self-Interaction Modelling and Reachability Matrix

Following step 01, Table 6 presents the Structural Self-Interaction Matrix (SSIM) developed for the identified barrier themes using expert opinions. This study adopted the Delphi method to develop the SSIM using four experts from academia and industry. Since this study was looking at barriers within a global context, the academics were selected based on their research exposure in a global context. Similarly, industry practitioners were selected based on their working experience in various countries. Interviews were conducted with

experts to develop a matrix, and then differentiations among the experts' opinions were again taken into account until data saturation was reached.

Table 6. Structural self-interaction matrix of barriers.

Barrier Categories	Barrier Themes ID	Barriers to Stakeholder Collaboration in Risk-Sensitive Urban Planning	External Barrier			Inter-Organisational Barriers			Intra-Organisational Barriers			People-Related Barriers			
			Policies and Legislation-Related Barriers	Governance-Related Barriers	Politics-Related Barriers	Leadership-Related Barriers	Organisational Interest-Related Barriers	Communication and Coordination-Related Barriers	Collaboration Processes-Related Barriers	Organisational Structure-Related Barriers	Organisational Culture-Related Barriers	Organisational Resource Capacity-Related Barriers	Intrinsic Barriers	Profession-Related Barriers	Knowledge-Related Barriers
External barriers	1	Policies and legislation-related barriers	X	V	A	V	V	V	V	O	V	V	O	V	O
	2	Governance-related barriers		X	A	V	V	V	V	V	V	V	O	V	V
	3	Politics-related barriers			X	V	V	V	V	V	V	V	O	O	O
Inter-organisational barriers	4	Leadership-related barriers				X	X	V	V	V	V	V	V	X	X
	5	Organisational interest-related barriers					X	X	A	O	A	O	V	X	X
	6	Communication and coordination-related barriers						X	X	A	A	A	A	X	X
	7	Collaboration processes-related barriers							X	A	A	A	A	A	A
Intra-organisational barrier	8	Organisational structure-related barriers								X	V	A	V	O	X
	9	Organisational culture-related barriers									X	V	X	V	X
	10	Organisational resource capacity-related barriers										X	X	O	X
People-related barriers	11	Intrinsic barriers											X	A	X
	12	Profession-related barriers												X	X
	13	Knowledge-related barriers													X

The relationships among the barrier themes were established pairwise based on the experts' opinions as follows. For example, the influence of the policies and legislation-related barrier theme on itself is represented by "X"; its influence on the governance theme was represented by "V"; the influence of politics on this theme was represented by "A"; and the absence of a connection with other barriers was represented by "O". The SSIM was then used to produce the initial reachability matrix (Appendix B, Table A1). The final reachability

matrix (Appendix B, Table A2) was produced, including transitivity links marked as "1*". For example, the initial reachability matrix indicates that policies and legislation-related barriers lead to leadership-related barriers, and leadership-related barriers lead to conflict-of-interest barriers. Therefore, policies and legislation-related barriers indirectly influence the conflict-of-interest barriers. This relationship was included in the final reachability matrix as a transitivity link.

3.2.2. MICMAC Analysis—Classification of Barrier Groups Based on Their Driving and Dependence Power

The final reachability matrix was converted to a conical matrix which calculates the total driving power and dependence power for each barrier group (Appendix B, Table A3). Thus, these barrier groups can be classified into four clusters based on their driving and dependence power (Figure 4). Cluster 1 consists of autonomous barriers with weak driving power and weak dependence power, and these barriers can be considered as less influential on other barriers and have a low chance of being influenced upon. Cluster 2 consists of dependence barriers that have high dependence power and weak driving power. In our analysis, none of the barriers fell into these two clusters. Cluster 3 consists of linkage barriers that have high driving power and high dependence power (e.g., leadership, communication and coordination, knowledge, competition and different interests, personal intrinsic barriers, profession-related barriers, organisational structure, organisational culture, organisational resource capacity, and collaboration process). Since these are linkage barriers, the elimination of one barrier in this group will help to remove or lower the other barriers in the same cluster as well. Finally, cluster 4 consists of independent barriers with high driving power and less dependence power (e.g., politics, policies and legislation, governance). The removal or lowering of these barriers, which have high driving power, can have a significant impact on the removal or lowering of the barriers in the other three clusters.
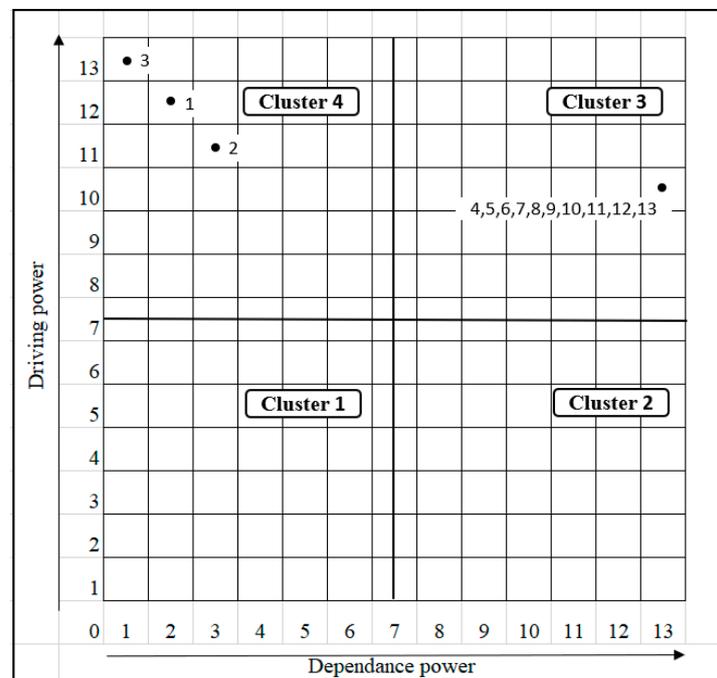

Figure 4. MICMAC analysis of barriers' themes.

