**ANKARA YILDIRIM BEYAZIT UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

# MANAGEMENT OF PHYSICAL BUILT ENVIRONMENT RECONSTRUCTION AFTER DISASTER CHALLENGES, PRIORITIES, AND STRATEGIES

**M.Sc. Thesis by**

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# MANAGEMENT OF PHYSICAL BUILT ENVIRONMENT RECONSTRUCTION AFTER DISASTER CHALLENGES, PRIORITIES, AND STRATEGIES

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## M.Sc. THESIS EXAMINATION RESULT FORM

We have read the thesis entitled **"MANAGEMENT OF PHYSICAL BUILT ENVIRONMENT RECONSTRUCTION AFTER DISASTER / CHALLENGES, PRIORITIES, AND STRATEGIES"** completed by **FADI ORFALI** under the supervision of **PROF. DR. SLAH HAJ ISMAIL** and co-supervision of **ASSIST. DR. ABDULLAH DİLSİZ.** we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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**Date:** 2024, 01 February **Signature……...**

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**2024, February** **Fadi Ahmad ORFALİ**

# MANAGEMENT OF PHYSICAL BUILT ENVIRONMENT RECONSTRUCTION AFTER DISASTER CHALLENGES, PRIORITIES, AND STRATEGIES

## ABSTRACT

Natural and man-made disasters cast a long shadow over the built environment, jeopardizing lives, infrastructure, economies, and ecological integrity, these events underscore the criticality of proactive preparedness, immediate response, and long-term, sustainable reconstruction strategies, effective disaster management necessitates robust protocols for mitigating impacts, prioritizing recovery operations, and fostering multi-level stakeholder engagement.

This thesis navigates the intricate interplay between disaster, reconstruction, and the built physical environment, using geographically diverse case studies, it meticulously dissects how reconstruction processes unfold in the wake of different disaster types, each case study serves as a microcosm, illuminating the multifaceted challenges, priorities, and contextual nuances that shape post-disaster recovery trajectories, to shed light on these complex dynamics, the research employs a multifaceted approach such as exhaustive literature review and deep-diving into individual case studies to assessing its strengths and opportunities, through this methodology, the research seeks to comprehend the multifaceted impact of reconstruction and to glean valuable lessons that can inform future post-disaster interventions, by unraveling the intricate dance between disaster, reconstruction, and the built environment, so we can strive to build sustainable cities capable of recovering and emerging stronger from the ashes of adversity.

This research offers valuable insights into post-disaster reconstruction by Proposing a conceptual framework, a comprehensive framework is developed to guide future reconstruction efforts in disaster-affected physical built environment areas, finally generalizing findings to Syria, the case studies' lessons are extrapolated to provide a broader understanding of reconstruction dynamics within the specific context of Syria.

**Keywords:** Physical built reconstruction, disaster management, resilience, challenge, post reconstruction, sustainability, strategies, priorities.

# AFET SONRASI FİZİKSEL YAPILI ÇEVRENİN YENİDEN İNŞASININ YÖNETİMİ ZORLUKLAR, STRATEJILER VE ÖNCELIKLER

## ÖZET

Doğal ve insan kaynaklı afetler, inşa edilmiş çevreye uzun bir gölge düşürerek yaşamları, altyapıyı, ekonomileri ve ekolojik bütünlüğü tehlikeye atıyor. Bu olaylar, proaktif hazırlık, acil müdahale ve uzun vadeli sürdürülebilir imar stratejilerinin, etkili afet yönetimi konularındaki eleştirilerin altını çizmektedir. Etkileri azaltmak, kurtarma işlemlerine öncelik vermek ve çok düzeyli paydaş katılımını desteklemek için sağlam protokoller gerektirir.

Bu tez, afet, yeniden imar ve inşa edilen fiziksel ortam arasındaki karmaşık etkileşimi yönlendirir. coğrafi olarak çok çeşitli vaka çalışmaları yapıyor. farklı afet türlerinin ardından, yeniden inşa süreçlerinin nasıl geliştiğini titizlikle keser.Her örnek çalışması, afet sonrası kurtarma yörüngelerini şekillendiren çok yönlü zorlukları, öncelikleri ve bağlamsal nüansları aydınlatan bir mikrokozma hizmet vermektedir.

