Housing Reconstruction after Conflict and Disaster: A Process Framework

Hawamdeh, Ahmad

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Housing Reconstruction after Conflict and Disaster: A Process Framework

By

Ahmad Hawamdeh

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ABSTRACT

To lose one's home due to conflict or disaster is a devastating experience. Globally, conflict and disaster events are increasing, causing displacement and inadequate housing in many regions. Therefore, a rapid and effective housing reconstruction response is needed to improve coping capacity after each event. Housing reconstruction (HRC) approaches link resources, logistics, people, skills, and environment to deliver appropriate housing reconstruction based on a comprehensive plan. These strategies are determined by the geographic, economic, and political factors dominating each situation and circumstance. This study focuses on material adequacy. In this thesis, material adequacy refers to having sufficient quality and quantity of material to make positive impact on the processes and methods of housing reconstruction in compliance with the relevant building codes. Post-conflict or disaster, materials are likely to be scarce due to high demand, and poor, stopped, or delayed supply. Therefore, the quality and quantity of materials, skills and method of construction, prices, logistics and supply chains must be carefully considered and integrated in any HRC framework.

This thesis aims to propose a material adequacy framework for post-conflict, post-disaster housing reconstruction. The study undertook an in-depth investigation of the literature to create a generic framework to better understand and aid decision-making in housing reconstruction. Twenty-nine previously published studies and review articles on housing reconstruction were used to investigate the relationship between material adequacy factors and other factors, including labour, transportation, site and environment, coordination, government, hazards, economy, project management, and community. The thematic analysis derived fifty-nine factors affecting the success and failure of the reconstruction process were deduced. Of these factors, four are related to material adequacy and are explored in detail; material availability, quality, local production capacity, and procurement strategy. The findings were used to propose an interim material adequacy framework for housing reconstruction which was evaluated by two experts working in this domain. The validated framework showed that material adequacy during housing reconstruction is influenced by the following themes/trends: Material Selection, Material Tracking Tool, Housing Reconstruction Engagement Criteria, and Material Logistical Considerations for Economic Recovery. This study affirmed the importance of material adequacy in pre-conflict, pre-disaster housing reconstruction. The novel pre-planning framework for HRC makes theoretical and practical contributions that will benefit the agencies responsible for housing re-construction as well as the affected communities.

ACKNOWLEDGEMENT

The Proper Translation:

“1:1 In the Name of Allah — The Most Compassionate, Most Merciful. 1:2 All praise is for Allah - Lord of all worlds, 1:3 The Most Compassionate, Most Merciful, 1:4 Master of the Day of Judgement. 1:5 You ˹alone˺ we worship and You ˹alone˺ we ask for help. 1:6 Guide us along the Straight Path, 1:7 The path of those You have blessed - not those You are displeased with, or those who are astray.” (The Quran, 1:1)

Amen! First, I thank God, who simplifies my life and has aided my completion of this work.

I would like to express my gratitude for the guidance and supportive direction I have received from my lead supervisor, Alexander Copping, and second supervisor, Kemi Adeyeye.

I would like to thank my father (Salman) for his continued support on this journey and throughout my life. I want to thank my wife and daughter (Raghad and Noha), as this work would never have been completed without their motivation. I thank my sisters (Razan, Rawan, and Al-Hanoof) for collaborating to fill my absence and for being supportive family members. I thank my nieces (Celine and Rashed) for enjoyable times and breaks during my work. I thank my brothers-in-law (Amer and Mohammad) for supporting me and taking care of the family. I would also like to thank my friends and colleagues for their experiences, sharing and support during this research.

Finally, may God grant my mother compassion and heaven for her motivation and support to start this research. Amen!

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LIST OF ABBREVIATIONS

BBB: **Build Back Better**

CSFs: **Critical Success Factors**

HRC: **Housing Reconstruction**

TA: **Thematic Analysis**

PCR: **Post-Conflict Reconstruction**

PDR: **Post-Disaster Reconstruction**

PEELS: **Political, Economic, Environmental, Logistical, and Social**

CHAPTER 1: INTRODUCTION

1.1. BACKGROUND

Disasters of all types can cause damage to the built environment, housing, economy, critical infrastructure, and even social structure. According to the World Bank Groupe (2023), there were direct damage to nearly $8 billion of houses in Syria during the Turkey-Syria Earthquake in 2023. This loss cannot be accurately quantified as the pre-earthquake destruction compounds them because of the Syrian war (World Bank GPURL D-RAS team, 2023). The Core Logic Climate Change Catastrophe Report estimates that 1 in 10 US residential properties were impacted by natural disasters in 2021, and the UN Office for Coordination of Humanitarian Affairs OCHA reported that more than 800,000 houses were damaged or destroyed in Ukraine since the latest Russian-Ukrainian Conflict started in February 2022 (UN-OCHA, 2022). In most cases, the poor are the most vulnerable in terms of their relative inability to recover from disastrous events. Therefore, reconstruction after conflict or disaster is aimed at assisting those in need to rebuild their homes. Article 26 (1) of the Universal Declaration of Human Rights mentions the principle that "everyone has the right to adequate housing" (OHCHR, 2009). Unfortunately, one of the major causes of a lack of such housing is the unsafe and miserable conditions resulting from conflicts for those living around war zones, which often forces them to leave their homes to ensure their survival. However, once the war has ended, there is an immediate and pressing need for the country to implement redevelopment programmes to reconstruct areas destroyed or otherwise impacted by the conflict.

Reconstruction after conflict and disaster is defined as a development process to re-establish assets, not a humanitarian action to simply provide safe shelters (Barakat, 2003). By ignoring the need to reconstruct and reinstate residents in stable housing, Al Asali and Shahin (2016) point out the likelihood of further disruption of economic activities and thus of the country as a whole. This could lead individuals to reconstruct spaces in an ad hoc and unsatisfactory manner according to their material situation, their skills, and their access to supplies. In other words, residents may attempt informal construction (Al Asali & Shahin, 2016). This construction of informal housing/settlements is also likely to create a situation in which housing does not comply with current planning and building regulations and lack of land tenure (Glossary of Environmental Statistics, 1997; Cherunya et al. 2021). The informal settlements definition could extend to define houses with insufficient infrastructure (Nadimpalli et al. 2020). To mitigate this issue, housing pre-reconstruction plans should be in place to help

manage material resources, logistics, and construction methods to deliver adequate housing (Ahmed, 2011). An added benefit of these practices is their contribution to the local economy and the transformation of informal settlements (if they have been constructed) into more durable and formal housing.

Reconstruction approaches consist of a framework of strategies that link resources, logistics, people, skills, and environment to deliver appropriate housing reconstruction based on a comprehensive plan. Housing Reconstruction (HRC) approaches are vital for the delivery of adequate material by guaranteeing the concept of Build Back Better (BBB), a term which denotes the process of ensuring that reconstruction efforts improve on the environment as it was before disaster or conflict.

Importance of Housing Reconstruction

It is important to first differentiate between HRC after a conflict and HRC after a disaster, as these are two distinct categories of reconstruction. In conflict zones, HRC occurs after the physical destruction and damage done to houses due to a disagreement between parties that leads to armed conflict, such as in the case of the Syrian Civil War. With disasters, on the other hand, HRC repairs the damage due to natural hazards, such as earthquakes and tsunamis, and due to technological disasters (e.g., the Chornobyl nuclear accident). Post-conflict HRC can be more challenging than post-disaster reconstruction due to the former also inevitably destroying administrative, economic, and socio-political capacities (Barakat, 2003; High, 2016). In contrast, post-disaster "housing reconstruction is one of the first steps towards environmental and economic recovery and development after a 'complex emergency'" (Minervini, 2002, p. 571). However, disasters of all types affect economic and social life by interrupting regular life activities in the affected state or country. Natural disasters in a developing country, where economic capacity is already weak, are more likely to have limited capacity to absorb or respond to disasters. According to Margesson and Taft-Morales (2010), the Haiti earthquake damaged 117% of the Haitian economic output.

HRC is not only aimed at the physical action of reconstruction; it also aids the recovery of social, economic, and environmental aspects of a nation, region or area. As such, physical housing reconstruction and socioeconomic recovery are interrelated. Management of housing reconstruction after conflict and disaster also involves the intersection of project management of the physical need to reconstruct the houses from the material, labour, funds and resources available on the one hand, and the community's role and their engagement on the other. This

thesis will thus explore, in some detail, the community's role in HRC.

Conflicts are a form of disaster that affect the modern world daily due to the large-scale loss of lives and the destruction they cause to infrastructure and livelihoods. In addition to a large number of deaths, armed conflicts have a massive impact on economic, social, and political structures through the destruction of soft and hard infrastructure, the natural environment, livelihoods, and cultural heritage, all of which require some form of reconstruction. Thus, post-conflict societies face several challenges, including rebuilding of infrastructure, ensuring livelihoods, reducing poverty, achieving economic recovery, and re-establishing social and political institutions (Athukorala & Jayasuriya, 2013). Added to these issues, post-conflict societies are often at high risk of reverting to conflict (Höglund & Orjuela, 2011). Therefore, it is crucial to address the root causes of such conflicts and implement sustainable solutions while ensuring the safety and security of the local populations. In this context, security has two measures; physical design and structures based on Build Back Better (BBB) principles. These contain geometrical measures such as building earthquake resistance structures in active seismic areas. The second measure is to secure supply. For example, gravel material may be distributed in different geographical areas, and to reserve quantities required for the concrete mix and to apply within a reconstruction process, trucks and materials need to be supplied sometimes from conflicted areas which need security to supply construction materials. Kijewski-Correa et al. (2012), agreed on the need of security due to lack of native construction material spatially where the reconstructing house need to build.

Therefore, post-conflict reconstruction (PCR) intervention should not only focus on rebuilding the economy via infrastructure development but also ensure that root causes of conflict are addressed so that new conflicts are not created (Jabareen, 2013). Hence, it is crucial to consider the planning stage carefully before beginning any reconstruction effort. In other words, post-conflict housing reconstruction projects should determine a set of objectives to deliver housing reconstruction within economic development frameworks that also seek to avoid recurrent conflict. It should also be noted that, in addition to labour, funds, and risk of renewed conflict, reconstruction is a process affected by other factors that influence its success or failure. These will be explored fully in Chapter 2, Section 2.2 (Song & Wang, 2020).

1.2. HISTORY OF RECONSTRUCTION AND JUSTIFICATION OF THE RESEARCH

The reconstruction process presents an opportunity for re-establishing equality, dignity,

identity, and well-being in society. A particularly distasteful historical example of a major reconstruction effort is the aftermath of the American Civil War (1861-1865), following which many of the States in America enacted legislation to guarantee the funds and human resources needed for the national reconstruction programme. One of these legislations was known as the "Black Code", relating closely to the new generation of the former slaves of – predominantly – the American South. The Black Code considered free and freed African Americans to have no legal rights. The majority of Southern States (and some of the Northern States) implemented a Black Code, primarily to secure cheap labour after the Civil War (Britannica, 2022). This legislation helped to speed up reconstruction between 1865 and 1877. However, after reconstruction had effectively ended, the legislation began to face some resistance from the American public; as a result, Congress approved the American Civil Rights Act, which made all American citizens equal before the law. The Black Codes represent one of the most morally suspect methods of guaranteeing funds throughout the history of American reconstruction, in which political power is wielded over others to curtail their freedoms (Browning, 1930).

Housing Reconstruction over the Construction of Shelters

Humanitarian engineering would start the appealing response for the post-war event to provide all kinds of shelters as categorised by the ICRC and as cited in (Albadra et al., 2018) emergency, temporary, transitional, progressive and core shelters. Humanitarian engineering would also provide various shelters according to the many variables accompanying the disaster event. At some point, humanitarian engineering and development engineering conjunct to transfer the displaced to most permanent sittings, which are the ultimate permanent option that would reconstruct their original houses.

Ziersch *et al.* (2017) studied the effect of housing conditions on the health of refugees in Southern Australia and determined that housing is of the utmost importance to refugees' physical and mental health. They concluded that the better the quality of accommodation accessible to refugees and asylum-seeker families, the more positive health outcomes and the higher the probability of successful integration (Ziersch *et al.*, 2017). Another example is refugee housing conditions in the UK. A Somali refugee living in Liverpool stated in an interview that "all I want is a nice place to live for my family and me, with no damp, no leak from the toilet and no holes in the floor, and for a peaceful life" (Phillip, 2006, p. 551). This shows that refugees desire decent living conditions and shelters that could also serve as permanent living quarters. Unfortunately, shelters are always considered temporary, and thus

are not a durable solution for refugees or survivors of war zones that are being reconstructed.

Surprisingly, given their evident lack of quality, Barakat (2003) has shown that temporary housing can cost as much as permanent housing. This is a particularly serious issue as funding for temporary housing necessarily reduces future funds for the construction of permanent dwellings (Barakat, 2003). Because of this, the construction of shelters often consumes massive amounts of international aid as part of reconstruction programmes (Twigg, 2006). A comprehensive HRC plan/study for HRC areas that aims to implement a sustainable housing reconstruction framework can help to encourage permanent housing reconstruction in the early periods of the recovery phase. This would confer huge savings in international aid money for the affected communities and allow more efficient use of resources for the provision of better-quality housing.

The following section explores, in more detail, the recommended planning stages of any HRC effort to enable efficient use of resources and provide the best outcomes in terms of quality of build and social reconstruction.

1.3. EFFECTIVE PLANNING OF HRC

Housing pre-reconstruction plans should aim to create more appropriate housing settlements by providing a solid framework or strategy to suit each unique condition. Such development plans can create the best long-term solutions following a humanitarian response. In short, plans should lead to more sustainable and durable housing that also considers the ethnographical needs of the local population.

Much criticism has been levelled at post-conflict reconstruction processes for their lack of adequate planning, resources, and funding strategy (O'Driscoll, 2018). Infrastructure projects in post-conflict reconstruction often suffer from low-quality design and/or sub-standard construction, resulting from a failure to consider local conditions, needs, and capacities (El-Masri & Kellett, 2001). Therefore, more effort is needed to deliver on the promises of reconstruction efforts by designing robust frameworks to deliver infrastructure projects that balance post-conflict reconstruction (PCR) or post-disaster reconstruction (PDR), on one hand, and community conditions and needs on the other. In this context, frameworks for housing reconstruction after conflict and disaster need to consider the circumstances of the surrounding environment (O'Driscoll, 2018).

“Housing PCR” projects are unique projects focusing on a determined set of objectives. These should be set within the context of all PCR projects within a specific area to achieve economic development and seek to avoid the recurrence of conflict. For this reason, local participation is imperative in the initial stages of planning and design of the project to ensure that the projects are relevant and consider the needs of all sections of the population (Earnest, 2015). The context must therefore be considered when developing post-conflict reconstruction plans (Caplan, 2005). To this end, Sakalasuriya *et al.* (2018) developed a conceptual framework to link Post-Conflict Housing Reconstruction with potential economic, environmental, social, and political consequences, as illustrated in Figure 1.1.

The authors of this framework highlight the dynamics of PCR by providing the potential consequences of reconstruction intervention and the long-term effects of such actions. The conceptual framework sets out the various factors that can be present in a post-conflict context, clearly demonstrating the links between PCR and its effects.

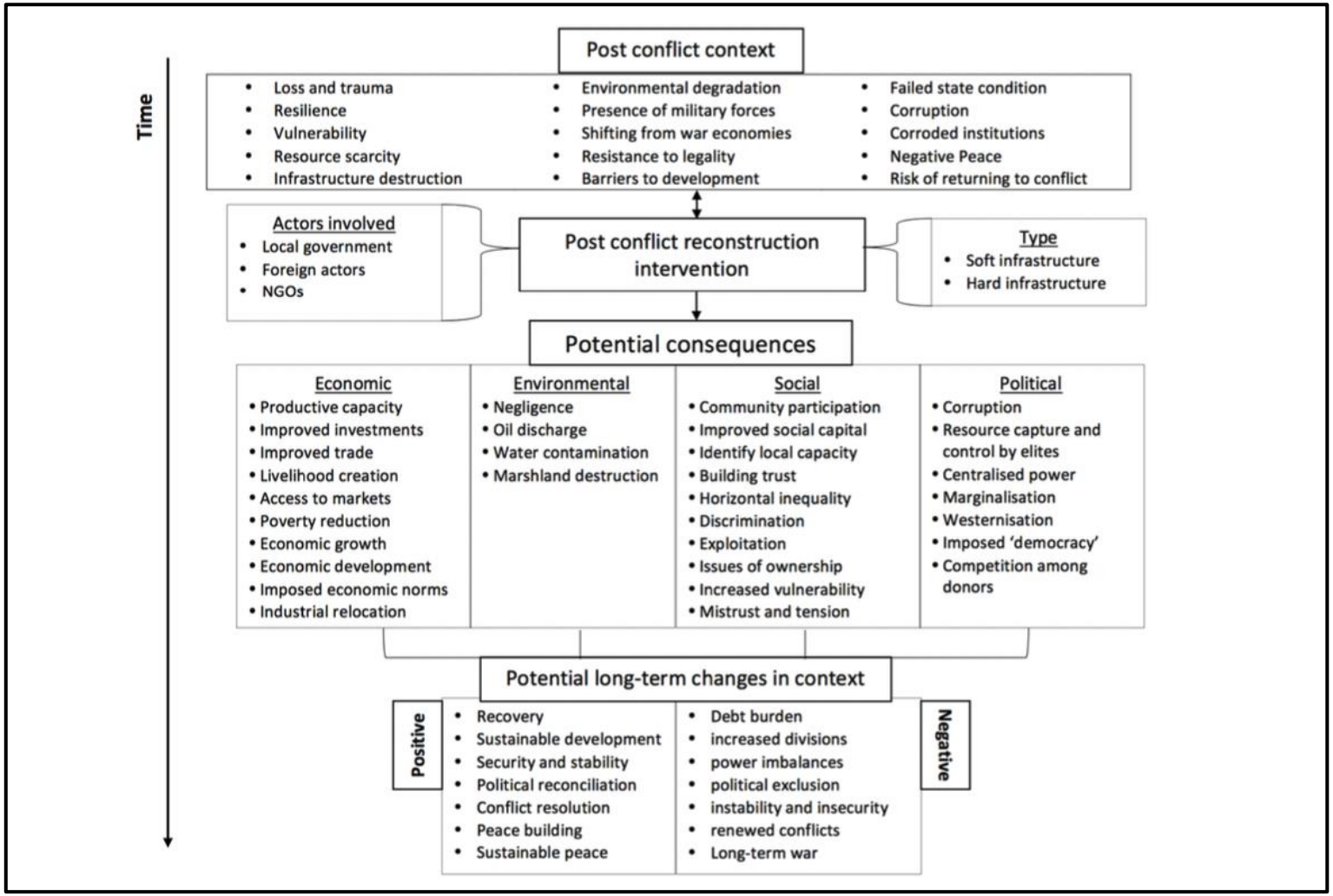

Figure 1.1 Conceptual framework of post-conflict reconstruction (Sakalasuria *et al.*, 2018)

As previously noted, PCR is different from reconstruction following disasters or reconstruction within normal contexts. The characteristics of the conflict environment are clearly set out in Figure 1.1. Accordingly, an HRC framework should guarantee that it carefully considers various aspects, such as environmental stability, to achieve reconstruction sustainably.

Sustainable HRC planning

The UN Office of Disaster Risk Reduction (DRR) defined disaster recovery as aligning with sustainable development principles through BBB and reducing future risk (Rouhanizadeh et al., 2020). Therefore, sustainability in the sector of housing reconstruction is crucial and critical.

A fully planned approach produces the best opportunities to restore damaged structural houses and implement sustainable disaster recovery (Amilkumar & Banerji, 2021).

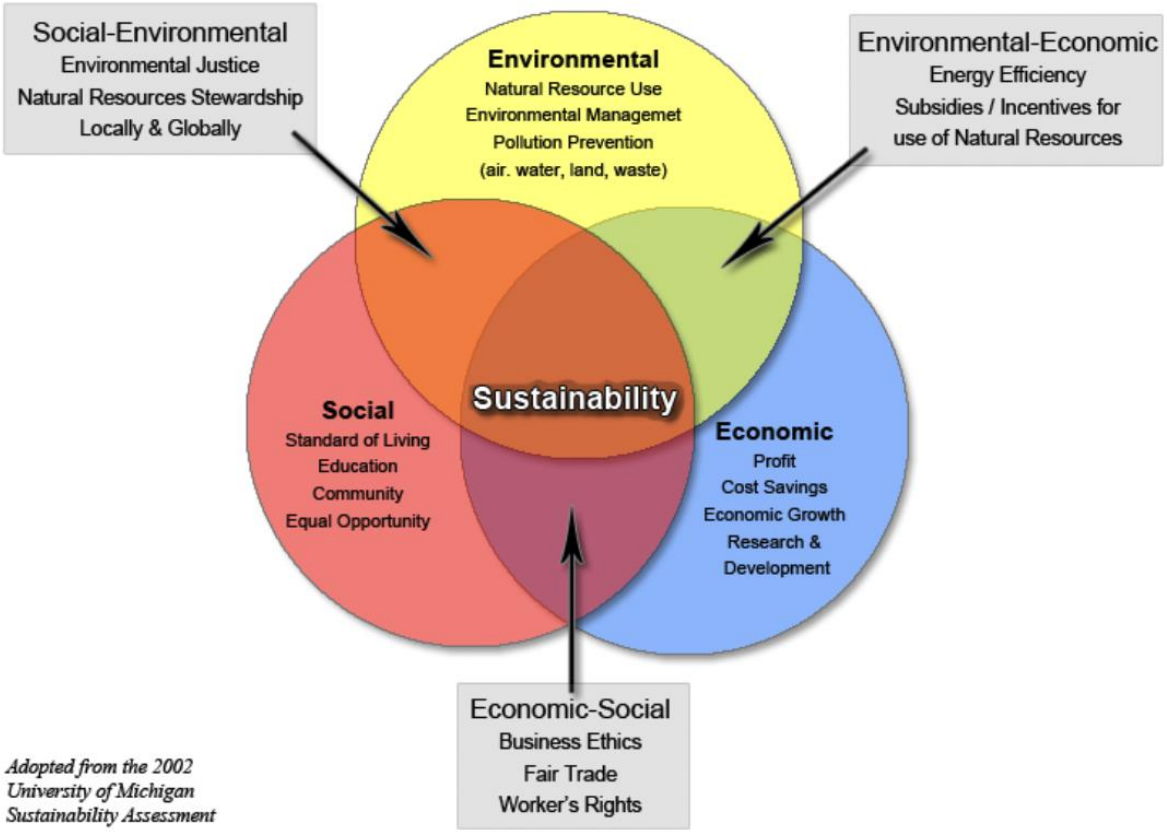

Figure 1.2 The three spheres of sustainability (Emanuel *et al.*, 2011)

Emanual *et al.* (2011) confirmed that creating a sustainable framework requires finding a balance between the environmental, social, and economic aspects as the three main pillars of delivering a sustainable framework, as shown in Figure 1.2.

Build Back Better (BBB) emerged in Aceh in 2006 as a post-tsunami recovery concept centred on reducing risk and improving lives, now widely used in disaster risk reduction and recovery plans, notably in the 2015 Sendai Framework. Despite its popularity, BBB is criticised for being too broad, lacking specific guidance for housing reconstruction. To address this, the "People-centred Housing Recovery" (PCHR) framework is proposed, emphasising tailored housing design, inclusive decision-making, and holistic policies for an indeed improved post-disaster reconstruction process, as exemplified in cases from Indonesia and the Philippines (Maly, 2018). Therefore, BBB is a long-term sustainable framework aimed at fostering social and economic recovery. The development plan includes enhancing local capacity, sustaining livelihood provision, and promoting the sustainability of reconstruction and the environment. Sustainability encompasses various aspects, including the institutional capacity to respond to disasters, community empowerment through education, technical assistance, and other necessary support during recovery (Bilau et al., 2018).

- Regarding housing reconstruction after conflicts and disasters, sustainability encompasses:
- Developing capability and efficient consumption of construction materials.
- Establishing a process that fosters social and economic recovery.
- Designing and building houses that can withstand hazardous environments.
- Implementing cost-effective housing reconstruction projects.
- Balancing local resource availability and demand while mitigating inflation.

Promoting long-term sustainability by creating new career opportunities through skill development within affected communities.

Chang et al. (2010) concluded that sustainable housing reconstruction can be achieved by linking allocated resources with comprehensive strategies before and after the disaster.

However, Daly et al. (2020) argue that sustainable post-disaster housing reconstruction in the developing world requires greater attention to integrating a sustainable framework for delivering housing reconstruction while restoring livelihoods. Moreover, the sustainable development of livelihood assistance necessitates financial aid. For instance, in Indonesian Aceh, the post-disaster housing reconstruction program consumed 12% of the financial aid allocated for sustainable livelihoods (Daly et al., 2020).

All environmental, socioeconomic, and political factors should be balanced to provide a successful housing reconstruction programme. Indeed, housing reconstruction within a sustainable system is vital to avoid inequality in resource distribution and incomplete HRC projects. Even more importantly, as emphasised in the literature, failure to ensure the equal distribution of resources is a major factor that can lead to the re-emergence of conflict (Sakalasuriya *et al.*, 2018). By combining the details within Figure 1.1 and Figure 1.2, it is clear that conflict is likely to continue or re-emerge if reconstruction is carried out in an unsustainable environment or manner. This fact lends more weight to the calls for robust frameworks for housing reconstruction that consider all crucial factors. These factors will be explored more fully in the following sub-sections.

Proactive Engagement

One of the most significant issues that is faced in post-conflict and post-disaster HRC in terms of preventing successful outcomes is the clear inconsistency between the funds allocated and the technical support provided (Silva & Batchelor, 2010). Therefore, HRC funders should be prepared to provide sufficient resources to meet the community's needs and offer livelihood support over the entire reconstruction period. Added to this, the local community should play a role in planning, execution, and evaluation, with the government and population fully supporting the process. One of the reasons for this need is that political stability is crucial to the success of post-conflict housing reconstruction; ensuring a secure environment enables the delivery of post-conflict reconstruction. Traditionally, PCR has focused on re-establishing macroeconomic structures; however, this often encourages the corruption of elites and does not benefit the affected society. Indeed, as noted succinctly by Lawther (2009, p. 154), "the underlying theorem [in terms of community involvement in housing reconstruction] is that the more the recovery relies upon local resource, the quicker the community will be able to move to self-sustainability, and thus from recovery to normalcy". Therefore, a framework of housing reconstruction must be developed to allow for a participatory process.

In terms of the specifics of preventing inequality of resource distribution, Lyons *et al.* (2010) confirm that housing reconstruction is an opportunity to tackle issues that arise from low-income housing, such as managing land tenure-ship laws, which only a proper framework could do. If PCR fails to address inequality in resource distribution, this would further marginalise those suffering due to the conflict and exacerbate tensions that might lead to conflict re-emergence. Moreover, failure to address horizontal inequality in post-conflict reconstruction

can lead to interventions that increase citizens' vulnerability via the exploitation of resources and widening of socio-economic inequalities. Therefore, local participation is important to provide sustainable housing reconstruction, in which projects should be people-centred rather than project-centred (Sakalasuriya *et al.*, 2018).

Based on the evidence provided of best practices in post-conflict reconstruction from academic, policy and non-governmental organisation (NGO) sources, it is recommended that donors and reconstruction partners be prepared to provide enough funding to meet society's needs and offer support over the long term. It is also vital that the local community plays a role in planning, execution, and evaluation, and that the government and population support the process. This being the case, security is also a key element affecting the success of post-conflict reconstruction: ensuring a secure environment enables the processes of post-conflict reconstruction to be successfully executed.