3.2.3. Relationship Diagram of the Barriers to Stakeholder Collaboration in RSUD

Following Step 03 in level partitioning (see Appendix B, Table A4), Figure 5 was developed to show the relationships among the barrier groups. According to the diagram, political barriers, policies and legislation-related barriers, and governance-related barriers are the most influential barriers in the hierarchy due to their high driving power and low

dependence power. Hence, these barriers are identified as the most prominent barriers to stakeholder collaboration in risk-sensitive urban planning. The elimination of these barriers will help to avoid forming other low-level barriers due to their driving power. Moreover, this study identified potential enablers to overcome these barriers, as discussed in the next Section 3.3.
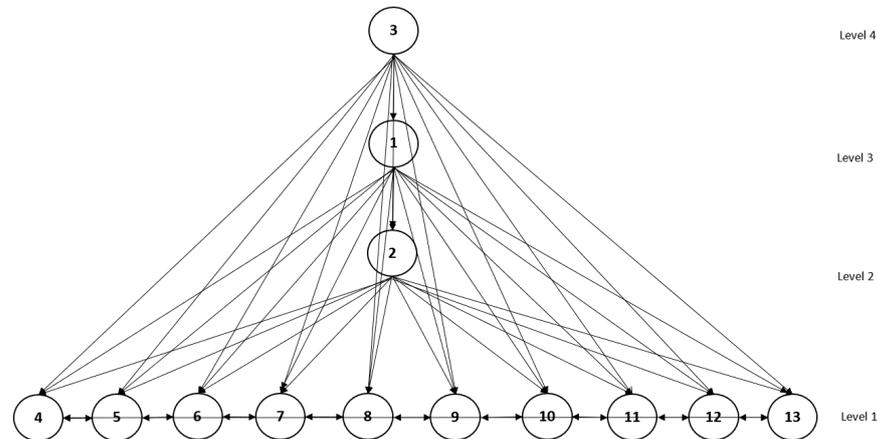

Figure 5. Hierarchical arrangement of barriers based on their interdependency.

3.3. Enablers for Overcoming Barriers

This study has identified 48 enablers that can be used as the catalyst to overcome the barriers associated with stakeholder collaboration in risk-sensitive urban planning. The following section discusses how these enablers can be utilisedtilized to overcome the identified barriers under the four clusters identified in Section 3.2.2.

3.3.1. Enablers for Overcoming Linkage Barriers (Cluster 3)

The enablers to overcome the barriers under cluster 03 (leadership, communication and coordination, knowledge, competition and different interests, personal intrinsic barriers, profession-related barriers, organisational structure, organisational culture, organisational resource capacity, and collaboration process) are shown in the following Table 7.

Table 7. Enablers to overcome dependence barriers.

Barriers' Theme	Enablers	Source
Leadership	Establish a dedicated coordination organisation	[22,23,28,31,37,37,42,49,51]
	Engage neutral partners to facilitate multi-stakeholder collaboration processes	[5]
Organisational interest	Establish synergies by creating a joint vision among organisations	[16,48]
	Harmonise and strengthen policies and laws that support collaboration	[16,21–23,29,36,40,41,48,49,52–54]
Communication and coordination	Establish formal agreements for information-sharing	[16]
	Improve understanding of the information needs and requirements among organisations	[45]
	Establish regular and transparent information flows and communication among organisations	[42]
Collaboration process	Nurture trust-based relationships	[16,25,47]
	Select appropriate stakeholders and maintain continuous engagement	[45]
	Anticipate and manage conflicts	[28]
Organisational structure	Re-organise or set up new structures with clear rules and responsibilities for promoting collaborative working	[48]
Organisational culture	Establish collaborative practices as regular routines	[48]
	Encourage top management to influence the change in culture	[48]
	Incorporate responsibilities for collaborative tasks along with their official job description	[30]

Table 7. *Cont.*

Barriers' Theme	Enablers	Source
Organisational resource capacity	Identify and provide essential technical and financial resources to build organisational capacity for collaboration	[42,43]
	Better financial planning to optimise the available funds to support collaboration requirements	[39,43,55]
	Recruit additional skilled staff to strengthen collaboration capacity	[30,53]
	Introduce digital technology to improve efficiency	[16,39,56–59]
	Allocate funding for building collaboration capacity through policies	[60]
Intrinsic barriers	Establish indicators to monitor the progress and ensure participation	[16,42]
	Offer incentives and rewards for their collaborative performance	[22,40,44,49,55]
	Address personal interests and concerns for collaboration	[43]
Profession-related barriers	Acknowledge and enable power-sharing, shared responsibility, and accountability towards other stakeholders which are important in multilevel governance	[51]
	Raise awareness of the positives and negatives of collaborative ventures to reduce hesitancy in collaborative working	[24]
Knowledge-related barriers	Build capacity through knowledge development and training programmes	[16,24,26,27,33,41,48,51]
	Encourage knowledge-sharing	[61]
	Collaborative knowledge-brokering with the help of an expert	[28,47]
	Implement measures to address the knowledge gap, build trust, clarify uncertainties, and bridge values	[25,62]
	Facilitate knowledge co-production through formal and informal social relationships	[19,23,25,27,47,59]

The establishment of a dedicated coordination organisation that can offer high-level strategic coordination and guidance would be an appropriate enabler to enhance stakeholder collaboration [22,23,31,37,42,51]. This coordinating entity can be an institution or committee with a specific cross-sectoral mandate and sufficient powers to drive collaborative initiatives. Alternatively, appointing a leader who can be an individual or organisation to provide cross-organisational leadership [28,37,49] can also help to supervise and monitor the collaborative process. Moreover, engaging neutral partners who have the capacity to facilitate the multi-stakeholder collaboration process [5] can also help to overcome leadership-related barriers.

The organisational interest-related barriers that arise due to different sectoral interests and focuses can be overcome by establishing a common vision for different sectors [16] and harmonising and strengthening the laws and policies that can support collaboration [16,21–23,29,36,40,41,48,49,52–54]. Similarly, the introduction of mechanisms that can facilitate communication across organisational boundaries is a significant enabler for enhancing the willingness to collaborate [45,63]. However, this requires the legal enforcement of formal agreements to overcome reluctance to information-sharing [16]. The reluctance to share data can be avoided by having a clear understanding of the required information from the collaborating organisations and the benefits [45]. Furthermore, the establishment of regular and transparent information flows and communication can lead to better coordination and collaboration among the stakeholders [42].

Fostering trusted relationships [16,25,47] among stakeholders is a key enabler for long-term collaboration and learning processes with the involvement of a large number of stakeholders. Such trusted relationships can be formed by creating a safe space to collaborate on projects while respecting the views of others [47] with the support of policies, laws, and transparent and accountable collaborative governance with power-sharing. In addition, selecting appropriate stakeholders and maintaining continuous engagement [45] and anticipating and managing conflicts [30] are essential to accomplishing long-term collaboration initiatives.