Bu karmaşık dinamiklere ışık tutmak için, araştırma yorucu literatür incelemesi gibi çok yönlü bir yaklaşım kullanıyorç Güçlü ve fırsatları değerlendirmeye yönelik bireysel vaka çalışmalarına derinlemesine dalmak ve bu yöntembilim ile araştırma, yeniden yapılanmanın çok yönlü etkilerini kavramayı ve gelecekte yapılacak felaketler sonrası müdahaleleri bilgilendirecek değerli dersler çıkarmayı amaçlıyor. afet, yeniden imar ve inşa edilmiş çevre arasındaki karmaşık dansı çözerek sürdürülebilir şehirler inşa etmeye çalışabiliriz, böylece zorlukların küllerinden daha güçlü hale gelebiliriz

Bu araştırma, bir kavramsal çerçeve önererek, afet sonrası yeniden imar hakkında değerli bilgiler sunmaktadır. Afetten etkilenen fiziksel yapı alanlarında gelecekteki yeniden inşa çabalarına rehberlik etmek için kapsamlı bir çerçeve geliştirilmiştir.

Vaka çalışmalarından alınan derslerin, Suriye'nin belirli bağlamında yeniden imar dinamiklerinin daha geniş bir şekilde anlaşılmasını sağlaması bekleniyor.

**Anahtar Kelimeler:** Aşırı doldurma, ara soğutma, kompakt ısı değiştiricileri, plakalı-kanatlı ısı değiştiricileri, ısı geçişi, basınç düşümü, ikinci yasa analizi.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| PBER | Physical Built Environment Reconstruction |
| ESHA | Environmental, Safety and Health Affairs |
| FAO | Food and Agriculture Organization |
| GDP | Gross Domestic Products |
| IDPs | Internally Displaced People |
| IFAD | International Fund for Agricultural Development |
| MDGs | Millennium Development Goals |
| MSMEs | Micro, Small, and Medium Enterprises |
| SDGs | Sustainable Development Goals |
| SEA | Strategic Environment Assessment |
| EU | European Union |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNHCR | United Nations High Commissioner for Refugees |
| UNISDR | United Nations International Strategy for Disaster Risk Reduction |
| UNOCHA | United Nations Office for the Coordination of Humanitarian Affairs |
| UNCCD | United Nations Convention to Combat Desertification |
| UNDRR | UN Office for Disaster Risk Reduction |
| UN- HABITAT | United Nations Human Settlements Programme |
| WFP | World Food Programme |
| FAO | Food and Agriculture Organization |
| HFA | Hyogo Framework of Action |

| | |
|---|---|
| IBRD | International Bank for Reconstruction and Development |
| WB | World Bank |
| WHO | World Health Organization |
| APA | American Planning Association |
| IFRC | International Federation of Red Cross and Red Crescent Societies |
| NRA | National Reconstruction Authority |
| PRU | Provincial/Regional Reconstruction Units |
| WWII | Second World War |

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# CHAPTER 1

## INTRODUCTION

Human settlements, encompassing both urban and rural environments, alongside their interconnected infrastructure and physical structures, stand as testaments to humanity's capacity for creation, adaptation, and response to diverse conditions and threats. However, this pronounced concentration of population and material assets inherently increases vulnerability to natural and man-made disasters. Earthquakes can trigger widespread physical destruction, floods can fundamentally alter landscapes, and conflicts or wars can inflict severe damage on communities, leaving behind tangible scars. Beyond the immediate devastation to buildings and infrastructure, these events often trigger cascading effects, including economic disruption, environmental degradation, and social disintegration. Recovery from such events necessitates not only prompt action to address material damage but also strategically planned reconstruction efforts aimed at enhancing resilience and fostering a more robust built environment.

