sustainability

MDPI

Article

Modelling Interrelationships of the Factors Impeding Community Engagement in Risk-Sensitive Urban Planning: Evidence from Sri Lanka

Devindi Geekiyanage *, Terrence Fernando and Kaushal Keraminiyage

School of Science, Engineering and Environment, University of Salford, Maxwell Building, 43 Crescent, Salford M5 4WT, UK; t.fernando@salford.ac.uk (T.F.); k.p.keraminiyage@salford.ac.uk (K.K.)
* Correspondence: d.geekiyanage@salford.ac.uk

Abstract: During the last two decades, global disasters have impacted over 5.2 billion people, with economic losses exceeding USD 2.97 trillion. This underscores the critical need for inclusive risk-sensitive urban planning (RSUP) that integrates community insights. Community-based disaster risk reduction (CBDRR) has demonstrated a potential reduction of up to 40% in mortality rates during disasters and cost savings in disaster response and recovery. However, research has shown that only 20% felt they are involved in decisions related to neighborhood planning, despite communities' lived experience in surviving local hazards. This highlights a gap where practitioners dominate the development of mitigation and development plans, sidelining local perspectives. Using Sri Lanka as a case study, this study investigated the barriers to effective community participation in the decision-making of RSUP and thereby developed an interpretive logic model to establish an understanding of why they occur and how each barrier is interlinked. The data gathered from a sample of 44 experts and community representatives revealed 19 factors that impede community inclusion in the decision-making of RSUP in Sri Lanka. The Total Interpretive Structural Modelling (TISM) analysis adopted identified that the absence of legal provisions for inclusive development, political dynamics, and corruption are the most significant barriers. The Matrix Impact of Cross Multiplication Applied to Classification (MICMAC) further revealed that fewer financial provisions and the absence of an institutional framework for community engagement are the linking barriers to the other 17 barriers. This study not only extends the theoretical debate on barriers to community engagement for risk-responsive and equitable development but also helps urban planners, disaster management practitioners, and strategy policymakers focus on critical areas that need major reforms.

Keywords: barriers; community engagement; disaster risk reduction; participatory development; risk-sensitive urban planning; total interpretive structural modelling; SDG 11; SDG 10

Citation: Geekiyanage, D.; Fernando, T.; Keraminiyage, K. Modelling Interrelationships of the Factors Impeding Community Engagement in Risk-Sensitive Urban Planning: Evidence from Sri Lanka. *Sustainability* **2023**, *15*, 14662. https://doi.org/10.3390/su152014662

Academic Editor: Awais Piracha

Received: 2 July 2023
Revised: 15 September 2023
Accepted: 6 October 2023
Published: 10 October 2023

1. Introduction

Disasters have a profound impact on communities. According to the Centre for Research on the Epidemiology of Disasters (CRED) and United Nations Office for Disaster Risk reduction (UNDRR) [1], between 2000 and 2019, there were approximately 7348 disasters globally, affecting over 5.2 billion people and resulting in economic losses exceeding USD 2.97 trillion. These statistics underscore the urgency of effective disaster risk mitigation and the need for inclusive planning that incorporates community perspectives. Since the inception of the Sendai Framework for Disaster Risk Reduction in 2015, community-based disaster risk reduction (CBDRR) has taken a prominent role in driving community-led initiatives. According to UNDRR data, CBDRR activities have been shown to reduce mortality rates by up to 40% during disasters [2]. Additionally, the UNDRR highlights that for every dollar invested in community engagement, approximately USD 4 to USD 7 can be saved in disaster response and recovery costs [3]. Furthermore, the Global Facility for Disaster Reduction and Recovery (GFDRR) indicates that engaging communities in

disaster risk-sensitive neighbourhood planning can lead to a 10–20% reduction in potential damages [2,3]. This demonstrates the tangible impact of involving local residents in decision-making processes and highlights the cost-effectiveness of proactive measures.

However, it is evident that practitioners tend to build rapport and liaise with locals mainly to inform and consult them on local disaster risks [4–6]. On rare occasions, practitioners have attempted to collaborate with locals to develop risk mitigation plans and empower them through community capacity building to build resilient neighbourhoods [7]. Towards the end of 2015, community-based approaches began to be extended to the realm of sustainable development, aligning with the objective of achieving Sustainable Development Goal 11: creating cities that are inclusive, safe, resilient, and sustainable. However, a survey conducted by the International Federation of Red Cross and Red Crescent Societies (IFRC) revealed that only 20% of respondents felt they were engaged in decision-making processes related to DRR in their communities [8]. This indicates a gap between the intentions of inclusive planning and the actual level of community participation. Thus, the literature asserts that community engagement is not widely applied in the context of risk-sensitive urban planning (RSUP) as there are many challenges in integrating community inputs into disaster risk management (DRM) and urban development, led by multiple agencies, due to often discrepancies between practitioners' decision-making and community involvement [9].

Numerous barriers are evident in community inclusion in disaster risk-responsive urban planning. Some of the significant hurdles include the lack of knowledge among communities about how to engage effectively in participatory decision-making, inadequate awareness of the benefits of community engagement, insufficient meaningful engagement with communities by decision-makers, vague aims and objectives of community engagement, and unclear expectations among stakeholders during the engagement processes [10]. From the literature, it was observed that these barriers vary from country to country, and within different communities, due to the fact that major differences exist with regard to the social-behavioural characteristics of respective communities, political and power dynamics, economic stability, the skill levels of the workforce, and technological capability [11]. Therefore, it is worth investigating this issue in a more contextualised approach to study why and how community engagement has been hindered in a particular context.

The ongoing expansion of urban areas in South Asia, sub-Saharan Africa, and other regions is expected to increase and worsen the risk of disasters. Sri Lanka, with an urban sprawl rate of 9.57 per cent per year during the period of 1995–2017 [12] (which is a remarkably high figure even by global standards), is currently experiencing the adverse effects of unsustainable developments. Due to the relatively small island setting, the demand for land in the growing urban areas has led to the expansion of cities to areas that are prone to flooding and landslides, which are often deemed unsuitable for habitation [13]. As of 2010, the population annually affected by river flooding in Sri Lanka is estimated at 59,000 people, and the expected annual impact on GDP is estimated at USD 267 million, while the annually affected population is expected to increase by 26,000 by 2030 [ADB, [14]]. Consequently, many projects have been terminated or disrupted by community protests (e.g., the seaplane platform proposed in Negombo Lagoon, Muthurajawela wetlands). Sri Lanka also suffers from political corruption, whereby policy-decisions are negatively influenced by politicians; thus, communities have been overlooked in city planning and local development related decision-making, which is one of the reasons for unsafe developments [12].

Accordingly, this study aimed to develop an interpretive model of barriers to establishing an understanding of what impedes community-inclusive decision-making for RSUP, why they occur, and how each barrier is interlinked. The specific objectives of this study are outlined as follows:

I. to identify the barriers to community-inclusive RSUP in Sri Lanka;
II. to establish the pair-wise contextual interrelationships among the identified barriers;
III. to develop a logical knowledge base to provide reasoning for the inter-dependencies between barriers;

IV. to develop a Total Interpretive Structural Model (TISM) and thereby priorities the barriers; and
V. to identify autonomous, dependent, linkage, and driving barriers.

Leveraging multiple research methods such as Grounded Theory Methodology (GRM), followed by the Total Interpretive Structural Modelling (TISM) and Matrix Impact of Cross Multiplication Applied to Classification (MICMAC) analysis, this study effectively deconstructs the key barriers and systematically builds a model that identifies formalised relationships between specific barriers. Consequently, not only the barriers' network characteristics can be revealed, but also a roadmap for addressing these barriers to promote inclusive developments can be depicted.

2. Barriers to Participatory RSUP

There is a dearth of international empirical research that has investigated the factors that impede communities from engaging in decision-making for participatory urban planning and development. A recently conducted systematic review of barriers to inclusive RSUP, a published work by the authors [10], uncovered 48 obstacles that limit community involvement in participatory decision-making for RSUP. After analysing the characteristics and commonalities of the barriers identified, they were classified into five categories: (1) community context, (2) agency practitioners related, (3) institutional, (4) processes, and (5) infrastructure.

2.1. Community Context-Specific Barriers

The community context is shaped by a locality's inherent socio-cultural, income, education, and other neighbourhood characteristics. The lack of community knowledge and awareness of urban planning procedures and the benefits derived from the engagement [15–19] is prominent, causing communities to be disengaged from participation. This is further worsened by consultation fatigue [20,21], high poverty levels, mostly within slum communities [20,22], low literacy and numeracy rates, and the prevalence of oral culture [23,24]. Additionally, some communities view community engagement as a threat because of discrimination and the possibility of exposing sensitive information (i.e., drug use, illegal immigration status, or stigmatising illness) to authorities [20].

2.2. Agency Practitioners-Related Barriers

The literature asserts that, in most cases, practitioners consult with communities to fill project requirements without genuinely attempting to engage with locals, especially with those who are vulnerable and marginalised [17,22,25]. However, Cropley and Peter [26] assert that it would be a mistake to assume that all marginalised groups would be willing to engage in planning if the barriers were removed. Furthermore, there is no reason to believe that the seldom-heard would be more motivated to participate than the apathetic majority [21]. Moreover, poor relationships between locals and decision-makers, including urban planners, is often highlighted in the literature [22]. Eastern European countries, for example, still prioritise community consultation over allowing citizens and stakeholders to contribute actively to the urban planning process [27]. In addition, the participation of displaced communities in resettlement planning is minimal in many contexts, with city officials handling the entire process and only involving communities during the registration stage [22].