The existing organisational structures enforce strict responsibilities, hindering collaboration. Therefore, the organisational structures need to be re-organised to improve collaborative awareness and practices among the staff by introducing collaborative tasks with clear roles and responsibilities that can support collaboration [48]. Following well-

defined routines in collaboration tasks can bring consistency in coordination with other stakeholders and create a collaborative culture in organisations [48]. This cultural change can be further facilitated by changing organisational rules and regulations and allocating available resources towards collaboration [47]. Moreover, establishing collaborative practices as regular routines [47] can encourage top management to influence a change in culture [47] and incorporate collaborative work tasks in the staff's official job description [30]. The influence of the top managers is one of the enablers that can help to transform silo-based organisational culture to collaborative culture.

The identification and provision of essential technical, financial, and human resources are crucial to uplifting organisational capacity to achieve collaborative goals [30,42,43,53]. Better financial planning and the efficient use of resources for multiple uses could potentially address the lack of funding issues for implementing collaborative practices [39,43,55]. In addition, the recruitment of additional qualified staff would be helpful in handling overloaded collaborative tasks [30,53]. Furthermore, the use of digital technology, such as online collaborative platforms [28,31,56], can reduce the overheads associated with collaborative working and decision-making involving geographically dispersed stakeholders [16,39,56–59]. Moreover, policy plans need to ensure funding allocations [60] for uplifting organisational capacity for collaborative working.

Overcoming stakeholders' intrinsic barriers is challenging since they are embedded in their personal characteristics. The introduction of indicators to monitor stakeholder involvement [16,42] in the collaboration process and the provision of incentives and rewards based on their collaborative performance [22,40,44,49,55], as well as addressing their personal interests and concerns for collaboration [43], can be a strong pull towards improving collaboration, regardless of their intrinsic barriers. Furthermore, inter-organisational collaboration requires multilevel governance which involves power-sharing, shared responsibility, and accountability toward all stakeholders. Therefore, acknowledging and enabling such governance characteristics can help to reduce the fear of losing power and degradation [51]. Moreover, raising awareness of both the positives and negatives of collaborative endeavour [24] is also vital to overcoming the profession-related barriers related to power-sharing, job insecurities, and competition.

Knowledge is a crucial enabler in stakeholder collaboration since it allows staff or collaborative members to communicate and digest complex information, including advanced techniques and tools which can bring innovation [28]. Building capacity through knowledge development increases the commitment and involvement of collaborative members [16,24,26,27,33,41,48,51] since it improves their understanding of the importance of urban resilience [39], the urgency of collaboration initiatives, and the roles and responsibilities in the collaboration process [16,41]. Moreover, training programmes provide the collaborative members with soft skills [52,53], leadership and team-working skills [33,52], and negotiation skills [46,47] which are important when collaborating with other organisations. Such capacity development can make collaboration processes much simpler and smoother, avoiding conflicts that could arise due to a lack of collaboration skills [16,26].

The lack of multidisciplinary knowledge or knowledge deficiency that typically exists among stakeholders from different disciplines can be addressed by introducing knowledge-sharing opportunities [61] and collaborative knowledge-brokering with the assistance of experts [28,47]. Furthermore, activities for building trust among stakeholders, clarifying uncertainties, and understanding different values can help to establish a sound foundation for building collaboration among various stakeholders [25,62]. Collaborative learning activities such as policy experiments, joint fact-finding, role-play simulation exercises, and brainstorming workshops are some of the participatory methods that can be used to introduce collaborative working styles. These methods bring together various ideas and comprehensive information to introduce collaborative decision-making processes [16]. Moreover, such methods facilitate horizontal learning [40,42,44,52]; create formal and informal relationships and networks; improve coordination among stakeholders; enable trust-based knowledge co-production; bring about knowledge-to-action translation; create

joint problem exploration and solution development; and help to identify equitable collaboration processes [19,23,25,27,47,59]. The introduction of such knowledge development activities for stakeholders creates possibilities for organisations to overcome their structural and cultural barriers and communication and coordination barriers due to a lack of knowledge and awareness.

3.3.2. Enablers for Overcoming Independent Barriers (Cluster 4)

Politics, policies and legislation, and governance-related barriers were identified as independent barriers under cluster 04. The enablers to overcome these barriers are shown in Table 8.

Table 8. Enablers for overcoming independent barriers.

Theme	Enablers	Source
Politics	Bridge different political interests and values	[62]
	Secure political will and commitment	[23,36,42]
	Seek support and approval of dedicated politicians	[30]
	Introduce and encourage an apolitical approach	[25,63]
Policies and legislation	Harmonise and strengthen the laws and policies that can support collaboration	[16,21–23,29,36,40,41,48,49,52–54,64]
	Introduce policies and legislations to mainstream collaboration	[44,48]
	Ensure policies provide space for setting up informal structures that promote collaboration	[25,65]
	Provide guidance and support that assists policymakers' awareness	[28]
	Policy development with stakeholder involvement	[47,60]
	Develop and implement adaptive policy	[66]
Governance	Create collaborative governance structures that remove traditional power-based relationships	[22,49,67,68]
	Adopt accountable governance mechanisms	[27,39]
	Shift towards flexible and self-organised network governance	[38,51]
	Establish decentralised organisational arrangements linked with the centralised system	[22]
	Establish reporting mechanisms and assessments of progress	[51]
	Incorporate formal and informal ways of inter-organisational arrangement in collaborative governance	[25,30,31,65,69]

Bridging different political interests and values [62] can eliminate conflicts among political leaders that arise due to their sector-based political disputes, hence removing the barriers to collaboration. In addition, securing political will and commitment [23,36,42] and seeking the support and approval of dedicated politicians are necessary for implementing collaborative initiatives [30]. In contrast, Ahn and Schmidt [63] and Yumagulova and Vertinsky [25] suggest that an apolitical approach is the best way to carry out collaboration processes without any political influences.