This thesis, in its four chapters, examines the potential challenges and priorities for the physical built environment reconstruction (PBER) after war and disasters, aiming formation of national frameworks and concepts that form a comprehensive and integrated strategy proposed for the physical built environment reconstruction in Syria. Based on the research main question posed is: Can the reconstruction of the physical environment, create a better and stronger built environment than before? The thesis examines the various dimensions of the process through dedicated sections, after the introduction, the rationale for the research and its importance were determined. Define the physical built environment, and then highlight the importance of understanding the stages and principles of general reconstruction, then define the objectives of the study beginning from studying and enumerating challenges to prioritizing the PBER as a basis for social cohesion and economic growth, ultimately contributing to the restoration of normal life and building a prosperous future. The methodology used is

a qualitative, deductive approach, which includes the analysis of data on the impact of the war on Syria and focused studies of specific case studies.

The second Chapter began with a comprehensive overview of recent research and through the existing knowledge, highlighting the complexities of post-disaster reconstruction and laying the foundation for a robust understanding of this domain. This chapter takes a two-pronged approach, commencing with a panoramic overview of recent research in physical built environment reconstruction after disasters and delving deeply into the theoretical frameworks and concepts governing post-disaster management. Within each domain, the review scrutinizes the most thoroughly documented case studies and best practices in physical built reconstruction across diverse global regions. This critical analysis identifies potentially applicable methodologies and best practices for the unique challenge of post-war reconstruction in Syria, considering the interplay with pre-existing natural disasters and ongoing conflict. Subsequently, the review shifts focus to a rigorous assessment of the primary challenges encountered in managing post-disaster physical building reconstruction, followed by a meticulous analysis of the critical factors impacting this process. Drawing upon reference data and statistics gleaned from available documentation and datasets concerning the damage inflicted upon Syria's built physical environment, this focused analysis underscores the unique challenges, complexities, and specific needs of the Syrian context. Notably, the chapter concludes by emphasizing the critical absence of methodologies, plans, and strategies for rebuilding both the physical and non-material environments within Syria, highlighting the pressing need for the development of a comprehensive and context-specific reconstruction framework.

The third chapter of thesis examines the complexities of post-war reconstruction through six meticulously analyzed case studies. Despite their context-specific nature, these case studies reveal transferable methods for successful rebuilding. Employing a qualitative, heuristic approach, the analysis rigorously explores strengths, weaknesses, priorities, and challenges within each case. Rotterdam's in the Netherlands after World War II resurgence showcases the power of modern urban planning, green spaces, and pedestrian-friendly design for creating resilient, livable cities. While L’Aquila’s, Italy, post-earthquake journey highlights the delicate balance between historic preservation

and earthquake-resistant construction, offering insights into innovative retrofitting and community-driven approaches. The Erzincan, Turkiye, case reveals the reshaping of a built environment with an emphasis on seismic resilience, including relocation for enhanced long-term safety. In contrast, Latin America's Valdivia, Chile, prioritizes resilient waterfronts and sustainable infrastructure, integrating disaster risk reduction into its reconstruction. Kobe, Japan, known for its seismic technology leadership, emphasizes community needs and open spaces in its post-quake transformation. Lastly, finally sixth case study from India, Gujarat's recovery reveals the potential of owner-driven reconstruction and the power of collaborative community processes.

By meticulously comparing and contrasting these diverse case studies across geographical and cultural settings, the research identifies key factors contributing to successful reconstruction, unveils potential pitfalls, and extracts transferable solutions applicable to various contexts. This rich tapestry of knowledge informs future research, policy interventions, and initiatives aimed at identifying common challenges and solutions for post-war reconstruction. The accumulated insights eventually contribute to the development of a comprehensive strategy for rebuilding the physical built environment in Syria, drawing upon the valuable lessons learned from these diverse global experiences.

The concluding chapter of this study delves into the multifaceted Syrian context, marked by over a decade of political, economic, and social turmoil under various governing bodies. Notably, violence persists in several regions even at the time of research. The analysis exposes the acute shortage and inadequacy of laws governing reconstruction planning, decision-making, and management procedures.