1.4. THE SIGNIFICANCE OF MATERIAL ADEQUACY DURING HRC

The term "material adequacy" in this thesis refers to the concept of having sufficient quality and quantity of material, but it should be noted that no formal academic definition of this term exists in the literature. In contrast, the related term "housing adequacy" has been well-defined. The Office of the United Nations High Commissioner for Human Rights (OHCHR) associates adequate housing with security and tenure, availability, affordability, habitability, accessibility, location, and cultural housing suitability. In addition, Barakat has added sustainable access to facilities to the definition of the OHCHR (Barakat, 2003).

Construction materials for housing reconstruction can be local or imported. However, during the period of reconstruction, materials are likely to be scarce due to high demand, and many housing reconstruction projects are cancelled, stopped, or delayed due to such scarcity (Okazaki & Narafu, 2007). According to Cowen and Coyne (2005), the Japanese and the Germans provide evidence of the most successful models of post-war reconstruction, while the Bosnians stand as the least successful example. In searching for the reasons for the failure of the Bosnian experience in the post-war reconstruction, Marcus Cox (2001) blames the lack of political instability and delay in funds, which resulted in main roads that would have served as central veins for the country remaining unbuilt. Pobric and Robinson (2019) added to this analysis by referring to a number of factors, one being unequal resource distribution by replacing workers' houses with expensive luxury apartments. Other factors included high

levels of unemployment, ethnic cleansing from some areas, and social unrest. In further analysis, Serwer (2005), during his work at the US Institute of Peace as Balkans Initiative Director, analyses the failure in the Bosnian reconstruction as being due to transport supply route disruption (Serwer, 2005). In contrast, the success of the Japanese and the German experience can be linked to many factors. The most significant was the scale of community participation and the effective management of reconstruction post-WWII (Cowen & Coyne, 2005).

In these examples, material adequacy (quantity and quality) has can have significant effects on the technical deliverables of the methods of construction and building codes (Barakat *et al.*, 2020). Therefore, housing reconstruction approaches are directly affected by the quality of material, method of construction, prices, and quantity of material (Elsayed, 2018) and must be carefully considered in any PCR framework.

1.5. RESEARCH GAPS

As Al-Samurai and Al-Qaraghuli (2021) and Saeed *et al.* (2022) confirm, reconstruction is an opportunity to provide better material, design, and socially preferable housing reconstruction. Although the 28 studies analysed within the literature review (see Chapter 2) provide a good analysis of housing reconstruction critical success factors (CSFs), cultural and community considerations, approaches to delivering housing reconstruction, and conceptual historical and future designs of for housing, the clear gap is a failure to fully explore the concept of finding a framework to measure the scale of the problem or assist the pre-reconstruction planning process for post-disaster and post-conflict housing reconstruction. Moreover, the published literature fails to attempt to connect CSFs with conceptual design to introduce efficient design models and frameworks. As noted in the literature, efficient design should consider the unique social ethnography of each case study (Oliver-smith, 1996).

In short, HRC disaster and conflict is a complex process, which requires focused investigation to cover aspects that contribute to a framework that ensures the success of HRC by providing material adequacy (Jha, 2010; High, 2011). Above all, pre-reconstruction plans and approaches should consider the nature and circumstances of the affected population (Aránguiz *et al.*, 2020).

The research gaps are summarised in the following points:

1) Most of the previously mentioned research investigates the positive and negative impacts

of case studies or focuses on the conceptual designs for reconstruction. However, the studies fail to establish a mechanism for providing a framework for the pre-reconstruction planning phase, especially in terms of material adequacy planning.

2) Previously mentioned studies indicated that material, labour, and monitoring are repeating issues affecting the success and failure of HRC. Nevertheless, these studies overlook these factors in terms of finding solutions that can prevent failure or encourage success in HRC.
3) The research area requires a framework for addressing material availability, knowing that the studies that have already been published have emphasised the importance of materials for housing reconstruction.

1.6. AIM, RESEARCH QUESTIONS AND OBJECTIVES

This thesis aims to propose a sustainable housing reconstruction (HRC) framework for post-conflict and disaster. The following research questions underpin the aim:

- What main elements and factors affect the success or failure of HRC?
- What are the trends/themes driving and connecting HRC factors in delivering material adequacy?
- How can these factors affect bottom-up community engagement and top-down (governmental, NGOs, and privet sector) management in a housing reconstruction framework?
- How can a framework deliver material adequacy during HRC?
- How do links between HRC approaches, case studies and themes affect pre-reconstruction planning, and what is the nature of the material adequacy juxtaposition within that planning?

The research objectives are, therefore, as follows:

1) Determine the success and failure factors of HRC strategies, including understanding the pre-reconstruction priorities for HRC, by studying top-down approaches in delivering successful HRC programmes and bottom-up perspectives of local residents.
2) Investigate material adequacy practices, models, methods, and approaches in housing reconstruction.
3) Explore the factors and success indicators that drive material adequacy during housing reconstruction.
4) Propose an adapted framework containing challenges and characteristics drawn from case

studies by integrating them with the academic literature on HRC.

5) Investigate material adequacy within housing reconstruction after conflict and disaster case studies by conducting a comprehensive literature analysis.

1.7. OVERVIEW OF THE METHODOLOGY

Since this thesis is firstly aimed at fully exploring existing literature on the topic of HRC to extract CSFs for social and human issues (i.e., reconstruction of people's damaged houses), the research adopts a qualitative design method, starting with a literature review and qualitative analysis, as detailed in Chapter 3. The qualitative analysis required the selection of general themes from a group of potential themes via close analysis of the literature, a process which represents a constructive research approach (Creswell, 2014). This research used the coding technique at the first analysis stage to interpret data systematically because coding is a process that aids in the organisation and conceptualising of data (Strauss & Corbin, 1990, p. 103). Moreover, "Conceptualising is the process of grouping" (p. 121). Therefore, data was grouped to answer the research questions by allowing the formation of clearly categorised concepts, as presented in the literature review analysis (see Table 2.2). These concepts and groups were then thematically analysed to produce themes to assist in the construction of an HRC framework (Bryman, 1994). This systematic and constructive method allowed clear identification of key aspects and issues to determine the most important factors for inclusion in the planning framework for HRC. The framework reflects importance (reason) and method (rigour) (Ravitch & Riggan, 2016) within the chosen context. To be more specific, the constructive method chosen for this thesis involved a thorough review of case studies to construct a framework based on a Thematic Analysis Network (TAN) that was produced to illustrate the resulting themes and presented as a result of the thematic literature analysis to construct a process framework proposal for housing reconstruction after conflict and disaster. The themes are presented at the end of Chapter 2.

CHAPTER 2: LITERATURE REVIEW

2.1. STRATEGIES IN HOUSING RECONSTRUCTION

Several reconstruction strategies have been suggested in the literature for HRC: cash-driven, owner-driven, community-driven, and contractor-driven are the main four, but there are others, such as agency-driven and loan-driven (Barakat, 2003; Jha *et al.*, 2010; Ahmed, 2011). These approaches would be led by a governmental reconstruction agency, agency reconstruction agency, or both depending on each case situation's governmental capacity, administrative capacity, and other factors such as developing or developed country, post-conflict or post-disaster events, and political stability level. The four main HRC approaches will be explored in turn in the following sections.

Cash-Driven Approach

The cash-driven approach involves providing cash for beneficiaries to allow reconstruction firms to access financial assistance. However, once the assistance is received, no follow-up or monitoring from the cash provider is usually applied. Therefore, this approach does not tend to provide the necessary level of technical assistance (Jha, 2010). When applying this approach then, any opportunity to introduce new technology, engage the community in a new training programme, or present new material is lost (Saleh *et al.*, 2020). To highlight these issues, Silva and Batchelor (2010) note that during the Indonesian Aceh reconstruction, which used this approach in conjunction with others, “the owners faced huge difficulties in managing money to carry out construction” (p. 256). Another issue with this approach highlighted in the literature is that money is often spent on activities that are not related to reconstruction, such as in Gaza, where the cash-driven approach led to the misuse and misappropriation of funds (Enshassi *et al.*, 2017b). As a result, money is often diverted from HRC efforts applying this approach, and the necessary engineering measures and building codes may be absent (Enshassi, 2019a).

Nevertheless, this approach is preferable for inaccessible areas where a technical assistant cannot deliver services (Saleh, 2020). An example of this approach is in the Gaza strip, in which it was adopted to reconstruct residential housing after its destruction (Enshassi *et al.*, 2019; Ali, 2020). Interestingly, due to the complex conflict-driven environment in Gaza, it continues to be difficult to provide technical or engineering assistance since access to experts, donors, technical assistance, and materials can be prohibited, as explained in Chapter 4. Therefore, the cash-driven approach is one of the few options feasible for reconstruction in

Gaza.

Owner-Driven Approach

This approach is characterised by the provision of technical assistance to house owners by engaging them in design and planning activities. This approach allows them to reconstruct their houses without significant ongoing assistance by training them on suitable methods of construction in the earlier stages, as well as introducing them to environment-friendly design. Furthermore, this approach can provide new materials and technologies to develop a house constructed in a BBB manner (Barakat, 2003; Jha, 2010; Saleh, 2020).

New materials or designs are not essential components of effective post-conflict housing reconstruction. However, records have shown that this approach can needs more technical support than perhaps some have suggested (Barakat, 2003). This being the case, the delay between technical and financial help may result in considerable stoppages to the efforts and rework (Aliakbarlou *et al.*, 2018; Choudhary & Mehmood, 2013; Kekar *et al.*, 2020; Safapour *et al.*, 2020). This is because technical assistance, such as more detailed skills training, should be provided. In addition, some individuals within some communities might be unable to manage the reconstruction process due to a lack of knowledge of construction techniques, lack of time to reconstruct their own houses, or being physically incapable of carrying out the work. One example of the effective use of this approach was in the post-earthquake HRC of Kashmir in 2005 (Mumtaz *et al.*, 2008; Saleh *et al.*, 2020). In this case, engineering design, workshops, construction guidelines, and funds were provided for the community to reconstruct their houses, which resulted in the reconstruction of more than 150,000 houses (Mumtaz *et al.*, 2008; Hicyilmaz *et al*., 2012).

Contractor-Driven Approach

The contractor-driven approach works by engaging local or international contractors to achieve the reconstruction programme. This approach usually involves relocation and construction of complex, multi-story buildings to serve a more significant number of families (Sadiqi *et al.*, 2012). Contractors are responsible for comprehensive resource procurement and delivery. There is also a need here to address the new location's socio-economic impact on the displaced community. Nonetheless, contractors usually aim to maximise their profit by minimising material and labour costs, which results in poor quality construction and a lack of trust in the reconstruction outcomes (Barakat, 2003; Steinberg, 2007; Saleh *et al.*, 2020). In addition, this approach tends to be linked with limited budgets since contractors are often able to reduce

materials and labour costs due to their connections with suppliers and their ability to pool resources to cover a more significant number of houses (Chang *et al.*, 2011). As noted in numerous sources, to achieve a successful reconstruction programme, community engagement and material quality and quantity are crucial factors which are notably absent in this approach (Barakat, 2003; Hidayat & Egbu, 2011; Chang *et al.*, 2012; Enshassi *et al.*, 2017). Interstingly, the Indonesian Aceh housing reconstruction project involved community-driven and contactor-driven approaches (Boen, 2006; Steinberg, 2007), highlighting the ability to combine two or more approaches to deliver HRC. In this case, though, poor quality of construction was a core issue due to a lack of technical support (Boen, 2006).

Community-Driven Approach

Davidson (2007), with evidence from Arnstein (1969) and Choguill (1996), showed that the more a community is empowered to participate, the more they contribute to decision making related to the reconstruction process. This approach increases the chances of success in the reconstruction process by developing the local population's skills in business, socioeconomic recovery, and construction. According to Cowen and Coyne (2005), the Japanese and Germans are good examples of this approach. Specifically, the German model engaged as many community members as possible in the efforts, which relieved tension between the country's divided eastern and western parts (Anyang, 2015). Consequently, the reconstruction process clearly increased stability in post-war cities and regions.

However, reconstruction in developing countries is more challenging due to the greater need to create opportunities for communities in terms of employment, reducing poverty, and facilitating equality. This means that the community-driven approach is highly appropriate in these cases. Funding agencies, such as the International Monitory Fund (IMF), claim that community-driven HRC programmes provide macroeconomic stability, fewer taxes, and empowers small enterprise businesses (SEBs) (Venner, 2014). This results in an improvement in the economic life of communities; a vital factor for the development of a sustainable community without the need to wait for significant assistance. According to the World Bank (WB) guidelines, one of the potential contributions of empowering the community is to develop construction practices of the affected country by providing training to the local builders (Jha, 2010). As the reconstruction process works hand-in-hand with the local community, the HRC community is then empowered to meet its own needs. Notably, this also enables the HRC programme to meet macro socioeconomic recovery needs (Maskrey, 1989).

In El Salvador's earthquake of 2001 and Columbia's earthquake of 1999, community-based reconstruction was a mandatory approach. The people were forced to participate in HRC and work for the re-establishment of their essential needs, which only served to embitter the community as regards their contribution to the reconstruction process (Davidson *et al.*, 2007). These cases are far from the community-driven approach's intended outcomes, where community participation is supposed to be wholly optional, motivated by the government, and preferably involves paid participation of the population. This approach obviously increases the community's capacity for reconstruction and improves their skills for the future (Davidson *et al.*, 2007; Bilau & Witt, 2016). However, the historical case studies noted in the literature provide only limited success stories for the community-driven reconstruction approach. Various researchers note that the failures have been caused by a lack of organisation in the participation process, and this adds urgency to the need for more studies to define the best way to manage all the elements related to this approach.

Summary of Approaches

Each reconstruction approach confers its own advantages and disadvantages and has differing relationships to materials adequacy in HRC. These are summarised in Table 2.1 below.

Table 2.1 HRC approach summary and relationship with material adequacy in HRC

Reconstruction Approach	Advantages	Disadvantages	Synthesised Relationships to Material Adequacy in HRC
Cash-driven	Useful in inaccessible areas (Saleh, 2020).	The absence of technical support, and cash might be spent on needs not related to reconstruction. (Enshassi 2019a)	Measurable assistance, but lack of control over material adequacy and source of origin.
Owner-driven	Can be used in rural areas with simple designs. Technical assistance from construction experts could be applied (Mumtaz, 2008).	Not all owners can or like to work in construction. The owner's personal situation may also affect the degree of income that can be assigned to the project (Barakat, 2003).	Applying cultural design. Applying BBB by providing technical assistance for the housing engineers. Local material most likely used in this approach. Material and technical assistant should be synchronised.

Community-Driven	Engaging affected community to supply their needs – reconstruct their houses, find a job opportunity, or own local business (Bilau & Witt 2016; Bilau *et al.,* 2018)	The approach may not cover everyone in the community. Large-scale engagement would be very hard to monitor, evaluate, or indicate impact (Bilau *et al.,* 2018; Anilkumar & Banerji, 2021)	The community would be engaged in socio-economic recovery. Local material can be used in this approach.
Contractor-Driven	Useful for complex buildings when relocation of HRC site considered (Saleh *et al.,* 2020)	Low material quality and less community engagement. Commercial house design (Saleh *et al.,* 2020). Single design for a complex building should be accepted. "One size fit all" is the main theme of this approach with absence of community socio-cultural needs (Barkat, 2003; Saleh *et al.,* 2020).	Minimum community engagement. The material is likely to be imported. Use of new material and new house design, which would affect community acceptance.

Studying HRC approaches is impractical in specific contexts where stakeholders are the main driver of the reconstruction approaches rather than other factors. Indeed, other aspects and practical solutions need to comprise more interceptive and supportive instruments to deal with complex HRC circumstances in damaged and disastrous environments (Barakat, 2003). Barakat (2003) also indicated that there are no inherently right or wrong approaches, but rather the choice of approach/es must be made to best suit the situation. This claim means that one approach would produce better results over others depending on the situation (Barakat, 2003). However, some reconstruction approaches will overlap, such as in the Cankiri post-earthquake reconstruction in 2000 in Central Turkey (Davidson, 2007), as will be discussed in detail in Chapter 4.

The available approaches detailed in this section serve different aspects of the reconstruction process, and each reconstruction approach has success and failure factors that this thesis attempts to synthesise. Within the literature, success factors are repeatedly mentioned for post-disaster and post-conflict HRC. All the factors refer to a critical indicator of HRC. Sometimes these factors also refer to a significant issue affecting the reconstruction process (Song & Wang, 2020). For example, the European Post-WWII reconstruction plan was successful (The United Nations, 2017). The programme focused on productivity growth, coordination policies, "financing for development" (instead of financing for destruction), demand for primary goods

traded internationally, and development of socioeconomic and environmental legislation (United Nations, 2017). The plan was successful because it considered the European community's socioeconomic factors as part of its development plan. In this case, the economic recovery, the social aspects, and the reconstruction process were incorporated into the same plan. This is an important point to carry forward to develop effective HRC frameworks.

2.2. FACTORS AFFECTING HOUSING RECONSTRUCTION AFTER CONFLICT AND DISASTER

Housing Reconstruction after conflict and disaster is a process that either succeeds or fails on the strength of its implementation. Therefore, HRC factors that significantly influence the success of the process are categorised as Critical Success Factors (CSFs). These factors include stakeholders, challenges, or impacts influencing the Housing Reconstruction process. For instance, Chang *et al.* (2011) studied resourcing challenges of HRC through a comparative study of the 2004 Indonesian Indian Ocean tsunami and the 2008 Chinese Wenchuan earthquake. The study deduced 37 factors that affected material availability within the selected case studies. These factors were related to implementation methods, market capacity, and transportation issues. As a result, Chang *et al.* (2011) and Hidayat & Egbu (2011) confirmed the community's role as one of the main factors in the reconstruction process. Furthermore, Hidayat and Egbu (2011) investigated the link between material and labour regarding the skills needed to utilise the chosen material in the construction process. Moreover, the authors investigated how familiar the local skilled labour force were with local materials compared with exported materials. While Hidayat and Egbu identified 32 Critical Success Factors (CSFs) for housing reconstruction, Ophiyandri *et al.* (2013) identified 12. Despite this discrepancy, both sets of authors agreed that the most important factors are related to the accountability and transparency of labour, hence further confirming the community's vital role in the HRC process. In another example, Anilkumar *et al.* (2021) studied the Indian Kerala post-Tsunami HRC programme. They identified 26 success factors. Logistical planning and monitoring were the factors found to be most significantly affecting the availability of resources.

Other literature has presented a conceptual design for damaged houses even before the HRC has started. For instance, Williams (2015) studied post-war reconstruction from a heritage-architectural point of view, focusing on the Syrian post-war period as a case study. Similarly, Al Asali and Shahin (2016) investigated the heritage of rural traditions revealed by the architecture of Syrian houses and the diversity in cultural houses designed with local materials.

Al Asali and Shahin agreed that the community here played a significant role in affecting the reconstruction and selection of material by addressing human preferences and living conditions. The authors highlighted that HRC can achieve its proper architectural role by linking cultural house design, local materials, and local methods of construction. (Al Asali & Shahin, 2016). Soufan (2018) agreed on the importance of the community's role by understanding the aftermath of the ties of the community in the last years of the Syrian war. Soufan (2018) further stated that an ethnographical understanding of the pre-war Syrian community further contributed to heritage reconstruction (Soufan, 2018).

Dopplehofer (2016) also discussed the need for a pre-reconstruction plan and conceptual designs as the main factors affecting HRC by understanding the local historical material for future economic resources, with Ismail *et al.* (2017) investigating a possible solution for the post-war HRC by studying vernacular design for houses in rural areas and examining the Beehive house design in Aleppo. They discussed design from the materiality aspects of internal spaces and provided a conceptual structural design for the top of the damaged houses in the rural areas of Syria. In addition, Ismail *et al.* (2017) addressed the possibility of using rubble from damaged houses. Interestingly, Munawar investigated the issues of heritage underlying the Syrian case study and the community role from the German experience (Munawar, 2018; 2019; 2021).

Al-Samurai and Al-Qaraghuli (2021) and Saeed *et al.* (2022) have discussed the post-war reconstruction of Mosul in Iraq. They investigated the conceptual designs of post-war Mosul through a macro lens to introduce modern models that showed the vernacular architecture of a sustainable and environmentally friendly city. On the other hand, Saeed *et al.* (2022) focused more on the environmental design preferred by the community by using a combination of different materials to have the best houses that would be compatible with the climate conditions in Mosul (Saeed *et al.*, 2022). To conclude, Al-Samurai and Al-Qaraghuli (2021) and Saeed *et al.* (2022) confirmed that reconstruction is an opportunity to provide better material, design, and socially preferable housing reconstruction.

Although all these studies provide a good analysis of certain CSFs for post-disaster and post-conflict HRC (cultural and community considerations, approaches to delivering housing reconstruction, and conceptual historical and future designs of the housing reconstruction), they fail to examine the best frameworks for measuring the scale of the problem and best assisting the pre-reconstruction planning process. Furthermore, the published literature reveals a lack of

an attempt to connect CSFs with the conceptual design process to introduce efficient design models and frameworks. Indeed, efficient design should also consider the unique social ethnography of each case study.

In addition to factors that affect HRC, its processes have been studied in a variety of disciplines, including conflict studies, geosciences, seismology, build environment, and architectural and civil engineering (e.g., Barakat, 2003; Haigh *et al.*, 2006; Mumtaz *et al.*, 2008; Jha, 2010; Ahmed, 2011; Al Asali & Shahin 2016; Ismail *et al.*, 2016; Saeed *et al.*, 2022). Moreover, the published studies represent cases with different reconstruction approaches. Studies have also shown the importance of planning and coordination amongst reconstruction partners to best suit local dynamics and apply various CSFs (Barakat, 2003; Haigh *et al.*, 2006; Mumtaz *et al.*, 2008; Jha, 2010; Ahmed, 2011; Al Asali & Shahin 2016; Ismail *et al.*, 2016; Saeed *et al.*, 2022). With the considerable number of factors affecting the HRC process, as shown in Table 2.2, this thesis presents the results of a content analysis and coding process on the studied literature (more details are provided on the methodology in Chapter 3). The purpose is to illustrate correlation to construct themes to find trends and explore connections between factors that affect material adequacy in HRC. Studying the factors and exploring success in applying these factors will allow for the construction of a sustainable framework for post-disaster and post-conflict HRC.

This chapter is aimed at developing of a conceptual CSF framework for housing reconstruction after conflict and disaster by reviewing 28 major studies related to the HRC process. The papers were selected based on the following criteria:

1) Studies that focused on and addressed the subject of housing reconstruction.
2) Studies that discussed critical success factors for housing reconstruction by evaluating historical case studies which directly examined and criticised the HRC process.
3) Studies with keywords “reconstruction”, “housing reconstruction”, “reconstruction approaches”, “post-conflict”, “post-disaster”, and “critical success factors”.

The systematic literature review conducted on HRC approaches, factors, and case studies showed limitations in materials use and incomplete implementation process of HRC (Choudhary & Mehmood, 2003; Hidayat & Egbu, 2011; Ophiyandri *et al.*, 2013; Yilmaz *et al.*, 2013; Aliakbarlou *et al.*, 2017; Enshassi *et al.*, 2017; Kakar *et al.*, 2020; Anilkumar & Banerji, 2020; Sfapour *et al.*, 2020). Papers that particularly focussed on housing reconstruction and

discussed CSFs were included in the analysis. The most critical factors were systematically extracted by using the coding approach described in Chapter 3: Methodology. Table 2.2 presents the selected studies in terms of the major categories mentioned and indicates sub-themes that include indicators/factors driving the reconstruction as drawn from the literature in the research area. Ten main factors that affect and drive the HRC were defined. A total of 59 sub-factors boosting the success of HRC or limiting the progress of HRC by creating failure, delay or downsizing of HRC projects were also identified. These factors led to further investigation of the correlation between these factors with 'material' as the main focus.

Table 2.2 Synthesised factors affecting the HRC process.