It is essential to establish a sound legal environment that gives the decision-makers the authority to implement collaboration practices in development initiatives [26]. Existing laws and policies are more geared towards supporting silo-working approaches through mandates given to various organisations and do not encourage formal collaborative ac-

tions [21–27]. Therefore, laws and policies that mediate institutional boundaries between related organisations [21,64], with a view to harmonising and strengthening current collaboration practices among different sectors, are essential [16,21–23,29,36,40,41,48,49,52–54]. This harmonisation provides a legal background [32,44] to develop formal collaborative processes which can integrate overlapping responsibilities among different governance [29]. The forming of formal agreements between the organisations through a memorandum of understanding and service-level agreements can help foster collaborative initiatives [43]. However, the strengthening of legislation is not enough to change stakeholder behaviour in adopting collaboration practices. It requires an entrenching collaboration culture at the department level [44] to push the collaborative routines that can force actors to change their habituated silo-based working patterns [44,48]. Hence, the introduction of policies and legislation for mainstream collaboration is vital. Beyond this, it is essential to ensure policy plans for setting up informal structures that promote collaboration [25,65] to create flexibility in the collaborative process. Moreover, it is important to provide guidance and support to policymakers and to engage stakeholders during the consultation phase of policymaking, to capture formal and informal collaborative requirements and to create awareness among policymakers [47,60]. The creation of adaptive policies [66] is identified as a crucial enabler in coping with the complexity, dynamics, and uncertainties evident in the risk-sensitive urban development domain. Adaptive policies offer many positive features for creating a collaboration culture, such as self-organisation and social networking capacity, decentralised governance to the lowest and most effective jurisdictional level, variation in policy responses, formal policy review and continuous improvement [66].

Collaborative governance arrangements are considered essential to enhance stakeholder collaboration in risk-sensitive urban planning [42,68] since stakeholder collaboration requires governance arrangements that can offer mechanisms to handle tensions and conflicts among collaborative partners and to promote cross-organisational collaboration and joint problem-solving practices [22]. Collaborative governance arrangements should introduce new institutional arrangements that remove traditional power-based relationships [22,49,67,68] and support multilevel power-sharing among stakeholders [51] with accountable mechanisms [27,39]. Therefore, current hierarchical mode governance structures need to be modernised with flexible and self-organised network governance [38,51] or decentralised organisational arrangements linked with the centralised system [22] that allows all relevant stakeholders to gain participation [17] at appropriate stages in the design and planning cycle, with transparency. Additionally, studies [27,39] emphasise the need for ensuring that institutional arrangements have clear structures with proper task distribution without any overlaps or conflicts and avoid the dysfunction of existing actors' roles. Moreover, establishing reporting mechanisms and assessments of progress [51] is also identified as an important approach to assessing the effectiveness of the system and making improvements. On the other hand, Smedby and Neij [65] and Yumagulova and Vertinsky [25] argue that the creation of informal relationships or networks is essential for successful collaboration since they offer informal approaches for handling sensitive issues among stakeholders and allow informal changes in the formal agreements and policy documents when necessary [30]. Therefore, there is a need to step beyond the formal governance structures and introduce informal structures that can support stakeholder collaboration [29]. Therefore, enabling formal and informal organisational arrangements is essential in collaborative governance to support stakeholder collaboration [25,30,31,65,69].

Among these barriers, policies and legislation-related barriers, governance-related barriers, and political barriers are identified as the most often discussed barriers to stakeholder collaboration in risk-sensitive urban planning. These barriers determine the administrative environment of collaborative risk-sensitive urban planning. This study found that even though inter-organisational barriers, intra-organisational barriers, and personal barriers can be propagated by each other, these barriers can all be controlled by external barriers such as collaborative legislation and policies with well-defined roles and responsibilities and collaborative governance arrangements. Above all the barriers, political barriers play

a key role that can vary from country to country and from time to time, based on the nature of political leaders. Political barriers are considered unstable; therefore, the study suggests creating robust collaborative policies and laws with a suitable collaborative governance structure that can provide a sound administrative environment for collaborative risk-sensitive urban planning while controlling the other barriers which are generated by ineffective policies, laws, and unsupportive governance arrangements and mechanisms.

4. Conclusions

Stakeholder collaboration is a key challenge in creating transformation in urban planning procedures that will include DRR and CCA. Therefore, this study conducted a systematised literature review with the motive of identifying the limitations of and solutions for stakeholder collaboration in risk-sensitive urban planning. As a result, thirty-eight barriers were identified and classified into thirteen themes and four categories. Additionally, forty-three solutions and best practices for overcoming these barriers were presented and discussed under each theme. The findings show that, to have great collaboration across sectoral boundaries, organisations need to overcome micro-level barriers (such as personal and organisational barriers) and macro-level barriers (such as policies and law, governance, and political barriers). Therefore, collaborative members need to find approaches for going beyond their personal boundaries, organisational boundaries, and external boundaries to achieve successful collaboration outcomes.

This study adopted an interpretive structural modelling approach with the purpose of identifying the dependency among the barrier themes. Results show that inter-organisational barriers, intra-organisational barriers, and personal barriers drive each other or interdepend on each other. These linkage barriers are driven by external barriers such as politics, legislation and policies, and governance-related barriers. Therefore, the elimination of these external barriers will help eliminate or reduce the other barriers that are driven or led by them. Therefore, greater efforts need to be focused on eliminating these influential barriers in order to improve stakeholder collaboration in risk-sensitive urban planning. This research found several enablers that can be used as a catalyst to overcome these barriers to enhance stakeholder collaboration in risk-sensitive urban planning, including adapting an apolitical approach for the collaboration process, strengthening the laws and policies to support collaboration, and establishing transparent and accountable collaborative governance.

It is essential to note that these findings are limited to the literature sources selected based on the selection criteria of the study and, therefore, some barriers and enablers might not be covered and explained in detail. For example, the data security aspect was not addressed in the literature considered in this systematised review. However, despite this limitation, it is hoped that this study structured and presented a basic understanding of the barriers and enablers for stakeholder collaboration in risk-sensitive urban planning and indicated key driving barriers and the relationships among the barriers. It is hoped that this research provides a basis for further investigation of the driving barriers and for proposing strategies to eliminate them in order to enhance stakeholder collaboration in risk-sensitive urban planning.

Appendix A.

Appendix A.1. Basic Search Terms of the Study

"Stakeholder" and "risk sensitive" and "urban planning" and "collaboration" and "decision making" and "barriers" and "enablers".

Appendix A.2. Boolean Operator for Data Base Search (Key Terms Developed with Synonyms)

(((("stakeholder*" OR "actor*" OR "agent*" OR "agenc*" OR "organisation*" OR "institution*" OR "decision maker*" OR "policy maker*") AND ("Risk sens*" OR "Risk- sens*" OR "Disaster risk*" OR "Disaster reduc*" OR "Disaster risk reduc*" OR "Disaster management" OR "Risk Management" OR "Risk reduction" OR "Risk assessment" OR "Risk evaluation" OR "Risk based" OR "Disaster" OR "climate change adapt*" OR "climate change*") AND ("urban develop*" OR "Urban planning" OR "urban plan" OR "Urban proce*" OR "Urban design*") AND ("collaborat*" OR "Participat*" OR "intergrat*" OR "harmoni?*" OR "synergi*" OR "collaborative governance" OR "link") AND ("Decision making process" OR "Decision-Making process" OR "Plan proce*" OR "Planning proce*" OR "Develop* proce*" OR "design*" OR "Process design" OR "Design* method*" OR "Decision* proce*" OR "plan" OR "planning") AND ("issue*" OR "challenge*" OR "Problem" OR "difficult*" OR "boundar*" OR "barrier*" OR "opportunit*" OR "find*" OR "enabler*"))).