Drawing upon these findings, the study proposes comprehensive recommendations at all levels local, regional and national. The creation of an independent body dedicated to post-disaster planning stands as the cornerstone of these proposals. Additionally, the research emphasizes the need for multi-level damage assessment criteria and measures, encompassing village to national levels, to ensure thorough evaluation. Collaboration with national and international NGOs is advocated to promote

transparency, combat corruption, address financial limitations, and optimize resource utilization.

Building community capacity through targeted training programs is highlighted, aiming to empower informed and resilient citizens capable of active participation in reconstruction processes. The study further encourages bottom-up approaches, advocating for community involvement in planning, prioritization, and measurement design. Recognizing the need for further research, the study emphasizes exploring policy development opportunities to enhance sustainability, resilience, and rebuilding efforts within post-disaster plans. This, in turn, will equip government institutions with better tools to mitigate and minimize the effects of natural and man-made disasters.

Finally, acknowledging the diverse geographical, social, and demographic characteristics across Syrian regions, the study underlines the importance of future research focusing on additional experimental areas. Representative selection based on geography, politics, and ethnicity, alongside stakeholder participation in planning and decision-making, is deemed crucial to ensure the sustainability of resources and the design of flexible frameworks adaptable to each region's specific context.

## 1.1 Definition of physical built environment

The physical built environment encompasses the tangible and constructed elements of human surroundings, constituting the spatial context in which individuals live, work, and engage in various activities [1] [2]. It includes:

- Buildings: Homes, offices, commercial centers, schools, hospitals, etc.
- Infrastructure: Roads, bridges, railways, airports, power grids, water and sanitation systems.
- Public spaces: Parks, plazas, streetscapes, sidewalks, recreational areas.

Landscaping and natural features: Trees, vegetation, waterways integrated into urban spaces, and that collectively shape the urban and rural fabric.

The built environment is a multidimensional concept, encompassing not only buildings and physical structures but also the arrangement, design, and organization of spaces [3]. As defined by the World Health Organization (WHO), the built environment significantly influences public health, social interactions, and overall well-being. Researchers such as Francis and Lorenzo [4] highlight the role of the built environment in shaping human behaviors, lifestyle patterns, and community dynamics. Moreover, the American Planning Association (APA) emphasizes the environmental, economic, and social aspects of the built environment, emphasizing the need for sustainable and resilient urban and rural development [5]. Understanding the physical built environment is crucial for effective urban planning, disaster resilience, and post-disaster reconstruction, as it directly impacts the quality of life and the sustainable development of communities.

Furthermore, the built environment transcends its physical form, carrying historical and cultural significance that reflects the values and priorities of the communities that created them [6]. Understanding these diverse layers enriches our comprehension of the built environment's influence on human experience and behavior.

In conclusion, the physical built environment encompasses all human-constructed elements that shape our daily lives. From individual structures to their interconnected systems and socio-cultural dimensions, the built environment exerts a profound influence on our health, behavior, and experiences. Studying and understanding this complex and dynamic system is crucial for creating thriving and sustainable communities for the future.

## 1.2 Importance of physical built environment reconstruction

In the wake of natural or human-induced disasters, the imperative for post-disaster physical built environment reconstruction (PBER) emerges as a vital component of community recovery and resilience [7]. PBER encompasses the rehabilitation and reconstruction of infrastructure, buildings, public spaces, and other physical elements essential to urban functionality [8]. Its overarching aims are to restore livability, resilience, and sustainability, empowering affected communities to reclaim and rebuild their lives [9]. This multi-faceted endeavor necessitates collaboration between diverse

stakeholders, including government agencies, NGOs, communities, and private entities, throughout the planning, coordination, and execution of reconstruction efforts [10].

The scope of PBER varies depending on the disaster's nature and scale. It may involve repair or rebuilding of damaged infrastructure like roads, bridges, water supply systems, and housing [8]. Additionally, urban planning and design interventions become crucial, incorporating disaster risk reduction, environmental sustainability, and social equity considerations to enhance resilience, livability, and long-term economic development [11].