2.3. Institutional Barriers

Institutional barriers refer to policies, procedures, or situations that systematically disadvantage certain groups of people. Centralised governing authorities resist sharing power and control with community actors, leading to a shallow commitment to community engagement from developers and local authorities [17,20,28–32]. Thus, engagement is often seen as managing expectations rather than a real commitment to listen and respond to community views, with limited evidence of willingness to change policies or

proposals [21]. Furthermore, the role of third-sector organisations (such as voluntary associations, non-governmental organisations (NGOs), community organisations, and non-profit organisations) in supporting community development activities is minimally discussed in current procedures [23]. In terms of resource allocation, limited financial support for community participation is highlighted [28]. Additionally, the availability of experienced professionals in community engagement is limited [31]. Research [17,24,33] shows that DRR and urban planning related agencies do not conduct appropriate training for professionals to excel in participatory methods suitable for different circumstances [17,24,33]. As a result, engagement practices tend to be limited to conventional methods such as public meetings and community workshops. The literature, therefore, emphasises the need for increased investments in professional capacity-building and development programs.

2.4. Process Centred Barriers

Many researchers are of the view that the lack of clarity and transparency in defining the purpose of community engagement results in unclear expectations [15,17,21,30]. Furthermore, most of the development projects, especially donor-driven projects, have tight programmes, which limits time for trust building with communities [15,17,21]. This can undermine participatory decision-making efforts and compromise the community's informed engagement. Moreover, the lack of information available to citizens has made it difficult for them to participate in urban planning processes [18,34]. For instance, government meetings and official announcements are often not well-publicised, and it can be challenging to obtain information at the local level [24,35]. Additionally, the use of technical language and inconsistent terminology can make the information provided to participants hard to understand, which can limit effective contribution [23,36]. As a result, some community members may be excluded from the participatory process, and there can be an imbalance of stakeholders between interest groups with different levels of communication abilities [27]. Failures such as overlooked participation, the exclusion of seldom-heard people [37], and partisanship among community representatives [17] can exacerbate this imbalance.

2.5. Infrastructure Related Barriers

These barriers mostly concern investments in infrastructure and planning to support community engagement. One significant challenge is the poor coordination of event logistics, which can prevent some individuals from participating due to geographic constraints, transportation issues, safety concerns, or inaccessibility of meeting locations [17,24,33,35,38]. Weak communication channels between decision-makers and communities [28] and a lack of appropriate technology to support community participation [23] can also hinder effective community engagement.

3. Materials and Methods

The study employed a hybrid method of data collection: a systematic review followed by expert interviews and focus group discussions with communities to identify the barriers to community-inclusive RSUP. The empirical data were then systematically analysed through qualitative data coding and subjected to the TISM and MICMAC analysis. The research framework adapted for the study is graphically presented in Figure 1, while the subsequent sections describe the research methods in detail.

3.1. Systematic Review

A systematic review was conducted considering literature from 2010 to 2020 to identify the barriers from a global perspective; this review has already been published in [10]. This study included 50 past studies, and the synthesis revealed 48 constraints to participatory decision-making with regard to RSUP, summarised above in Section 2.

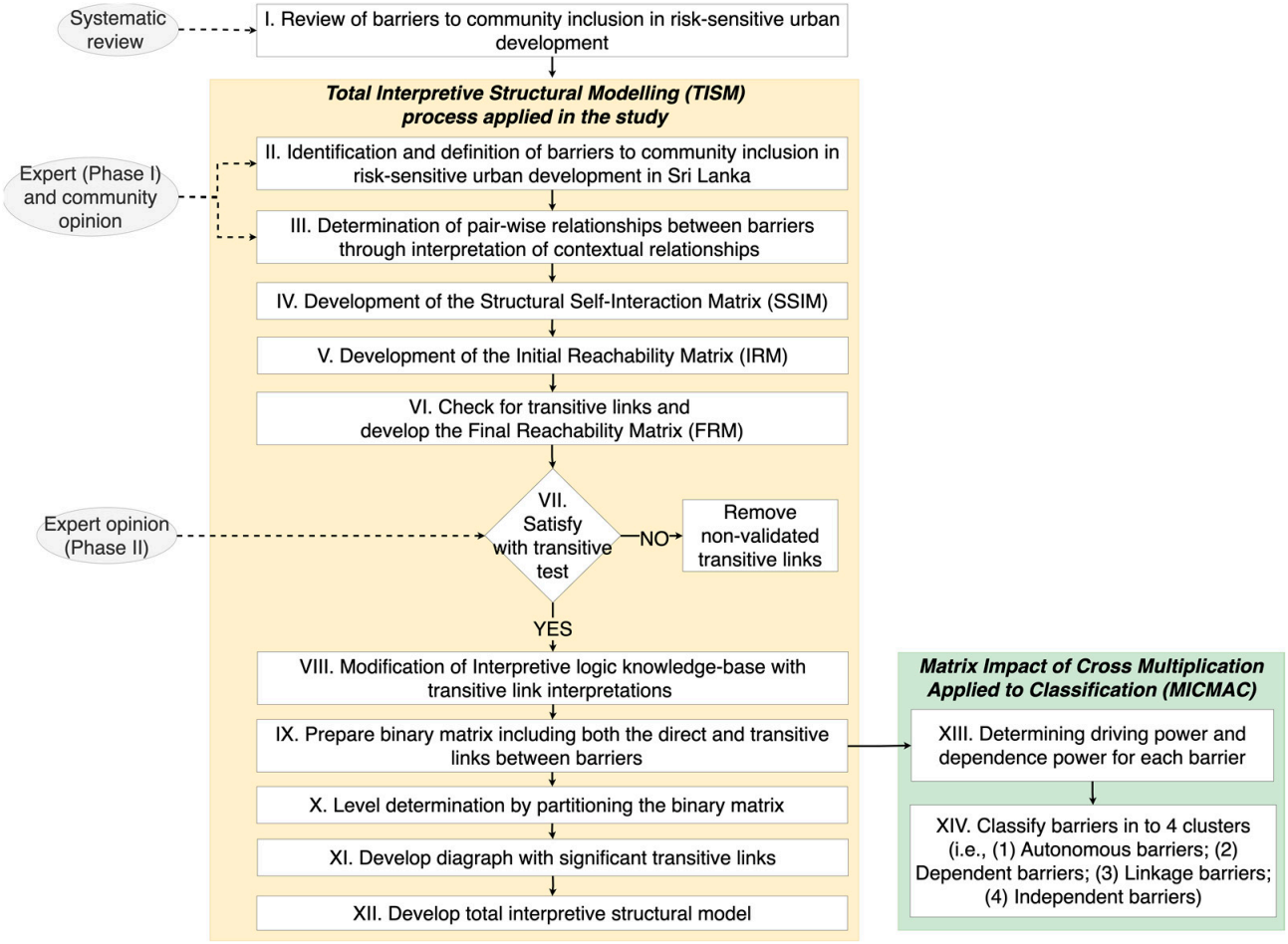


Figure 1. Research framework adapted for the study (Source: Modified from [36]).

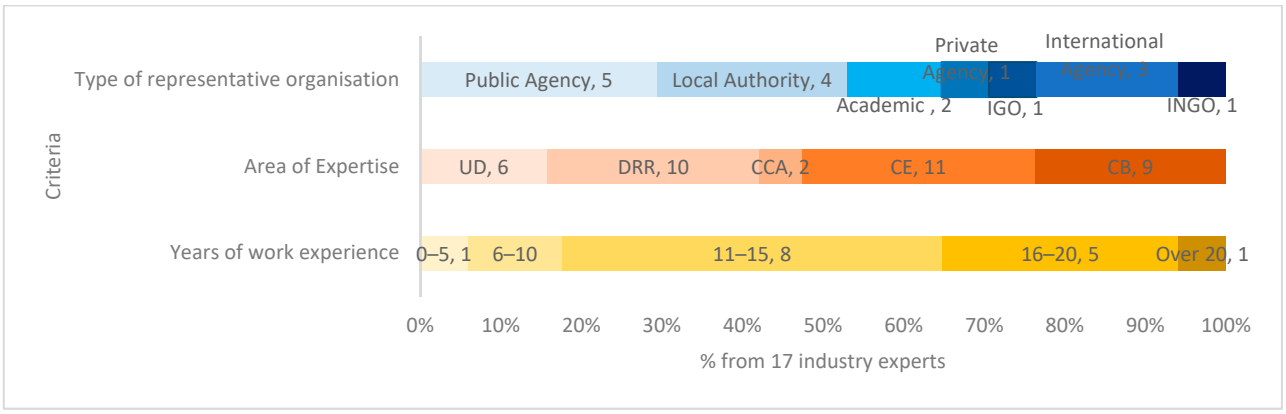
3.2. Empirical Data Collection

Subsequently, the context-specific knowledge about barriers to participatory RSUP was generated through interviews. Given that community engagement is a collective effort of both agency practitioners and community members, the empirical data pertaining to the barriers were extracted from both perspectives. Initially, 11 semi-structured interviews were conducted with industry experts to identify the barriers to participatory development and their interrelationships from the practitioners' viewpoint. Subsequently, 6 structured interviews were conducted to validate the generated transitive links. Separately, seven focus group discussions, including 27 community members, were conducted to include the community perspective. The profile of the experts and community representatives included in the study is presented in Figure 2.