Appendix B.

Table A1. Initial reachability matrix.

Barrier Categories	Barrier Themes ID	Barriers to Stakeholder Collaboration in Risk-Sensitive Urban Planning	External Barriers			Inter-Organisational Barriers				Intra-Organisational Barriers			People-Related Barriers			Driving Power
			Policies and Legislation-Related Barriers	Governance-Related Barriers	Politics-Related Barriers	Leadership-Related Barriers	Organisational Interest-Related Barriers	Communication and Coordination-Related Barriers	Collaboration Processes-Related to Barriers	Organisational Structure-Related Barriers	Organisational Culture-Related Barriers	Organisational Resource Capacity-Related Barriers	Intrinsic Barriers	Profession-Related Barriers	Knowledge-Related Barriers	
External barriers	1	Policies and legislation-related barriers	1	1	0	1	1	1	1	0	1	1	0	1	0	9
	2	Governance-related barriers	0	1	0	1	1	1	1	1	1	1	0	1	1	10
	3	Politics-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10

Table A1. *Cont.*

Barrier Categories	Barrier Themes ID	Barriers to Stakeholder Collaboration in Risk-Sensitive Urban Planning	External Barriers			Inter-Organisational Barriers				Intra-Organisational Barriers			People-Related Barriers			Driving Power
			Policies and Legislation-Related Barriers	Governance-Related Barriers	Politics-Related Barriers	Leadership-Related Barriers	Organisational Interest-Related Barriers	Communication and Coordination-Related Barriers	Collaboration Processes-Related to Barriers	Organisational Structure-Related Barriers	Organisational Culture-Related Barriers	Organisational Resource Capacity-Related Barriers	Intrinsic Barriers	Profession-Related Barriers	Knowledge-Related Barriers	
Inter-organisational barriers	4	Leadership-related barriers	0	0	0	1	1	1	1	1	1	1	1	1	1	10
	5	Organisational interest-related barriers	0	0	0	1	1	1	0	0	0	0	1	1	1	6
	6	Communication and coordination-related barriers	0	0	0	0	1	1	1	0	0	0	0	1	1	5
	7	Collaboration processes-related barriers	0	0	0	0	1	1	1	0	0	0	0	0	0	3
Intra-organisational barriers	8	Organisational structure-related barriers	0	0	0	0	0	1	1	1	1	0	1	0	1	6
	9	Organisational culture-related barriers	0	0	0	0	1	1	1	0	1	1	1	1	1	8
	10	Organisational resource capacity-related barriers	0	0	0	0	0	1	1	1	0	1	1	0	1	6
People-related barriers	11	Intrinsic barriers	0	0	0	0	0	1	1	0	1	1	1	0	1	6
	12	Profession-related barriers	0	0	0	1	1	1	1	0	0	0	1	1	1	7
	13	Knowledge-related barriers	0	0	0	1	1	1	1	1	1	1	1	1	1	10
		Dependence power	2	3	1	7	10	13	12	6	8	8	8	8	10	

Table A2. Final reachability matrix.

Barrier Categories	Barrier Themes ID	Barriers to Stakeholder Collaboration in Risk-Sensitive Urban Planning	External Barriers			Inter-Organisational Barriers				Intra-Organisational Barriers			People-Related Barriers			Driving Power
			Policies and Legislation-Related Barriers	Governance-Related Barriers	Politics-Related Barriers	Leadership-Related Barriers	Organisational Interest-Related Barriers	Communication and Coordination-Related Barriers	Collaboration Processes-Related Barriers	Organisational Structure-Related Barriers	Organisational Culture-Related Barriers	Organisational Resource Capacity-Related Barriers	Intrinsic Barriers	Profession-Related Barriers	Knowledge-Related Barriers	
External barriers	1	Policies and legislation-related barriers	1	1	0	1	1	1	1	1*	1	1	1*	1	1*	12
	2	Governance-related barriers	0	1	0	1	1	1	1	1	1	1	1*	1	1	11
	3	Politics-related barriers	1	1	1	1	1	1	1	1	1	1	1*	1*	1*	13
Inter-organisational barriers	4	Leadership-related barriers	0	0	0	1	1	1	1	1	1	1	1	1	1	10
	5	Organisational interest-related barriers	0	0	0	1	1	1	1*	1*	1*	1*	1	1	1	10
	6	Communication and coordination-related barriers	0	0	0	1*	1	1	1	1*	1*	1*	1*	1	1	10
	7	Collaboration processes-related barriers	0	0	0	1*	1	1	1	1*	1*	1*	1*	1*	1*	10
Intra-organisational barriers	8	Organisational structure-related barriers	0	0	0	1*	1*	1	1	1	1	1*	1	1*	1	10
	9	Organisational culture-related barriers	0	0	0	1*	1	1	1	1*	1	1	1	1	1	10
	10	Organisational resource capacity-related barriers	0	0	0	1*	1*	1	1	1	1*	1	1	1*	1	10
People-related barriers	11	Intrinsic barriers	0	0	0	1*	1*	1	1	1*	1	1	1	1*	1	10
	12	Profession-related barriers	0	0	0	1	1	1	1	1*	1*	1*	1	1	1	10
	13	Knowledge-related barriers	0	0	0	1	1	1	1	1	1	1	1	1	1	10
		Dependence power	2	3	1	13	13	13	13	13	13	13	13	13	13	

1* Transitivity link.

Table A3. Conical Matrix.