The success of any reconstruction effort depends not only on well-managed built environment planning but also on broader factors like good governance, equitable distribution of resources, and inclusion of affected populations in the process. After examining the definition and crucial role of managing the reconstruction of physical structures following wars and disasters, it becomes clear that effective management has far-reaching impacts critical to successful rebuilding. These impacts manifest at various levels and significantly influence several key aspects of recovery, including:

- Humanitarian and Social Imperatives: Disaster-stricken communities face immense vulnerabilities, including lost homes, livelihoods, and services. Timely and targeted PBER efforts provide necessary support like temporary shelter, clean water, sanitation, and other essentials, contributing to restoring safe and livable conditions, ultimately fostering community well-being and social recovery [12]; [13].

- Economic Recovery and Development: Urban centers serve as economic engines, and disasters can cause severe disruptions. Effective PBER revitalizes local economies by rebuilding crucial infrastructure like roads, ports, and utilities, which stimulates employment opportunities and revives markets [8]. Furthermore, incorporating sustainable urban planning principles fosters long-term economic growth and resilience [14].

- Prioritizing Environmental Sustainability and Resilience: Disasters often inflict significant environmental damage. Sustainable PBER prioritizes restoring and protecting natural resources, mitigating environmental risks, and enhancing resilience to future events through incorporating green infrastructure, sustainable building practices, and disaster risk reduction measures [15]; [16]. This leads to the creation of more environmentally sustainable and resilient urban areas.

- Governance and Institutional Capacity Building: Robust governance and institutional capacity at various levels are crucial for effective PBER. This involves inter-stakeholder coordination, resource allocation, decision-making, and monitoring of reconstruction activities [17]. Managing PBER effectively contributes to stronger governance by enhancing transparency and accountability, promoting participatory decision-making, and building institutional resilience for future challenges [18].

- Learning from Past Experiences and Improving Future Disaster Management: PBER presents an opportunity to learn from past experiences and improve future disaster management. Monitoring and evaluating PBER outcomes, identifying successes and challenges, and incorporating lessons learned into disaster management plans and policies contribute to evidence-based approaches, leading to more resilient and sustainable urban environments [9]; [19].

In conclusion, managing PBER for humanitarian, economic, environmental, governance, and learning imperatives holds immense significance. It empowers communities to recover, revitalizes economies, fosters environmental sustainability, strengthens governance, and lays the foundation for more resilient urban fabric in the aftermath of disasters. By prioritizing sustainability, strengthening governance and institutional capacities, and incorporating lessons learned for future disaster management, PBER can ensure that communities not only rebuild, but build back better than before.

## 1.3 Overview of the situation in Syria

### 1.3.1 Background

Syria presented a geographically diverse tapestry encompassing 187,437 square kilometers. Its Mediterranean coastline offered access to the sea and fertile plains [20]. The Anti-Lebanon and Jabal al-Arab mountain ranges provided cooler climates and diverse vegetation [21]. The vast Syrian steppe dominated the east, characterized by arid plains and rolling hills, while the southeast housed the Syrian Desert, known for its harsh climate and scattered oases. In 2011, Syria boasted an estimated population of 20.8 million, ranking 37th globally [22].




**Figure 1.1** Governorates of Syria map [23]

Urbanization was steadily increasing, with around 52% of the population residing in major urban centers like Damascus (capital), Aleppo, Homs, Hama, and Latakia [22].

The remaining 48% lived in rural areas, primarily concentrated in fertile agricultural regions like the Ghab Valley and the Jazira plains [22]. Syria was divided into 14 governorates, each with its own administrative center and varying degrees of urban and rural populations [24].

Rural communities primarily engaged in agriculture, with wheat, cotton, and olives being key crops [22]. However, many faced challenges like limited infrastructure, water scarcity, and unemployment [22]. Urban areas served as hubs for commerce, industry, and services. Aleppo was a major industrial center, while Damascus housed government institutions and cultural centers [22].