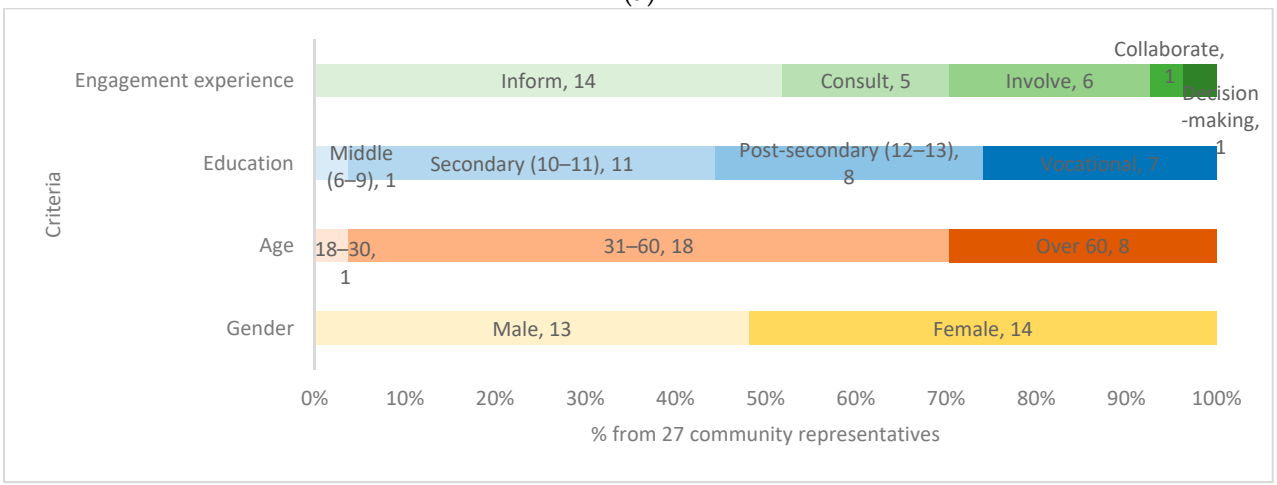
As shown in Figure 2a, most of the experts were from public agencies (29%) and local authorities (23%) (see Figure 2); it is reasonable to put more weight on their opinions as most of the disaster management and urban development projects in Sri Lanka are governed by the government. Expertise in five key areas, such as urban development (16%), DRR (26%), climate change adaptation (5%), community engagement (29%), and community capacity building (24%), were taken into consideration to generate perspectives for the study's focus on barriers to participatory development from all related disciplines. Most experts possessed more than 11 years of experience in at least one discipline.

As observed in Figure 2b, community representatives were selected based on five urban and peripheral development projects in Sri Lanka (i.e., (1) Negombo lagoon development project, (2) Meethotamulla garbage dump conversion into an urban park and associate resettlement project, (3) Piliyandala bus stand and market complex development project, (4) Balangoda post-disaster resettlement project, and (5) Kalutara landslide risk

mitigation project). The sample was chosen to maintain gender equity (52% female and 48% male) and include a diverse age range. Notably, it was observed that female participation is not overlooked or restricted in Sri Lanka when compared to most other Asian countries. However, child and youth participation in urban planning was found to be lacking, which has been reflected in the study sample. The majority of participants (41%) had completed secondary education. In addition, the engagement experiences they have received from respective development projects were classified based on the spectrum of public participation published by the International Association for Public Participation [39]. Most participants (58%) had only been informed about the projects, with 22% and 19% having been involved and consulted, respectively. Only a small percentage (4%) had experienced collaboration and co-decision-making with implementors. The study sample, therefore, seems to be a true reflection of community engagement practice in the Sri Lankan DRR and urban planning context.



(**a**)



(**b**)

Figure 2. (**a**) Classification of experts based on their years of work experience (row 1), area of expertise (row 2), and type of organisation (row 3), (**b**) Classification of community participants based on their gender (row 1), age (row 2), the highest level of education (row 3), and level of engagement (row 4).

3.3. Qualitative Data Analysis

In the data analysis process, the thick interview data underwent an extensive coding process using the constructivist grounded theory methodology outlined by Charmaz [40]. The data were open-coded to examine salient data, which were subsequently organised through focused coding. Finally, theoretical coding was conducted to generate barrier themes by categorising structured data (Table A1 in Appendix A provides a sample of the coding process). This process allows constant comparison of data while collecting

them until a substantive model is formulated through theoretical sampling [39]. It facilitates the emergence of new insights directly from the participants' perspectives, ensuring a comprehensive and nuanced understanding of the phenomenon under investigation. Following the grounded theory based data coding approach, the study adopted TISM (i.e., an enhancement of interpretive structural modelling (ISM)) and MICMAC analysis. The integration of grounded theory with TISM and MICMAC analysis is demonstrated in the studies related to risk analysis [41–43], whereas TISM and MICMAC analyses are substantially adopted in varying related disciplines including risk management, smart city planning [44–46], and sustainable urban development [46] alike.

TISM is a well-established qualitative data analysis method in the field of social science research used for comprehensively analysing and understanding the intricate relationships among elements that define complex problems [47]. It extends the foundations laid by Interpretive Structural Modeling (ISM) by not only identifying factors and their interconnections but also delving into the underlying reasons for these interdependencies. TISM offers a deeper level of insight, allowing researchers to not only discern "what" factors are at play and "how" they are linked but also to uncover the crucial "why" behind these interrelationships. By retaining transitive links and embracing a participatory approach, TISM promotes inclusivity and collaboration, enabling researchers to engage stakeholders and experts in the modeling process. This not only enhances the quality of results but also fosters a more comprehensive understanding of complex social issues, making TISM an invaluable tool in social science research. In this study, the purpose of adopting TISM was to uncover complex interrelationships among the barriers, providing a visual model for understanding intricate dependencies. It aids in identifying key barriers within a system, facilitating informed decision-making.

Subsequently, the MICMAC analysis was employed in conjunction with TISM to gain deeper insights into the hierarchy of barriers and the relative significance of various factors within a system. In this context, it was applied to differentiate between driving barriers and dependent barriers identified through TISM, thereby providing a clearer understanding of their roles in the overall system [48]. MICMAC analysis serves the purpose of categorising these factors, often referred to as 'barriers' in this study, into four distinct clusters. These clusters are: (1) Autonomous barriers, which have relatively low influence and dependence; (2) Dependent barriers, which are influenced by other factors but also exert influence themselves; (3) Linkage barriers, which serve as intermediaries between different elements within the system; and (4) Independent barriers, which exert a high level of influence and drive the system independently. By organising barriers into these clusters based on their driving power and level of dependence, MICMAC analysis provides a clear framework for understanding the dynamics and relationships among these factors, aiding in the formulation of effective strategies and interventions to address the identified barriers and improve the system's performance.

4. Results

This section presents the data analysis and findings pertaining to each step of the TISM and MICMAC analysis employed for the study.

4.1. Identification and Definition of Barriers to Community-Inclusive RSUP in Sri Lanka

The data garnered through inductive coding shed light on 19 themes of barriers to community entry and engagement in RSUP from several aspects, namely, community context, institutional, industry practitioners related, legal and political, collaborative, and unclassified. These barrier themes are defined in Table 1.

Table 1. Empirical data on barriers to community-inclusive risk-sensitive urban planning (RSUP) in Sri Lanka.

Category	Code	Barrier Theme	Description	No. of Participants Contributed to Each Barrier Theme	
				Experts	Community Representatives
Community-context	B1	Communities' lack of knowledge, skills, competencies	The general public have little knowledge of urban planning, disaster risk reduction (DRR), and climate change adaptation (CCA), as well as little understanding of the benefits of engagement, and has no or limited skills and competencies to engage with decision-makers, effectively.	5	11
	B2	Lack of engagement culture of communities	Communities are reluctant to come together and work for neighbourhood development due to diversities in ethnicities, religious beliefs, languages, political partisanships, and education and income levels.	8	5
Institutional and policy	B3	Less financial provision for community engagement	Little budgetary allocations for community inclusion in urban planning and DRR projects.	7	18
	B4	Absence of an inclusive policymaking process for DRR and urban planning	Communities are not allowed to make and amend policy decisions due to the absence of an entry point for locals.	5	5
	B5	Absence of a strategic plan and a process for community selection and entry	Selection of community representatives as a random sample or based on political preferences without focusing on project objectives and on including a fair representation of communities.	8	7
	B6	Absence of/incomplete institutional framework	Governing agencies of urban planning and DRR have incomplete guidelines or no formal procedure, including aim, objectives, and purposes of engagement with participatory methods specific to the varying purposes of community engagement.	6	7
	B7	Absence of a local DRR mitigation and urban development strategy	The country has little focus on developing local strategies for DRR and urban planning, thus following national strategies at the local level.	2	3
	B8	Top-down decision-making approach in urban planning	Urban planning and DRR decisions are made solely by ministries, national-level agency practitioners, and urban planners and politicians	5	7
	B9	Little focus on community capacity building	Little budgetary allocation for community capacity building in terms of community awareness, skills' development, and empowering them towards influencing agency-made decisions.	3	9
	B10	No policy for employee training for community engagement	Urban development-related agencies have no policy for the periodic training of their field workers on community engagement and the application of participatory methods for specific circumstances.	4	0