Material	
Factor	***References***
Local material production capacity	Barakat (2003); Boen (2006); Masyrafah and McKeon (2008); Ahmed (2011); Hidayat and Egbu (2011); Chang *et al.* (2012); Choudhary and Mehmood (2013); Ophiyandri *et al.* (2013); Yilmaz *et al.* (2013); Pribadi *et al.* (2014); Jordan *et al.* (2015); Bilau and Witt (2016); Haigh *et al.* (2016); Aliakbarlou *et al.* (2017); Enshassi *et al.* (2017); Ismail *et al.* (2017); Enshassi *et al.* (2019); Rouhanizadeh *et al.* (2019); Anilkumar and Banerji (2021); Kakar *et al.* (2020); Sfapour *et al.* (2020); Saleh *et al.* (2020); Anilkumar and Banerji (2021)
Material availability, quality, and quantity	
Material procurement strategy	
Material spatial availability and temporal mobilisation	

Labour	
Factor	***References***
Human resources composition and workforce formation	Choudhary and Mehmood (2003); Mumtaz *et al.* (2008); Hidayat and Egbu (2011); Yilmaz *et al.* (2013); Aliabarlou *et al.* (2017); Enshassi *et al.* (2017) a; Bilau *et al.* (2018); Enshassi *et al.* (2019b); Ismail *et al.* (2020); Kakar *et al.* (2020); Saleh *et al.* (2020); Sfapour *et al.* (2020); Sospeter *et al.* (2020); Anilkumar and Banerji (2021)
Education of human resources, skills, technical knowledge, and artisan capacity	
Labour recruitment strategy includes an intelligent system that considers teamwork and market wages	
Training provided in order of the quality and desired deliverables and supervisory guidance	
Labour (project team) performance, and motivation	
Transportation	
Factor	***References***
Transportation capacity and cost	Choudhary and Mehmood (2003); Chang *et al.* (2012); Bilau and Witt (2016); Aliabarlou *et al.* (2017); Enshassi *et al.* (2017); Hayat *et al.* (2019); Sfapour *et al.* (2020)
Safe corridors	
Reconstruction Site and Environmental Aspects	
Factor	***References***
Competing of contractors	Barakat (2003); Mumtaz *et*

Contractor capacity and qualification, and corporate commitment	*al.* (2008); Yilmaz *et al.* (2013); Enshassi *et al.* (2017); Hidayat and Egbu (2011); Chang *et al.* (2012); Ophiyandri *et al.* (2013); Aliabarlou *et al.* (2017); Enshassi et al (2017); Rouhanizadeh *et al.* (2019); Kakar *et al.* (2020); Saleh *et al.* (2020); Sfapour *et al.* (2020); Anilkumar and Banerji (2021)
Reconstruction site infrastructure	
4Cs: Communication, Coordination, Cooperation, and Collaboration	
Factor	***References***
Complications in communication and coordination	Barakat (2003); Choudhary and Mehmood (2003); Hidayat and Egbu (2011); Ophiyandri *et al.* (2013); Yilmaz *et al.* (2013); Bilau and Witt (2016); Bilau *et al.* (2018); Aliabarlou *et al.* (2017); Enshassi *et al.* (2017); Enshassi *et al.* (2019); Rouhanizadeh *et al.* (2019); Ismail *et al.* (2020); Kakar *et al.* 2020; Sfapour *et al.* (2020); Sospeter *et al.* (2020); Anilkumar and Banerji (2021)
Coordination and communication between the affected community and the reconstruction agency (officials), including access to the affected community	
Adequate communication among related parties for collaboration (synergy) considerations	
Complications in communication and coordination	
Institutional arrangement, Government, non-governmental and reconstruction agency	
Factor	***References***

Local government support and assistance capacity	Barakat (2003); Choudhary and Mehmood (2003); Steinberg (2007); Tajik (2008); Mumtaz *et al.* (2008); Galtung and Tisné (2009); Romtimi *et al.* (2009); Hidayat and Egbu (2011); Chang *et al.* (2012); Ophiyandri *et al.* (2013); Yilmaz *et al.* (2013); Bilau and Witt (2016); Aliabarlou *et al.* (2017); Enshassi *et al.* (2017); Bilau *et al.* (2018); Enshassi *et al.* (2019); Rouhanizadeh *et al.* (2019); Ismail *et al.* (2020); Kakar *et al.* (2020);); Sfapour *et al.* (2020); Sospeter *et al.* (2020); Anilkumar and Banerji (2021)
Establishing institutional and organisational arrangements	
Political stability and counterinsurgency	
Sufficient number of facilitators and competition for resources	
Lack of preparedness plans for disaster events, including learning from previous experience	
Bureaucracy and decentralisation related	
Governance management	
Housing environment including hazards, vulnerability, and risk management	
Factor	***References***
Environmental design in understanding surrounding parameters, such as hazards or possibility of disaster recurrence, and considering this in the construction design	Steinberg (2007); Mumtaz *et al.* (2008); Hidayat and Egbu (2011); Ophiyandri *et al.* (2013); Yilmaz *et al.* (2013); Bilau and Witt (2016); Aliabarlou *et al.* (2017); Enshassi *et al.* (2017); Bilau *et al.* (2018); Rouhanizadeh *et al.* (2019); Ismail *et al.* (2020); Kakar *et al.*
Environmental side effects due to disaster	
The environmental issues considered in execution, including HSE	
Implementation level of risk management	
Location and physical environment	

Damage and loss assessment, including hazard assessment and desired deliverables	(2020); Saleh *et al.* (2020); Sfapour *et al.* (2020); Anilkumar and Banerji (2021)
Economy	
Factor	***References***
Sufficient funds, including secured international assistance	Barakat (2003); Choudhary and Mehmood (2003); Davidson *et al.* (2007); Steinberg (2007); Mumtaz (2008); Hidayat and Egbu (2011); Ophiyandri *et al.* (2013); Yilmaz *et al.* (2013); Bilau and Witt (2016); Enshassi *et al.* (2017); Bilau *et al.* (2018); Anilkumar and Banerji (2021); Ismail *et al.* (2020); Kakar *et al.* (2020); Saleh *et al.* (2020); Sfapour *et al.* (2020); Sospeter *et al.* (2020); Anilkumar and Banerji (2021)
Economic environment recovery	
Extraordinary financial requirements and flexibility in funding plan, including a budget update	
X-factor and corruption	
Increasing prices in material, energy, and labour wages	
Housing as a socio-economic recovery process rather than a physical product	
Projects Management	
Factor	***References***
Reporting, monitoring, and evaluation function by expert inspection	Barakat (2003); Choudhary and Mehmood (2003); Steinberg (2007); Mumtaz (2008); Hidayat and Egbu (2011); Chang *et al.* (2012); Ophiyandri *et*
Construction methods and familiar techniques that fit the scope of the project.	
Management information system MIS for the project that is transparent and accessible	

Competent project manager	*al.* (2013); Yilmaz *et al.* (2013); Bilau and Witt (2016); Aliabarlou *et al.* (2017); Enshassi *et al.* (2017) a; Bilau *et al.* (2018); Enshassi *et al.* (2019); Ismail *et al.* (2020); Kakar *et al.* (2020); Saleh *et al.* (2020); Sfapour *et al.* (2020); Sospeter *et al.* (2020); Anilkumar and Banerji (2021)
Stakeholder level of involvement and understanding of the project's scope and objectives	
Start and end time of the project	
Size of the project	
Livelihood assessment, including mapping	
Logistics and sufficient supply	
Funding approach and reconstruction strategy	
Use of technology and GIS	
Impromptu decision making	
Project prioritisation methodology	
Houses to material ratio: quantity of houses requiring reconstruction and the scale of the project	
Community	
Factor	***References***
Socio-cultural for housing design and acceptability	Barakat (2003); Steinberg (2007); Mumtaz *et al.* (2008); Hidayat and Egbu (2011); Chang *et al.* (2012); Ophiyandri *et al.* (2013); Yilmaz *et al.* (2013); Bilau and Witt (2016); Aliabarlou *et al.* (2017) Enshassi *et al.*
Community psychology and faith	
Community engagement and participation	
Community participation in decision making	
Community training and empowerment, including guidelines	

Trust from the community, including the contract of reconstruction	(2017a); Enshassi *et al.* (2019) b; Hayat *et al.* (2019); Sospeter *et al.* (2020); Kakar *et al.* (2020); Anilkumar and Banerji (2021); Saleh *et al.* (2020)
Conducive social environment, social capital, and social solidarity	
The population of the affected community and social vulnerability	

The focus of this thesis, material adequacy, as noted previously, quality and price of the material are the primary factors affecting the quality of delivered houses. Quality is vital to ensure that the construction efforts result in durable dwellings, and prices of construction materials need to be viable and allow for the quality required. These two factors are explored in more detail in the following sections.

Quality

The quality of building materials greatly affects the resulting construction and impacts the construction methods used. For example, concrete is one of the main materials used in reconstruction, and in the Aceh reconstruction project in Indonesia, poor mixtures resulted from the poor composition of the concrete mixture (Okazaki & Narafu, 2007). Less knowledge of concrete mixtures, scarcity of cement material, poor monitoring and technical support for workers, scarcity of mixture machinery, and lack of labour are some of the factors that affected the composition of the concrete mixture in Aceh's case.

In addition, the quality of materials used for reconstruction also affects the safety of the housing, as evidenced again in the Indonesian Aceh project, where poor quality of construction methods and defective equipment for delivering mixtures produced poor results (Imai & Boen, 2018). It has been suggested that monitoring and technical advice from experts can alleviate this situation and should be established once a large-scale housing reconstruction starts (Bilau *et al.*, 2017). Indeed, this was implemented by the Indonesian government to assist and monitor the housing reconstruction activities. They employed engineers, but they were mostly new graduates or otherwise lacking in experience (Imai & Boen, 2018).

Effective monitoring is a joint factor with the quality of material delivery. Therefore, reconstruction agencies must implement monitoring from international donors, governments, or NGOs to deliver success in managing housing reconstruction (Seneviratne *et al.*, 2016; Anilkumar & Banerji, 2021). Alternatively, monitoring can be done by a specialised technical

group, such as the International Management Group, which was established in 1994 as an initiative from the UNHCR to manage and monitor the reconstruction process in Bosnia (Archive-UNESCWA, 2022). This monitoring would ensure that the quality of material meets the minimum building code requirements.

Material Prices

One of the main issues affecting housing delivery during housing reconstruction is the price of materials. In Gaza, post-Israeli invasion, a blockade by Israeli forces over Gaza's Strip affected the price of construction materials, which increased by 60% (Barakat *et al.*, 2020). Inflation of material prices in this manner almost certainly led to a decrease in the number of houses that could be constructed (Bilau *et al.*, 2017). An inflation of prices has also occurred in previous HRC projects due to the large-scale reconstruction required, which increased demand for construction materials. A review of the literature has revealed suggestions that bureaucratic and governmental strategies must be adopted during HRC to control the prices of materials (Boy *et al.*, 2019). However, uncertainty in material prices is a reason for an expansion of black markets for construction materials during the process of HRC after a conflict or disaster. Interestingly, the black market in housing reconstruction after the Second Sino-Japanese War was the largest source of construction materials (Ono, 2017). The authors added that controlling the construction material market and prices were challenging. These issues resulted in frustration for the after-conflict and disaster communities (Chang-Richards *et al.*, 2013).

2.3. THEMATIC ANALYSIS OF LITERATURE

There is comprehensive agreement amongst all sources that it is vital to transfer the knowledge gained from the study of HRC to concrete actions (Ward *et al.*, 2009). For this reason, Thematic Analysis (TA), as adopted in this research, is one of the most effective approaches for developing a framework (Ward *et al.*, 2009; Clarke & Braun, 2014). Further details of the TA performed for this research are provided in Chapter 3.

This stage of research uses discourse analysis, narrative review, and identification of themes generated from the literature review. On this basis, most themes are in some way related to material adequacy. This is because material prices during the reconstruction period and subfactors affecting the material adequacy of housing reconstruction impact the process and assist in shaping the framework needed for HRC.

This thesis has found several themes that captured patterned answers in relation to the research

questions (Braun & Clarke, 2006), all of which form the basis for the Thematic Analysis provided in the following sub-sections.

Theme 1 – Material Selection Criteria

The first theme reveals the importance of the type of material selected and its impact on the environment. Moreover, it highlights whether this material is available locally and whether it is available in quantities sufficient to meet the required demand within a limited timeframe. The theme also illustrates the relationship between the scale of demand and environmental harm. This demand may cause the production of material in an unsustainable way, such as in producing timber through illegal deforestation. The theme also reflects the undesirable scenario in which the material may result in a significant inflation in material prices due to unstable material quality and quantity. As noted in the literature to highlight these points:

> *The immediate upsurge of wood construction has led to a large influx of wood of questionable origin, mostly wood from unlicensed and illegal logging in Indonesia. The donor community has reacted to this with great concern, and undertaken tedious importation drives of massive stocks of certified, environmentally cleared timber resources for construction. The importation of these resources from Canada and New Zealand had to face unprecedented bottlenecks by immigration authorities and roadside pirates in northern Sumatra*
>
> *(Steinberg, 2007, p 161).*

A narrative review of the previous quote shows the importance of material origin as one of the criteria to select material criteria for housing reconstruction as wood was the primary material that has been selected based on design and cultural and traditional construction, increasing demand for wood that affects cost, availability, and environmental impact.

Moreover, the Indonesian case showed that due to high demand, the unlicenced and illegal market expanded during the reconstruction period. Those acts of illegal construction materials increased the awareness of the donors to question the material's origins. Such a scenario reflects the lack of pre-reconstruction planning that ignores the reconstruction program's size after the Indian Ocean tsunami. Lack of planning would struggle to reserve adequate materials required for reconstruction, especially during high demand for housing reconstruction. Therefore, housing reconstruction material strategies should regulate and manage local and imported materials if needed. Indeed, as described in Roseberry (2008), after the first round of illegal

wood material, some INGOs enforced using of the Forests Stewardship Council (FSC), which preserves legal and sustainable timber from abroad.

As shown by Steinberg (2007), during the HRC programme, a vast demand for construction materials increases the possibility of illegal and unstandardised material supply. These illegal actions, in turn, can affect the quality of local materials and cause difficulty for governments to monitor reconstruction agencies due to the scale of the HRC projects. Responding to such illegal actions is vital. However, pre-reconstruction planning should list everything needed for material in a criteria list, improving the process of delivering both construction materials and housing reconstruction performance. In addition, such illegal and poor-quality material can result in a shortage in the quantities of the material provided:

The initial response has shown fast construction progress, but lack of supervision and technical support have produced quality flaws; and cost increases and construction material shortages have slowed down progress

(Steinberg, 2007, p. 165).

As noted above, shortages in materials almost certainly result in a delay in the HRC delivery. Such a delay (as previously discussed in the owner-driven approach) also negates the benefits of the owner-driven approach, as the technical support that usually comes via this approach is in the form of training on methods of construction. If there is an absence of material, training cannot be conducted (Steinberg, 2007). Moreover, material shortages and illegal materials significantly increase prices. This inflation would then increase the demand for extra funds for the reconstruction programme beyond those which have been allocated in the pre-construction phase. In such cases, pre-reconstruction legislation is required to manage the prices of the resources and prevent exploitation, as suggested by Bilau *et al.* (2018) and reproduced below. In this context, Boy *et al.* (2019) point out that the governance of material prices during reconstruction would speed up housing reconstruction, as is also quoted below:

The provision of appropriate legislation, regulation and policies is required to facilitate the effective management of PHR [Permanent Housing Reconstruction] processes and enables PHR programme implementation … Cross-cutting measures for PHR… Provision and/or review of legislation governing local resource exploitation

(Bilau et al., 2018, p 9).

There were a significant risk is the increase in the price of the building, which the researchers suggest that the government simplify the bureaucratic process and make regulations for the control of prices of building materials is challenge for the government to speed up reconstruction process

(Boy et al., 2019, p. 8).

The quotes from Bilau et al. (2018) and Boy et al. (2019) highlight some critical issues and challenges in housing reconstruction and material selection after disasters. Bilau et al. (2018) emphasize the importance of appropriate legislation, regulation, and policies to manage housing reconstruction processes effectively. However, the quotes do not delve into the challenges of the existing legal frameworks. It would be helpful to understand the specific issues hindering effective legislation implementation and enforcement. Bilau et al. (2018) mention the need for cross-cutting measures in housing reconstruction. While the quote acknowledges the importance of considering various aspects simultaneously, it does not provide specific examples or guidelines for implementing these measures. With clear guidance, it may be easier for stakeholders to understand and incorporate cross-cutting measures into material selection criteria. Boy et al. (2019) highlight the significant risk of increasing building prices and the bureaucratic processes involved in housing reconstruction. While this quote focuses on broader challenges, it does not address material selection criteria directly. It would be beneficial to have more specific insights into how these challenges affect the choice of construction materials, such as cost implications or delays in material procurement. Both quotes acknowledge challenges in the housing reconstruction process but must provide detailed recommendations for addressing these issues. With specific guidance and actionable solutions, it may be easier for policymakers, practitioners, and stakeholders to navigate the complexities of material selection in post-disaster contexts effectively.

Both quotations relate to the legislative, regulatory, and policy decisions concerned with HRC. In addition, one of the critical factors often affecting reconstruction programmes is the source of the materials that must be legislated and regulated. The literature notes that local materials have the best impact on HRC due to the following factors:

- Materials can be measured locally.
- Materials quality and quantity can be controlled and managed by governments and reconstruction agencies.

- Local artisans know how to use them.
- Local material use always has a positive impact on the local economy.

In other words, the use of local materials avoids any complexity of having to incorporate new or unfamiliar construction materials that may need additional engineering considerations. This would naturally add to the difficulties of reconstruction as it would require additional training for the local population. An additional consideration from the literature is that the use of non-local materials may result in houses that are not acceptable to the community:

The use of local materials, techniques and technology enables quick reconstruction, provides livelihood source options for local communities, reduces logistics costs and enhances acceptability and long-term project sustainability

(Bilau et al., 2018, p. 16).

The quote from Bilau et al. (2018) highlights several positive aspects of utilising local materials, techniques, and technology in housing reconstruction after disasters. The quote suggests that using local materials, techniques, and technology can enable immediate reconstruction. While this can be beneficial in terms of efficiency and timely recovery, it is essential to consider the quality and safety aspects of the reconstruction. Immediate reconstruction should maintain the housing structures' durability, resilience, and long-term functionality. Using local materials and techniques can provide livelihood source options for local communities involved in the reconstruction process. Local materials can contribute to economic development, skills enhancement, and community empowerment. However, it is essential to ensure that utilising local materials does not result in overexploitation or depletion of resources and that equitable economic opportunities are provided to all community members. Utilising local materials can reduce logistics costs associated with transportation and sourcing from distant locations. Local materials can lead to cost savings and improved cost-effectiveness in housing reconstruction. However, it is necessary to balance the cost considerations with other factors such as material availability, quality, and suitability for the local environment and climate conditions. Using local materials, techniques, and technology may enhance the acceptability and long-term sustainability of the reconstruction project. When materials and techniques align with local traditions, cultural preferences, and architectural styles, it can contribute to community acceptance, a sense of ownership, and cultural preservation. However, it is essential to ensure that local materials

and techniques meet safety standards and comply with relevant building codes and regulations.

As shown by Bilau *et al.* (2018), local materials can positively impact the livelihood of communities affected by disasters. Another benefit of using local material is that it reduces logistics costs and provides a sustainable HRC project produced and accepted locally. On the other hand, Yilmaz *et al.* (2013) suggested that the issue is not with the source of the material; the issue is with the construction method since construction carried out by locals can be under-engineered:

> *The vulnerability of the rural built-environment as a result of construction practices in rural areas, which produce non-engineered structures built with local materials such as raw timber, rubble stone and earth*
>
> *(Yilmaz et al., 2013, p. 40).*

In this case, the absence of experts' input and technical advice would affect the quality of the housing reconstruction activities. Indeed, both local and imported construction materials have the risk of resulting in poor structures when applied with a total absence of engineering technical support. This phenomenon of non-engineering construction practices can be hazardous when using owner-driven or cash-driven approaches to deliver HRC. As discussed in the cash-driven approach, as shown in the quote, rural areas are more likely to adopt non-engineering practices where access to technical assistance can be an issue. On top of that, an owner-driven approach with a lack of durable local materials or skills will be an issue in implementing the built environment and delivering BBB construction.

Another point raised in the literature is that if HRC misses the opportunity to produce comprehensive pre-reconstruction plans that incorporate material adequacy, the material price can quickly escalate (Pirabadi, 2014). This is because illegal activities often result in price inflation of construction materials, as in Afghanistan (Kaker *et al.*, 2020). Therefore, the pre-reconstruction plans must be built with firm legislation in mind that controls the logistics of materials to benefit the HRC programme and avoid delays in delivering housing:

> *According to Akar's study (2016), disasters represent an opportunity for societies to build healthier, more comfortable, and energy-efficient buildings within the approach of green architecture to contribute to avoiding other disasters in the future. The study, through its*

review of the Turkish experience in facing earthquakes, demonstrated the importance of encouraging green construction using environmentally friendly building materials, recycling and energy efficiency that contribute to the reform process by setting economic mechanisms such as adopting disaster insurance and providing discounts to legalize their use by consumers

(Al- Samurai & Al- Qaraghuli, 2021, p. 3).

Of extreme important is the point that any sustainable considerations of HRC material should only be recommended after the pre-reconstruction planning stage is completed. This sequence is to ensure the legality and adequacy of the materials. After this, material selection should be a technical process to support the built environment in providing resilient houses against any future spatial hazards. The previous quote determined factors will assure BBB, which are healthier, more comfortable, and energy-efficient (Passivhaus) construction, using environment-friendly materials, recycled and energy efficient. The authors above may need more feasibility of applying such measures when resources in developing countries are scarce to reserve factors needed to prove BBB construction. Pre-reconstruction planning by merging material options available in the destructive area and best practices to deliver the above BBB need to be evaluated feasibly.

Pribadi *et al.* (2014) defined other criteria of a BBB programme as an effective method in the reconstruction process:

The recent program of "build back better" for post-disaster housing reconstruction in West Sumatera indicates that the role of building material supply stores played in this campaign was important. It clearly shows the critical role that these shops can play in ensuring the general public has a better understanding about earthquake-safe building standards

(Pribadi et al., 2014, p. 217).

Throughout the exploration of the literature situated within this theme, a link has been found between material adequacy of the HRC process on the one hand, and legislation, source of material, and economic concerns on the other. Clearly, the selection of the most suitable construction method can result in the success of an HRC programme. In conclusion, this Thematic Analysis has confirmed that reconstruction material needs to be sustainably and legally affirmed, tested, and available to meet the high demand during the limited time and

budget of any HRC programme.

Theme 2 – Housing Reconstruction Engagement Criteria

This theme discusses literature related to the community's impact on material and how material selection can impact community well-being during the HRC process. One of the major points expressed in the literature is that the quality of community skills affects the outcomes of the HRC projects. Ahmed (2011) indicated the importance of empowering the affected community:

> *The quality of homes produced varied depending on factors such as each beneficiary's capacity to contribute to the construction costs, logistics, locally available building materials, beneficiary capacity, and availability of beneficiaries to participate in the construction.*
>
> *(Ahmed, 2011, p. 12).*

In most reconstruction approaches, the local community expects to provide the labour needed to accomplish the projects and material supply and production (Ahmed, 2011). In some cases, though, lack of experience in the construction methods of selected material can result in poor quality houses. In such cases, HRC work is put on hold until the local community or skilled labour learns skills is imported to the area. However, in the latter case, the community would miss the opportunity for local labour to benefit from the housing reconstruction and achieve the community's economic recovery:

> *Shortage of materials for construction was the most common problem and they had to be imported from outside Aceh …. the introduction of new technology, e.g. concrete material to local people that were perceived as 'modern', also poses problems of vulnerability due to the skills of local people*
>
> *(Hidayat & Egbu, 2011, p. 895).*

Hidayat and Egbu (2011) highlight that the use of relatively new construction materials required the learning of new skills for the Aceh HRC project by the local population. As the quotation suggests, the selection of new materials was caused by significant shortages in local construction materials. And whilst new technology or material can sometimes produce more durable construction materials than local materials, lack of experience in the newly devised technology could cause the community to miss the opportunity to construct more durable

houses than the damaged ones. Selecting new construction material will affect community engagement and, in some cases, limit their economic recovery when participation is a payable role. It should also be noted that providing new material from outside the area can sometimes be necessary for areas vulnerable to disasters such as earthquakes, slides, or floods due to the specific requirements of disaster prevention construction:

> *The focus is on developing the production and distribution of building materials; improving the quality of the materials; and training local builders. It is particularly valuable in hazard areas where building materials and construction techniques have proved to be the main source of vulnerability, for instance in earthquake zones*
>
> *(Barakat, 2003, p. 23).*

Barakat (2003) claims that material selection and its corresponding construction method are the most critical elements when performing BBB as an environmentally resilient house, which is the HRC programme's primary concern (Barakat, 2003). The previous quote shows overlapping factors of the HRC. The built environment, local community skills, material selection, material quality and quantity are required to deliver HRC. Mumtaz *et al.* (2008) further argues that selecting building types is the main factor in providing houses that are considered environmentally designed:

> *Poor performance of the buildings is to blame for the catastrophe, though performance of traditional building types such as Dhajji-dewari and Batar performed far better than their modern counterparts. Buildings performed poorly because of very weak construction materials such as dry stone, stone in mud mortar; or were constructed very poorly despite being of good materials such as fired brick or stone in cement mortar, confined masonry, and reinforced concrete*
>
> *(Mumtaz et al., 2008, p. 67).*

Certain designs mentioned by Mumtaz *et al.* (2008) are disaster resistant, but he also points out that poor-quality materials or construction methods result in a newly reconstructed house that presents extra hazards to its occupants.

Another point raised in the literature in terms of the importance of the community's role, is that the construction methods should apply materials according to the selected design. Davidson *et*

al. (2007) presented an example of how the local skills are essential in housing construction:

On 6th of June 2000 an earthquake of magnitude 5.9 on the Richter Scale shook the Orta district in Cankırı [in Central Turkey] ⋯ 1892 rural houses were demolished or heavily damaged … It should be noted that rural areas suffer more from earthquakes because most of the rural houses in Turkey are constructed by their owners or by local artisans, without any professional assistance regarding choice of materials and construction techniques.

(Davidson et al., 2007, p 110).

As in the case of Cankiri, local communities in rural areas constructed their own houses without expert assistance. In this instance, the choice of the material and the construction method was a community responsibility. When these rural areas were exposed to a natural hazard, local material or construction knowledge was easily provided to design disaster-resistant housing (Davidson *et al.*, 2007). If locals cannot complete the work alone, it has also been suggested that construction capacity be increased by employing a local contractor:

If local communities are accustomed to building their own homes, contracting the job to a company may be unnecessary. In some instances, small local contractors that employ and source materials locally can be engaged to undertake the work

(Barakat, 2003, p. 31).

However, Barakat (2003) warned that if local contractors do not have sufficient experience in construction, this can result in delays to the HRC project. In a similar vein, Choudhary and Mehmood (2013) highlight the numerous risks of engaging contractors and managers without sufficient skills:

In terms of project management, the researcher noted that management roles have been unclear because generalist line managers are managing reconstruction programs and they are not competent. Considerable failure in term of project completion timing, significant scope and cost drift is just because of inadequate or unqualified staff in dynamic policy and resource environment of disaster affected areas

(Choudhary & Mehmood, 2013, p. 13).

Clearly then, skills and material are interlinked factors in delivering an HRC project, with one

affecting the other and both having the power to affect the project's schedule and cost (Choudhary & Mehmoud, 2013; Safapour *et al.*, 2020). In addition, Safapour *et al.* (2020) noted that a careful consideration of the size of the HRC staff is essential due to the often-large-scale nature of reconstruction programmes, meaning that shortages of labour could delay delivery:

> *After a disaster, clients are usually faced with a shortage of human resources; therefore, when the reconstruction project is complex, the probability of reworks being needed might remarkably increase*
>
> (Safapour et al., 2020, p. 7).

It has also been suggested that in the owner-driven approach, material and technical training be coordinated (Safapour *et al.*, 2020). Indeed, a trained community and community capacity encourages social development, another of the goals of HRC:

> *A sense of society and reestablishment of the bonds between the different components of the Syrian community will be reestablished by training the returnees to build their own houses together with the cooperation of the other village residents*
>
> (Ismail et al., 2017, p. 8).

As with the European and Japanese experience of post-WWII HRC, in the Syrian post-conflict, HRC was expected to create a socioeconomic impact on the community to increase social bonds (Ismail *et al.*, 2017). Therefore, as discussed in the literature, the proper approach to delivering HRC is considering socioeconomic factors that positively impact the affected population.

Theme 3 – Material Logistical Criteria for Economic Recovery

The source of origin of materials is an essential factor that affects the delivery of HRC and the economic recovery of post-conflict and post-disaster areas. This theme reflects the inter-relationships that connect origin, availability, prices, and material quality during HRC. In addition, this theme reveals the role of governments and NGOs in managing macro-logistics and maintaining a stable environment for the material adequacy of HRC. As Ahmed (2011) describes in an analysis of a case study in Nepal:

> *The projects faced a number of challenges including labor shortages due to employment*

migration, material shortages as a result of political unrest and communication difficulties faced by INGOs due to budget limitations that impacted translation services. However, community engagement in all aspects of project decision-making resulted in the community taking ownership of their own recovery, resulting in a high level of beneficiary satisfaction

(Ahmed, 2011, p. 14).

Ahmed (2011) discussed the material and labour stability as significant in delivering HRC in Nepal within allocated financial resources. In addition, whilst the level of community engagement is one of the challenges of HRC, he noted that the engagement and participation in Nepal were clearly linked to developing material production capacity and creating new jobs. In sum, labour and material are the main factors that affect the cost of reconstruction, and these can be mitigated via community involvement.

Despite the benefits of engaging local help though, it has been noted that expert help is required for the planning of material adequacy logistics:

Engaged experts would identify construction materials, components and equipment requirements especially those with long lead times, while their quantity, location and timing of resources needs is established. Subsequently, adequate budgetary provision should be made with consideration for price inflation due to changing market conditions

(Bilau & Witt, 2016, p. 14).

These logistics need to ensure quality, quantity, and temporal availability for the HRC, and it has been suggested that governments and NGOs should take responsibility for these aspects of planning:

The focus of the local government and NGOs should be on mapping construction capability and local material supply capacity at the early recovery stage

(Chang et al., 2012, p. 15).