The pre-conflict Syrian economy relied on various sources. Significant oil and gas reserves contributed to government revenue and exports [24]. Agriculture accounted for roughly 20% of GDP and employed a large portion of the workforce [22]. Tourism, particularly cultural and historical sites, was a growing sector before the conflict [22]. Syria participated in regional trade agreements and exported goods like textiles, food products, and chemicals [22]. In 2010, Syria's GDP was estimated at $62.6 billion, ranking 61st globally [22].

### 1.3.2 Syria's administrative structure

Prior to the 2011 conflict, Syria's administrative structure comprised of 14 governorates (muhafazat), each serving as a regional unit with its own capital city [24]. These governorates, including Damascus (housing the national capital), Aleppo, Homs, Hama, and Latakia, acted as key centers for local governance and resource allocation [22]. Further subdivisions within each governorate ensured the effective management of diverse territories and populations.

Each governorate was further segmented into districts (manatiq), typically encompassing towns and villages within their jurisdiction [24]. The number of districts varied based on population density and geographic features, with larger and more populated governorates containing more districts [22]. To ensure granular administration, these districts were further subdivided into subdistricts (nawahi), providing localized management structures [24].

Damascus Governorate operated with a unique structure within this system. Several districts resided within the city itself, while the surrounding rural areas fell under the separate Rif Dimashq Governorate [24]. Additionally, some governorates housed autonomous or semi-autonomous administrative units, such as the Jabal al-Arab region within As-Suwayda Governorate, a region predominantly inhabited by the Druze minority group [21].

It is crucial to acknowledge that administrative boundaries and structures are not static. While this description accurately reflects the pre-2011 situation, the Syrian conflict has drastically altered the country's governance and territorial control. Recognizing these complexities is essential when researching or referencing administrative divisions in the context of contemporary Syria.

### 1.3.3 Pre-conflict the organization and structure of decision-making

Understanding the real structure of decision-making in Syria remains complex and challenging due to the ongoing conflict and the fragmented nature of governance. However, by analyzing the pre-conflict situation and the subsequent shifts, we can gain a more nuanced picture.

Prior to 2011, Syria operated under a centralized decision-making structure dominated by the Ba'ath Party [25]. The President, typically the party leader, held significant power to appoint officials, enact policies, and control key institutions [26]. Despite a multi-party system, opposition parties lacked real influence, and political decision-making remained largely confined to the Ba'ath Party leadership [27]. Alongside formal institutions, informal networks and powerbrokers also influenced decision-making, particularly at the local level. This often-involved influential families, regional figures, and security officials [25].

### 1.3.4 Disaster management regulations and laws in pre-conflict Syria

Disaster management regulations and laws are critical for countries to effectively prepare for, respond to, recover from, and reduce disaster risks. These frameworks typically outline the roles and responsibilities of government agencies, coordination

mechanisms, resource allocation strategies, and measures to mitigate the impact of disasters on local communities [28].

In pre-conflict Syria, disaster management efforts were likely guided by a combination of laws, policies, and international frameworks, as Syria was a signatory to the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. However, specific details related to these regulations and laws are not transparent and are not easily accessible due to the restrictions imposed on comprehensive documentation and access to information, particularly during the ongoing conflict.

Syria has experienced various natural disasters, including earthquakes, droughts, and floods. The drought of 2006-2010, in particular, was a significant disaster, along with the collapse of the Zezoun dam and the terrible Kahraman Maraas earthquake of 2023, which occurred during the armed conflict that began in 2011. The response to these disasters has highlighted several shortcomings in preparedness and mitigation strategies. One of the main issues was the lack of comprehensive drought monitoring tools and early warning systems. The Civil Defense Authority is the competent body for rescue operations, but it is insufficiently trained to respond to all types of disasters. Additionally, the competent committee for the management and coordination of Disaster Response Operations is formed simultaneously by several ministers without prior plans and a clear methodology for managing disasters, with little response to community participation. These experiences have shown the failure of the top-down approach to adequately meet the specific needs of the affected population, resulting in inefficient allocation of resources and limited effectiveness of relief efforts.

## 1.4 Justification and context

The Syrian conflict, erupting in 2011, has cast a long shadow on the country's physical landscape, leaving scars on both urban and rural areas and crippling its vital infrastructure.