Table 1. *Cont.*

Category	Code	Barrier Theme	Description	No. of Participants Contributed to Each Barrier Theme	
				Experts	Community Representatives
Agency-practitioners-related	B11	Lack of skilled and experienced practitioners for community engagement	Current workforce has little knowledge and skills to engage with communities effectively.	6	1
	B12	Attitude of industry practitioners	Industry practitioners lack confidence in, and satisfaction with, locals and their opinion.	4	5
	B13	Lack of stakeholder collaboration	Silo approaches to community engagement are followed by stakeholders representing three key domains of RSUP: urban planning, DRR and CCA.	6	1
	B14	Communication gaps between key domains: society, research groups, interest groups and policymakers.	The theoretical and practical implications of research are not used in the form of data and information by the decision makers, neither to make decisions nor to legitimise decisions. Conversely, what research produces is not from a proper grounded analysis as well as not that which industry demands.	4	7
Legal and political	B15	Absence of legal provisions for community engagement	There is no national law to enforce community engagement in urban planning.	3	0
	B16	Political dynamic	Dynamics in political governance and political corruption discourage community entry and inclusion in government-led development projects.	6	5
Relational	B17	Conflictive interest between public and agencies	Communities' requirements are not captured in agency-led project plans.	6	7
	B18	Poor relations of agencies with public	Decision-makers/implementors and communities are reluctant to engage with each other due to lessons learnt from previous inclusive projects.	5	0
	B19	Limited time for trust building	Projects with a short life span provide no or little time for practitioners to build trust with communities thus resulting in community protest.	4	3

4.2. Determination of Pair-Wise Relationships between Barriers through Interpretation of Contextual Relationships

In this study, the contextual relationships between the listed barriers were identified by experts' opinions (i.e., whether B1 is influencing B2 or B2 is influencing B1 or both B1 and B2 are influencing each other, and so on), which were recorded as a logical knowledge base (See Table A2 in Appendix A). Since the study considers 19 barriers, the total number of possible relationships is 342 (19 × 18). Sixty pair-wise relationships between the nineteen barriers were established with reasoning. The knowledge base provides a single interpretive statement formed by combining opinions provided by the experts for each pair-wise relationship.

4.3. Structural Self-Interaction Matrix (SSIM)

Experts' interpretations of the contextual relationships of the barriers presented in Table A2 (Appendix A) were converted to a nominal matrix of $i_n \times j_n$ (i.e., where i and j represent raw variables and column variables, respectively) based on the directions of pair-wise relationships. According to the TISM methodology, the four symbols stated below were applied to represent the direction of relationships between two barriers (i and j):

- V: Barrier "i" influences barrier "j", e.g., B1 influences B4;
- A: Barrier "i" is influenced by barrier "j", e.g., B9 is influenced by B1;
- X: Barriers "i" and "j" influence each other, e.g., B1 and B2 influence each other;
- O: Barriers "i" and "j" are unrelated, e.g., there is no link between B1 and B3.

Using these symbols as contextual relationships, Table 2 was prepared for the 19 barrier themes of community-inclusive RSUP in Sri Lanka.

Table 2. Structural Self-Interaction Matrix (SSIM) of barriers to community-inclusive RSUP in Sri Lanka.

Barrier Theme	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
B1		X	O	V	O	O	O	O	A	O	O	O	O	O	O	O	O	O	O
B2			O	O	O	O	O	O	A	O	O	O	O	O	O	O	O	O	O
B3				V	O	X	A	O	V	V	O	A	A	A	A	A	O	V	O
B4					A	A	O	O	O	O	A	A	O	O	A	A	V	O	O
B5						A	O	O	O	O	A	A	A	O	O	A	O	V	O
B6							A	O	V	O	A	A	O	O	A	A	O	O	O
B7								O	V	O	O	O	O	O	O	A	O	O	O
B8									O	O	O	O	O	O	A	A	V	O	O
B9										O	A	A	O	A	A	O	O	O	O
B10											V	A	O	O	A	O	O	O	O
B11												O	O	V	O	O	O	V	O
B12													O	O	O	A	O	V	O
B13														A	O	O	O	O	O
B14															O	O	V	V	O
B15																X	O	O	O
B16																	O	V	O
B17																		O	A
B18																			A
B19																			

4.4. Initial Reachability Matrix (IRM)

Next, the SSIM was converted into an IRM by transforming all V, A, X, and O entries into binary digits of 1 s and 0 s. To convert SSIM to an IRM, the following rules were applied:

- V in the SSIM, the entry in cell (j, i) was changed to 0, and the entry in cell (i, j) was changed to 1;
- A in the SSIM, the entry in cell (j, i) was changed to 1, and the entry in cell (i, j) was changed to 0;
- X in the SSIM, the entries in both cells (j, i) and (i, j) were changed to 1; and
- O in the SSIM, the entries in both cells (j, i) and (i, j) were changed to 0.

Using these correlations, the IRM was composed. As the only difference between the IRM and Final Reachability Matrix (FRM) is transitive links, the FRM is shown in Table 3.

4.5. Check for Transitive Links and Developing the Final Reachability Matrix (FRM)

Having composed the IRM, the rule of transitivity was applied to contextual pair-wise relationships identified for the barrier themes. The transitivity rule refers to if factor "B1" affects factor "B2" and factor "B2" affects factor "B3", then factor "B1" will affect "B3". Accordingly, the IRM was checked for existing transitive links and the transitive links generated were then indicated as "1 *". The FRM was updated until full transitivity was established; 89 transitive links were thereby identified, as shown in Table 3. The FRM can reveal whether there is a path connecting one barrier to another. If the cell (i, j) in the final reachable matrix is equal to 0, then there is no direct or indirect relationship from factor "i" to factor "j".

Table 3. Final Reachability Matrix (FRM) of barriers to community-inclusive RSUP in Sri Lanka.

Barrier Theme	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
B1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1 *	0	0
B2	1	1	0	1 *	0	0	0	0	0	0	0	0	0	0	0	0	1 *	0	0
B3	1 *	1 *	1	1	1 *	1	0	0	1	1	1 *	0	1 *	1 *	0	0	1 *	1	0
B4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
B5	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1 *	1	0
B6	1 *	1 *	1	1	1	1	0	0	1	1 *	1 *	0	1 *	1 *	0	0	1 *	1 *	0
B7	1 *	1 *	1	1 *	1 *	1	1	0	1	1 *	1 *	0	1 *	1 *	0	0	1 *	1 *	0
B8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
B9	1	1	0	1 *	0	0	0	0	1	0	0	0	0	0	0	0	1 *	0	0
B10	1 *	1 *	1 *	1 *	1 *	1 *	0	0	1 *	1	1	0	1 *	1 *	0	0	1 *	1 *	0
B11	1 *	1 *	1 *	1	1	1	0	0	1	1 *	1	0	1 *	1	0	0	1 *	1	0
B12	1 *	1 *	1	1	1	1	0	0	1	1	1 *	1	1 *	1 *	0	0	1 *	1	0
B13	1 *	1 *	1	1 *	1	1 *	0	0	1 *	1 *	1 *	0	1	1 *	0	0	1 *	1 *	0
B14	1 *	1 *	1	1 *	1 *	1 *	0	0	1	1 *	1 *	0	1	1	0	0	1	1	0
B15	1 *	1 *	1	1	1 *	1	1 *	1	1	1	1 *	1 *	1 *	1 *	1	1	1 *	1 *	0
B16	1 *	1 *	1	1	1	1	1	1	1 *	1 *	1 *	1	1 *	1 *	1	1	1 *	1	0
B17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
B18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
B19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

Note: 1 * denotes the transitive links.

4.6. Level Determination by Partitioning the FRM

By using level partitioning, it becomes possible to determine the placement of barriers at each level. Using the FRM in Table 3, the reachability set, antecedent set, and intersection set were calculated for each barrier theme to establish their respective partition levels. The

reachability set is the assembly of the barrier themes that are affected by other barriers and themselves. In contrast, the antecedent set is the assembly of the barrier themes that affect the other barriers and themselves. The intersection set includes barrier themes that are common to both the reachability and antecedent sets. The barrier theme for which the intersection set is the same as the reachability set was assigned the topmost level (Level 1), and the Level 1 barriers were removed from the entire set for the next iteration table. This process was repeated until each barrier theme was assigned its corresponding level. After seven iterations, all the barrier themes were assigned their levels; this iterative process is depicted in Table 4. These levels serve as the foundation for the digraph and TISM model.

Table 4. Hierarchical partitioning of barriers to community-inclusive RSUP in Sri Lanka.

Barrier Theme (Mi)	Reachability Set R(Mi)	Antecedent Set A(Ni)	Intersection Set R(Mi)∩A(Ni)	Level
B17	17	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,19	17	1
B18	18	3,5,6,7,10,11,12,13,14,15,16,18,19	18	1
B4	4	1,2,3,4,5,6,7,9,10,11,12,13,14,15,16	4	2
B8	8	8,15,16	8	2
B19	19	19	19	2
B1	1,2	1,2,3,6,7,9,10,11,12,13,14,15,16	1,2	3
B2	1,2	1,2,3,6,7,9,10,11,12,13,14,15,17	1,2	3
B5	5	3,5,6,7,10,11,12,13,14,15,16	5	3
B9	9	3,6,7,9,10,11,12,13,14,15,16	9	4
B3	3,6,10,11,13,14	3,6,7,10,11,12,13,14,15,16	3,6,10,11,13,14	5
B6	3,6,10,11,13,14	3,6,7,10,11,12,13,14,15,16	3,6,10,11,13,14	5
B10	3,6,10,11,13,14	3,6,7,10,11,12,13,14,15,16	3,6,10,11,13,14	5
B11	3,6,10,11,13,14	3,6,7,10,11,12,13,14,15,16	3,6,10,11,13,14	5
B13	3,6,10,11,13,14	3,6,7,10,11,12,13,14,15,16	3,6,10,11,13,14	5
B14	3,6,10,11,13,14	3,6,7,10,11,12,13,14,15,16	3,6,10,11,13,14	5
B7	7	7,15,16	7	6
B12	12	12,15,16	12	6
B15	15,16	15,16	15,16	7
B16	15,16	15,16	15,16	7

4.7. Examine with Transitive Test and Modification of the Interpretive Logic Knowledge-Base with Transitive Link Interpretations

In this step, the study revisited transitive links established in the FRM to identify corresponding barriers that manipulated such interrelationships. Transitive links can be caused by multiple elements (i.e., B1 is transitively related to B17 due to B4, while B7 is transitively linked to B4 given the impact of two elements: B3 and B6), and six experts involved in phase 2 data collection were consulted to establish their validity. Subsequently, the logic knowledge base developed in Table A2 was updated to incorporate experts' opinions for satisfied transitive links (see Table A3 in Appendix A), and unsatisfied transitive links were eliminated from further study. Only 10 out of the 89 transitive links were deemed acceptable by the experts, resulting in the elimination of 79 transitive links at the end of phase 2 data collection.