Barrier Categories	Barrier Themes ID	Barriers to STAKEHOLDER Collaboration in Risk-Sensitive Urban Planning	Inter-Organisational Barriers				Intra-Organisational Barriers			People-Related Barriers			External Barriers			Driving Power	Level
			Leadership-Related Barriers	Organisational Interest-Related Barriers	Communication and Coordination-Related Barriers	Collaboration Processes-Related Barriers	Organisational Structure-Related Barriers	Organisational Culture-Related Barriers	Organisational Resource Capacity-Related Barriers	Intrinsic Barriers	Profession-Related Barriers	Knowledge-Related Barriers	Governance-Related Barriers	Policies and Legislation-Related Barriers	Politics-Related Barriers		
Inter-organisational barriers	4	Leadership-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
	5	Organisational interest-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
	6	Communication and coordination-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
	7	Collaboration processes-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
Intra-organisational barriers	8	Organisational structure-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
	9	Organisational culture-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
	10	Organisational resource capacity-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
People-related barriers	11	Intrinsic barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
	12	Profession-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
	13	Knowledge-related barriers	1	1	1	1	1	1	1	1	1	1	0	0	0	10	1
External barriers	2	Governance-related barriers	1	1	1	1	1	1	1	1	1	1	1	0	0	11	2
	1	Policies and legislation-related barriers	1	1	1	1	1	1	1	1	1	1	1	1	0	12	3
	3	Politics-related barriers	1	1	1	1	1	1	1	1	1	1	1	1	1	13	4
		Dependence power	13	13	13	13	13	13	13	13	13	13	3	2	1		
		Level	1	1	1	1	1	1	1	1	1	1	2	3	4		

Table A4. Level partitioning.

Elements	Reachability Set	Antecedent Set	Intersection Set	Level
1	1	1,3	1	3
2	2	1,2,3	2	2
3	3	3	3	4
4	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
5	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
6	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
7	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
8	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
9	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
10	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
11	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
12	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1
13	4,5,6,7,8,9,10,11,12,13	1,2,3,4,5,6,7,8,9,10,11,12,13	4,5,6,7,8,9,10,11,12,13	1

References

1. United Nations Department of Economic and Social Affairs (16 May 2018). 68% of the World Population Projected to Live in Urban Areas by 2050, Says UN. Available online: https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html (accessed on 27 April 2021).
2. Chang, S.E.; Yip, J.Z.; Tse, W. Effects of urban development on future multi-hazard risk: The case of Vancouver, Canada. *Nat. Hazards* **2019**, *98*, 251–265. [CrossRef]
3. Zhou, Q.; Leng, G.; Su, J.; Ren, Y. Comparison of urbanisation and climate change impacts on urban flood volumes: Importance of urban planning and drainage adaptation. *Sci. Total Environ.* **2019**, *658*, 24–33. [CrossRef]
4. Cutter, S.L.; Emrich, C.T.; Gall, M.; Reeves, R. Flash flood risk and the paradox of urban development. *Nat. Hazards Rev.* **2018**, *19*, 05017005. [CrossRef]
5. Munene, M.B.; Swartling, Å.G.; Thomalla, F. Adaptive governance as a catalyst for transforming the relationship between development and disaster risk through the Sendai Framework? *Int. J. Disaster Risk Reduct.* **2018**, *28*, 653–663. [CrossRef]
6. Schipper, E.L.F.; Thomalla, F.; Vulturius, G.; Davis, M.; Johnson, K. Linking disaster risk reduction, climate change and development. *Int. J. Disaster Resil. Built Environ.* **2016**, *7*, 216–228. [CrossRef]
7. Buffenbarger, J.K. Building Toward a Sustainable and Resilient Future. *Spec. Publ.* **2015**, *305*, 26.1–26.16.
8. Pachauri, R.K.; Allen, M.R.; Barros, V.R.; Broome, J.; Cramer, W.; Christ, R.; Church, J.A.; Clarke, L.; Qin, D.; Dasgupta, P.; et al. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; IPCC: Geneva, Switzerland, 2014; p. 151.
9. Dempsey, N.; Jenks, M. The future of the compact city. *Built Environ.* **2010**, *36*, 116–121. [CrossRef]
10. Malalgoda, C.; Amaratunga, D.; Haigh, R. Creating a disaster resilient built environment in urban cities: The role of local governments in Sri Lanka. *Int. J. Disaster Resil. Built Environ.* **2013**, *4*, 72–94. [CrossRef]
11. Thomalla, F.; Boyland, M.; Johnson, K.; Ensor, J.; Tuhkanen, H.; Gerger Swartling, Å.; Han, G.; Forrester, J.; Wahl, D. Transforming development and disaster risk. *Sustainability* **2018**, *10*, 1458. [CrossRef]
12. O'Brien, K.; Pelling, M.; Patwardhan, A.; Hallegatte, S.; Maskrey, A.; Oki, T.; Oswald-Spring, U.; Wilbanks, T.; Yanda, P.Z. Toward a sustainable and resilient future. In *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change*; Cambridge University Press: Cambridge, UK, 2012; pp. 437–486.
13. Dwirahmadi, F.; Rutherford, S.; Phung, D.; Chu, C. Understanding the operational concept of a flood-resilient urban community in Jakarta, Indonesia, from the perspectives of disaster risk reduction, climate change adaptation, and development agencies. *Int. J. Environ. Res. Public Health* **2019**, *16*, 3993. [CrossRef]
14. Ansell, C.; Gash, A. Collaborative governance in theory and practice. *J. Public Adm. Res. Theory* **2008**, *18*, 543–571. [CrossRef]
15. Shafique, M.; Kim, R. Recent progress in low-impact development in South Korea: Water-management policies, challenges and opportunities. *Water* **2018**, *10*, 435. [CrossRef]
16. Hardoy, J.; Gencer, E.; Winograd, M. Participatory planning for climate resilient and inclusive urban development in Dosquebradas, Santa Ana and Santa Tomé. *Environ. Urban.* **2019**, *31*, 33–52. [CrossRef]
17. Wijaya, N. Disaster Risk Reduction and Climate Change Adaptation Integration into Peri-Urban Development Planning: A Case Study of Bandung Metropolitan Area, Indonesia. In *IOP Conference Series: Earth and Environmental Science*; IOP Publishing: Bristol, UK, 2018; Volume 145, p. 012079.
18. Nguyen, V.N.; Ginige, K.; Greenwood, D. Challenges in integrating disaster risk reduction into the built environment—The Vietnam context. *Procedia Eng.* **2018**, *212*, 316–323. [CrossRef]
19. Dias, N.; Clegg, G.; Amaratunga, D.; Haigh, R. A resilient environment through the integration of CCA and DRR: An overview of existing challenges. *Int. J. Adv. Sci. Eng. Inf. Technol.* **2019**, *9*, 129–135. [CrossRef]

20. Wendler, R. The maturity of maturity model research: A systematic mapping study. *Inf. Softw. Technol.* **2012**, *54*, 1317–1339. [CrossRef]