The reconstruction of Syria's physical built environment presents a complex undertaking, interwoven with the legacies of pre-existing socio-economic challenges,

the damage caused by the conflict, and the compounding effects of natural disasters that have happened before and during the conflict. Addressing this complex task demands a comprehensive, integrated approach that acknowledges the complex interplay of these factors.

Before the 2011 conflict, Syria grappled with vulnerabilities like poverty, inequitable resource distribution, and rural-urban migration [29]. These underlying fractures exacerbated the war's impact, pushing a fragile system towards collapse. Urban centers like Aleppo, Homs, and Deir ez-Zor endured intense shelling and bombardments, leaving over 40% of urban infrastructure damaged or destroyed [22]. Millions fled their homes, seeking refuge internally or abroad [30]. Rural areas also suffered, with ravaged agricultural land and food insecurity [31]; [32].

The Syrian war has inflicted devastating damage upon the nation's physical built environment, with profound repercussions for its people and economy. Housing losses are massive, with over 3.5 million units partially damaged or destroyed [33]. Cities like Aleppo have been particularly hard-hit, with an estimated 50% of their housing stock destroyed [34]. Critical infrastructure has also been decimated. Over half of schools are damaged or unusable [35], and a similar proportion of hospitals are severely damaged or inoperable. Water and sanitation systems are compromised, hindering recovery and impacting public health. The economic cost of this destruction falls between $250-$400 billion (estimates vary), far surpassing Syria's pre-war GDP. The Syrian economy has been ravaged, with an estimated 60% contraction in GDP, further crippling its construction industry and impeding rebuilding efforts. This humanitarian crisis is evident in the staggering numbers of displaced people: 6.8 million Syrians remain internally displaced and an additional 5.7 million are refugees within neighboring countries or globally [30]. This influx places immense strain on cities and their limited resources. It's important to note that data collection during active conflict is hampered, and true costs may be even higher. Moreover, the long-term economic and social ramifications of this devastation will be felt for decades to come.

Reconstruction efforts now face a multitude of interconnected challenges. Essential services like transportation, energy, and water require extensive restoration [22]. The

conflict fractured communities, displacing populations and disrupting social fabric, necessitating efforts to address social needs and foster reconciliation. Widespread destruction and population displacement have crippled the Syrian economy, hindering recovery and development. Additionally, the conflict and natural disasters have taken a toll on the environment, necessitating sustainable reconstruction practices.

Given this complex interplay, fragmented solutions are inadequate. A comprehensive, integrated approach is required, prioritizing humanitarian needs like shelter, food, and healthcare [22]. Reconstruction efforts must involve and benefit all communities, fostering social cohesion and equity. Rebuilding infrastructure and services must incorporate green practices and disaster risk reduction strategies for long-term resilience.

Reconstructing Syria's physical built environment is an important task, fraught with challenges. Recognizing the complex context, prioritizing humanitarian needs, and adopting an integrated, inclusive, and sustainable approach are critical for success. By collaborating with the Syrian people and prioritizing long-term peace and development, the international community can play a vital role in supporting Syrians in rebuilding their lives and creating a brighter future.

In summary, the Syrian conflict has had a significant impact on the physical built environment, rural areas and infrastructure, resulting in significant damage and loss of life. Considering that the cost of rebuilding and repairing infrastructure and services is estimated at billions of dollars to enrich the Syrian capabilities is not enough to do this work alone, adding that addressing the environmental impact of the conflict will take years, which cannot be counted until after the end of the conflict and the return of full stability, with the development of a comprehensive integrated strategic plan of action.

## 1.5 Statement of need and research rationale

The Syrian conflict wreaked havoc on the country's urban environment. Devastation of the housing stock is exemplified by the loss of over 3.5 million units and the staggering destruction of nearly 50% of Aleppo's housing [34]. The decimation extends to critical infrastructure: 53% of schools are damaged or destroyed [35],

crippling education, while 40% of hospitals are inoperable or heavily damaged [34], severely compromising healthcare. Disruptions to water and sanitation systems create further health hazards, hampering recovery efforts, necessitating immediate action towards peace and reconstruction. This study addresses the immense challenge of post-disaster urban regeneration, conceptualizing it as an integral phase within the urban life cycle [36]. It focuses on analyzing effective strategies applicable across all stages of this process, encompassing proactive short-term recovery, and long-term rebuilding [37].