4.8. Binary Interaction Matrix of the Themes of the Barriers

Following the transitive link test and considering the experts' interpretations of transitive links, the binary interaction matrix was developed to include all direct and approved significant transitive links. Accordingly, the binary interaction matrix was developed by

entering "1"s in the FRM and "1 *" approved by the experts as "1"s, and the original "0"s in the FRM, and the unsatisfied transitive links were input as "0"s, as shown in Table 5.

Table 5. Binary interaction matrix of barriers to community-inclusive RSUP in Sri Lanka.

Barrier Theme	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	Driving Power
B1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
B2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
B3	1	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	1	1	0	12
B4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
B5	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	4
B6	1	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	1	1	0	10
B7	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	10
B8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
B9	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
B10	0	0	0	1	1	1	0	0	1	1	1	0	0	1	0	0	0	1	0	8
B11	1	1	1	1	1	1	0	0	1	0	1	0	1	1	0	0	1	1	0	12
B12	1	1	1	1	1	1	0	0	1	1	1	1	0	0	0	0	1	1	0	12
B13	0	0	1	1	1	1	0	0	1	1	0	0	1	0	0	0	0	1	0	8
B14	1	1	1	1	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	12
B15	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	16
B16	0	0	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	0	13
B17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
B18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
B19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3
Dependence Power	10	10	9	15	11	10	3	3	11	9	5	3	3	4	2	2	13	13	1	

Note: Transitive links retained by the experts are shaded in red colour.

4.9. Develop the Total Interpretive Structural Model

The last stage involves constructing the TISM model. The 19 barrier themes were positioned in the hierarchy based on their levels determined in Table 4, and the links between them were symbolised with arrows, as shown in the binary interaction matrix in Table 5. The TISM model, presented in Figure 3, consists of sixty direct links established through the opinions of industry experts, with ten significant transitive links that have valid interpretations retained. The model illustrates the driving barrier for each link to enhance clarity and understanding. For example, the arrow text "B3–B18" indicates that this arrow represents a link from B3 at level 5 to B18 at level 1, highlighting the driving barrier when linked barriers are positioned at different distance levels.

4.10. MICMAC Analysis of the Barriers to Community-Inclusive RSUP in Sri Lanka

MICMAC analysis helps segregate factors with regard to their dependence and driving power [48,49]. The driving power and dependence power for each barrier were calculated by a summation of the rows, to analyse the driving power, and the columns, to study the dependence power for each barrier. This was facilitated through a cross-impact matrix multiplication of the binary interaction matrix shown in Table 5. In the TISM approach, MICMAC analysis was used to cluster the barriers into four quadrants comprising:

- Quadrant 1 (Autonomous barriers): Barriers with low dependence and driving power.
- Quadrant 2 (Dependent barrier): Barriers with low driving power but high dependence.
- Quadrant 3 (Linkage barriers): Barriers have both dependence and driving power. These factors are the most volatile part of the TISM as a change in these factors will affect the networking of the barriers.
- Quadrant 4 (Independent barriers): Barriers with high driving power but very low dependence.

Illustrating the above classification, Figure 4 shows the cluster diagram of the barriers to community-inclusive RSUP in Sri Lanka.

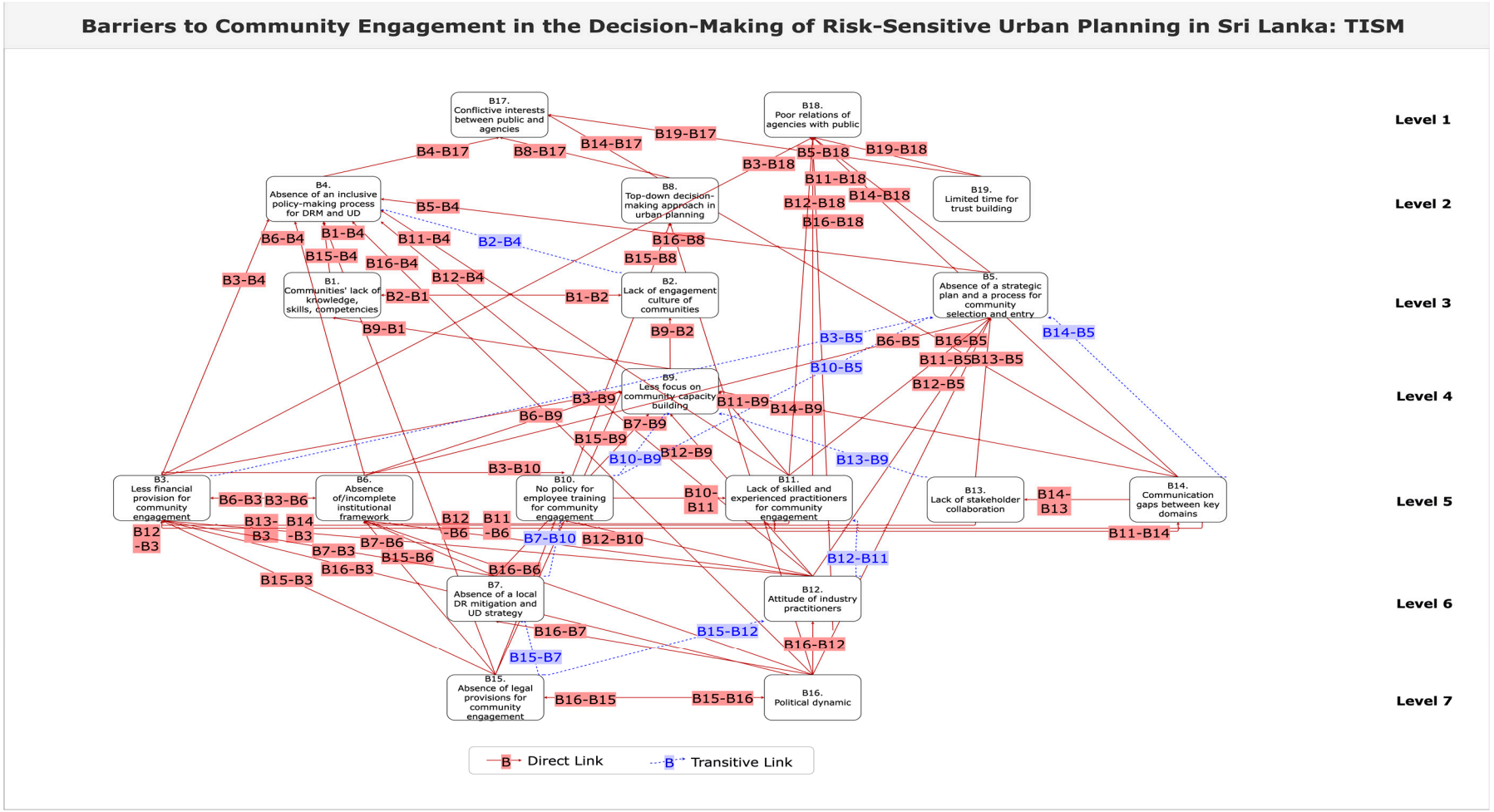


Figure 3. Total interpretive structural model of barrier to community-inclusive RSUP in Sri Lanka (Note: DRM—Disaster Risk Management, UD—Urban Development).