21. Wamsler, C.; Wickenberg, B.; Hanson, H.; Olsson, J.A.; Stålhammar, S.; Björn, H.; Falck, H.; Gerell, D.; Oskarsson, T.; Simonsson, E.; et al. Environmental and climate policy integration: Targeted strategies for overcoming barriers to nature-based solutions and climate change adaptation. *J. Clean. Prod.* **2020**, *247*, 119154. [CrossRef]

22. Trapp, J.H.; Kerber, H.; Schramm, E. Implementation and diffusion of innovative water infrastructures: Obstacles, stakeholder networks and strategic opportunities for utilities. *Environ. Earth Sci.* **2017**, *76*, 154. [CrossRef]

23. Shrestha, S.; Dhakal, S. An assessment of potential synergies and trade-offs between climate mitigation and adaptation policies of Nepal. *J. Environ. Manag.* **2019**, *235*, 535–545. [CrossRef]

24. Broto, V.C.; Macucule, D.A.; Boyd, E.; Ensor, J.; Allen, C. Building collaborative partnerships for climate change action in Maputo, Mozambique. *Environ. Plan. A* **2015**, *47*, 571–587. [CrossRef]

25. Yumagulova, L.; Vertinsky, I. Moving beyond engineering supremacy: Knowledge systems for urban resilience in Canada's Metro Vancouver region. *Environ. Sci. Policy* **2019**, *100*, 66–73. [CrossRef]

26. Malalgoda, C.; Amaratunga, D. A disaster resilient built environment in urban cities: The need to empower local governments. *Int. J. Disaster Resil. Built Environ.* **2015**, *6*, 102–116. [CrossRef]

27. Chu, E.; Brown, A.; Michael, K.; Du, J.; Lwasa, S.; Mahendra, A. *Unlocking the Potential for Transformative Climate Adaptation in Cities*; Background Paper prepared for the Global Commission on Adaptation, Washington DC and Rotterdam; World Resource Institute—Ross Center: Washington, DC, USA, 2019.

28. Webb, B.; Petheram, L.; Weiske, P. *Climate Adaptation Decision Support Strategies: Developing a National Agenda*; Australian National University: Canberra, Australia, 2014.

29. Bissonnette, J.F.; Dupras, J.; Messier, C.; Lechowicz, M.; Dagenais, D.; Paquette, A.; Jaeger, J.A.G.; Gonzalez, A. Moving forward in implementing green infrastructures: Stakeholder perceptions of opportunities and obstacles in a major North American metropolitan area. *Cities* **2018**, *81*, 61–70. [CrossRef]

30. Wamsler, C.; Luederitz, C.; Brink, E. Local levers for change: Mainstreaming ecosystem-based adaptation into municipal planning to foster sustainability transitions. *Glob. Environ. Chang.* **2014**, *29*, 189–201. [CrossRef]

31. Forino, G.; Von Meding, J.; Brewer, G.J. Challenges and opportunities for Australian local governments in governing climate change adaptation and disaster risk reduction integration. *Int. J. Disaster Resil. Built Environ.* **2018**, *9*, 258–272. [CrossRef]

32. Rendon, O.; Gebhardt, O.; Branth Pedersen, A.; Breil, M.; Campos, I.; Chiabai, A.; Harmácková, Z. *Implementation of Climate Change Adaptation: Barriers and Opportunities to Adaptation in Case Studies*; BASE: Leeds, UK, 2016.

33. Malalgoda, C.; Amaratunga, D.; Haigh, R. Challenges in creating a disaster resilient built environment. *Procedia Econ. Financ.* **2014**, *18*, 736–744. [CrossRef]

34. Leck, H.; Pelling, M.; Adelekan, I.; Dodman, D.; Issaka, H.; Johnson, C.; Manda, M.; Mberu, B.; Nwokocha, E.; Osuteye, E.; et al. Towards risk-sensitive and transformative urban development in Sub Saharan Africa. *Sustainability* **2018**, *10*, 2645. [CrossRef]

35. Therrien, M.C.; Matyas, D.; Usher, S.; Jutras, M.; Beauregard-Guérin, I. *Towards Urban Resilience: Synthesising the Strategies that Enable and Factors that Impede Implementation—WORKING PAPER*; 2018; Available online: http://cite-id.com/documents/synth%C3%A8se-de-connaissances/Scoping-review-Final-version-siteweb.pdf (accessed on 19 January 2023).

36. Mwenje, E. Regulatory Mainstreaming Climate Change Adaption into Urban Planning in the Global South. A Case of Kigali City. Master's Thesis, University of Twente, Enschede, The Netherlands, 2019.

37. Webb, R.; Bai, X.; Smith, M.S.; Costanza, R.; Griggs, D.; Moglia, M.; Neuman, M.; Newman, P.; Newton, P.; Norman, B.; et al. Sustainable urban systems: Co-design and framing for transformation. *Ambio* **2018**, *47*, 57–77. [CrossRef]

38. Taylor, A. Institutional inertia in a changing climate: Climate adaptation planning in Cape Town, South Africa. *Int. J. Clim. Chang. Strateg. Manag.* **2016**, *8*, 194–211. [CrossRef]

39. Coaffee, J.; Clarke, J.; Davis, P.T. A HARMONISE'd approach to building security-driven urban resilience: A call to arms. *J. Financ. Manag. Prop. Constr.* **2016**, *21*, 73–80. [CrossRef]

40. Torabi, E.; Dedekorkut-Howes, A.; Howes, M. Adapting or maladapting: Building resilience to climate-related disasters in coastal cities. *Cities* **2018**, *72*, 295–309. [CrossRef]

41. Uittenbroek, C.J.; Janssen-Jansen, L.B.; Spit, T.J.; Runhaar, H.A. Organisational values and the implications for mainstreaming climate adaptation in Dutch municipalities: Using Q methodology. *J. Water Clim. Chang.* **2014**, *5*, 443–456. [CrossRef]

42. Valencia, S.C.; Simon, D.; Croese, S.; Nordqvist, J.; Oloko, M.; Sharma, T.; Taylor Buck, N.; Versace, I. Adapting the Sustainable Development Goals and the New Urban Agenda to the City Level: Initial Reflections from a Comparative Research Project. *Int. J. Urban Sustain. Dev.* **2019**, *11*, 4–23. [CrossRef]

43. Nemakonde, L.D.; Van Niekerk, D. A normative model for integrating organisations for disaster risk reduction and climate change adaptation within SADC member states. *Disaster Prev. Manag. Int. J.* **2017**, *26*, 361–376. [CrossRef]

44. Farrell, L.A. Mainstreaming Climate Change Adaptation into Urban Development: Lessons from Two South African Cities. Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge, MA, USA, 2010.