Chang *et al.* (2012) here discuss the vital role of governments and NGOs in presenting geo-informatics techniques that can assist the material provision of the HRC due to their expertise. However, as Bilau *et* al. (2018) note, this assistance depends on the level of destruction of the country implementing the HRC and the level of the country's development that will provide

technical assistance:

Securing international assistance is crucial to effective initiation of large-scale housing reconstruction programmes and the achievement of reconstruction outcomes since it enables the provision of financial aid and resources to the affected community (including the most vulnerable members). This enhances disaster risk reduction by enabling the reconstruction of safe and resilient housing and helps to resolve underlying social and economic issues. The study identified the need for the establishment of multi-level institutional and organisational arrangements at national and/or state levels to facilitate programme management and the coordination of stakeholders and resources. It is also crucial that local level administrative and organisational structures are strengthened and engaged to enable the buy-in of the beneficiary communities and allow them to take ownership of the programme, which, in turn, facilitates community recovery and long-term sustainability of the programme

(Bilau et al., 2018, p. 24).

The quotation from Bilau *et al.* above highlights that HRC projects are almost always large-scale, requiring a vast amount of material within the period of reconstruction. Therefore, locally allocated resources and international aid are required to successfully achieve socioeconomic recovery (Bilau *et al.*, 2018). In addition, the authors echoed the conclusions of other studies that found that reconstruction efforts create an opportunity for economic activities and provide new jobs for the material production industry and artisans. They also suggested that both governments and international organisations (reconstruction agencies) coordinate and manage the HRC material logistics. However, in post-conflict zones, governments and administrational functions might need to be revised due to the destruction that has been caused.

In addition, during HRC, it has been noted that material shortages can be a detrimental factor to the continuity of the housing project. Any unstable conditions in material, such as shortage or increase in prices, would affect the process:

Reconstruction projects are susceptible to numerous resourcing bottlenecks inherent in post-disaster circumstances, such as resource shortages, price escalation, and supply chain disruption, which significantly impede the reconstruction process success in disaster-affected areas

(Choudhary & Mehmood, 2013, p. 5).

Masyrafah and McKeon (2008) provide their suggested solution for this issue:

Better coordination amongst the reconstruction actors in procurement, such as establishing a multi- party procurement system or warehouse-sharing, could have maximized economies of scale and also helped to curb the steep price increases in construction materials

(Masyrafah & McKeon, 2008, p. 16).

Governments and NGOs must also have material supply plans for HRC. These plans should regulate material production or provide agreements with neighbouring countries to allocate required resources (Masyrafah & McKeon, 2008). However, in some post-conflict zones, such as Afghanistan, a robust governmental administration is unavailable to manage imported material, as noted in the following:

Most of the construction materials in Afghanistan, such as cement, are imported from Iran and Pakistan. However, the supply of materials is often irregular because of import restrictions and the changing political relationships with these countries. Although Afghanistan has abundant natural resources of limestone for producing high-quality cement, the local production output is too low to meet the growing demands for cement.

(Kakar, 2020, p. 7).

To alleviate the risk of material shortages, it has also been suggested that governments and organisations, via multi-level coordination, accurately estimate the material required on a national level and indicate the local capacity for reserving this quantity and quality. Alternative plans should also be in place by creating an alternative construction design that considers local materials and provides a complete HRC programme for post-conflict zones (Kakar *et al.*, 2020). This is because, as noted by numerous other sources, shortages in construction materials can have a significant impact:

Due to an increase in raw materials and transport costs, the unit price of housing rose significantly at the end of the first year of reconstruction, with the Government raising its budget per new house from Rp 30 million to Rp 60 million

(Masyrafah & McKeon, 2008, p. 12).

Masyrafah and McKeon (2008) go on to suggest that pre-reconstruction plans must prevent

any material shortages and curb any inflations in the market resulting from the HRC project. In some cases, they note that material scarcity and lack of material planning can cost the reconstruction agencies double their allocated resources to complete the HRC process (Masyrafah & McKeon, 2008). However, when governments or NGOs do not have extra financial help for unforeseen circumstances, they often reduce the scope of their reconstruction project by minimising the number of houses, as in the following example:

> *Material and labor cost increases effectively doubled the initial estimates of the unit cost of housing development. As a result, many NGOs were forced to cut targets and reduce the scope of their programs, or alternatively source additional funding*
>
> (Masyrafah & McKeon, 2008, p. 14).

Therefore, governments and NGOs must guarantee material stability by developing pre-reconstruction plans that consider the origin of material sources, quality, and logistics to provide the required material (Masyrafah & McKeon, 2008). Noticeably, the required material needs further work in terms of damage assessment and surveys, which should impact the economy positively rather than create a complex, unaffordable housing environment.

From the evidence presented for this theme, the absence of material delivery plans for an HRC will cause the affected community to be unable to deliver on the project with any great degree of success. In addition, HRC project managers and teams need tools to help them monitor and coordinate functions within the project and influence project managers to systematically report project circumstances such as resource availability, timeframes, and project schedule.

Theme 4 – Material Tracking Criteria

Moving now to the fourth theme identified in this Thematic Analysis; material tracking criteria. According to Ahmed (2011), corruption starts during the procurement process within most HRC projects. However, poor site conditions, miscommunications, and management failure during the reconstruction are due to a lack of monitoring (Bilau & Witt, 2016). Therefore, monitoring of reconstruction programmes is of key importance for every aspect of the project. In addition, monitoring will allow a reconstruction process that can be dynamically evaluated by the project's stakeholders and future project stakeholders in different areas and contexts.

As understood from the literature, monitoring material adequacy can prevent inflation, corruption, and environmental harm. With large-scale reconstruction and the unexpected

demand this creates, local materials must be monitored to determine material locations, production status, portability, quantities, accessibility, and affordability. If done properly, such monitoring will inevitably improve the resultant quality of the reconstructed houses (Bilau & Witt, 2016). It has also been suggested that monitoring of material incorporates a tracking tool for the quantities and their locations (Barakat, 2003). This is particularly vital because HRC programmes contain so many overlapping activities, stakeholders, key actors, and interdependent projects. For this reason, monitoring needs to be done on the micro-level of activities and the macro-level of organising processes.

As previously noted, in HRC, the quality of the material and method of construction are crucial to deliver adequate housing for the affected community. For this reason, monitoring is essential. This includes monitoring of material availability to clearly show levels of stockpiles from various sources such as in warehouses, from suppliers, and of imported material in ports. To carry this out effectively, large-scale and complex monitoring is required, which can only be carried out by larger organisations and governments. Connecting material to its destination is also crucial for the success of the project, and transport and material availability to material consumption ratio needs to be understood to avoid duplicating material supply, as implied in the following example:

However, most of the beneficiaries are currently living in the new settlement, while the new houses are either used by relatives or remain vacant. In both Sites 4 and 14, there was a duplication of resources due to a lack of coordination between NGOs, which could have been avoided through better communication

(Jordan et al., 2015, p. 530).

Material coordination is interdisciplinary and inter-sectoral work that needs coordination across different sectors and stakeholders during reconstruction projects. Lack of coordination and temporal information might produce inflation in prices due to monopoly of supplies by some actors. Warehouses have been suggested as a potential solution, but construction and management of these would require coordination from governments and NGOs:

Government-appointed engineers provided technical assistance and certified work at each stage of construction, ensuring compliance with the National Building Code. Certification was required prior to the release of each stage of funding

(Ahmed, 2011, p. 14).

Materials may be delivered to target groups or official warehouses, from where families can request materials (if families have access to transport, establishing a warehouse may be a more cost-effective option than delivering materials directly to the target community)

(Barakat, 2003, p. 33).

Material cost stability during the reconstruction process is a significant challenge. Having warehouses can help in achieving this material stability and overcoming this challenge. Once the materials are housed appropriately, requesting material is a process that needs a monitoring tool to ensure the availability of the material ordered, on the one hand, and the distribution method on the other. In addition, when requesting the material, a link should connect the reconstruction site with the material as an effective tool for future material mapping and HRC progress, as suggested by Enshassi *et al.* (2019b):

The local government and implementing organizations should have warehouses in Gaza Strip to store the necessary quantities of construction materials to suffice them during the housing reconstruction projects. Conduct periodic meetings with the affected communities to determine their needs and measure their satisfaction with the progress of housing reconstruction projects

(Enshassi et al., 2019b, p. 8).

As is clear from the quotation above, governments and organisations should be the main stakeholders in providing warehouses. They should also have access to the community to evaluate the reconstruction process and coordinate other related activities. It is also clear from the case study of Afghanistan, as analysed by Kakar et al. (2020) and quoted below that providing material with no equipment or labour to accomplish the HRC will disrupt the process:

The availability of resources, such as machinery and material and the provision of funding, is critical for completing construction projects on time. In Afghanistan, shortages of construction material and funds often force construction work to stop multiple times during a project

(Kakar et al., 2020, p. 5).

Clearly, large-scale material monitoring often also encounters resourcing issues, especially in developing countries. As noted by Choudhary and Mehmood (2013), material adequacy is a significant issue:

> *Putting inadequate resources in project will have a direct impact on project performance. This is the biggest problem in developing countries as they are always lacking the financial resources. With significant time's pressures and finite duration for post-disaster construction projects, resource allocation needs to be based on speedy response, flexibility in procedures and transparency*
>
> (Choudhary & Mehmood, 2013, p. 13).

Another related issue that can result from shortage in HRC material and lack of monitoring is provided by Jordan *et al. (2015)* in their analysis of post-tsunami HRC in India. They noted that duplication of resources occurred due to lack of a joined-up approach to the reconstruction. Such reworking costs time and money, negatively affecting the outcomes of the project. This will also likely result in the inflation of material costs:

> *However, most of the beneficiaries are currently living in the new settlement, while the new houses are either used by relatives or remain vacant. In both Sites 4 and 14, there was a duplication of resources due to a lack of coordination between NGOs, which could have been avoided through better communication*
>
> (Jordan et al., 2015, p. 530).

Timing is another vital factor that requires monitoring as this is the factor that overarches all others. Funding is often linked to a certain project duration, and contractors and external agencies commit to projects for a limited time period. Thus Enshassi (2019a) suggests the following:

> *Developing procurement strategies for crucial resources such as advisers, contractors, and other systems (e.g., time management software) can save so much time as soon as they respond to any disaster*
>
> (Enshassi, 2019a, p. 138).

The literature has also revealed that monitoring can be an anti-corruption tool but that it needs

to be automatic due to potential complaints regarding the obvious pitfalls of human monitoring of personal corruption:

> *An anticorruption approach that emphasizes local accountability in the earliest postwar stages and builds on local resources and competencies and distinctive ways will not only see greater success in steaming corruption but will also increase participation and trust in the reconstruction process*
>
> (Galtung & Tisane, 2009, p. 107).

In conclusion, material adequacy monitoring provides a tool by which all aspects of the material lifetime within the reconstruction project can be controlled. Monitoring tools can also prevent monopoly and curb material price inflation. This finding forms the research gap addressed in this thesis and will therefore be explored in greater detail in the case studies presented in Chapter 4 and discussion presented in Chapter 5.

2.4. CHAPTER CONCLUSION

Literature on housing reconstruction after conflict and disaster overwhelmingly focuses on the effects of construction materials in terms of quality, quantity, and prices on the delivery of each historical case analysed. There are also housing reconstruction strategies recommended within the literature to aid in the delivery of material during reconstruction. Indeed, community, method of construction, material familiarity and acceptability, and reconstruction site condition meaningfully interact with material adequacy during the reconstruction process. CSFs presented in the first two chapters indicate the need for both a high level of material and resource intervention, and the need for preconstruction planning to manage and determine a conceptual framework for more successful housing reconstruction projects. However, CSFs as they currently exist require more functionality for effective implementation in future housing reconstruction projects; specifically, guidance on their critical use within a framework.

Having completed the Thematic Analysis, the following points represent summaries of the core factors to be considered within such a framework:

- **Material Selection Criteria:** The need to have a triangle material model of quality, quantity, and cost, ensuring that all material is legal and sustainable.

- **Housing Reconstruction Engagement Criteria:** The community needs to be encouraged to systematically participate by having assigned roles according to skills that guarantee the implementation of the proper construction method.
- **Material Logistical Criteria for Economic Recovery:** The need to source material locally to provide more rapid economic recovery. Both governments and NGOs can work to achieve this.
- **Material Tracking Criteria:** Material adequacy monitoring can provide a temporal and spatial record of material during housing reconstruction. Moreover, monitoring can prevent inflation in material prices and deter corruption.

The methodological tools employed in this thesis to construct the process framework of material adequacy of HRC are discussed in the following chapter.

CHAPTER 3: METHODOLOGY

This chapter explains the adopted research methods used in this thesis to answer the research questions and achieve the objectives. The research began with a literature review of papers related to post-conflict housing reconstruction, in which the researcher found numerous points related to the issue of material adequacy. Further reading on post-disaster housing reconstruction was needed to cover broader technical and engineering aspects of housing reconstruction, in general, and material adequacy, in particular.

Following a thorough review of 28 seminal research papers, coding, discourse, and narrative analysis were conducted in a systematic fashion, leading to the determination of the CSFs found in Table 2.2. The study used a Thematic Analysis (TA) technique to find themes from the published literature. TA was used as it is an ideal method to determine the trends affecting material adequacy in HRC by presenting them within organised themes and sub-themes. These trends reflect the continuous aspects of each theme, which answered the first two research questions (1) HRC trends of CSFs related to material adequacy factors, (2) and the themes and sub-themes. A visualisation tool for the Thematic Analysis Network produced for this research is presented in Figure 3.3 to present the main themes/trends (Material Selection Criteria, HRC Engagement Criteria, Material Logistical Criteria for Economic Recovery, and Material Tracking Tool Criteria) and the characteristics of each theme.

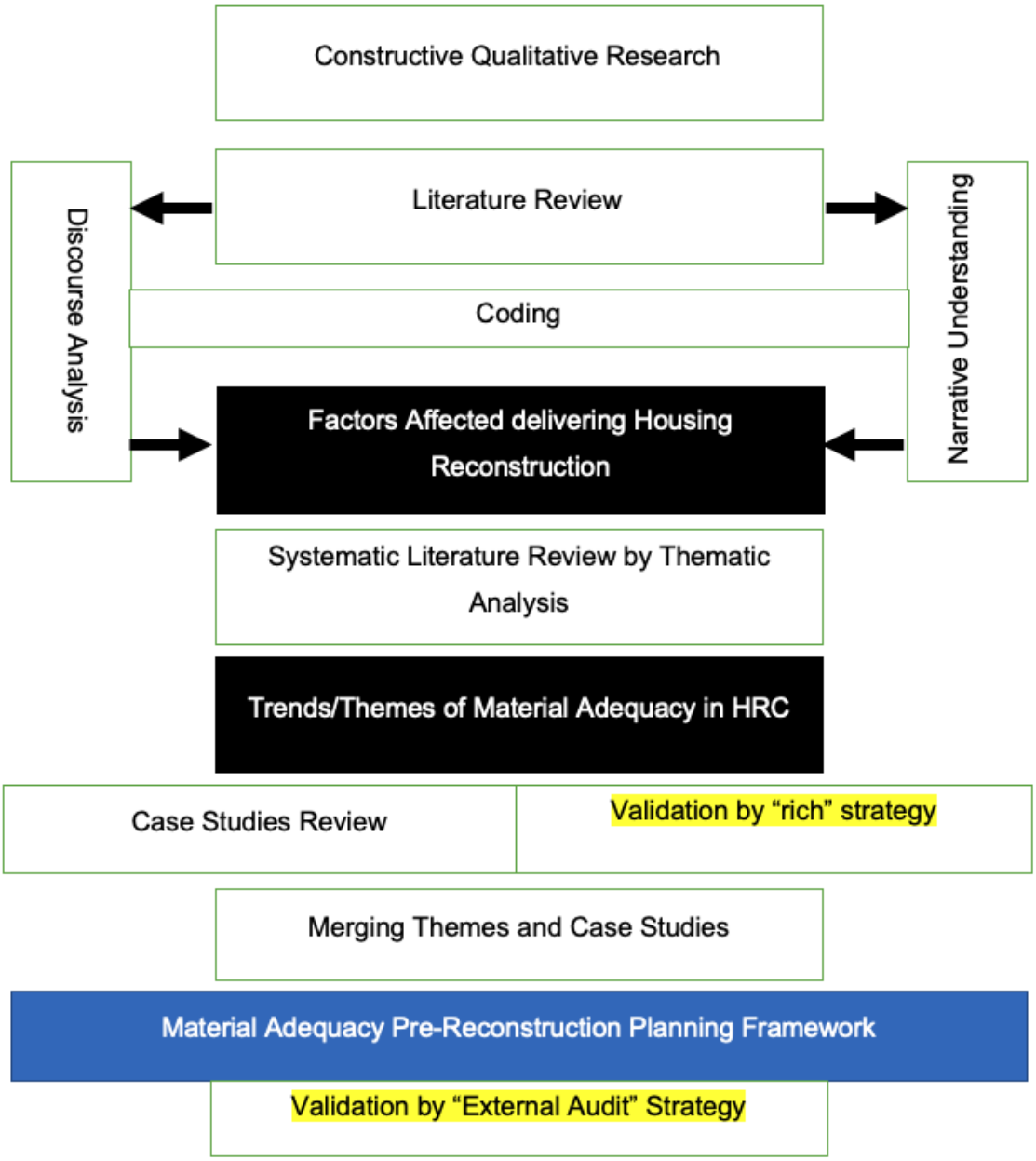

Figure 3.1 Research design

Figure 3.1 illustrates the following process used for this research:

1. The constructive qualitative research method was used to take findings from the systematic literature review to narrow down the options of the research method that best served to achieve the research objectives.
2. The qualitative data were coded using discourse and narrative analysis to start forming the first set of themes.
3. Axial coding was then used to categorise themes, which are presented in Table 2.2

4. A further review of the literature was then conducted to enable the trends and themes to be further refined and developed.
5. Thematic analysis was conducted on the findings using selective coding to form four major semantic themes once the second literature review was complete.
6. The themes were then visualised and conceptualised as latent themes, as presented in Figure 5.1
7. The final stage comprised reporting of the findings to achieve the main aim of this thesis; to present a novel material adequacy pre-construction planning framework for post-conflict and post-disaster HRC. And the validation procedures will describe in Chapter 6.

3.1. CONSTRUCTIVE APPROACH

> *LANGUAGE IS CONSTRUCTIVE. THIS MEANS THAT DISCOURSE IS A WAY OF CONSTITUTING A PARTICULAR VIEW OF SOCIAL REALITY. MOREOVER, IN RENDERING THAT VIEW, CHOICES ARE MADE REGARDING THE MOST APPROPRIATE WAY OF PRESENTING IT, AND THESE WILL REFLECT THE DISPOSITION OF THE PERSON RESPONSIBLE FOR DEVISING IT*
>
> *(BRYMAN, 2012, P. 5).*

A constructive research method was chosen to investigate the complexity of delivering material adequacy during the process of HRC (Oyegoke, 2011). As already explained in Chapters 1 and 2, the complexity of managing HRC is due to the network of processes, culture, conditions, and actors (Lehtiranta, 2015). Due to this complexity and the wealth of information available, discourse analysis was used in the first stage of the research (the coding technique) to generate the CSFs displayed in Table 2.2. The factors found from the mentioned literature were then analysed using the following methods:

1) Discourse analysis with a narrative review
2) Open coding for categorisation and theoretical reconstruction within the research focus.
3) Rereading and observing narrative flow in literature to construct categories.

The constructive research developed to serve this thesis is based on basic guidelines provided by Kasanen (1993) and reproduced as follows:

1. Selecting the problem (Material Adequacy of HRC after conflict and disaster).

2. Obtaining comprehensive understanding (via a thorough literature review and practical experience).
3. Constructing one or more applications or solutions (Thematic Analysis findings).
4. Demonstrating the feasibility of the solution (by evaluating the themes and constructing a framework presented in Chapter 5: Discussion).
5. Linking results with theory (transforming from sematic to latent themes).

3.2. QUALITATIVE METHODOLOGY

The qualitative research method was used to better understand the existing literature's gaps and aid the constructive research process for further analysis. The findings of the latest data collection methods were employed to construct and finalise a post-conflict and post-disaster HRC framework associated with delivering adequate material for the process (Creswell & Plano Clark, 2011).

This research method allowed the collection of robust data that had a positive impact on the systematic research outcome in terms of the following key elements:

- **Completeness:** Using qualitative research links the findings constructively.
- **Instrument development:** to develop a material adequacy framework.
- **Confirm and discover:** by confirming or disproving the theoretical aspects of case studies and practicality through future fieldwork.

Framework

The framework approach was developed in the 1980s at the National Centre for Social Research (NatCen) (Smith & Firth, 2011). This centre is Britain's leading independent social research organisation to study qualitative data analysis. This thesis used a framework approach to construct a conceptual framework for material adequacy in delivering HRC. It has been suggested that a conceptual framework should include the research focus – material adequacy of HRC in this case – and that the outcomes of the Thematic Analysis should be compared with case study analysis (Ravitch & Riggan, 2016). Furthermore, the theoretical framework explains empirical work, answers the why and the how of this research, and leads to the conceptual framework. Maxwell (2012) confirmed that a framework should be constructed by linking incorporated parts of the gathered research findings to form a coherent model, and this approach has been followed in this present work.

Phases of Thematic Analysis	Means of Establishing Trustworthiness
Phase 1: Familiarizing yourself with your data	Prolong engagement with data
	Triangulate different data collection modes
	Document theoretical and reflective thoughts
	Document thoughts about potential codes/themes
	Store raw data in well-organized archives
	Keep records of all data field notes, transcripts, and reflexive journals
Phase 2: Generating initial codes	Peer debriefing
	Researcher triangulation
	Reflexive journaling
	Use of a coding framework
	Audit trail of code generation
	Documentation of all team meeting and peer debriefings
Phase 3: Searching for themes	Researcher triangulation
	Diagramming to make sense of theme connections
	Keep detailed notes about development and hierarchies of concepts and themes
Phase 4: Reviewing themes	Researcher triangulation
	Themes and subthemes vetted by team members
	Test for referential adequacy by returning to raw data
Phase 5: Defining and naming themes	Researcher triangulation
	Peer debriefing
	Team consensus on themes
	Documentation of team meetings regarding themes
	Documentation of theme naming
Phase 6: Producing the report	Member checking
	Peer debriefing
	Describing process of coding and analysis in sufficient details
	Thick descriptions of context
	Description of the audit trail
	Report on reasons for theoretical, methodological, and analytical choices throughout the entire study

Figure 3.2 Phases of Thematic Analysis and presentation of findings (Nowell *et al.*, 2017)

Figure 3.2 shows the steps and methods used to present the Thematic Analysis findings and the outcomes of the validation process. Developing a process framework is not automatic; it

requires the application of logic and perceptive thinking by shaping the findings of the Thematic Analysis (Bryman & Burgess 2002). In other words, a framework is not purely mechanical, and while "systematic and disciplined, it relies on the creative and conceptual ability of the analyst to determine meaning, salience, and connections." (Bryman & Burgess, 2002, p. 177).

Having fully explained the methodology followed in completing this research and the reasoning behind the choice of methods and processes, the following chapter presents findings from a close analysis of sources that report on case studies of regions that have undergone post-conflict and post-disaster HRC.

3.3. RESEARCH METHODS

Literature Review: Methods in Data Analysis

In the first stage of the research, a full review of relevant articles and books was undertaken to understand the fundamental issues and determine the research questions (Creswell, 2007; Bryman, 2012). More specifically, to fully investigate the most current post-conflict/post-disaster HRC, papers in the study areas of HRC were reviewed to construct a theoretical understanding of the research area and to form the most appropriate design for future work (Rayan & Bernard, 2003). Therefore, contextual investigation was used in this research to find trends. This was followed by a close analysis of existing academic research and, finally, the construction of a process framework to serve future HRC projects.

Case Studies

Housing reconstruction after conflict and disaster encompasses numerous historical case studies with varying conditions, challenges, and circumstances. *Idiographic* case studies explain and interpret individual events and *hypothesis-generating* case studies (as in this study) analyse and present each case to generalise beyond the data. In the latter, the research analyses cases to develop a more general position, which can be tested. In this hypothesis-generating case, studies are well-positioned for additional explanation. (Collier, 1999; Levy, 2008). Moreover, Levy (2008) described a case study as an instrument that examines historical events to develop an explanation that can be generalised on other upcoming events. This thesis examines three case studies: historical post-conflict scenarios, historical post-disaster situations resulting from natural hazards, and a third case study focusing on a

situation where reconstruction has not yet commenced. The Syrian case study serves as an example of this latter case.

Validation

Rayan and Bernard (2003) argue that themes can be observed and constructed in many ways; however, by applying the methodology prescribed by TA, the validity of emergent themes can be ensured, the importance of which is highlighted by Strays and Corbin (1998, p. 46). Alhojailan (2012) describes the validation of themes as an essential step to evaluate themes and guarantee the reliability of the findings. Validation can be done in several ways: the triangular method, member checking, thick discerption, clarifying the bias, presenting negative information, spending a prolonged time in the field, peer debriefing, or via an external auditor (Creswell, 2014). These methods have been divided by Ritchie and Lewis (2003) into internal and external types. They recommend a constant comparative method to check the accuracy of the fit of data by comparing findings with another set of data. This can be done by checking data across different sites and locations (Ritchie & Lewis, 2003). This has also been referred to as a "member check" by Nowell *et al.* (2017) or described as "rich" validation (Creswell, 2007), where the writer describes in details information which allowed the reader to transfer findings to another set of data due to the shared characteristics. Which was done in this study by referring to as many published sources as possible and by conducting an analysis of case studies to check the validity of the findings presented in these sources. More specifically, the themes found in the literature review were compared with the factors mentioned in the various case studies, the results of which are presented in Chapter 4. This was successful since the case studies were reviewed by evaluating success and failure factors. Creswell (2007) recommended that any study needs two validation procedures. Therefore, after completing the findings of this thesis, the second validation phase of the findings' outcomes would carry out by an 'external audit' procedure after finishing this thesis. The framework results would be summarised in a document and sent to external experts in this validation process. This latter validation procedure will help identify the gap for future research, develop motivational aspects for new research, and categorise the main topic found in the thesis (Appelbaum et al., 2018).

Validation Process and Participants Recruitment

A summary of a few pages was sent to the external validators to describe and summarise the research. the validators were selected based on LinkedIn contacts and LinkedIn profiles. The criterion for choosing participants depends on their area of expertise. Two main factors were

utilised. First, professional background - civil and architectural engineer, or working in the humanitarian context, especially in housing reconstruction. Second, participants with experience of working in Syria context and in the post-conflict, post-disaster context. Participants were provided with a brief introduction of the research and the purpose of the validation. If a response was guaranteed, then a findings overview document was shared with a request for an interview or to validate the results and provide feedback via email. The recruitment process lasted for two months. Fifteen potential participants were contacted; two complete and one partially complete response were received.

3.4. DATA ANALYSIS

Coding

To review the CSFs that were extracted from a first review of the literature, coding was used to organise data to better conceptualise findings from the literature and to help form a better illustration of the theory of HRC. According to Bryman (2012, p. 568), "Coding in qualitative data analysis tends to be in a constant state of potential revision and fluidity. The data are treated as potential indicators of concepts, and the indicators are constantly compared […] to see which concepts they best fit with."

In terms of coding data, according to Creswell (2007), categories should be created to organise the data to reflect the core phenomenon. Axial coding was the specific technique used here to formulate themes as it provides the ability to find connections in information from a variety of sources and to enrich the themes that are determined. Van Manen (1990) adds that this type of analysis allows a researcher to construct a robust theory from the data by reflecting on it to aid its categorisation.

The following criteria were considered to enable the categorisation of the first sweep of data:

(i) Focusing on the repetitive issues in the reconstruction process, as mentioned in the literature.
(ii) Determining theoretical issues facing HRC, as observed in the literature.
(iii) Assigning discipline codes within the context of the HRC and related keywords.