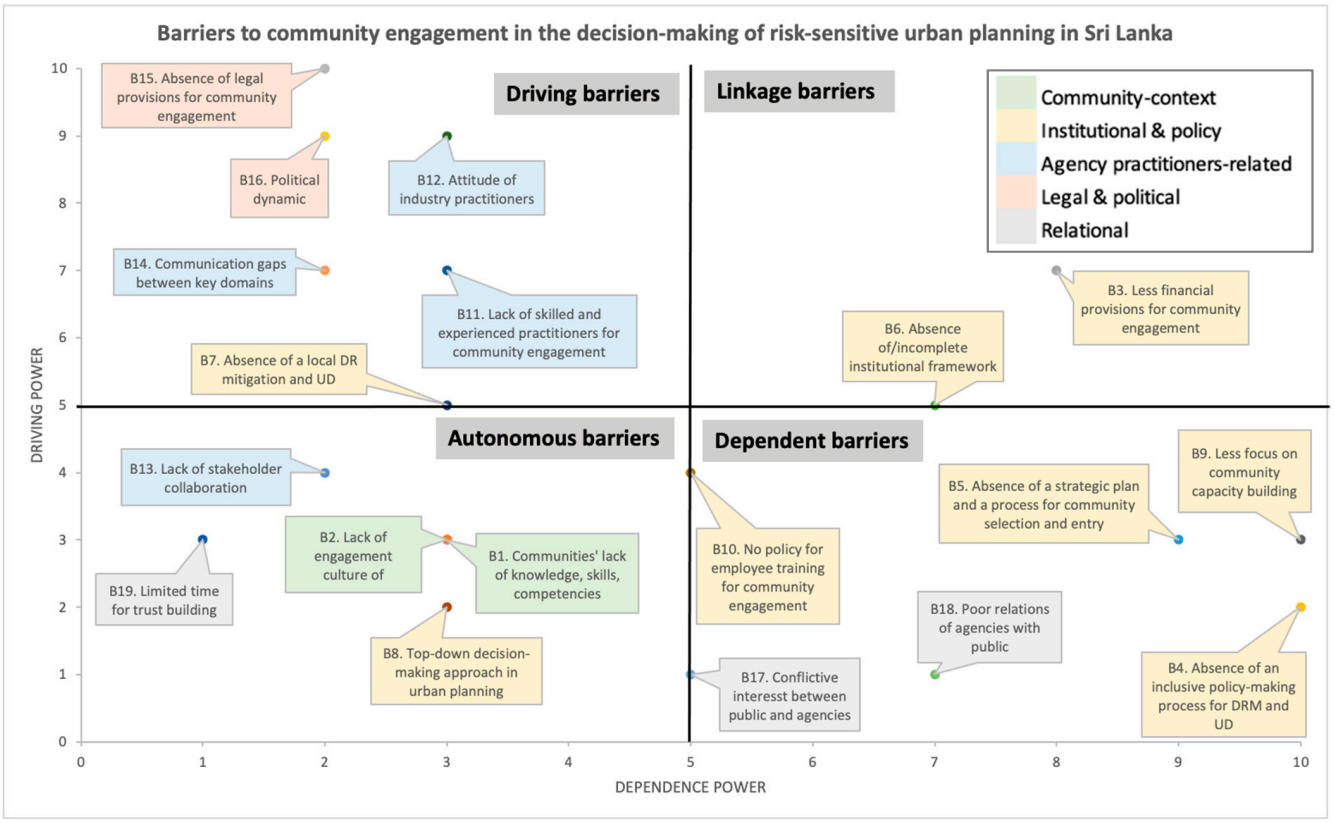


Figure 4. Cluster diagram of barriers to community-inclusive RSUP in Sri Lanka.

5. Discussion

The grounded theory based coding procedure revealed 19 factors hindering communities' engagement in decision-making, particularly in the context of RSUPD in Sri Lanka. All participants frequently cited the lack of financial provisions for engagement (B3) as the most significant factor. Experts highlight a few other vital factors, such as a lack of engagement culture within communities (B2) and the absence of a strategic plan and selection process for community involvement (B5). Contrarily, the absence of local DRR and UD strategies (B7) is the least recognised barrier by the experts. Confronting the statistical emphasis, the TISM introduces the underlying causal relationships and dependencies between the identified factors. Despite the fact that communities are unaware of the impact of the absence of legal provisions for community engagement (B15), B15 with political dynamics and corruption (B16) appears to be the most crucial hindrance to participatory urban planning. Thus, obstacles from the current legal and political systems were found to be the drivers of, or the causes of, other constraints.

The results strengthen and refine previous studies [5,6,11] on barriers to community-inclusive development. This study contributes to building and refining the status quo of the literature on constraints with regard to engaging communities in the decision-making of RSUP and offers structured empirical normative recommendations to practitioners. The results demonstrate the absence of legal provisions (B15); political dynamics and corruption in the country (B16); the attitude of industry practitioners (B12); the communication gap between the key domains (i.e., policymakers, practitioners, academics, and locals) (B14); the lack of skilled and experienced practitioners (B11); the absence of local strategies for DR mitigation and regional development (B7); and fewer financial provisions (B3) as the most powerful driving factors that impede inclusivity in RSUP. Conflictive interests between the general public and agencies (B17) and poor relations of agencies with the public (B18) occupy the top of the framework because of their higher dependency. The absence of an institutional framework for community engagement is the linking barrier to many other

barriers. Thus, this is an integral barrier within the entire system since it has not only driving power but high dependence as well. Linking barriers provide stability to the entire system and any changes to these will disturb the entire system either positively or negatively [48].

This study offers an empirical model that establishes the connection between barriers to inclusive RSUP in emerging economies; this has been noted but not explored in-depth in prior research [5]. These findings support previous arguments that (i) community engagement is constrained by both locals and practitioners [15–20,28–32], and (ii) exclusively bottom-up decision-making is not ideal for facilitating inclusive developments [5]. The study contradicts some of the previous findings, such as "community engagement is mostly constrained by locals [11]", as this study has proved that many driving barriers are caused by the practitioners, due to a lack of legal frameworks and political influence. Furthermore, it contradicts a previous finding "fewer women engagement [20]", as the study has shown the greater involvement of women in Sri Lanka.

The MICMAC analysis further confirms that community engagement is drastically constrained by those with legal and political powers, agency practitioners, and institutions with minimal impact from the grassroots level. Overall, the study disproves the misconception that achieving inclusive urban development is impossible due to the perceived shortcomings of uneducated and impoverished communities or their lack of engagement culture. On the contrary, it strongly asserts that the main obstacles to inclusive development are the corrupt and misguided practices of the central government.

While the study extensively delved into data analysis, it remains cognizant of the inherent perceptual nature of the findings. Due to the qualitative essence of the research, these outcomes could potentially mirror the subjectivities and biases of the participants. For instance, the perspectives of experts might incline towards barriers caused by locals, and vice versa. Furthermore, contextual factors such as specific community dynamics, the influence of the COVID-19 pandemic during data collection, and cultural elements might also have concealed impacts on the study's outcomes. For instance, the pandemic's impact on local residents could manifest as an amplified voice of concern towards authorities when their needs are unmet. However, it is worth noting that the researchers exercised careful due diligence in drawing conclusions, leveraging their deep comprehension of the study's context.

The implications of the findings transcend Sri Lanka's boundaries, offering valuable insights applicable to similar contexts that have vulnerable urban communities, political instability, and diverse ethnic groups. Comparable situations in South Asian nations such as Bangladesh, Pakistan, and specific regions in India may yield similar outcomes, including issues with legal and political frameworks, as well as limited stakeholder collaboration. These parallels underscore the study's pertinence in addressing widespread challenges and shaping effective strategies regionally.

5.1. Theoretical Contributions

This study is vital for identifying the driving barriers that impede inclusive RSUP initiatives and for understanding how they influence other barriers, which the status quo literature (including [10,14–16,20,22,24,25,27,28,35]) has failed to address. This study contributes to theory by providing a self-explanatory conceptual model for the barriers to participatory RSUP by establishing contextual knowledge with rich interpretations that is comprehensive in methodology. Prior to this study, it was difficult to priorities the barriers in order to develop strategies tailored to deal with them. Additionally, the study deploys three analysis approaches (i.e., Grounded Theory, TISM, and MICMAC analysis) to unravel what constitutes the barriers to community inclusion in RSUP, how they interact, and why such interactions prevail. Therefore, this study expands upon previous studies that are based on the global perspective to purely understand the barriers to community engagement.

5.2. Practical Implications

The externalisation of the specific barriers that Sri Lanka faces to support inclusive decision-making related to RSUP and their interlinks will help urban development and disaster management professionals and strategy policymakers to focus on critical areas that need major reforms. One of the main implications of this study is that it has helped to identify reasons why community engagement is lacking in a specific local context and to identify engagement strategies tailored to the local context. For example, strategies such as introducing 'inclusive development' as part of the secondary education curriculum, community education, and outreach can be developed to address the lack of community awareness. Furthermore, knowing community-context-specific barriers helps to identify and address structural inequalities and power imbalances within communities that prevent certain groups from participating in decision-making processes. This can help to ensure that the voices of marginalised communities are heard and considered in the development of risk-sensitive urban projects. Moreover, the model of barriers informs decision-makers which barriers should be first addressed and how that will impact minimising the related barriers. For example, the results show that most of the barriers impeding participatory decision-making in, and execution of, RSUP in Sri Lanka can be lowered by (1) enacting an act for community engagement and/or (2) introducing strict legal provisions for community engagement in existing DRM and urban planning and development related policies. Additionally, investigation of the barriers has helped to identify areas where further research is needed. For example, an absence of an institutional framework for community engagement was identified as the linking barrier to many other barriers, which is a gap to be filled by proposing an effective institutional framework.

Furthermore, the following key considerations should be taken into account in order to enhance community engagement in RSUP:

- The lead agency and other key stakeholders involved in an RSUP project should initially make efforts to attract political support and formalise community engagement for the project in order to minimise the occurrence and impact of many subsequent constraints.
- Regular training for local authorities and field officers should be conducted to build their capacities and attitudes for effective community engagement.
- Impact-driven research should be promoted through international collaboration.
- A mechanism to report research outcomes to policy formation institutes in the country/region should be devised.
- NGOs and IGOs should be welcomed in participatory projects to attract more funds, knowledge, and technical support to overcome resource constraints.

6. Conclusions, Limitations, and Future Research

This paper analyses the barriers to the successful adoption of community engagement in RSUP. This study is unique in presenting and discussing barriers based on both expert and community opinion and in clearly depicting the level and interlinks amongst them. The study extends the extant inclusive development literature by offering a TISM-based strategic model with a comprehensive logic knowledge base. The TISM model revealed that the lack of legal provisions supporting inclusive developments and political dynamics and corruption in the country are the most influential barriers. It goes a step further by pinpointing other driving barriers (i.e., practitioners' attitude, communication gaps, lack of experienced practitioners, absence of local DRR and development strategies) that need urgent attention and dependent barriers (i.e., less community capacity building, absence of inclusive policy-making, absence of a strategic process for community selection and entry, poor agency-community relations, no employee training policy, conflictive agency-community interests) that can be resolved by addressing the driving barriers. These aspects set our study apart from previous research, which often provided an isolated view of barriers without considering their relative importance and interplay.