45. Giordano, R.; Pilli-Sihvola, K.; Pluchinotta, I.; Matarrese, R.; Perrels, A. Urban adaptation to climate change: Climate services for supporting collaborative planning. *Clim. Serv.* **2020**, *17*, 100100. [CrossRef]

46. Walsh, C.L.; Roberts, D.; Dawson, R.J.; Hall, J.W.; Nickson, A.; Hounsome, R. Experiences of integrated assessment of climate impacts, adaptation and mitigation modelling in London and Durban. *Environ. Urban.* **2013**, *25*, 361–380. [CrossRef]

47. Sitas, N.; Reyers, B.; Cundill, G.; Prozesky, H.E.; Nel, J.L.; Esler, K.J. Fostering collaboration for knowledge and action in disaster management in South Africa. *Curr. Opin. Environ. Sustain.* **2016**, *19*, 94–102. [CrossRef]
48. Uittenbroek, C.J. From policy document to implementation: Organisational routines as possible barriers to mainstreaming climate adaptation. *J. Environ. Policy Plan.* **2016**, *18*, 161–176. [CrossRef]
49. Hegger, D.; Zeijl-Rozema, V.; Dieperink, C. Toward design principles for joint knowledge production projects: Lessons from the deepest polder of The Netherlands. *Reg. Environ. Chang.* **2014**, *14*, 1049–1062. [CrossRef]
50. Attri, R.; Dev, N.; Sharma, V. Interpretive structural modelling (ISM) approach: An overview. *Res. J. Manag. Sci.* **2013**, *2319*, 1171.
51. Nugraha, E.; Lassa, J.A. Towards endogenous disasters and climate adaptation policy making in Indonesia. *Disaster Prev. Manag. Int. J.* **2018**, *27*, 228–242. [CrossRef]
52. Amaratunga, D.; Malalgoda, C.I.; Keraminiyage, K. Contextualising mainstreaming of disaster resilience concepts in the construction process. *Int. J. Disaster Resil. Built Environ.* **2018**, *9*, 348–367. [CrossRef]
53. Taylor, A. *Urban Climate Adaptation as a Process of Organisational Decision Making*; University of Cape Town: Cape Town, South Africa, 2017.
54. Parthasarathy, D. Decentralisation, pluralisation, balkanisation? Challenges for disaster mitigation and governance in Mumbai. *Habitat Int.* **2016**, *52*, 26–34. [CrossRef]
55. Pieterse, A.; Van Niekerk, W.; du Toit, J. Creating resilient settlements through climate change adaptation planning. In Proceedings of the Planning Africa Conference, Cape Town, South Africa, 15–17 October 2018; South African Planning Institute: Johannesburg, South Africa, 2018; pp. 15–17.
56. Monteiro, J.; Austin, M.; Mandilwar, G.; Sharman, R. Smart City App. In *International Conference on Design Science Research in Information Systems*; Springer: Cham, Switzerland, 2015; pp. 396–400.
57. Kuller, M.; Bach, P.M.; Roberts, S.; Browne, D.; Deletic, A. A planning-support tool for spatial suitability assessment of green urban stormwater infrastructure. *Sci. Total Environ.* **2019**, *686*, 856–868. [CrossRef]
58. Baloye, D.O.; Palamuleni, L.G. Modelling a critical infrastructure-driven spatial database for proactive disaster management: A developing country context. *Jàmbá J. Disaster Risk Stud.* **2016**, *8*, 1–14. [CrossRef]
59. van de Ven, F.H.; Snep, R.P.; Koole, S.; Brolsma, R.; van der Brugge, R.; Spijker, J.; Vergroesen, T. Adaptation Planning Support Toolbox: Measurable performance information based tools for co-creation of resilient, ecosystem-based urban plans with urban designers, decision-makers and stakeholders. *Environ. Sci. Policy* **2016**, *66*, 427–436. [CrossRef]
60. Kehew, R.B.; Kolisa, M.; Rollo, C.; Callejas, A.; Alber, G.; Ricci, L. Formulating and implementing climate change laws and policies in the Philippines, Mexico (Chiapas), and South Africa: A local government perspective. *Local Environ.* **2013**, *18*, 723–737. [CrossRef]
61. Stepanova, O.; Polk, M.; Saldert, H. Understanding mechanisms of conflict resolution beyond collaboration: An interdisciplinary typology of knowledge types and their integration in practice. *Sustain. Sci.* **2020**, *15*, 263–279. [CrossRef]
62. Chu, E.; Schenk, T.; Patterson, J. The dilemmas of citizen inclusion in urban planning and governance to enable a 1.5 C climate change scenario. *Urban Plan.* **2018**, *3*, 128–140. [CrossRef]
63. Ahn, C.; Schmidt, S. Designing wetlands as an essential infrastructural element for urban development in the era of climate change. *Sustainability* **2019**, *11*, 1920. [CrossRef]
64. Papa, R.; Galderisi, A.; Saretta, E.; Vigo Majello, M.C. European Cities Dealing with Climate Issues: Ideas and Tools for a Better Framing of Current Practices. *TeMA J. Land Use Mobil. Environ.* **2015**, 63–80. [CrossRef]
65. Smedby, N.; Neij, L. Experiences in urban governance for sustainability: The Constructive Dialogue in Swedish municipalities. *J. Clean. Prod.* **2013**, *50*, 148–158. [CrossRef]
66. Swanson, D.; Bhadwal, S. (Eds.) *Creating Adaptive Policies: A Guide for Policymaking in an Uncertain World*; IDRC: Ottawa, ON, Canada, 2009.
67. Howell, K.; Wilson, B.B. Preserving community through radical collaboration: Affordable housing preservation networks in Chicago, Washington, DC, and Denver. *Hous. Theory Soc.* **2019**, *36*, 319–337. [CrossRef]
68. Diep, L. The liquid politics of an urban age. *Palgrave Commun.* **2018**, *4*, 76. [CrossRef]
69. Uittenbroek, C.J.; Janssen-Jansen, L.B.; Runhaar, H.A. Mainstreaming climate adaptation into urban planning: Overcoming barriers, seizing opportunities and evaluating the results in two Dutch case studies. *Reg. Environ. Chang.* **2013**, *13*, 399–411. [CrossRef]