According to Strauss and Corbin (1990, as cited in Bryman, 2012), coding is most effective when following the following three coding processes, as followed in this research:

1. Open Coding: Turning codes into categories in this process.
2. Axial Coding: Axial coding allows the researcher to make connections between

categories by linking codes with context to find a pattern of interaction (trends) as an added value for the indicators.

3. Selective Coding: This process comprised the final stage of coding, which is to systematically connect the core category to other related categories to determine the final themes.

Critical Success Factors as a Methodology

Critical Success Factors (CFSs) are those elements that must be considered to solve any core problem and should work perfectly to ensure success (Boynton & Zmud, 1984). Ronald D. Daniel (1961) is regarded as one of the first scholars to discuss CDFs in his earlier research (Daniel, 1961; Leidecker & Bruno, 1984; Zahisy, 1984), and CSFs were first used in construction project management by Rockart in 1982 (Sanvido *et al.*, 1992). They can be used in construction to assist in resource management planning and especially for indicating the success of the project's ideal delivery (Sanvido, 1992; Chau *et al.*, 1999). For this reason, CSFs are vital tools that can reveal the reasons for success or failure within HRC. From the study of CSFs, this thesis aims to solve as many of the indicated factors that push projects more towards success or failure. The results presented in Chapter 2 show that materials, adequate funds, and construction methods are the most impactful CSFs for HRC (Hidayat & Egbu 2001; Banerji, 2021).

HRC must agree on criteria or guidelines for measuring success (Ahmed, 2011, p. 160). However, this is particularly challenging because of continuously changing data and conditions in the aftermath of each disaster. Therefore, to provide housing effectively in any given situation, a pre-reconstruction plan that covers all HRC elements (e.g., material issues, labour force, community well-being, and implementation mechanisms) has to be designed to accept variable data regardless of the kind of disaster framework. This framework will then hopefully lead to an increase in the capacity and empowerment of the community with the necessary skills that can assist them in their HRC efforts. A comprehensive study of CSFs from previous case studies was the method chosen for this research to help develop housing pre-construction planning and for the effective reuse of CSFs in future cases. Once a new framework of CSFs has been applied for future cases, they can become validated with more focus on how they could help with the materials used in the reconstruction process and indicate the opportunities and challenges to achieve adequate materiality (policy, skill, cost, process, and people).

Following the determination of CSFs for this research (Table 2.2), they were thematically

analysed (as presented in Chapter 2 and discussed in the following section) to identify the themes that enabled the design of a framework (see Chapter 5) that reflects supportive instruments for HRC housing pe-reconstruction planning.

Thematic Analysis (TA)

Thematic Analysis (TA) is a process by which knowledge transfer occurs via understanding the context of reviewed literature or other data. Therefore, the first step in TA is for the researcher to familiarise themselves with the content of the research (Herzog, 2019). Findings of this analysis process were generated and developed after a thorough reading of each selected study to achieve a high level of content familiarity that allowed the confident application of the Thematic Analysis technique. As noted in the literature, "TA provides accessible and systematic procedures for generating codes and themes […] Codes are the building blocks for themes, (larger) patterns of meaning, underpinned by a central organising concept - a shared core idea." (Clarke & Braun, 2017, p. 297). Coding and Thematic Analysis were used systematically to construct a literature evidence framework and research model. Clarke and Braun (2017) agree that thematic analysis should be used with a framework to "interrogate patterns" (Clarke & Braun, 2017). Indeed, this thesis used it to find trends that formed the basis of the creation of a post-conflict HRC framework as the final outcome. It should be noted, however, that Attride-Stirling (2001) critiqued TA for its simplicity and the high risk of the researcher subjectively selecting information. For this reason, as Braun and Clark (2006) suggest, the development of a framework post-analysis should be done to lend more credibility to the analysis itself.

This thesis developed a framework following the validation of the TA by comparing themes from the literature review analysis and exploration of case studies in the area of housing reconstruction after conflict and disaster. Bryman (2016) emphasised that themes must be extracted from the research focus area. Therefore, before starting the Thematic Analysis, qualitative instruments were used after the content and literature analysis by identifying themes. All themes in this study are holistic and centred around material-related factors, as this is the study's primary concern. Therefore, the identified themes reflect the relationship between material adequacy and the other factors that were identified.

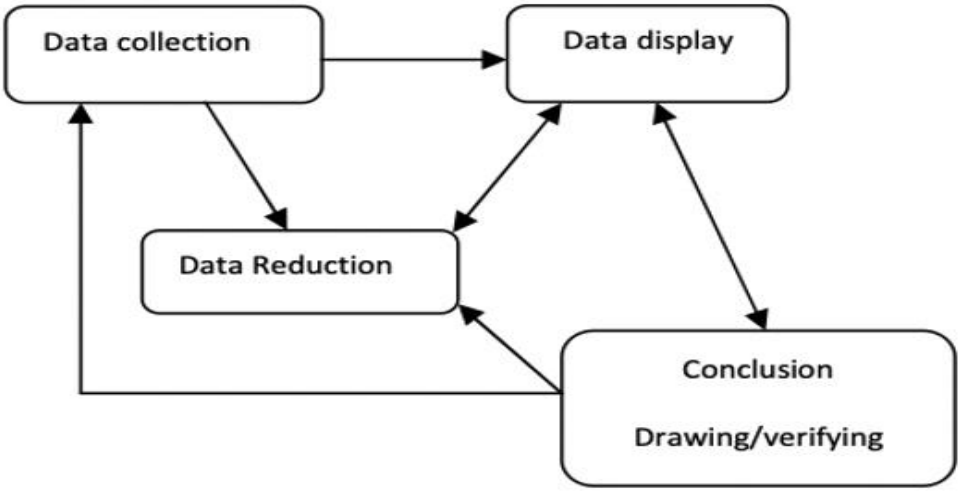

Figure 3.3 Stages of thematic analysis and interactive data analysis (Miles & Huberman, 1994, as cited in Alhojailan, 2012)

Figure 3.2 illustrates the importance of presenting the final data that emerges from TA and concluding with a clear data display (Alhojailan, 2012). One such mode of data display, and the one used for this research, is the Thematic Analysis Network created by Attride-Stirling (2001). The use of this method allows the findings to be displayed in a clearly digestible and comprehensible manner, avoiding information overload and ensuring the relationship between themes and concepts is presented clearly (Alhojailan, 2012). This data display method is further explored in the following section.

Displaying Thematic Analysis in a Thematic Analysis Network

As already noted, a Thematic Analysis Network is a visualisation tool that helps to illustrate the trends that emerge from Thematic Analysis. This stage is recommended to provide a clear matrix of themes and subthemes as a product of the reading and rereading of the transcripts of interviews, field notes, or (as in this research) the review of literature (Attride-Stirling, 2001). The Thematic Analysis Network template used in this research is presented in Figure 3.4, to which the following four organising themes/trends were assigned (Material Selection Criteria, HRC Engagement Criteria, Material Logistical Criteria for Economic Recovery, and Material Tracking Tool Criteria) and the characteristics of each theme (basic themes). These were all applied to construct the process framework that is presented in Chapter 5: Discussion.

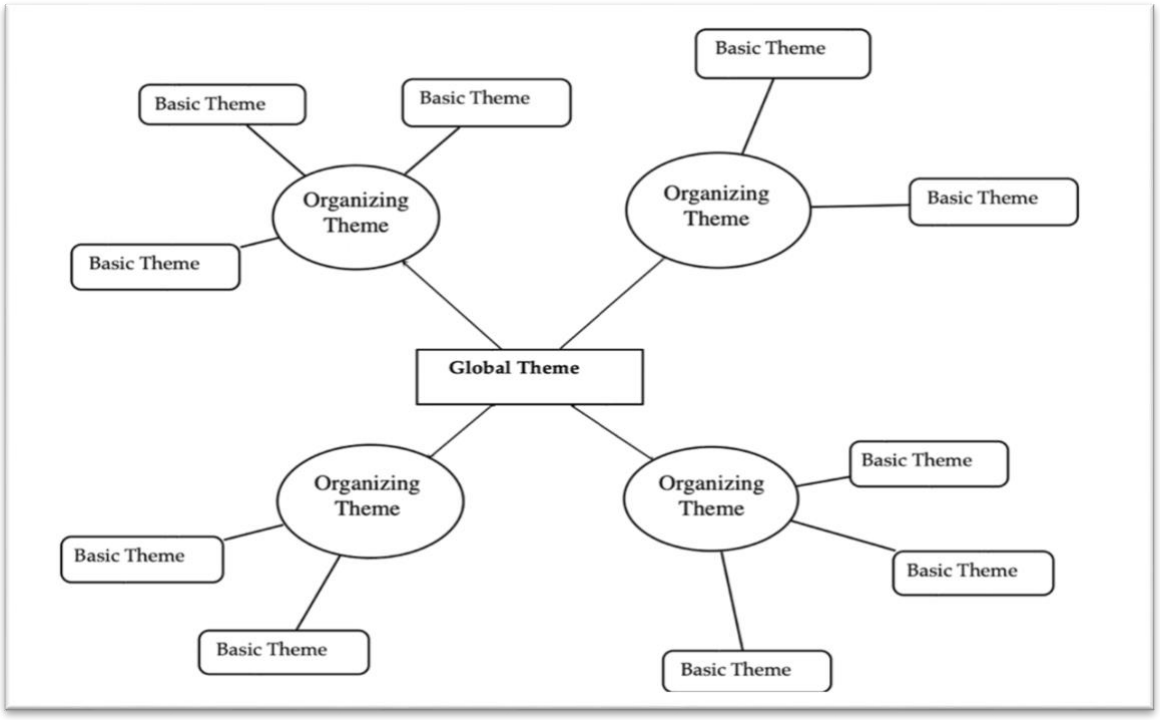

Figure 3.4 Thematic Analysis Network (Attride-Stirling, 2001, p. 388)

According to the structure of themes presented above, the main centre of the organising theme is the 'Global Theme'. The present study's global theme is 'Material Adequacy in HRC' and forms the main area of the research around which the organising themes are built. The 'Organising Themes' represent more abstract principles determined from the Thematic Analysis. Finally, the 'Basic Themes', as shown in Figure 3.4, describe the characteristics of each of the 'Organising Themes' as a component of the latter (Attride-Stirling, 2001). This method of presenting thematic order allows a firmer understanding of the inter-relationships between themes (Bazeley, 2013) and the sequence of each level of the themes. As Attride-Stirling (2001) explained in justifying his design of the Thematic Analysis Network at the time, "there is relatively little said on how to analyse the textual material that qualitative researchers are presented with at the end of the data gathering stage" (p. 386). Alhojailan (2012) summarises the benefit of such a network in presenting trends, grouping themes and subthemes, identifying interrelations, and building conceptual consistency to fit the theoretical framework (Alhojailan, 2012). The full Thematic Analysis Network is presented in Figure 5.1, Chapter 5.

Semantic Themes

In semantic strategy, as applied in this thesis, themes are recognised based on the surface meaning of texts or in other words, the language produced by the authors (Braun & Clarke,

2006). This strategy uses discourse analysis, with a narrative understanding of the context, to extract the first set of themes and to aid in their categorisation.

Latent Themes

Latent themes are those that are deduced via a process of transformation of the surface meaning of texts to conceptualisation. In other words, they are the themes identified following detailed interpretations of the meanings of semantic themes (Braun & Clarke, 2006; 2012: Bryman, 2012). Latent themes found in this research are the four themes identified from the TA and presented in Chapter 2. As a further explanation, a latent theme has been defined by Rayan and Bernard (2003) as "word co-occurrence", in reference to Charles Osgood's 1959 paper, where it was first used to explore the further relationship between major themes.

CHAPTER 4: CASE STUDIES

Since housing reconstruction is a complex process, this thesis is premised on the need for more robust pre-reconstruction planning via the application of a novel framework for the delivery of adequate material. It is understood that this will benefit and orient the planning aspects needed before starting physical housing reconstruction. Based on the findings of the literature review presented in Chapter 2, housing reconstruction can be divided into several approaches, each with its advantages and disadvantages and their relationship to material adequacy in HRC (see Table 2.1).

This study utilizes three case studies: historical post-conflict, historical post-disaster, and a case study where reconstruction has yet to commence. The first two cases explore housing reconstruction approaches in accordance with Table 4.1. Additionally, a table reflects HRC approaches and case studies and their relation to the themes identified in 2.3.

In contrast, the third case study (the Syrian case study) delves into pre-reconstruction planning and creating a process framework that can be tested and examined in a future study. It addresses critical issues and assesses material adequacy conditions before the housing reconstruction begins. Moreover, the selected historical case studies encompass all housing reconstruction strategies, including cash-driven, owner-driven, community-driven, and contractor-driven approaches.

Finally, the case studies will be discussed based on the material adequacy themes outlined in Figure 4.1.

Table 4.1 Housing Reconstruction approaches with a focus on material adequacy framework concerns

Reconstruction Approach	Advantages	Disadvantages	Material Adequacy Themes Concerns
Cash-driven	• Useful in inaccessible areas (Saleh, 2020).	• The absence of technical support and cash might be spent on needs not related to reconstruction. (Enshassi, 2019a)	• What are the material selection criteria to prevent inflation regarding the value of the fund? • How the community would be engaged by this theme? • How quality of material can be maintained by selecting this

			approach?
Owner-driven	• Can be used in rural areas with simple designs. • Technical assistance from construction experts can be applied (Mumtaz, 2008).	• Not all owners can or like to work in construction. The owner's personal situation may also affect the degree of income that can be assigned to the project (Barakat, 2003).	• How can owners meet the scope of work needed to cover the skills and labour required to accomplish the housing reconstruction? • What is the capacity of owners, and how to be developed to meet construction codes and BBB after a disaster and avoid informal construction activities? Can this trackable?
Community-Driven	• Engaging affected community to supply their needs – reconstruct their houses, find a job opportunity, or own local business (Bilau & Witt 2016; Bilau et al., 2018).	• The approach may not cover everyone in the community. • Large-scale engagement would be very hard to monitor and evaluate to indicate impact (Bilau *et al.* 2018; Anilkumar & Banerji, 2021).	• How to organise community engagement? • What are needed to assure economic recovery for the community? • Can material be selected by using this approach?
Contractor-Driven	• Useful for complex buildings when relocation of HRC site is considered (Saleh *et al.,* 2020)	• Low material quality and less community engagement. • Commercial house design (Saleh *et al.,* 2020). • Single design for a complex building should be accepted. • "One size fit all" is the main theme of this approach with absence of community socio-cultural needs	• What is the material selected criteria to meet adequate material needed for HRC? • How community engaged and benefit from the reconstruction process? • What is the level of acceptance within the affected community regarding the quality of material using and economic level of engagement?

		(Barkat, 2003; Saleh *et al.,* 2020).	

4.1. CASE STUDIES OF HOUSING RECONSTRUCTION AFTER CONFLICT

The selection of three case studies aims to encompass a wide range of variations. The first case study focuses on post-conflict reconstruction in Palestine. This case reflects a Middle Eastern context geographically close to the Syrian case study. The proximity suggests similarities in construction materials, cultural aspects, and construction methods.

The second case study chosen is Germany, an example of successful housing reconstruction practices in a developed country. It provides valuable insights into practical reconstruction approaches that can be applied in different contexts.

For the third case study, the Kosovan Civil War is selected. This case is characterised by factors such as the return of refugees after the conflict, the adoption of different reconstruction approaches, and a prolonged conflict period lasting nearly 10 years. These factors draw parallels to the Syrian case study and provide a basis for comparative analysis.

Palestine

Palestinians have been suffering occupation from Israeli settlers since 1948. This influx of the Jewish diaspora, supported by Western powers, has resulted in the dispersion of the Palestinian nation to create more area for multi-national Israelis (Dershowitz, 2003; Beinin & Hajjar, 2014). Post-conflict reconstruction in the Middle East varies from post-disaster reconstruction and from the case study of Western post-WWII reconstruction, which has already been noted as a largely successful programme. In terms of the Palestinian context, they are suffering from the results of the Israeli's invasion that is exceptionally prolonged, displacing people and requiring massive resettlement programmes.

According to the United Nations Relief and Works Agency for Palestine Refugees (UNRWA), numerous Palestinian refugees in Jordan have been forced to live in 10 heavily populated camps (2017). These camps were formed over 70 years ago as temporary shelters but have been used for over two generations. Katz (2017) also reported that most Palestinian refugees'

camp houses are prefabricated caravans with one or two bedrooms or tents that rely on one outdoor pipeline for water supply. Therefore, the residents must buy water from water tanker trucks. Katz (2017) obtained this information from 7,632 households and 40,950 individuals. The study showed that over half of the refugees lived in a one-unit prefabricated caravan. Three per cent of those living in caravans have additional tents connected to their caravans to create the extra space needed. Most importantly, this study has revealed the manner in which material limitations and poor usage affects the quality of life in camps occupied for very long periods.

One reason that post-conflict HRC is such a complex process is the frequent lack of any real administrative system in affected areas. This is the case with the Palestinian living in Gaza. A proper administrative system is required to deliver funds and resources to the beneficiaries of the housing reconstruction. There have, however, been attempts to administer relief in an efficient and effective manner in Palestine. For example, the International Management Group (IMG) provided the Palestinian people with a direct fund from the EU member countries to assist the Palestinian Authority in covering 25% of its public sector salaries (EU, 2009). Such a system was able to provide PEGASE cards for the Palestinian beneficiaries to allow the EU funds to be delivered directly to the beneficiaries without the need for the local authority to intercede:

Through PEGASE we are committed to ensuring fuel deliveries to generate electricity for the people of Gaza are uninterrupted throughout 2009 and at the beginning of 2010. All donors are welcome to participate in this programme in 2009… Through PEGASE we are committed to continuing to deliver regular and predictable allowances to the very poorest people of Gaza in 2009 and the beginning of 2010

(European Union
European Commission Technical Assistance Office, 2009, p. 3).

In terms of Gaza itself, the epicentre of the conflict and efforts for HRC, the lack of construction materials has been found to be the most critical factor affecting the success of the programme.

The cash-based approach entails providing financial assistance without any conditions or requirements for technical support, in addition, to misuse of cash delivered to beneficiaries whether by consuming the cash to serve the reconstruction process or to spend it on not reconstruction activities (Enshassi et al., 2017). Cash is hard to be monitored based on spending and evaluating the reconstruction process compared with aid delivered (Jha et al., 2010). This

is caused by a lack of proximity of the materials to the area in which they are needed (Enshassi, 2019). It has also been caused by transport disruption resulting from the continuous and ongoing Israeli siege of Gaza, whereby there is an active ban on entry into the area (Barakat *et al.*, 2020). In addition, lack of space and funds for ongoing and never-ending reconstruction in the Gaza Strip has resulted from continued Israeli airstrikes (Oxford Analytica, 2021). Therefore, the salvaged material from the rubble is considered a primary local material for the reconstruction process. Laboratory compressive strength tests show that the crushed materials of demolished concrete in Gaza can produce concrete of C25/30/35 Strength (Kharouby, 2011). Rubble material, however, can only be used as aggregate in the concrete mixture to preserve a specific amount of coarse aggregate (Gonçalves & Brito, 2010; Qasrawi *et al.*, 2012). Moreover, the quality and history of the recycled rubble affect the characteristics of the final products. For example, concrete that has suffered burning loses its strength and ability to be recycled. However, recycled aggregates are often used in sub-base layers of road construction (El Kharoubi, 2011). Interestingly, one tonne of demolished recycled concrete can save 0.2% of the total cost of the house. It should be noted though, that certain hazardous materials (like asbestos) mixed with rubble require extra effort to separate from the demolishing in addition to furniture and steel.

In this case study, reconstruction aid was delivered to the Palestinians from funders to the beneficiaries without the need for administrative arrangements. The Gaza Strip experienced a significant lack of materials due to Israeli sanctions and siege. The absence of construction materials, even with existing financial aid, may lead to the misallocation of funds towards non-reconstruction activities. To address the material shortages, an attempt was made to recycle materials from rubble. However, this approach has limited efficiency, mainly due to restricted usage and high energy consumption.

Germany Post WWII

Reconstruction efforts following WWII in Germany involved fully engaging the community, which helped to relieve tensions between the conflicted East and West Germans inside the country (Anyang, 2015). Therefore, it is important to consider the reconstruction process itself in terms of being a factor to increase stability in post-war cities. To fund this vast project, East Germany relied on the Soviet Union, West Germany on The American-funded Marshal Project. “West Germany was to experience the most rapid recovery in modern European history” (Hallett & Williams, 2021 p. 79).

The German infrastructure was not completely destroyed after the war, and the authorities were able to begin reconstruction with relatively stable prices for the materials required (Erhard, 1956). The Bavarian minister was responsible for distributing material; however, 40% of reconstruction material was sourced from the black market. Material sourced directly from the government was used in urban areas, but most of the reconstruction in rural areas relied on these black-market supplies (Diefendorf, 1993). For this reason, Germans called for a governmental reconstruction agency to be formed to ease the reconstruction process and to allow material to be allocated by the government.

The German approach to reconstruction was to keep the remaining buildings and add modern glass, steel, and new materials to the buildings as needed. For example, a long time after WWII, in the 90s, the Germans rebuilt the damaged Reichstag using a design by Norman Foster, adding a glass-steel dome to the building, which in addition to retaining the character of the building, allowed natural lighting.

Material selection and economic recovery were guaranteed under governmental administration to support community-driven housing reconstruction.

Kosovan Civil War

After the NATO intervention in the Kosovo conflict, the reconstruction began using a primarily contractor-driven approach (Minervini, 2002). The UN managed the entire housing reconstruction programme in Kosovo after the 10 years of civil war, whereby Reconstruction Guidelines set by the Housing Directorate of the Department of Reconstruction (UNMIK EU pillar) addressed municipalities and provided common rules for the identification of beneficiaries, rehabilitation, reconstruction of damaged and destroyed houses, implementation procedures, and general coordination of activities and actors. Investment in the social capital of disaster-affected communities was the key to building sustainable recovery in this case (Minervini, 2002). However, duplication occurred in Kosovo's reconstruction from the very early stages. Three parties ran a damage assessment (UN, IMG, and Municipal assessment), and each of these had its own criteria and damage scale to assess the number of heavily and partially damaged houses (Suri, 2009). Acts of corruption, such as the misappropriation of funds, receiving kickbacks for contract allocations while this reconstruction was a contractor-based, and bribing local communities to influence their acceptance of substandard construction quality, are prevalent in reconstruction efforts and lead to significant depletion of limited resources (Bilau et al., 2017). Despite this, one-third of the damaged houses were rebuilt in the

first year of the reconstruction project launching, which can be considered a great success.

However, in the second year, the funds were reduced by one-third and again by the same percentage in the third year. Therefore, a clear and robust reconstruction plan would have helped accomplish successful HRC before the fund began to decrease. (Gultung & Tisne, 2009). Figure 4.1 presented below presents the international financial assistance curve for Kosovo, which highlights that there was a decrease in the financial assistance following the commencement of reconstruction post conflict. This is also likely to be mirrored in other post-conflict situations.

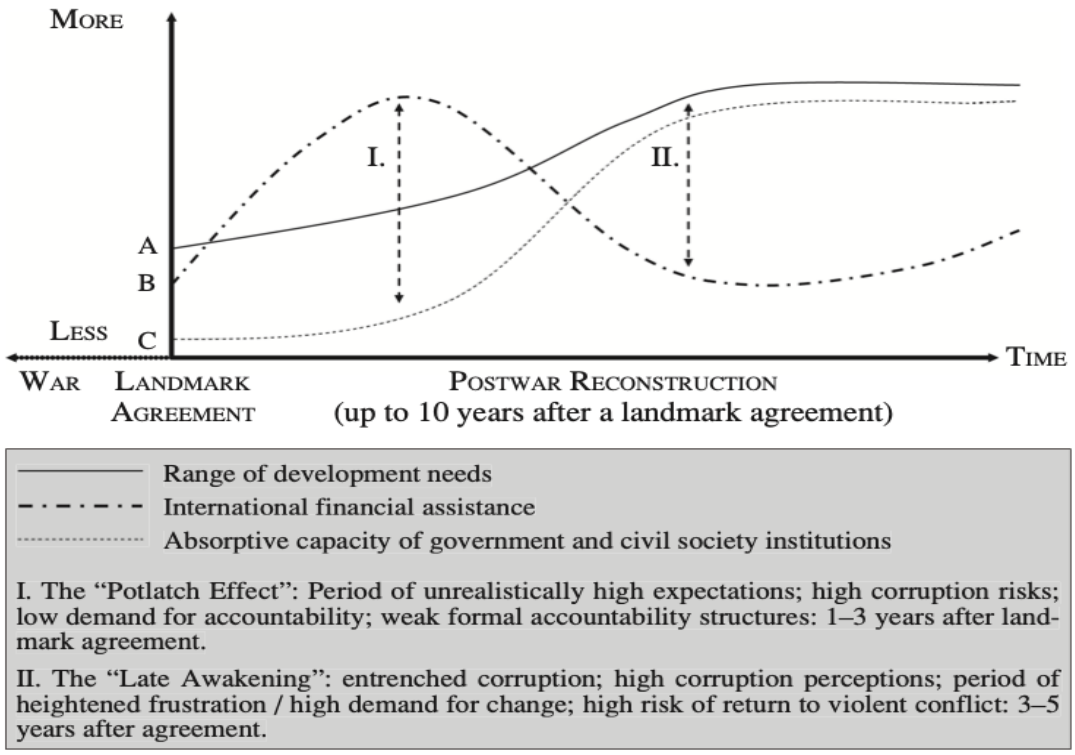

Figure 4.1 Phases of post-war reconstruction in Kosovo highlighting funding over time (Gultung & Tisne, 2009. p. 95). ***Note that the authors did not provide a key for A, B or C. The y axis indicates level of funding.***

Figure 4.1 shows the drop in funds during the recovery time after the war in Kosovo, in which the graph presents two maximums. The first gap the authors termed the "Potlatch effect", is when the need for recovery peaks and there is a high demand for reconstruction. The fund in the Potlatch period had just begun. The second maximum gap occurs at later stages when the reconstruction was already in progress, and the fund continuously decreases. The international aid and the reconstruction requirements only match at a very concise period.

Due to the significant oscillation between available funds and temporal and spatial needs, the

reconstruction process became more complex. However, securing construction materials for reconstruction in the Kosovan case was one of the main factors that motivated refugees to return to reconstruct their houses (Strohmeyer, 2001). Here is evidence that reconstruction efforts can provide the basis for continued peace.

In this case, and despite the increasing number of returnees during the reconstruction process, housing reconstruction with more than one leading reconstruction agency suffered duplication and expected failure in delivering adequate temporal and spatial material. Community engagement was limited due to the contractor-driven approach and the number of displaced people. Furthermore, communities suffer poor quality and show rejection of reconstruction outcomes.

4.2.CASE STUDIES AFTER DISASTER

The Turkish and Kashmiri case studies exemplify post-earthquake housing reconstruction efforts. The Turkish case study demonstrates the government's capacity and response to the disaster. Turkish post-disaster reconstruction represents overlapping HRC approaches and highlights the significance of region-specific plans that cater to each area's unique needs and circumstances. In the Kashmiri post-earthquake reconstruction, successful stories emerge in the effective delivery of HRC by using the owner-driven approach.