Furthermore, while previous research often examined barriers to community engagement in a global context, this study acknowledges the highly contextualised nature of community engagement. Sri Lanka, due to its economic (low-income, income inequality, high public debt, inflation, and trade deficits), political (political instability, ethnic conflicts), and social (ethnic tensions, high quality education, relatively good healthcare, relatively high literacy rates, improved investments in social infrastructure,) conditions, presents an interesting case study. Although it differs from some of its counterparts, the findings can be generalised to similar Global South contexts facing comparable challenges.

However, no research is without limitations. TISM and MICMAC analyses are excellent tools for unveiling interrelationships and dependencies among factors but struggle to provide a direct quantitative ranking when dealing with multifaceted and interconnected barriers. One plausible reason for this limitation could be the intricate nature of the identified barriers. These analyses focus on depicting relationships rather than assigning numerical weights. As such, translating the qualitative insights gained from these analyses into quantifiable relative weightings is challenging, particularly when the data lacks clear numerical metrics and when some barriers indicate indirect and cascading effects that are hard to encapsulate in precise numerical weightings. To address this limitation, future studies could incorporate additional methods such as Structural Equation Modelling (SEM), Analytic Network Process (ANP), and D-ANP (DEMATEL-based ANP) to quantify the mutual dominance of each barrier. However, it is important to acknowledge that even with quantitative methods, fully capturing the complex interplay of barriers and their precise relative weightings can be challenging as it might oversimplify the nuanced dynamics of human perception and context. Additionally, grey and Fuzzy theories could be used to overcome limitations related to the subjectivities of responses and experience levels of participants.

Author Contributions: Conceptualization, D.G.; methodology, D.G.; validation, D.G.; formal analysis, D.G.; investigation, D.G.; data curation, D.G.; visualization, D.G.; writing—original draft preparation, D.G.; writing—review and editing, T.F. and K.K.; supervision, T.F. and K.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the Global Challenges Research Fund (GCRF) and the Economic and Social Research Council (ESRC), Grant ES/T003219/1 entitled "Technology Enhanced Stakeholder Collaboration for Supporting Risk-Sensitive Sustainable Urban Development".

Institutional Review Board Statement: The study was conducted in accordance with and approved by the Ethics Committee of The University of Salford (Application ID 1375 approved on 6 April 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The research data will be made available upon request from the corresponding author. The qualitative data are not publicly available due to the privacy of individuals who participated in the study.

Acknowledgments: The authors would like to extend their sincere gratitude for all the study participants and to Hanneke van Dijk for their diligent proofreading assistance.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Appendix A

Table A1. Coding process: Generation of open and focused codes, categories, and themes of barriers to participatory developments in Sri Lanka.

Code #	Open/Initial Codes (Source)	Focused Codes	Theoretical Coding (Categories)	Barriers Themes
Q1: As per your experience, what constraints communities to engage in the decision-making of disaster risk reduction/urban planning in the Sri Lankan community context?				
1.1	"...the lack of understanding of the communities, with regard to the type of development that has been taking place." (E1)	Communities lack understanding of development plans	Communities lack understanding of - Urban development plans - Community engagement	Theme 1: Communities' lack of knowledge, skills, competencies
1.2	"it is exceedingly difficult for us to make them understand the significance of their engagement for them." (E2)	Communities lack of understanding of community engagement		
1.3	"if they have good knowledge of how important they are, then that will naturally improve their interest in community engagement. But if they do not have the interest, of course, consultation fatigue happens." (E2)	Consultation fatigue	Consultation fatigue	
1.4	Some community members are political followers involved in informal political networks to gain their own personal benefits...(E5)	Political followers among communities	Politicisation of the communities	Theme 2:Lack of engagement culture of communities
1.5	"one of the main barriers is the politicisation of the communities...if the blue government proposes the project, the green people of the community might be against that...." (E7)	Politicisation of the communities		
1.6	"one of the major barriers is lack of a culture of consultation within communities..." (E7)	Lack of consultation culture among communities	Engagement culture	
1.7	"...inconsistency with community tradition, language and religions is a barrier, that is cultural things." (E7)	Cultural and language differences	Ethnic diversities among communities	
1.8	"multi-religious, multi-cultural groups can be identified from the eastern as well as the northern. Because there are values, taboos, and different type of customs" (E2)	Cultural and language differences		

Interpretive logic knowledge base for networking between the barriers to community inclusion in RSUP in Sri Lanka

Table A2. Direct pair-wise contextual relationships (Phase 1 data collection).

#	Influencing Barrier	Influenced Barrier	Summary of Interpretive Relationship Statement
1	B1	B4	Communities' little knowledge of DRR and UP policies and plans Communities' consultation fatigue
2	B3	B4	No funds for situational analysis with community participation
3		B9	No funds for capacity building
4		B10	No funds to train employees
5		B18	Officials' reluctance to allocate a budget for engagement
6	B4	B17	Agencies try to convince the public of their plans
7	B5	B4	Difficulty in selecting community experts
8		B18	Unfair representation of communities
9	B6	B4	No methods are defined for inclusive policymaking
10		B5	Ill-defined community selection criteria
11		B9	No community capacity-building guideline
12	B7	B3	No influence from local development strategies
13		B6	No engagement strategy in local authorities
14		B9	No local level community capacity-building strategy
15	B8	B17	Do not incorporate community needs
16	B9	B1	No awareness programmes
17		B2	No participatory programmes
18	B10	B11	No periodic employee training

Table A2. *Cont.*

#	Influencing Barrier	Influenced Barrier	Summary of Interpretive Relationship Statement
19	B11	B4	Little expertise in inclusive policymaking
20		B5	No understanding of community selection criteria
21		B6	No expertise in inclusive developments
22		B9	No expertise in capacity building
23		B14	Fewer communication skills
24		B18	Making conflicts
25	B12	B3	Reluctance to allocate budget for community engagement
26		B4	Ego
27		B5	Political followers among officials
28		B6	Reluctance to engage
29		B9	Reluctance to engage
30		B10	Senior officials' attitude of engagement is impossible due to communities' lack of knowledge
31		B18	Negative attitudes towards seldom-heard people
32	B13	B3	No inter-organisational collaboration for fund allocation for community engagement
33		B5	Different community selection strategies make collaborative developments failed/hard
34	B14	B3	No inter-organisational collaboration for fund allocation for community engagement
35		B9	No integrated approach for community capacity building
36		B13	Improper exchange of information
37		B17	Agency-led developments do not incorporate community needs
38		B18	No information exchange between the public and agencies
39	B15	B3	No national-level budget allocation
40		B4	No legal requirement
41		B6	No legal enforcement to establish a proper mechanism for engagement
42		B8	No legal enforcement to impose bottom-up urban planning
43		B9	No legal impact
44		B10	Reluctance to allocate budget for employee training on engagement
45	B16	B3	Political corruption
46		B4	Politicians have their agendas
47		B5	Politicians want to include only their supporters
48		B6	Not allowing officials to form procedures as it would have gone against their corrupted political plans
49		B7	Political corruptions
50		B8	Politicians have their agendas
51		B12	Political followers among practitioners
52		B18	Political pressure
53	B19	B17	No time to seek community requirements
54		B18	No time to inform or consult communities in decision or plan making
			Bi-directional relationships
55	B1	B2	Consultation fatigue
56	B2	B1	Reluctance to attend awareness and community committees
57	B3	B6	No financial encouragement for community inclusion
58	B6	B3	No institutional budget allocation as there is no focus on engagement
59	B15	B16	Political corruption
60	B16	B15	Politicians not allowing laws to form for inclusive developments

Table A3. Satisfied transitive links by the experts (Phase 2 data collection).

#	Influencing Barrier	Influenced Barrier	Transitivity Cause(s)	Expert Clarification
1	B2	B4	B1	Communities' lack of knowledge, skills, competencies
2	B3	B5	B6	Absence of/incomplete institutional framework
3	B7	B10	B3	Little financial provision for community engagement
4	B10	B5	B11	Lack of skilled and experienced practitioners
5	B10	B9	B11	Lack of skilled and experienced practitioners
6	B12	B11	B10	No employee training policy
7	B13	B9	B3	Little financial provision for community engagement
8	B14	B5	B13	Lack of stakeholder collaboration
9	B15	B7	B16	Political corruption
10	B15	B12	B16	Political corruption