Turkey

Following the earthquake in the rural area of Cankiri in central Anatolia, Turkey, in the year 2000, The Turkish government provided zero-interest loans for rural communities affected by the earthquake. Prior to the earthquake, there was a strong tradition of local artisans and the owners of the structures themselves building their homes. These skills were leveraged for the reconstruction of affected homes; they were either rebuilt by the owners themselves or by hiring local artisans. Interestingly, the Cankiri case encompasses three reconstruction approaches: cash-driven, owner-driven, and community-driven. Engineering assistance was also provided through private architecture firms appointed by the government. Therefore, the Turkish reconstruction case study is evidence of a multi-approach HRC project.

A salient point regarding Turkey in terms of material adequacy is that the housing system had suffered from shortages for a long time prior to the earthquake:

Internal migration started in the 1950s, particularly from the eastern regions to the western

regions of Turkey. There was a high demand for rapid and massive housing construction, which urged changes primarily in the trend of construction materials such as concrete and steel, by replacing timber, stone, and adobe. This trend has steadily increased and today has naturally given a direction to the housing policy of the state

(Yilmaz et al., 2013, p. 41).

The Turkish case study is an example of an HRC's success. Yilmaz *et al.* (2013) point out the importance of traditional designs, self-reconstruction, and local materials, which would be all interconnected factors and should be considered in future post-conflict or post-disaster HRC cases. It should also be noted that by using a multi-approach strategy in delivering the HRC, there is clear evidence of pre-reconstruction planning and flexibility to tailor the solution to the situation and deliver material adequacy.

Kashmir

Another prime example of ensuring material adequacy successfully and connecting a variety of factors to achieve synergy is in the post-Kashmiri earthquake reconstruction of 2005. The earthquake killed more than 73,000 people and injured 128,000 (Mumtaz *et al.*, 2008; Halvorson & Hamilton, 2010), destroying more than 600,000 houses (Bahram & Paradise, 2020). Following this tremendous disaster, a training programme was organised in Kashmir to teach residents to construct Dhajji Dewari houses (traditional timber houses) using local materials. As a result of this training, more than 150,000 post-earthquake houses were constructed (Hicyilmaz *et al.*, 2012). The design of the traditional timber house incorporated a timber frame, and stones and mud as the filling materials for the walls. The stones used in Kashmir were all highly local as they were collected from the surrounding houses that had been damaged. This was the most feasible material because most of the areas affected were in remote areas far away from roads. In addition to this, the traditional timber Dhajji Dewari house uses an environmentally friendly design that reflects durability, renewability, and use of recycled materials (Hicyilmaz *et al.*, 2012; Bahram & Paradise, 2020). In addition, the houses, according to laboratory tests, represented significant seismic resistance in a model of Build Back Better (Mumtaz *et al.*, 2008). Clearly then, the more the design is connected to the environment and location, the more resilient the design is in delivering the best performance as part of that location.

Another key finding that can be drawn from this case study is that governments and NGOs

must consider pre-reconstruction planning in delivering HRC and the material needed. In the Kashmiri case, governmental/NGO arrangements were in place to provide the affected communities with a design to effectively tackle the environmental hazards of earthquakes. Training and workshops were provided to the community to participate in the owner-driven approach. It should be noted though, that arrangements for delivering material were absent, and the locals carried the building materials themselves, as shown in Figure 4.2 (Arshad & Athar, 2013). Thus, material delivery mechanisms should be put in place at the commencement of any HRC.

Figure 4.2 People in Kashmir carrying hollow blocks due to a lack of transportation infrastructure (Arshad & Athar, 2013)

Summary of Case Studies

Having presented the findings from an analysis of five key case studies of post-conflict and post-disaster HRC, Table 4.2 summarises these and links each case study with the four housing reconstruction framework factors determined from the Thematic Analysis. The last column presents a general analysis of the requirements and recommendations for each case. This represents the basis from which to analyse a new (and future) case study to consider material adequacy planning according to the case studies and themes found here. This will then allow a

more robust pre-reconstruction planning framework to be created and explained in Chapter 5.

Table 4.2 Case studies and development aspects in terms of material adequacy during HRC

Case Study: Reconstruction Approach	Theme 1: Material Selection Criteria	Theme 2: HRC Engagement Criteria	Theme 3: Material Tracking Tool	Theme 4: Material Logistical Criteria for Economic Recovery	Comments
Palestine (West Bank and Gaza): **Cash-Driven approach**	Fixed material prices to reflect the value of aid provided. The less the material is local, the more the reconstruction will be disrupted.	Via PEGASE, the community can be paid for their engagement in the housing reconstruction.	PEGASE delivers funds to the community using a card, and the card can monitor expenses. Tracking of material within multi-sovereign states helps the planning of reconstruction.	The PEGASE cards can only be used to buy local materials. Therefore, safe corridors and access to the material are vital to allow raw material to be provided for the reconstruction.	The West Bank remains under occupation, and no reconstruction has yet commenced. In Gaza, reconstruction needs more of a focus on the transport of material. The cash-driven approach requires political intervention to provide technical assistance.
Kosovo: Contractor-driven approach	Material prices should have been challenged by reconstruction authorities to tackle the decreasing funding.	Record of community engagement. Returnees increased when the material increased, and the community then increased their engagement.	Monitoring of both fund and material exploitation required to finish the HRC. Monitoring of the dynamic change in returnees to indicate the growth of reconstruction and further requirements.	Reuse of rubble material [if the machinery and skills available to do so], which can solve the problem of material adequacy.	The lack of pre-reconstruction plans resulted in duplication, which wasted funds. The contractor-driven approach was adopted with less participation from the community. More community

					engagement was required.
Germany: Community-driven approach	Adding new material to the destroyed buildings was a trend. Material was produced locally.	Community engagement was encouraged alongside governmental organisation of the process.	Both legal and illegal material served the housing reconstruction in Germany. Monitoring tools must be employed to avoid this kind of illegal activity.	Material implementation skills had to be developed to allow the adding of new materials to the damaged buildings. Governmental authorities oversaw distribution of material.	The German authorities may have allowed the black market to deliver material to rural areas at cheaper prices. The community-driven approach was adopted with a certain lack of monitoring and equity.
Turkey: Cash-driven, owner-driven, and community-driven approaches	Due to different approaches, there were varying material selection criteria applied. However, the main principles of using local material promoting and economic recovery were considered.	The level of community engagement was highest in rural areas due to the simplicity of houses and method of construction.	Monitoring was required to deliver the same quality in each approach used. The scale of reconstruction and high demand for material resulted in continued shortages.	The issuance of zero-interest loans was a particularly positive governmental action. Care needs to be taken with this approach, however, as the loans may have an inflationary pressure.	Monitoring in Turkey is a prime example that can be used for all other HRC approach development studies. Monitoring of the success of each approach can contribute to the material adequacy framework. Using a multi-approach strategy in delivering HRC is evidence of pre-reconstruction planning.
Kashmir: Owner-	Due to topographical challenges of the	Owners of each house were trained or already knew the	Due to the vast quantities of timber required for the	Governmental and NGO efforts should have been	Pre-reconstruction plans should aim to develop the

driven approach	reconstruction area, the main material for reconstruction was selected from the surrounding houses (stones and wood). Material was employed using a seismic-resistant design.	building techniques needed for the Dhajji-dewari construction. The community participated in the construction of their own houses.	Dhajji-dewari constructions, monitoring of the quantities of available timber to accomplish the reconstruction had to be considered.	directed at providing tools, equipment and developing infrastructure to deliver material to the reconstruction sites.	infrastructure required to deliver construction material to sites. That said, pre-reconstruction planning here was considered in delivering workshops for the local community regarding the skills required to build the houses.

4.3. SYRIAN CASE STUDY

The previous case studies showed the advantages and disadvantages regarding the HRC adopted and other unique circumstances that, in conclusion, reflect a different level of pre-reconstruction planning and management capacity in delivering housing reconstruction.

The Palestinian case involves reconstruction efforts during the conflict, where the absence of security and political stability acts as a resistance and struggle to deliver adequate materials.

This research's third type of case study pertains to situations where reconstruction has yet to commence. In the Syrian case study, housing reconstruction has yet to start. Therefore, this case study can draw insights from the information presented in Table 4.2, which summarizes the Thematic Analysis of the literature and case study analysis findings. By presenting the Syrian case study, it is possible to compare themes with future case studies to test the possibilities of pre-reconstruction planning in a post-war HRC (Humanitarian Response to Conflict) context and determine the most suitable approach to constructing a customized framework for the case study. Therefore, the following table presents a Syrian case study for future pre-reconstruction planning and what needs to be considered when adopting or implementing the HRC approach in accordance to Table 4.2

Table 4.3 Syrian case study developing aspects in accordance of material adequacy themes

Case Study: Reconstruction Approach	**Theme 1: Material Selection Criteria**	**Theme 2: HRC Engagement Criteria**	**Theme 3: Material Tracking Tool**	**Theme 4: Material Logistical Criteria for Economic Recovery**	**Comments**
Syria: adopting approach concerns	Infrastructure of producing and reserving mass quantities of to meet high	Community engagement is vital to achieve successful HRC program and	Many ideas of tracking criteria had been developed to achieve	Local material according to the studies has highest impact on local	Political stability, safe corridors (transport) for material

	demand during HRC, select acceptable materials, material that achieve economic recovery	will encourage refugee to return back home to participate on reconstructing their houses. Governmental efforts encourage, and organise the engagement	monitoring for the process and material adequacy. Need to consider effective method to monitor material availability from row to delivered material for HRC to assure complete HRC program.	economy. Construction design, know-how of construction, availability of tools, and training programs will guarantee a level of economic recovery accompanying the HRC.	required during HRC. Pre-reconstruction planning need to assure the reconstruction of production industries to deliver HRC material required. A comprehensive mentoring scheme is vital to achieve HRC.

Material selection criterion according to the historical case study and expected to be shown in the Syrian case study that local material availability and local production capacity plays a critical role in the material will be selected for the reconstruction. in addition, material and community engagement are linked in order of acceptability, familiarity, and using this material in reconstruction their houses. moreover, material that need to help the community in their economic recovery by working in producing, delivering, and applying the selected material by the community's handicraftsman to benefit to reconstruction their houses and get played by working in the selected material government and political stability can guarantee both the community effective engagement and political stability to material adequacy and housing reconstruction process. The Syrian case study would present a case that the reconstruction has not commenced yet and the pre-reconstruction planning would create a clear reconstruction program roadmap.

The choice of the Syrian case study to be investigated in this research is due to many factors:

- Due to ongoing conflict and a case that reflects a potential housing reconstruction.

- The Syrian case study included refugees in Jordan who are located within the researcher's home country, Jordan, where the researcher has access to personnel to interview for extended future work.
- The choice of the Syrian case study could open future work on both housing reconstruction after conflict and disaster as a poly-crisis (complex crisis) of the case study.

Introduction to the Case Study

In 2011, the war started in Syria, destroying many homes and displacing millions of people. Goulden (2011) found that Syrian families had been suffering from a housing crisis a few months before the Syrian crisis began in 2011. No less than 1.5 million houses were required due to natural population growth, internal migration from rural to urban areas, and a lack of development programmes. As a result, informal settlements without legal registration appeared, and settlers occupied private and government-owned lands (Goulden, 2011). This has become a distinct concern and challenge in the post-conflict areas for the displaced population as they return to these informal settlements. In such cases, a comprehensive framework (housing pre-reconstruction plans) can introduce instruments to deal with the multi-disciplinary aspects of managing the entire housing reconstruction process after conflict and disaster.

After ten years of the Syrian uprising, six million IDPs (Internal Displaced People) in Syria were living within unplanned settlements over agricultural areas, with some living in incomplete buildings (Global Shelter Cluster Annual Meeting, 2021). In addition, 1.7 million people are still unable to construct houses due to the lack of required funds. In Atmeh Camp (Northwest Syria), people have started moving from tents to houses with hollow blocks of buildings (Alasaad *et al.*, 2021). Refugees are not in a better situation. In Jordan, there are 89 refugees per 1000 inhabitants, and this number only reflects the Syrian refugees living in camps. Even more concerning, according to the Jordanian authorities, is that the official figure is likely to reflect a mere 20% of genuine refugees living in Jordan as the remaining 80% live within Jordanian communities (Daher, 2019). In addition, according to the World Food Program (WFP, 2020), nearly 9.3 million Syrians face the threat of food insecurity, and The United Nations Office for Coordination of Humanitarian Affairs (UNOCHA) disclosed that nearly half of the Syrian population lives in areas at high risk of attack from explosive munitions, with 69% of the total share of damage in Syria being in the housing sector (World

Bank, 2017). The Turkey-Syria earthquake of February 2023 resulted in tens of thousands of casualties, destroying homes and leaving millions homeless (Naddaf, 2023 and Sakariyahu, 2023).

Refugees and others who are living in camps are affected by a dire economic situation, impacting their decision to stay or move elsewhere. All these factors impact whether they decide to return to their houses after the conflict ends, and this provides proof of the necessity of prioritising housing pre-reconstruction plans for the recovery phase. Therefore, the calculation of any reconstruction costs in Syria needs to factor in the price increases resulting from the economic inflation due to sanctions on Syria. Regarding material adequacy, security affected the production of cement manufacturing after the Syrian conflict. Bulmer, M.H. (2021, page: 326) stated, "The decrease in production was attributed to the deterioration of security, which forced the closure of six of the company's nine plants". And cement as is a main component of housing construction, so any future reconstruction process will be affected by those closers and need to reconstruct the infrastructure and accompanying logistics to reactivate the plants before starting the reconstruction process.

Syrians as Refugees in Jordan and Their Housing Conditions

According to the UNHCR's Syrian refugees' population tracker, refugees in Jordan constitute 11.8% of the total Syrian refugees globally (UNHCR, 2020). This ratio includes those with refugee status living within the community houses instead of refugees living in the camps. However, there are issues with the refugee camps in Jordan. For example, despite the Zaatari refugee camp having been constructed based on the UNHCR official emergency handbook, the camp represents a failed settlement model due to settlers joining two or more shelter units to form small semi-closed clusters. In addition, the Zaatari camp has transformed into one of the largest urban centres in Jordan (Dalal *et al.*, 2018). In contrast, the shelters in another Syrian refugee camp in Jordan (Azraq camp) are constructed from corrugated steel, providing nearly 24 m^2 of space. According to Albadra *et al.* (2020), shelters in Azraq camps house an average of seven family members, but this does not meet the WHO recommendations for social distancing to avoid Covid-19 transmission (WHO, 2021).

Even though the Azraq shelters are fraught with several issues, they still meet the minimum requirements of emergency shelters according to the Sphere Standards Handbook, UNHCR Handbook for emergencies, and OXFAM minimum requirements for temporary shelters. For example, Sphere (2018) recommends the minimum living space per person as 3.5 m^2. However,

if refugees wanted to improve the conditions of their houses, they would not be able to do so, as refugee shelters are designed and constructed as temporary solutions. Furthermore, the refugees cannot use concrete, cement, or other permanent materials in their shelters because all materials should meet the conditions of the Refugees' Convention of 1951 and all additional modifications of the Refugees' Law of 1967. Therefore, affected communities are more than likely to be uncomfortable in such housing conditions over the long term.

Reconstruction Challenges

The Norwegian Refugee Council (NRC, 2018) estimated the reconstruction budget required in Syria to be $180 billion. In contrast, the German Institute for International and Security Affairs claimed the reconstruction might cost nearly USD 1 trillion. The differences in cost estimates are due to many factors, such as the need for studies that can calculate the reconstruction cost. Moreover, the fact that data, scale, and scope in Syria cannot be collected from one agency at one time due to the unstable situation adds to the complexity of estimating an accurate cost for the reconstruction needed (World Bank, 2017). In the absence of a comprehensive HRC plan, returning refugees would encounter the same problems faced in Bosnia during the reconstruction phase, where temporary settlements turned rapidly into permanent features (Barakat, 2003, p. 22). Moreover, infrastructure construction is fundamental as nothing else can occur without water, power, and roads (Bray, 2005).

More than 46% of Syrians live in rural areas, and most of the returnee's movement is towards rural areas due to the higher level of safety in such places compared to cities (Ismail *et al.*, 2017). Before the Syrian crisis, these areas were far behind the cities in terms of development (Al Asali, 2016). However, there is insufficient data on land distribution and land use across Syria to assess the current situation in these terms (Habib, 2020). Due to the destruction of more than 30% of the city's buildings, Kousa and Pottegiesser (2020) suggest the reuse of rubble material in Aleppo. However, even though this can reduce the amount of waste material and the cost of new material, it still requires energy and heavy machinery to be used in construction. As seen in the Turkish case study presented in Chapter 4 and echoed by Chang *et al.* (2012), the community can use rubble material resulting from housing damage if they have the skills to build their own houses and are provided with the tools and skills to extract and reuse material from the rubble. Furthermore, locals could participate in managing housing materials, including material selection, distribution, and production (Dasgupta & Beard, 2007;

Lawther, 2009; Samaddar *et al.*, 2016; Roosli *et al.*, 2018; Saleh *et al.*, 2020). Both skills and reconstruction methods are associated with using available materials. For example, when rubble material from destruction is used in reconstruction, the artisans need to learn the skills required for this destructive rubble material. In addition, increasing knowledge dispersal of the construction method must be linked with the type of available construction material. As a result, HRC plans require a focus on rural areas to explore suitable designs of houses that match the ethnographical needs of people, the local materials used in pre-war construction, and the development of a legal, structural framework for their procurement and delivery.

Thus, material adequacy in HRC can be delivered in the Syrian case study with a consideration of the findings and the discussion above according to the following Materials Adequacy Framework:

Table 4.4 Material Adequacy Framework within HRC

Material Adequacy Framework of HRC	**CSFs**	**Summary of pre-reconstruction planning for future HRC material adequacy delivery**
Material Selection Criteria	Quality	Material that meets the building codes.
		Acceptable for the community from durability aspects.
		Sustain the same quality during high demand.
	Demand and quantity	Material used in housing reconstruction needs to sufficient to meet the high demand
	Cost	To meet demand, quality should be ensured at a fixed cost
	Legal	Material needs to be controlled by law (governmental enforcement)
	Sustainable	Sustainable production/Sustainable from production to consumption.
		Design for better housing reconstruction (BBB)

Material Tracking Tool	Quality	A mechanism to monitor the quality during the process of HRC
	Quantity	Monitor the quantities of production, delivery, warehouses, and in-site quantities supplied or applied
	Temporal data and spatial info.	For material situations on micro and macro levels within the HRC programme
	Inflation	Prices must be monitored according to the data form of material status
	Corruption	Analytical tools must be pledged within this framework to avoid corruption (managerial and financial)
Material Logistical Criteria to Recover the Economy	Source of material: local or imported	Logistical planning for the selected material (local and imported)
	New material	If a new construction material is considered, then logistical actions, such as training programmes for locals, should be planned and they should hold meetings to gain local approval of these materials
	Encouragement	An encouraging environment should be developed during HRC
	Economic impact	Any interventions that will have a positive economic impact on locals must be considered for success.
Material Engagement Criteria	Skills	Develop engagement skills and construction skills amongst locals
	Number of labourers needed	Evaluate the damage, the reconstruction programme scale, and the material adequacy in terms of number of labourers available and needed
	Role	Assign roles according to skills and motivate the population to fill the shortages if recorded.
	Knowledge	Transfer knowledge of implementation of material used in

		construction and avoid overly technical designs
	Implementation method	Encourage the community to participate with several interventions and understand construction methods for proactive engagement.

CHAPTER 5: DISCUSSION

5.1. MATERIAL ADEQUACY THEMES AS APPLIED TO THE SYRIAN CASE STUDY

The Thematic Analysis contained in this thesis and case study analysis has revealed that many factors affect the success of project management of post-conflict and post-disaster HRC. Therefore, prior to engaging in reconstruction, it is critical to fully plan any efforts. A close analysis of the built environment is also critical in such cases of complex reconstruction due to the need for extensive reconstruction design and implementation. If the reconstruction process is unplanned, it will involve an unplanned group of reconstruction stakeholders that will become a barrier to the project.

The main themes identified in the Thematic Analysis presented in Chapter 2 comprise several factors:

- **Theme 1 - Material Selection Criteria:** The selected material needs to be sustainably and legally affirmed, tested, and locally available to meet the high demand within a limited timeframe and for a reasonable cost.

In addition to pre-reconstruction planning consideration for material and other factors affecting housing reconstruction, in the Syrian case study – as well as with the other nine pre-reconstruction main factors shown in Table 2.2 – the material choice is a key consideration for reconstruction agencies, understanding that there must be general acceptance of these materials from the community. Adding new material to the main structure of damaged buildings (as in the German case study) relies on many factors, including the availability of material, acceptance of material, production capacity, and knowledge of construction methods. By choosing predominantly local materials, all these potential issues will be mitigated. The quality of material in the future Syrian case study needs to be selected according to the community acceptability (Table 4.3). The Kosovan (Section 0), suffered duplication in material delivery and shortages in material in other places, which affect the process of delivering adequate material for housing reconstruction. The pre-reconstruction planning must organise material delivery to meet high demand, cost, legal and sustainable HRC process. Recycling construction material from destructed buildings must also be measured and evaluated to meet both building codes for the housing reconstruction process by using such recycled materials and measuring the quantity share within the HRC material. Infrastructure for material production factories

such as cement factories in Syria must be checked, run, and maybe developed to meet HRC demand required for the HRC process.

- **Theme 2 - HRC Engagement Criteria:** The community is the leading partner in HRC. Its main contributions are the provision of labour, knowledge, and skills. Proper community engagement will greatly increase the chances of successful reconstruction efforts.

The affected Syrian community can be divided into two types: refugees and internally displaced people (IDP). Both groups must be engaged in the reconstruction given that engagement has been shown to be beneficial for many reasons, including providing income for the participants. Ignoring one category of people over the other may also result in a recurrent conflict. Thus, a mechanism is needed to allow both IDP and refugee returnees to fully participate.

- **Theme 3 - Material Logistical Criteria for Economic Recovery:** The local economy is impacted by the materials' source. Local material is beneficial to the local economy, and the government and NGOs must be the coordinators of material delivery for the HRC.

The civil war has greatly damaged the local Syrian economy and the Syrian pound has collapsed in value against other fiat currencies. The economic situation is complex and will affect the housing reconstruction. As suggested in the literature, the use of rubble material for reconstruction might decrease the amount of waste construction material. However, the process requires the local people to be trained in the skills to reuse this material, and it can only replace a certain amount of course-aggregate material within a concrete mix. Therefore, it is important to increase production capacity within the local community as this will provide more material, economic benefits from the production process, and minimise the cost of the material. It is also important to note that importing new material could be impossible in the case of Syria due to a lack of dollar reserves. For this reason, NGOs and Governments must provide the infrastructure needed to produce reconstruction material locally and, in the quality and quantity required for the reconstruction. Before starting any housing reconstruction activity, water supply, power, and roads are essential.

- **Theme 4 – Material Tracking Criteria:** Monitoring is a quality- and quantity-assuring tool for material, starting from monitoring the source of origin and encompassing all stages until completion of construction. The monitoring process also

includes utilising anti-corruption and anti-inflation tools.

Due to the scale of reconstruction expected in Syria after more than ten years of civil war, monitoring the quantity and quality of materials will be challenging. Therefore, a framework should plan for the implementation of software and electronic inspection for the quantity and quality of the material. A comprehensive framework for connecting the material required for housing reconstruction with orders for the material from warehouses or manufacturers is also necessary to indicate the time required to produce the material. A framework could also help develop a mapping mechanism to connect material (quantity, type, and location), HRC, and economic situation.

As shown in this research, community engagement is a crucial factor during housing reconstruction. This engagement involves organising the role of the community to deliver material adequacy for HRC. This can be done by determining and defining all participants' role by understanding their skill sets. However, as shown in the analysis of reconstruction approaches, the engagement is varied depending on which is employed. Method of construction and skills can be provided by two of the approaches. First, in a community-driven approach, as in the German case study, the community is fully engaged in reconstruction and has access to materials. The intersectional interest between community engagement and material selection criteria is shown in this German example. High demand for materials created a black market that provided cheaper construction materials. In addition, government management was present for urban reconstruction but absent in rural, allowing the black market to function in the latter area. In the second, the owner-driven approach, the Kashmiri case study showed that the population can either already possess or be trained in construction techniques for HRC to great effect, and this should be noted for the Syrian case. The second is the owner-driven approach, as evidenced by the Turkish case study. Here, the provision of zero-interest loans and the innate local knowledge of construction techniques allowed the reconstruction efforts to be largely successful.

A completed Thematic Analysis Network, designed by Attride-Stirling (2001) as a visualisation tool to illustrate the themes of TA (as detailed in Chapter 2), is shown in Figure 5.1. As can be seen, the material should be selected according to a distinct set of criteria to guarantee economic recovery. The material should be at fixed prices and consider the community's familiarity and acceptance of that material. It is also imperative that monitoring tools are employed to assess the success of the CSFs in the framework and ensure robust pre-

reconstruction planning. The owner-driven approach is also an example of community engagement. The material selection criteria in the Kashmiri case linked the material with the resilient design needed. Both training and technical assistance were also provided to deliver community acceptance of housing reconstruction in rural areas of Kashmir. The reconstruction programme was well prepared and represents a successful housing reconstruction case study for several reasons: the use of local materials, community engagement and empowerment, building environment design, and governmental engagement.

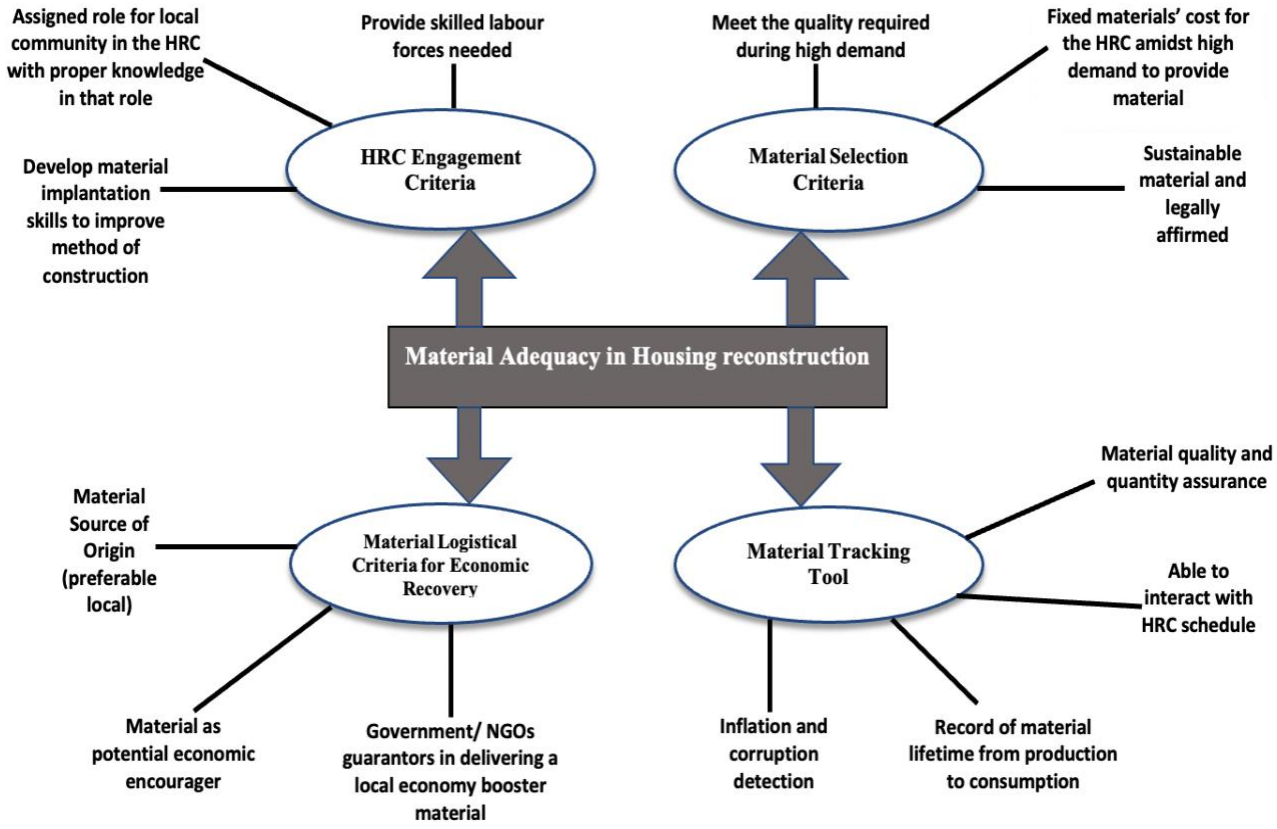

Figure 5.1 Material Adequacy: Synthesis of thematic Analysis based on the template provided by Attride-Stirling (2001) and theThematic Analysis Network template shown in Figure 3.4

Figure 5.1 presents the main criteria for delivering adequate materials during the Housing Re-Construction process (HRC).