References

1. Cred, U. *Human Cost of Disasters. An Overview of the Last 20 Years: 2000–2019*; UNDRR: Geneva, Switzerland, 2020.
2. Girardet, L.H. United Nations Office for Disaster Risk Reduction (UNDRR). 2020. Available online: https://policycommons.net/artifacts/2282562/united-nations-office-for-disaster-risk-reduction-undrr/3042634/ (accessed on 22 April 2023).
3. Hallegatte, S.; Rentschler, J.; Rozenberg, J. *Lifelines: The Resilient Infrastructure Opportunity*; World Bank Publications: Washington, DC, USA, 2019.
4. Cadag, J.R.D.; Gaillard, J.-C. Integrating knowledge and actions in disaster risk reduction: The contribution of participatory mapping. *Area* **2012**, *44*, 100–109. [CrossRef]
5. Tanwattana, P. Systematizing Community-Based Disaster Risk Management (CBDRM): Case of urban flood-prone community in Thailand upstream area. *Int. J. Disaster Risk Reduct.* **2018**, *28*, 798–812. [CrossRef]
6. Mercer, J.; Kelman, I.; Taranis, L.; Suchet-Pearson, S. Framework for integrating indigenous and scientific knowledge for disaster risk reduction. *Disasters* **2010**, *34*, 214–239. [CrossRef] [PubMed]
7. The Department of Disaster Prevention and Mitigation. The Implementation of Department of Disaster Prevention and Mitigation (DDPM) under Safety Thailand Agenda. 2016. Available online: https://www.adrc.asia/countryreport/THA/2016/Thailand_CR2016B.pdf (accessed on 20 May 2023).
8. International Federation of Red Cross. *A Red Cross Red Crescent Guide to Community Engagement and Accountability*; IFRC: Geneva, Switzerland, 2021.
9. Becher, D. The Participant's Dilemma: Bringing Conflict and Representation Back In. *Int. J. Urban Reg. Res.* **2010**, *34*, 496–511. [CrossRef]
10. Geekiyanage, D.; Fernando, T.; Keraminiyage, K. Assessing the state of the art in community engagement for participatory decision-making in disaster risk-sensitive urban development. *Int. J. Disaster Risk Reduct.* **2020**, *51*, 101847. [CrossRef] [PubMed]
11. Jaumotte, F.; Pain, N. *From Ideas to Development: The Determinants of R&D and Patenting*; OECD Publishing: Paris, France, 2005.
12. UN-HABITAT. *The State of Sri Lankan Cities Report*; UN-HABITAT: Colombo, Sri Lanka, 2018.
13. Dissanayake, P.; Hettiarachchi, S.; Siriwardana, C. Increase in disaster risk due to inefficient environmental management, land use policies and relocation policies. Case studies from Sri Lanka. *Procedia Eng.* **2018**, *212*, 1326–1333. [CrossRef]
14. Asian Development Bank [ADB]. Basic Statistics 2018. 2018. Available online: https://www.adb.org/sites/default/files/publication/419891/basic-statistics-2018.pdf (accessed on 20 May 2023).
15. Alawadi, K.; Dooling, S. Challenges and opportunities for participatory planning approaches within Dubai's urban context. *J. Urban. Int. Res. Placemaking Urban Sustain.* **2015**, *9*, 276–301. [CrossRef]
16. Haaland, C.; van den Bosch, C.K. Challenges and strategies for urban green-space planning in cities undergoing densification: A review. *Urban For. Urban Green.* **2015**, *14*, 760–771. [CrossRef]
17. Harden, A.; Sheridan, K.; McKeown, A.; Dan-Ogosi, I.; Bagnall, A.-M. *Review 5: Evidence Review of Barriers to, and Facilitators of, Community Engagement Approaches and Practices in the UK*; Institute for Health and Human Development, University of East London: London, UK, 2015; 222p.
18. Protik, A.E.; Nichols-Barrer, I.; Berman, J.; Sloan, M. Bridging the information gap between citizens and local governments: Evidence from a civic participation strengthening program in Rwanda. *World Dev.* **2018**, *108*, 145–156. [CrossRef]
19. Swapan, M.S.H. Who participates and who doesn't? Adapting community participation model for developing countries. *Cities* **2016**, *53*, 70–77. [CrossRef]
20. Shand, W. Efficacy in Action: Mobilising Community Participation for Inclusive Urban Development. *Urban Forum* **2018**, *29*, 109–126. [CrossRef]
21. Yellow Book Limited. *Barriers to Community Engagement in Planning: A Research Study*; Scottish Community Development Centre: Edinburgh, UK, 2017; pp. 1–140.
22. Kita, S.M. Urban vulnerability, disaster risk reduction and resettlement in Mzuzu city, Malawi. *Int. J. Disaster Risk Reduct.* **2017**, *22*, 158–166. [CrossRef]

23. Gosman, R.; Botchwey, N. *Community Engagement: Challenges & Tools from the Planner's Perspective*; Georgia Institute of Technology: Atlanta, GA, USA, 2013.
24. Lee, G.; Kwak, Y.H. An open government maturity model for social media-based public engagement. *Gov. Inf. Q.* **2012**, *29*, 492–503. [CrossRef]
25. Wheeler, C.A. Barriers to community development in distressed cities: A case study of Camden, New Jersey. *Community Dev.* **2016**, *47*, 496–513. [CrossRef]
26. Cropley, A.; Peter, P. *Public Participation in Planning Barriers, Opportunities and Ideas*; Henry Halloran Trust, University of Sydney: Sydney, Australia, 2013.
27. Lindenau, M.; Böhler-Baedeker, S. Citizen and Stakeholder Involvement: A Precondition for Sustainable Urban Mobility. *Transp. Res. Procedia* **2014**, *4*, 347–360. [CrossRef]
28. Deshpande, T.; Michael, K.; Bhaskara, K. Barriers and enablers of local adaptive measures: A case study of Bengaluru's informal settlement dwellers. *Local Environ.* **2019**, *24*, 167–179. [CrossRef]
29. Fung, A. Putting the public back into governance: The challenges of citizen participation and its future. *Public Adm. Rev.* **2015**, *75*, 513–522. [CrossRef]
30. Lima, V. The limits of participatory democracy and the inclusion of social movements in local government. *Soc. Mov. Stud.* **2019**, *18*, 667–681. [CrossRef]
31. Meredith, T.; MacDonald, M. Community-supported slum-upgrading: Innovations from Kibera, Nairobi, Kenya. *Habitat Int.* **2017**, *60*, 1–9. [CrossRef]
32. Tantoh, H.B.; Simatele, D. Complexity and uncertainty in water resource governance in Northwest Cameroon: Reconnoitring the challenges and potential of community-based water resource management. *Land Use Policy* **2018**, *75*, 237–251. [CrossRef]
33. Petriwskyj, A.; Warburton, J.; Everingham, J.-A.; Cuthill, M. Diversity and inclusion in local governance: An Australian study of seniors' participation. *J. Aging Stud.* **2012**, *26*, 182–191. [CrossRef]
34. Krishna, A.; Sriram, M.; Prakash, P. Slum types and adaptation strategies: Identifying policy-relevant differences in Bangalore. *Environ. Urban.* **2014**, *26*, 568–585. [CrossRef]
35. Herriman, J. *Local Government and Community Engagement in Australia*; University of Technology Sydney: Sydney, Australia, 2011.
36. Böhler-Baedeker, S.; Lindenau, M. Why Is Participation a Challenge in Sustainable Urban Mobility Planning? 2013. Available online: https://www.eltis.org/sites/default/files/trainingmaterials/challenge_participation_final.pdf (accessed on 15 January 2023).
37. Community Places. Community Planning Toolkit—Community Engagement. 2014. Available online: https://www.communityplanningtoolkit.org/sites/default/files/Engagement.pdf (accessed on 15 January 2023).
38. Chapman, J. *Well London—Community Activator Programme: An Independent Evaluation*; Institute for Health and Human Development, University of East London: London, UK, 2010.
39. IAP2 International Federation. IAP2 Public Participation Spectrum. Available online: https://iap2.org.au/wp-content/uploads/2020/01/2018_IAP2_Spectrum.pdf (accessed on 20 January 2020).
40. Charmaz, K. Grounded theory: Methodology and theory construction. *Int. Encycl. Soc. Behav. Sci.* **2001**, *1*, 6396–6399.
41. Mardani, B.; Latibari, A.J.; Tajdini, A. Presenting a Risk Management Model for Residential Wooden Structures in Earthquake-prone Areas of Iran. *BioResource* **2021**, *16*, 7855–7869. [CrossRef]
42. Zhao, G.; Liu, S.; Lopez, C.; Chen, H.; Lu, H.; Mangla, S.K.; Elgueta, S. Risk analysis of the agri-food supply chain: A multi-method approach. *Int. J. Prod. Res.* **2020**, *58*, 4851–4876. [CrossRef]
43. Zhao, G.; Liu, S.; Lu, H.; Lopez, C.; Elgueta, S. Building theory of agri-food supply chain resilience using total interpretive structural modelling and MICMAC analysis. *Int. J. Sustain. Agric. Manag. Inform.* **2018**, *4*, 235–257. [CrossRef]
44. Kumar, H.; Singh, M.K.; Gupta, M. A policy framework for city eligibility analysis: TISM and fuzzy MICMAC-weighted approach to select a city for smart city transformation in India. *Land Use Policy* **2019**, *82*, 375–390. [CrossRef]
45. Singh, A.; Singla, A.R. Modelling and analysis of factors for implementation of smart cities: TISM approach. *J. Model. Manag.* **2022**, *17*, 1587–1622. [CrossRef]
46. Xiahou, X.; Li, Z.; Zuo, J.; Wang, Z.; Li, K.; Li, Q. Critical success factors for the implementation of urban regeneration REITs in China: A TISM–MICMAC based approach. *Eng. Constr. Archit. Manag.* **2022**. [CrossRef]
47. Sushil, S. Interpreting the interpretive structural model. *Glob. J. Flex. Syst. Manag.* **2012**, *13*, 87–106. [CrossRef]
48. Mathivathanan, D.; Mathiyazhagan, K.; Rana, N.P.; Khorana, S.; Dwivedi, Y.K. Barriers to the adoption of blockchain technology in business supply chains: A total interpretive structural modelling (TISM) approach. *Int. J. Prod. Res.* **2021**, *59*, 3338–3359. [CrossRef]
49. Dubey, R.; Ali, S.S. Identification of flexible manufacturing system dimensions and their interrelationship using total interpretive structural modelling and fuzzy MICMAC analysis. *Glob. J. Flex. Syst. Manag.* **2014**, *15*, 131–143. [CrossRef]