The oval circles represent the main themes found based on literature thematic analysis based on discourse analysis, and narrative review. The first outcome of this study draws the main criteria required to deliver adequate materials during the Housing Re-Construction process

(HRC). As can be seen, the material should be selected according to a distinct set of criteria to set the conditions for economic recovery. For instance, the material should be at fixed prices by considering the community's familiarity and acceptance of that material. Each criterion has actions that are required to ensure the validity and efficiency of each criterion.

5.2. MATERIAL ADEQUACY FRAMEWORK FOR THE RECONSTRUCTION PROCESS

The primary focus of HRC after conflict and disaster by NGOs, governments, and reconstruction agencies is to ensure a successful programme. As shown in Figure 4.1, reconstruction fund behaviour during the first ten years of a post-war recovery period is worryingly variable, with funds decreasing significantly over the initial 1-3 years. In addition, according to this research analysis, material within housing reconstruction often suffers disruption in quantities, increasing prices during the reconstruction process, a decrease in quality, poor methods of construction due to the large scale of reconstruction, and negative environmental and economic consequences related to the delivery of material. Therefore, in selecting the type and source of material, coordination between governments, NGOs, local suppliers, and any potential foreign actors should be well planned to assist in the delivery of construction materials that adhere to the criteria for economic recovery.

There should also be a firm connection between the political, economic, environmental, logistical, and social (PEELS) aspects of the use of material to create an effective tool for future material mapping and the overall HRC process. Figure 5.2 presents the Material Adequacy Framework developed to illustrate the causes and effects of housing reconstruction factors and material adequacy according to the PEELS components previously mentioned. This framework is based on the information provided in Figure 1.1., which presents the consequences of post-conflict housing reconstruction processes over the time.

Each of the PEELS aspects will now be discussed in detail in the following sub-sections.

5.2.1. Political Aspects

According to the literature review, material adequacy during housing reconstruction is a critical factor for ensuring that conflict does not recur during PCR (post-conflict reconstruction) . HRC, in general, results in liquidity in the market through grants and loans, which can lead to inflation, black market surges, and price increases. Pre-reconstruction planning that considers these aspects should plan for material adequacy to avoid these consequences. Planning must

also seek to curb the negative consequences of political stress due to the high demand for material in a large-scale reconstruction programme.

5.2.2. Economic Development

A link between material adequacy and economic development was noticed in the literature. This link reflects the fact that if local material is selected and the mode of delivery is carefully planned, it will cause a recovery in the economy, but mismanagement of this aspect can create an increase in living expenses. Failure to deliver HRC material and HRC efforts themselves might cause a recurrent conflict in PCR. This instability would also damage the economy. Therefore, within the material adequacy of HRC framework, delivering material is a process that must be supported by local government and NGOs to select and ensure local economic development and stability.

5.2.3. Environmental Impact

Material adequacy impacts the environment according to how materials are exploited and how the process is regulated. Selection of materials must be done with a consideration of all environmental aspects to balance quality, quantity, and price with environmentally sound processes and design. Most importantly, any increase in production and material supply will increase CO2 emissions, and thus local materials should be used when possible.

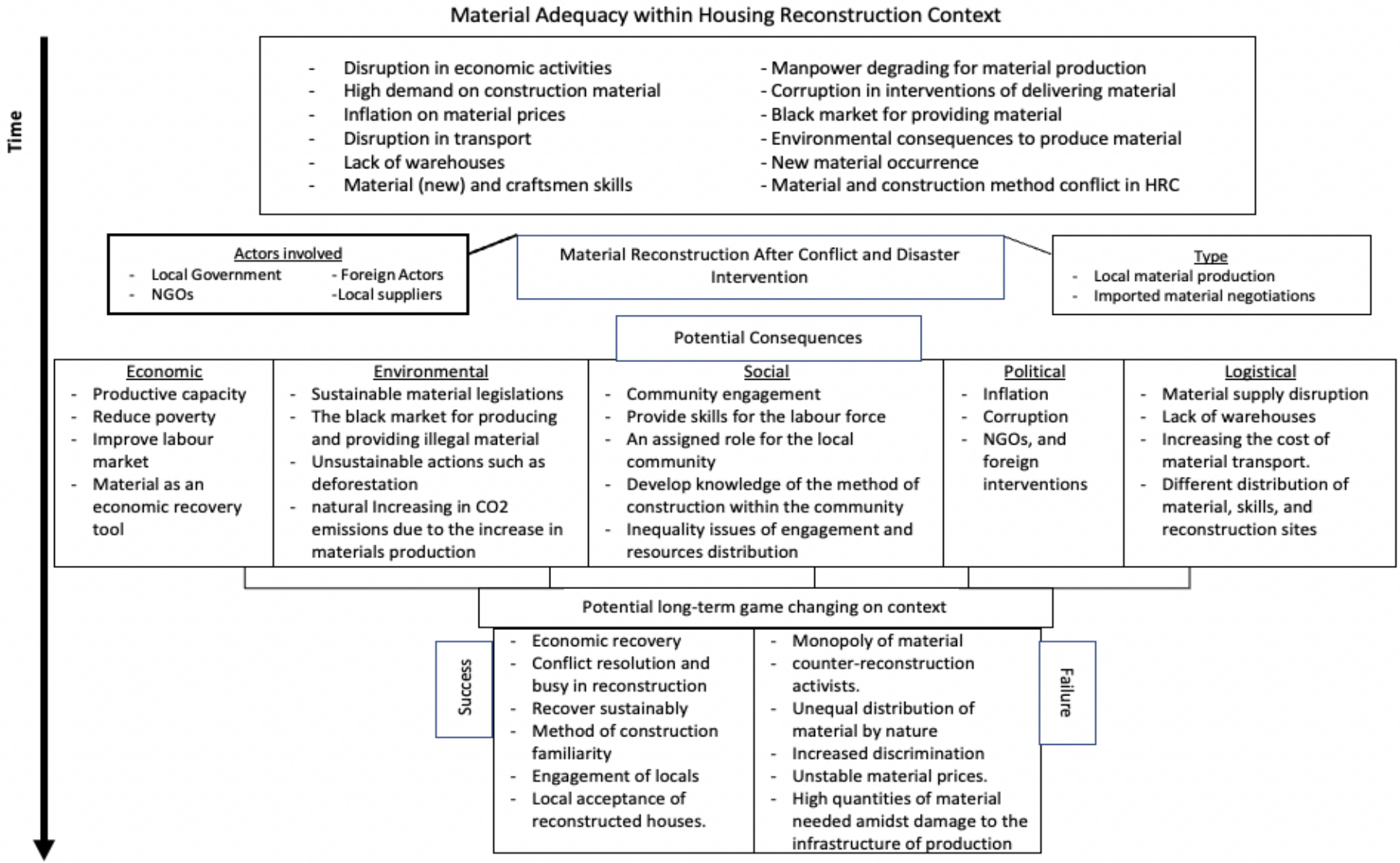

Figure 5.2 Material Adequacy: Synthesising timing and consequences of economic, environmental, social, political, and logistical development

Figure 5.1 and Figure 5.2 jointing reflect material adequacy criteria and what are the consequences of these criteria. The results listed would create a predictable tool to generate solutions for any expected outcomes depending on changes and circumstances of the pre-planning reconstruction program.

5.3. TOP-DOWN AND BOTTOM-UP APPROACHES FOR THE DEVELOPMENT OF AN HRC FRAMEWORK

In an attempt to design a fully robust material adequacy framework for HRC, this research has extracted data from the TA and case study analysis to note patterns of top-down management and combine them with patterns of community-driven bottom-up management patterns. The results of this analysis are presented in Figure 5.3

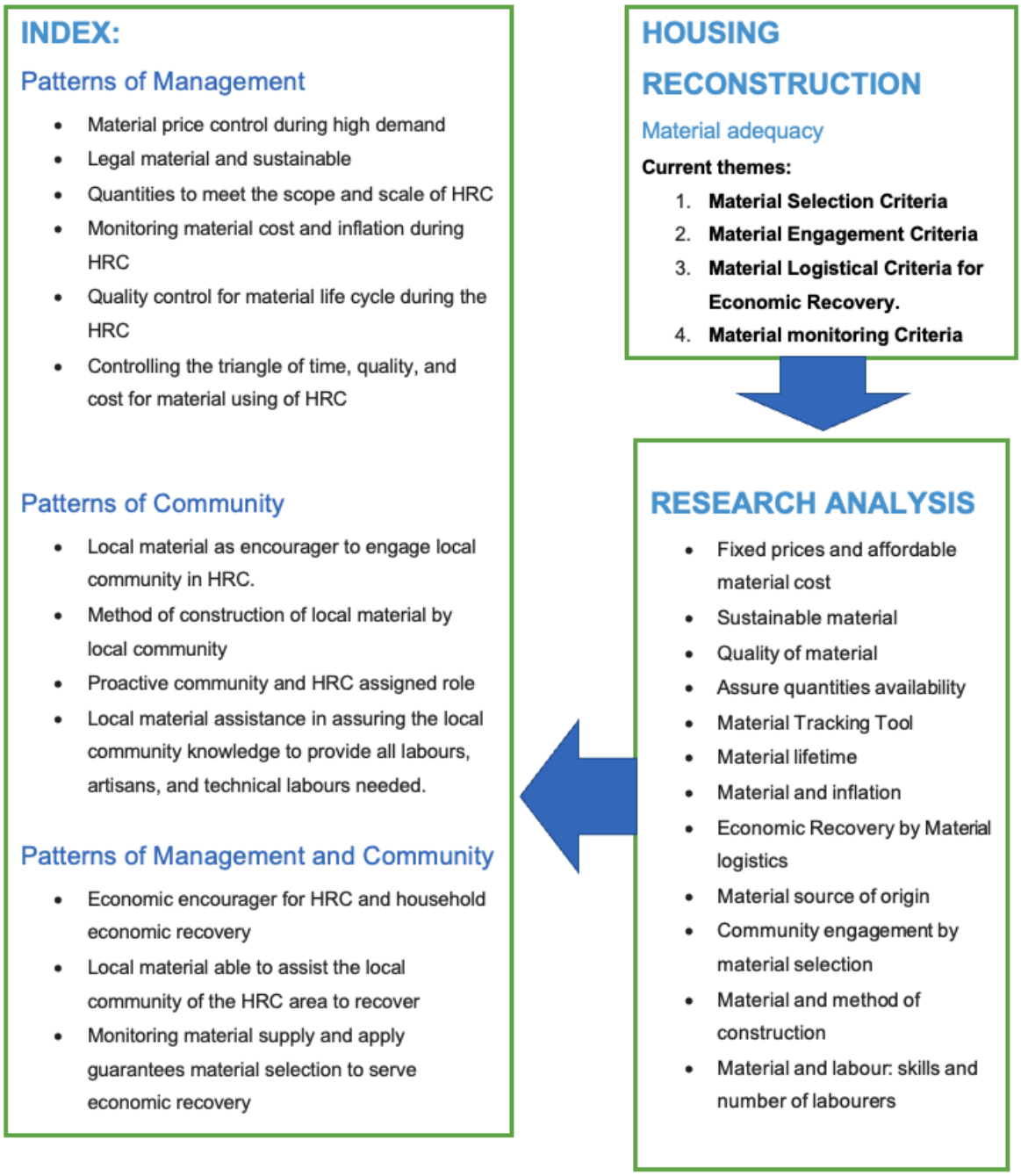

Figure 5.3 Material Adequacy by incorporating community management.

To achieve material adequacy during HRC, it is crucial to avoid failure by understanding fully understanding the manner in which material adequacy can be managed best to promote the interests of the affected community. Those in post-conflict situations are suffering extreme loss and miserable economic conditions. In particular, with civil wars, such as in Syria, intense distrust usually exists from the community towards the government (or at least from sections of the community). For a large-scale programme of HRC to deliver resources adequately, work

must be effective in all management aspects to ensure success and avoid failure.

As found in this thesis, the community is a game-changing factor in the success or failure of the material adequacy and the accompanying housing reconstruction process. Management actions from the housing reconstruction agency need to consider the second conceptual framework (Figure 5.3). The framework in this format reflects the extraction of the community management patterns from material adequacy themes. Patterns of management and community will precisely determine the governmental and reconstruction authority's main concerns as management patterns for top-down actions. In community patterns, the community's role in housing reconstruction ensures material adequacy within most community engagement and recovery after loss.

Based on the analysis presented in this study, the final version of the material adequacy framework is presented in Figure 5.4. Pre-reconstruction planning must consider all categories and subcategories of factors found in Table 2.2. The factors are represented in the framework in the orange box. In terms of pre-reconstruction planning of the top-down management concerns (HRC reconstruction agency, governments, and NGOs), these are clearly of prime concern due to the challenges of managing such a complex programme. The strategies in the right-hand box are aimed at tackling the challenges of top-down management. The left-hand box presents a bottom-up (local community) perspective. HRC patterns regarding material adequacy are the absence of building codes and informal methods of obtaining material for the reconstruction of houses. Informality in delivering housing reconstruction will result in the failure of the HRC and must be avoided.

Housing reconstruction after conflict and disaster is intended to increase the level of safety and stability of the affected community. However, as previously noted, this process carries a high risk of leading to shortages and scarcity in materials, thus increasing prices, the burgeoning of a black market for illegal materials, and a decrease in the quality of the material. As the reconstruction activity begins in rural areas, transportation expenses will also start to increase, and energy prices will also increase due to the increasing energy requirements of the reconstruction efforts, further increasing the price of materials. Moreover, personal loans and grants will be provided, which will result in inflation. All these risks must be carefully considered by following the framework designed for this study so that the risk of unstable material prices will not unduly affect the reconstruction process, especially for an approach where the communities are responsible for buying materials themselves to reconstruct their

house.

The proposed framework is presented in Figure 5.4. The orange box represents all aspects that need consideration before starting housing reconstruction as pre-planning aspects. The right column reflects concerns and strategies that must take from the policymakers and governmental agencies representing the housing reconstruction authority. The left column represents the community perspectives and patterns during housing reconstruction that need to consider for any adopted reconstruction approach to deliver housing reconstruction. The middle blue box represents material adequacy and is located in the middle to ensure material adequacy; need to consider the pre-reconstruction planning, top-down concerns and strategies, and bottom-up perspectives and patterns that will create a bottom box of challenges and stimulates in delivering housing reconstruction.

Five main challenges were listed, and five main stimulated generated from this framework to deliver adequate material within the reconstruction period. Monitoring tools, cost fixation, and material production management can stimulate delivering adequate material and a complete housing reconstruction if the required fund allocated.

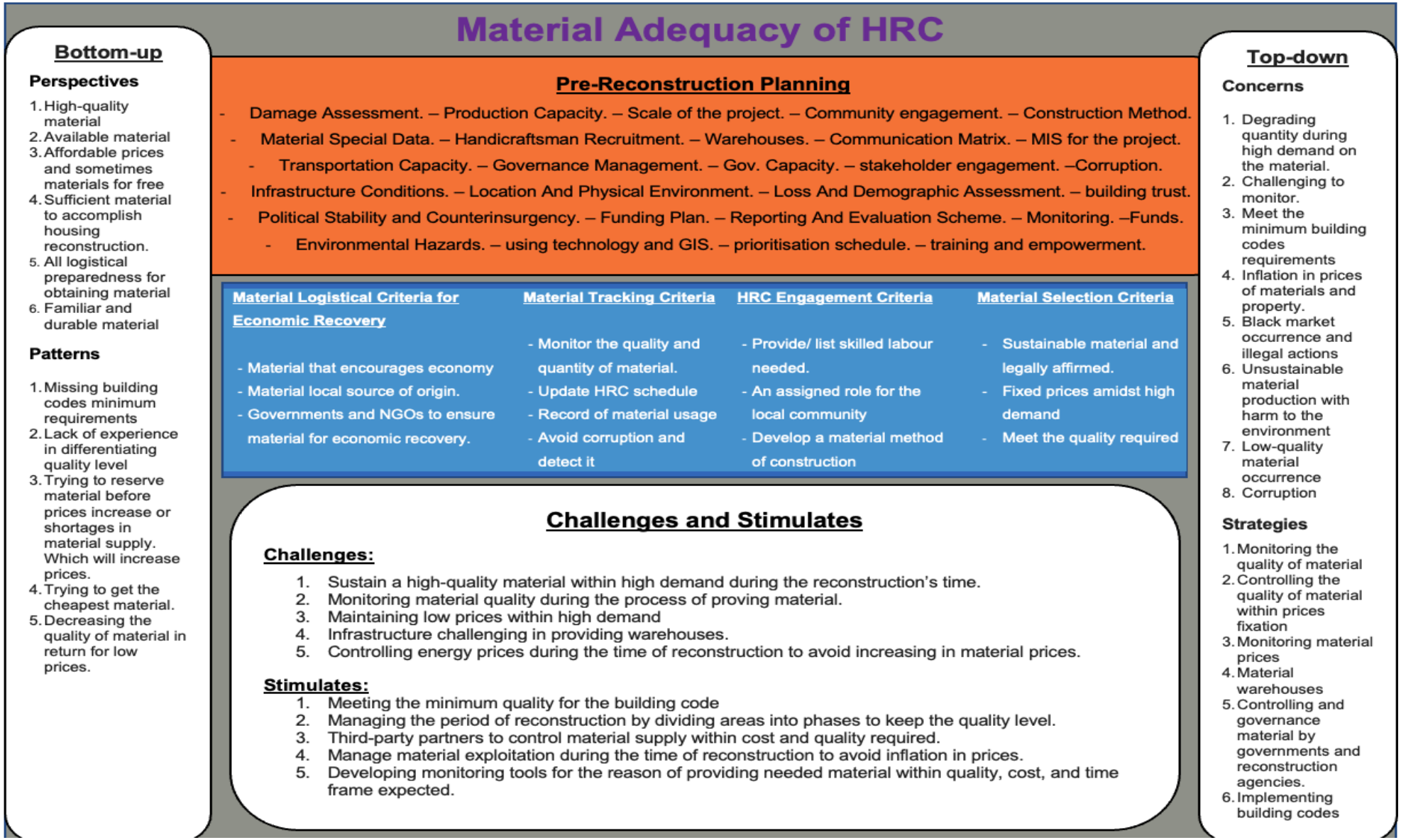

Figure 5.4 Pre-reconstruction planning framework of material adequacy of HRC

CHAPTER 6: VALIDATION OUTCOMES

This chapter aims to validate the frameworks proposed in Chapter 5. Participant 1 (P1) answered part of the questions and could not answer a portion due to his misunderstanding and needing more time to get clarification and complete the participation. P1 has three years of experience in Humanitarian work. It works as a humanitarian advisor for the Foreign, Commonwealth and Development Office FCDO for housing reconstruction-related programs. Participant 2 (P2) working INGOs who participate as project managers Nepalis housing reconstruction program. Participant 3 (P3) works as the national coordinator for Housing Reconstruction and Platform-Nepal. P3 accepted the invitation to an electronic interview.

The validation process aims to indicate the importance of the research area of material adequacy during the housing reconstruction process. Investigating the practicality of using any of Figure 5.1, Figure 5.2, Figure 5.3, and Figure 5.4 in the preconstruction planning phase and examining the community's role within the HRC process and the critical elements in managing their engagement, in addition to indicating the most concerning aspects of constructing the HRC framework for the Syrian case study as a case study that did not pass through the reconstruction process. Analysis of the participant's response will be done by thematic analysis.

6.1. VALIDATION THEMATIC ANALYSIS

Importance of Material Adequacy in HRC

The participants agreed on the importance of managing material delivery during the housing reconstruction process. Furthermore, the participants agreed that challenges would be different material adequacy for HRC after the conflict than challenges after the disaster. P2 and P3 agreed that material sufficiency is essential in which:

"The material management and making the balance between supply and demand is very crucial…new construction started. During the period, the demand of cement was so high, the cement companies couldn't fulfil the demand of the local communities. The rate of the cement at that time reached NRs 1100 per bag (50 kg) which was NRs 650 initially. The rate almost doubled. The cost of the construction increased …" **(P2)**

As P2 expressed in his experience in Nepali HRC, this importance of material adequacy during HRC showed that the consequences of high demand for material due to the size of construction at one time doubled the prices of material and construction. According to P2 and

P3, material is a critical factor in housing reconstruction during high demand for the material. P3 added,

"Material is very crucial, especially, in high-scale HRC. Different materials need to be introduced to the community… need to know what are the natural resources available? … Efforts are needed to increase supply chain management, especially, since demand and supply during HRC are very changing." **(P3)**

"Market Establishment, establishment of supply chain, increase in the number of vendors are very crucial for the materials adequacy and housing reconstruction. Again, the source of the material and its production are important aspects." **(P2)**

P1 and P2, agreed on the need of understanding the market system which added the material adequacy under "supply chain management". Also, P3 said the assessment of existing natural resources that would be used in producing construction material. As well as P2 as confirmed the source of material is important aspect. Uncertainty of material conditions during HRC is likely to form the scene of the HRC process. The validation process subjected the found frameworks in the practical world to tackle the challenges of delivering adequate material by asking which frameworks are more valuable to hindering the success of the HRC pre-planning process.

"The different options and varieties of materials are also important in maintaining the balance between the supply and demand." **(P2)**

"Material is very crucial, especially in high-scale HRC. Different selection would be introduced to the community." **(P3)**

P1 and P2 state the importance of having a variety of suitable material options for the local community, which can help maintain the balance between supply and demand while enhancing resource allocation and meeting the specific needs of the reconstruction context.

HRC planning frameworks practicality.

Both P2 and P3 agreed on the supply chain importance when considering pre-reconstruction planning for housing reconstruction. For the frameworks found in Chapter 5, P3 suggested that Figure 5.1 is more practical due to many factors.

Figure 1 [Figure 5.1] *is helpful in thinking of program design and provides space for policymakers to think. In a practical world, more simplification of the framework would be much more helpful. The material would be very different and need different logistics types is very helpful".* **(P3)**

During a discussion, P3 emphasised the importance of simplicity for a framework to be effective and useful. However, it was noted that different logistical factors must also be taken into consideration when developing a framework. On the other hand, P2 expressed the view that frameworks should be more tailored to fit the specific needs of each case study.

> *"Well, none of the frameworks will exactly fit, however, the framework should be customised according to the context of the local communities. Having being worked in the reconstruction process, I personally have found different findings and results. The local context is very important, and the frameworks and the reconstruction strategies should be dynamic and also open to the local communities."* **(P2)**

Each framework aims to engage the community in a systemic way to support their recovery. The research focused heavily on community participation to identify bottom-up management concerns and patterns in implementing a comprehensive HRC program. P3 stated that during HRC, everything would be in a rush and a pre-reconstruction planning overview would be necessary.

"During HRC, everything would be rushed, so pre-HRC planning is very important". **(P3)**

community's participation

Participant 1 (P1) confirmed that community engagement is "very important". Similarly, Participant 3 (P3) acknowledged the criticality of community engagement by stating the following:

"Often, decisions come from the top without community engagement. Timing of community engagement is essential … community is crucial and would be the biggest investor in the HRC process." **(P3)**

It is crucial to prioritise community engagement during the planning process and incorporate their perspective in each stage. Neglecting early engagement can lead to delayed participation and unsatisfactory outcomes due to missed opportunities for input. This was confirmed by Participant 3.

"It takes a very long time to understand the trends of the community" **(P3)**

P3's statement would agree with P2's description of community capacity in stating,

"Reconstruction cannot be completed without economic recovery, and the capacity of the community depends on how much they have economic capacity. However, it depends on the local culture and their behaviours." **(P2)**

P2 emphasised the importance of community involvement in various aspects of HRC, including economic recovery and capacity, among other elements, in the following statement.

"I believe the important aspect would be communities' involvement. Firstly, for their ownership, secondly for their decision-making power." **(P2)**

Timing community engagement can provide power and make the top-down approach more efficient and beneficial. Additionally, comprehending community trends can lead to a successful HRC program.

Critical factors and aspects to Consider.

In designing the HRC planning framework, P1, P2, and P3 included additional critical success factors. P1 specifically identified key material factors that must be considered for adequacy, as outlined in Figure 5.1, and suggested the inclusion of other relevant factors.

"Climate change (esp WRT timber, bamboo, natural cladding), salvage (laws, material testing) and governance (building code application rigour) should feature amongst these." **(P1)**

While P1 points out that climate considerations for certain materials influence material adequacy during housing reconstruction, the ability to salvage and test materials for reuse, and the effectiveness of governance in enforcing building codes. Addressing these factors will create more resilient and sustainable housing solutions in the post-conflict and disaster context. P3 considers other factors connected with material adequacy in housing reconstruction delivery.

"Framework is required and should connect HRC with other factors such as infrastructure, identification of housing typology, knowing the culture of the community, knowing the consequence of using material A or B… Assessment is very critical, especially, for critical facilities such as hospitals" **(P3)**

Other factors affecting the process of HRC need to consider in the post-conflict scenario. P1 described the Syrian situation and factors distressing the HRC as follows.

"Few in the coordination bodies since 2012 acknowledged the possibility of a major seismic event, despite the geological profile being well-documented. Drafting a HRC post-conflict (should say during, really, as the conflict is more than a decade old and still ongoing) is probably too wrapped up with conflict dynamics – power brokers and exclusionary tactics (pro and anti-gov), major actors (and their funding streams, sanctions and control of border posts and industries)" **(P1)**

The complex interplay of power dynamics and the influence of major actors can further complicate and shape the reconstruction process, potentially impacting the initiatives' inclusivity, efficacy, and sustainability. It emphasises the need for a comprehensive and well-informed approach that considers all these critical factors to address the challenges effectively.

However, P2 has a different opinion about aspects affecting housing reconstruction after the conflict in particular and claims that the reconstruction could be one of the

"Again conflict is a very difficult situation for reconstruction in compared with natural hazards. Sometimes, the reconstruction process can trigger conflict. The understanding of the

conflict, the local context can actually define any frameworks." **(P2)**

The reconstruction process can also be sensitive and potentially trigger further conflicts if not managed carefully. To navigate these challenges, it is crucial to have a deep understanding of the conflict and the local context to design appropriate and effective reconstruction frameworks that can address the unique challenges of each situation.

6.2. VALIDATION OUTCOMES:

Material adequacy framework needs to be simple to introduce a practical tool to provide decision-makers with design a planning approach of HRC and deliver adequate materials. The validation process confirmed the importance of material adequacy, community engagement, and considering various critical factors in housing reconstruction after conflict. It highlighted the need for a comprehensive and well-informed approach tailored to each case study's context and challenges to ensure successful and sustainable housing reconstruction. Figure 6.1 summarises all validator's responses in the HRC process framework.

As noted in the thematic analysis and according to their responses, the validators focused on different areas that all need to consider when planning for the HRC. In Figure 6.1, the framework is a validation version of Figure 5.4. framework. The pre-reconstruction planning framework needs to consider who would be using it and for what benefit this would help the creator develop the most helpful framework to be used effectively by its users. In the case of Figure 6.1, created to be used by engineers working in the humanitarian sector, housing reconstruction program managers, exclusionary tactics, academic researchers in their area of projects management, housing reconstruction, and other policymakers except to participate in the housing reconstruction planning phase. Therefore, the framework builds by considering the most concerned validators and academic points of view to look at specific areas, such as those at the top of the table, to be evaluated and studied before considering the reconstruction approach would be adopted in the case study. When the case study of housing reconstruction has the Most datum from the top of Figure 6.1, the reconstruction planning and delivering approach would be clearer for the reconstruction agency. Bottom-up and top-down management approaches are shown in the framework to list reparative issues and strategies expected to occur and forecast the early solutions for a healthy housing reconstruction

environment. Material is the significant and most concerning factor of this research; the framework selects the most validated factors affecting the selection of material expected to use in a future HRC case study. Challenges and stimulated boxes in the middle of the framework figure provide further concerns about delivering HRC material to avoid disruption and guarantee the acceptable flow of material

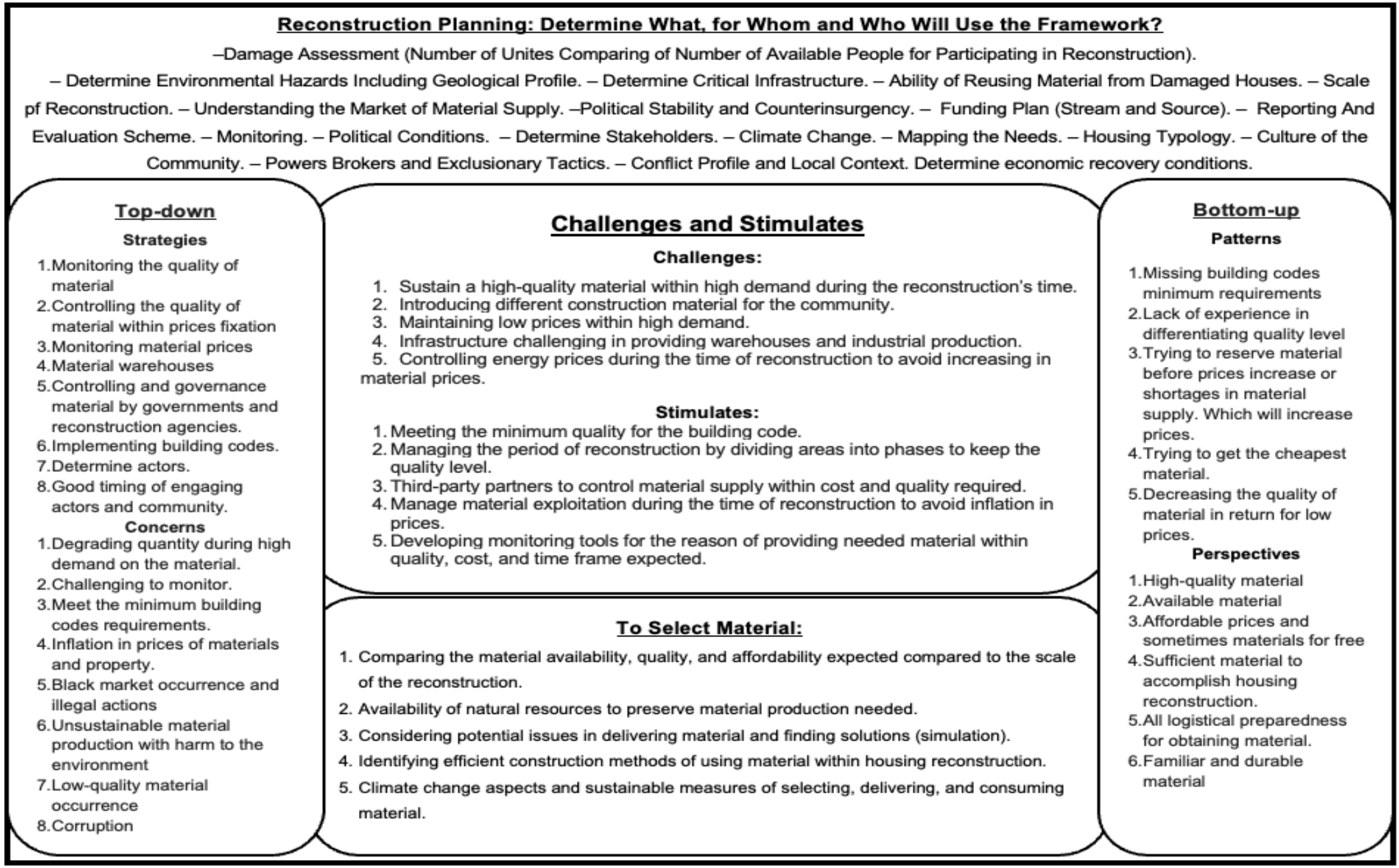

Figure 6.1 Material Adequacy framework of HRC

CHAPTER 7: CONCLUSION

This research has investigated the factors affecting housing reconstruction after conflict and disaster in terms of material adequacy. The ten major factors found from the initial literature review are as follows: material, labour, transportation, site and environment, coordination, government, hazards, economy, project management, and community. Following the identification of these factors, this thesis performed a TA to investigate material factor relationships with other factors to extract four HRC drivers in delivering material adequacy (Material Selection Criteria, HRC Engagement Criteria, Material Logistical Criteria for Economic Recovery, and Material Tracking Tool Criteria). These four themes/trends led to further investigation of case studies, concluding the drivers and inhibitors of each in relation to these themes.

In conclusion, in terms of the development of a pre-reconstruction planning framework for HRC that focuses on ensuring material adequacy for the Syrian case study, the analysis conducted in this research has allowed the formation of three separate versions. The first framework visualises themes and sub-themes of material adequacy for HRC. The second presents a framework that presents the community as a subject of management due to the links between material adequacy, the community, and the framework. With community engagement having been addressed, concerns and patterns with top-down management detailed formed the basis of the final framework presented in this thesis. After the validation process, modifications produced one more framework that could be used in the pre-reconstruction planning phase, providing space for policymakers to evaluate and localise the HRC approach and deliver adequate material.

7.1. THEORETICAL FINDINGS

The first research question in this thesis is about investigating factors affecting the success and failure of HRC. Chapter Two conducted an extensive literature review to answer the first questions and developed Table 2.2 Synthesised factors affecting the HRC process. In Chapter Two, a thematic analysis was conducted to identify the most critical factors and criteria that are considered for the material adequacy of HRC. These findings are presented later in chapter five, where a summary of the themes is illustrated in Figure 5.1 Material Adequacy: Synthesis of thematic Analysis based on the template provided by Attride-Stirling (2001) and

theThematic Analysis Network template shown in Figure 3.4 In the third question, the thesis investigated the role of the community and the role of the policymakers as the main actors of the HRC process by investigating both top-down and bottom-up management approaches from the HRC perspectives, strategies, concerns, and patterns. The thesis investigated the community role in two stages, as shown in Figure 5.3 Material Adequacy by incorporating community and illustrating the community management in both frameworks in Figure 5.4, and Figure 6.1.

The thesis concludes by addressing the research's final question regarding the effectiveness of pre-reconstruction planning and material adequacy in delivering housing reconstruction. The framework presented in Figure 5.4 places emphasis on pre-reconstruction planning as the starting point for addressing the most critical aspects of the project, followed by managing material adequacy factors to ensure a sustainable HRC framework for post-conflict and post-disaster. The final theoretical finding is presented in Figure 6.1, which is extracted from both the literature overview in producing the framework in Figure 5.4 and experts' experience in the field of HRC, after undergoing a validation process.

7.2. PRACTICAL RECOMMENDATIONS

In order for policymakers and practitioners to make informed decisions and take practical actions in material selection and reconstruction processes, it is important that future research or literature provide more in-depth analysis, specific examples, and practical recommendations for addressing the challenges identified. A comprehensive approach to material selection should carefully consider the benefits of using local resources in contrast to potential limitations and risks, ensuring that the chosen materials contribute to resilient, safe, and sustainable housing reconstruction after disasters.

7.3.RESEARCH LIMITATIONS

- Limited publications on housing reconstruction regarding material adequacy.
- Limited access to online books and articles due to subscription limitations.
- Lack of online reports that contain quantitative data regarding historical HRC projects.
- Limited bottom-up referenda from past case studies to reflect the success or failure of

the delivered houses in terms of community acceptance.

- Limited response from experts to participate in the validation process.

7.4. RECOMMENDATIONS FOR FUTURE WORK

This research has opened wide opportunities for prospective future research areas of housing reconstruction after conflict and disaster.

- The study can be used to customise an HRC approach for a new case study. After using the frameworks in Figure 6.1, outputs and data for the case study would be answered after answering all concerns in the figure, which would assist in customising the approach to construct more HRC approaches that could be more comprehensive in delivering adequate material in particular.
- The outcomes of this research can be considered in pre-reconstruction planning for future reconstruction programmes. This framework can be used as a compulsory stage of starting the pre-reconstruction planning by framework check and evaluation to consider what is the most proper plans and actions need to be on the ground.
- When analysing HRC approaches, it can be helpful to compare frameworks to historical case studies. By using Figure 6.1's framework, one can identify Critical Success Factors (CSFs), evaluate past approaches, and determine the best approach for a given case study. This method can be applied to additional case studies to further develop HRC approaches. The frameworks can be developed by conducting qualitative research that applies questionnaires or interviews to add to the data.
- The material adequacy framework is a useful tool for future research that aims to investigate other factors affecting housing reconstruction and develop new frameworks.
- The four themes of material adequacy identified through Thematic Analysis can be studied further to gain a deeper understanding.
- Conducting multi-disciplinary research can help evaluate all aspects of PEELS and integrate them into engineering and IT systems, leading to further advancements in material adequacy and HRC approaches.
- Future work on supply chain management to link all aspects of delivering adequate materials after war and disaster to boost the process of HRC.
- Connecting crisis and disaster management science with construction management themes in developing an early warning system and early recovery approach to creating

practical tools in delivering and monitoring the process of HRC and accompanying aspects.

- Engage contingency plans of the crisis and disaster management with local tracking tools for the material during HRC would create effective pillars for future research that can determine locations and distances of material in addition to temporal and spatial information regarding the material availability and consumption during the housing reconstruction process.

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ANNEXE A

Housing Reconstruction after Conflict and Disaster: A Process Framework

By
Ahmad Hawamdeh

A thesis submitted in partial fulfilment of the requirement for the award of Master of Philosophy in Civil Engineering

University of Bath

Department of Architecture and Civil Engineering

ABSTRACT

A house loss after a conflict or disaster is a devastating experience for residents and owners. The Core Logic Climate Change Catastrophe Report estimates that 1 in 10 US residential properties was impacted by natural disasters in 2021, and the UN Office for Coordination of Humanitarian Affairs OCHA reported that more than 800,000 houses had been damaged or destroyed in Ukraine since the latest Russian-Ukrainian Conflict started in February 2022 (UN-OCHA, 2022). Throughout the world, similar conflict and disaster events are being continuously observed. A rapid and effective response to housing reconstruction is needed after each event, shaped to the particular geographic, economic, and political factors dominating each situation and circumstance.

On the basis of such a significant need for viable housing reconstruction, this thesis has undertaken an in-depth investigation of the literature to create a generic framework to better understand and aid decision-making in housing reconstruction. 59 factors affecting the success and failure of the reconstruction process have been deduced. Of these factors, four are related to material adequacy and are explored in detail (material availability, quality, local production capacity, and procurement strategy). This report investigates the relationship between material adequacy factors and other factors, including labour, transportation, site and environment, coordination, government, hazards, economy, project management, and community, using 29 published literature papers and review articles on housing reconstruction. The findings of the Thematic Analysis show that material adequacy during housing reconstruction is influenced by the following themes/trends: Material Selection, Material Tracking Tool, Housing Reconstruction Engagement Criteria, and Material Logistical Considerations for Economic Recovery. This study contributes to the pre-reconstruction planning phase. It sets out a novel pre-planning framework for HRC in terms of material adequacy based on future Syrian reconstruction efforts following the civil war that will assist both affected communities and agencies responsible for re-construction.

AIM, RESEARCH QUESTIONS AND OBJECTIVES

As already explained, housing reconstruction should be delivered according to a robust framework that is, above all, sustainable. Accordingly, this thesis aims to construct a sustainable HRC framework for post-conflict and disaster, and in attempting to do so, will answer the following research questions:

- What main elements and factors affect the success or failure of HRC?
- What are the trends/themes driving and connecting HRC factors in delivering material adequacy?
- How can these factors affect bottom-up community engagement and top-down (governmental, NGOs, and privet sector) management in a housing reconstruction framework?
- How can a framework deliver material adequacy during HRC?
- How do links between HRC approaches, case studies and themes affect pre-reconstruction planning, and what is the nature of the material adequacy juxtaposition within that planning?

OVERVIEW:

This document was shared to get a "casual validation" for the MPhil outcomes. the Thesis created four conceptual frameworks that better understand and assist decision-making in housing reconstruction and delivering adequate construction materials.
The conceptual frameworks with underneath descriptions will be illustrated in this document with the following questions in order to validate the thesis.
Please note, this thesis has already been marked by internal and external examiners in the field and received minor corrections with around 10 concerns that one of which is to validate the outcomes.

CONCEPTUAL FRAMEWORKS

This thesis has found several themes that captured patterned answers in relation to the research questions, all of which form the basis for the Thematic Analysis

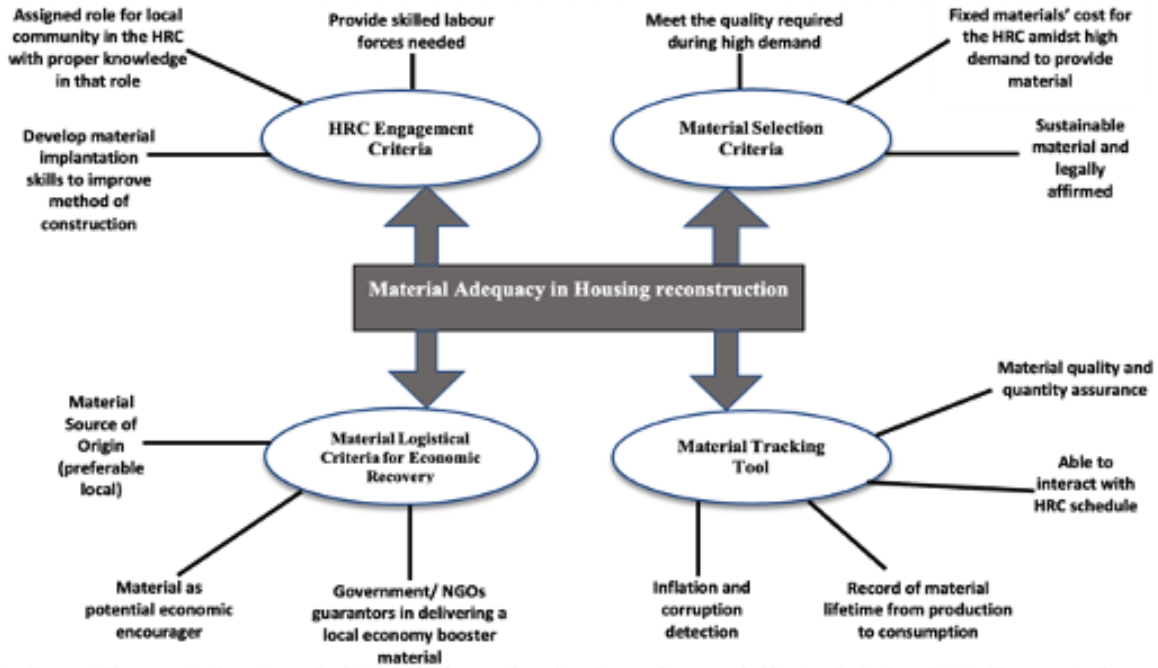

Figure 1 Thematic Analysis Network of Material Adequacy based on the template provided by Attride-Stirling (2001). Thematic Analysis Network template

The oval circles represent the main themes found based on literature thematic analysis based on discourse analysis, and narrative review. The first outcome of this study draws the main criteria required to deliver adequate materials during the Housing Re-Construction process (HRC). As can be seen, the material should be selected according to a distinct set of criteria to guarantee economic recovery. The material should be at fixed prices and consider the community's familiarity and acceptance of that material. Each criterion has actions that are required to ensure the validity and efficiency of each criterion.
There should also be a firm connection between the political, economic, environmental, logistical, and social (PEELS) aspects of the use of material to create an effective tool for future material mapping and the overall HRC process. Figure 2 presents the Material Adequacy Framework developed to illustrate the causes and effects of housing reconstruction factors and material adequacy according to previously

mentioned PEELS components.

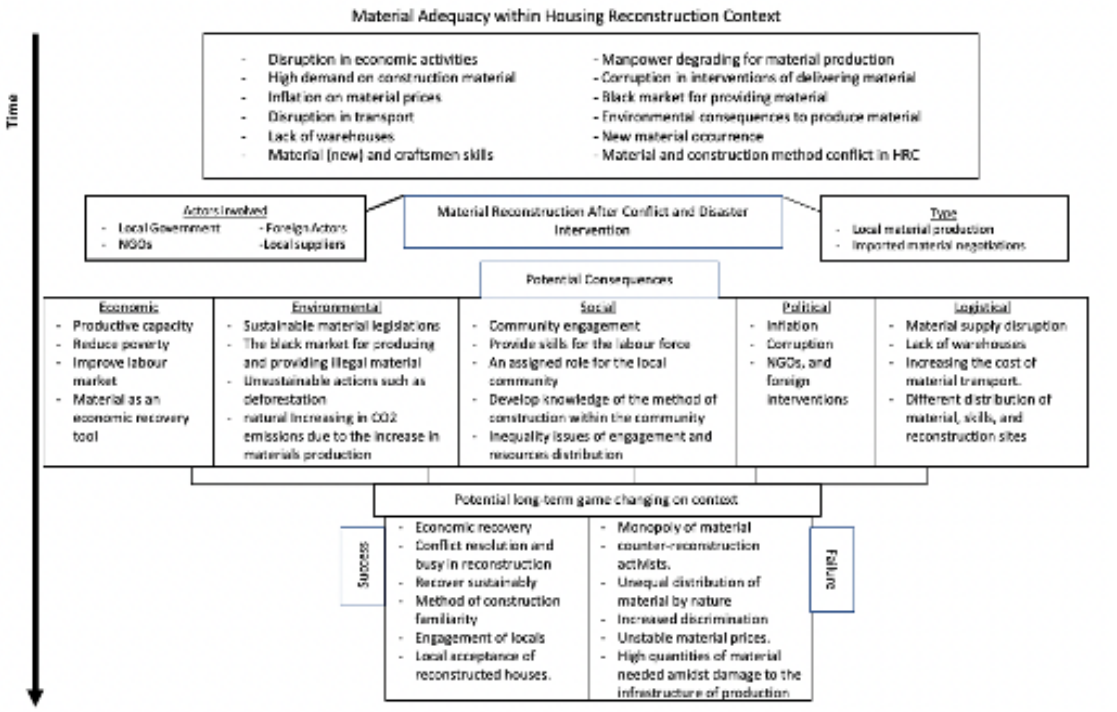

Figure 2 Material Adequacy HRC framework based on timing and consequences of economic, environmental, social, political, and logistical development by linking findings with theory

The second conceptual framework has been developed to demonstrate the linkages between the factors that affect the housing reconstruction process following a disaster or conflict. In the second phase, interventions by various actors and the preservation of material adequacy need to be undertaken. The third level involves considering and addressing economic, environmental, social, political, and logistical factors to deliver the housing reconstruction process successfully. In the final scenario, long-term factors of success and failure will either encourage or discourage delivering adequate materials during the housing reconstruction period.

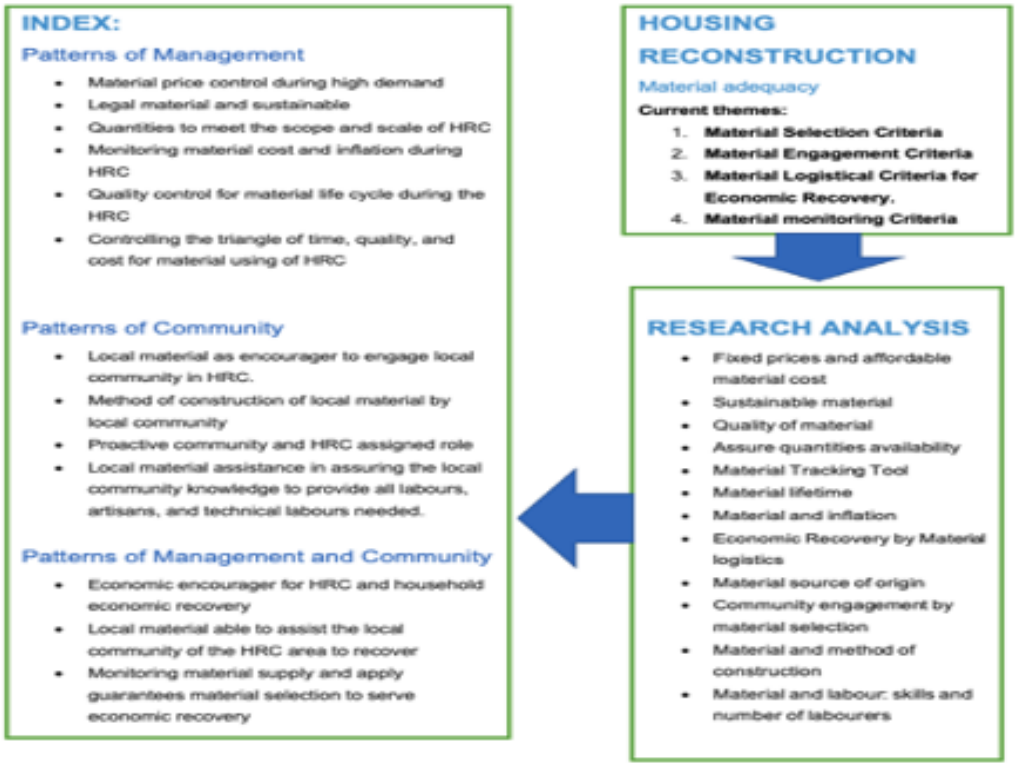

Figure 3 Material Adequacy Framework of community management index

As found in this thesis, the community is a game-changing factor in the success or failure of the material adequacy and the accompanying housing reconstruction process. Management actions from the housing reconstruction agency need to consider the second conceptual framework. The framework in this format reflects the extraction of the community management patterns from material adequacy themes. Patterns of management and community will precisely determine the governmental and reconstruction authority's main concerns as management patterns for top-down actions. In community patterns, the community's role in housing reconstruction ensures material adequacy within most community engagement and recovery after loss.

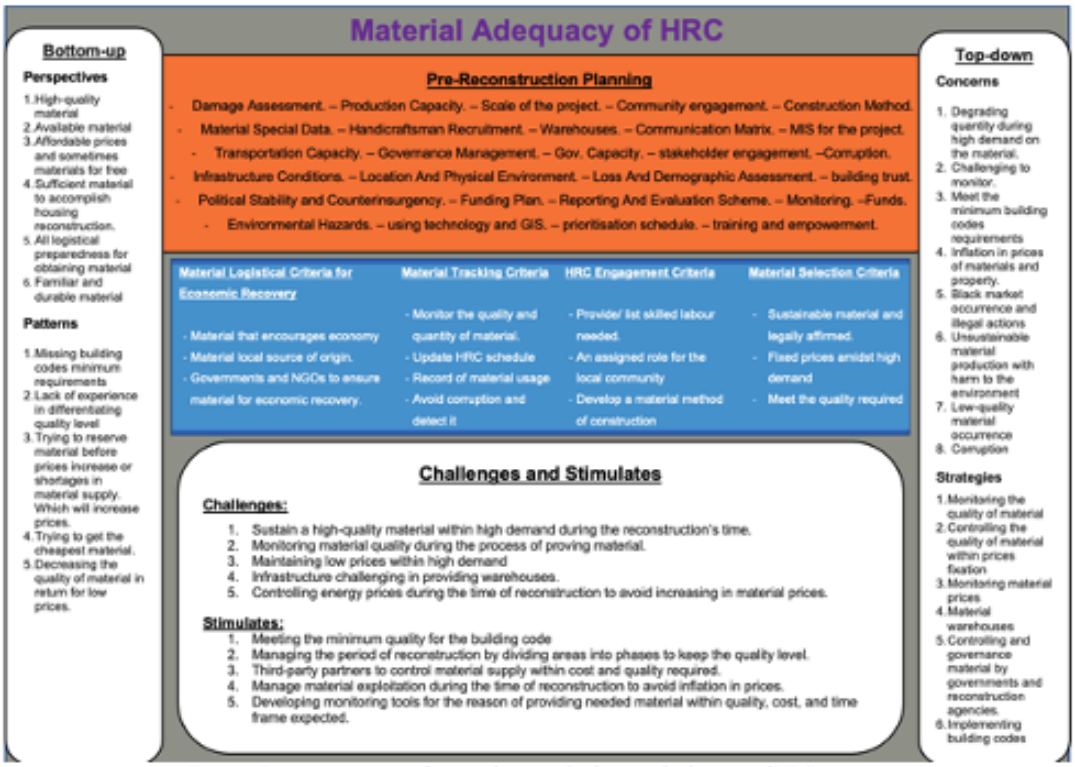

Figure 4 Pre-reconstruction planning framework of material adequacy of HRC

In this latest version of the framework, the orange box represents all aspects that need consideration before starting housing reconstruction as pre-planning aspects. The right column reflects concerns and strategies that must take from the policymakers and governmental agencies representing the housing reconstruction authority. The left column represents the community perspectives and patterns during housing reconstruction that need to consider for any adopted reconstruction approach to deliver housing reconstruction. The middle blue box represents material adequacy and is located in the middle to ensure material adequacy; need to consider the pre-reconstruction planning, top-down concerns and strategies, and bottom-up perspectives and patterns that will create a bottom box of challenges and stimulates in delivering housing reconstruction.

Five main challenges were listed, and five main stimulated generated from this framework to deliver adequate material within the reconstruction period. Monitoring tools, cost fixation, and material production management can stimulate delivering adequate material and a complete housing reconstruction if the required fund allocated.

VALIDATION GUIDING QUESTIONS

1. How important is managing material delivery in housing reconstruction after a conflict or a disaster?

2. What is the level of agreement or disagreement regarding potential consequences that arise in the figures regarding delivering housing reconstruction and adequate materials? In the practical world, how are these frameworks in the reconstruction process?

3. How beneficial would it be for the community to be involved in the housing reconstruction process?

4. Does the patterns of community management work in engaging them and benefitting them in their economic recovery?

5. Of the found frameworks, which one is more practical? Moreover, how could this be used and fit to deliver housing reconstruction?

6. Does the pre-reconstruction plan achievable during housing reconstruction planning? Furthermore, to what level can these frameworks help?

7. what are the most concerning aspects of constructing a housing reconstruction framework after the conflict for the Syrian case study/ or in other housing reconstruction case studies?