Recognizing the inherent dynamism of reconstruction programs, the study acknowledges the complex interplay of challenges encompassing time constraints, cost implications, stakeholder disagreements, and diverse implementation options [38]. Furthermore, it emphasizes the unique context of each urban area within Syria, with each possessing distinct socio-cultural and historical characteristics significantly impacted by the conflict [39]. Therefore, the study advocates for context-specific approaches that not only mitigate negative effects but also implement well-planned reconstruction strategies [40].

These strategies should prioritize integrated project development culminating in a sustainable urban plan that preserves city identity, human heritage, and intergenerational equity [41]. Consequently, participatory decision-making emerges as a key principle, ensuring that reconstruction serves the broader needs and aspirations of affected communities [42].

Acknowledging the multifaceted nature of reconstruction funding, the study highlights the need for a coordinated platform to manage engagement with diverse international and local contributors [20]. This platform would act as a vital intermediary, streamlining activities, facilitating effective response, and fostering transparent implementation of reconstruction projects. It would primarily guide the process towards achieving established goals within the reconstruction plan, mitigating the risk of individual decision-makers prioritizing personal or political agendas over community well-being [43].

## 1.6 Research Questions

### 1.6.1 Physical reimagination

How do post-disaster reconstruction plans shape the future physical built environment of impacted urban areas?

### 1.6.2 Contextualized reconstruction

How are reconstruction approaches chosen for specific urban contexts? What methodologies effectively address the diverse challenges arising from different disaster types and impacts?

### 1.6.3 Tailored strategies for Syria

Which reconstruction strategy is most suitable for implementation in Syria, considering its regional and rural variations, as well as the diverse city sizes (large, medium, and small)? Definition of post-disaster physical built environment reconstruction

## 1.7 Aim of the research

This research aims to develop a comprehensive framework for sustainable post-conflict urban reconstruction specifically tailored to the Syrian context. This framework will prioritize the preservation of urban identity, cultural heritage, and human history, while simultaneously promoting environmental sustainability and fostering community resilience Research objectives

## 1.8 Objectives of the desired strategy (research objectives)

The devastating conflict in Syria has inflicted immense damage upon its physical built environment, erasing centuries of history and cultural heritage. In the face of this immense challenge, and to achieve of the aforementioned aim of developing a framework for the reconstruction in Syria, different research objectives are achieved:

### 1.8.1 Key Components of the framework

Preserving Identity and Heritage: The framework will emphasize the critical role of historical preservation in post-conflict reconstruction. This includes strategies for the restoration of damaged structures, the documentation of intangible cultural heritage, and the engagement of local communities in shaping the reconstruction process [44].

### 1.8.2 Environmental sustainability

Recognizing the increasing frequency and intensity of natural disasters, the framework will incorporate green building practices, promote climate-resilient infrastructure development, and prioritize resource efficiency throughout the reconstruction process [7]; [45].

### 1.8.3 Flexibility and adaptability

Acknowledging the diverse needs and contexts of different Syrian cities and communities, the framework will be designed to be adaptable and flexible. This will allow for customization based on local priorities, cultural specificities, and available resources [46]; [43].

### 1.8.4 Stakeholder collaboration

The framework recognizes the importance of collaboration among diverse stakeholders, including local communities, government agencies, international organizations, and private sector actors. This collaborative approach will ensure inclusive decision-making, efficient resource allocation, and effective implementation of reconstruction projects [47].

### 1.8.5 Community empowerment

The framework will prioritize community participation and empowerment throughout the reconstruction process. This will involve capacity building initiatives, skills development programs, and inclusive decision-making mechanisms, ensuring that communities actively shape their own future and build resilience for the long term [48]; [45].

### 1.8.6 Planned outcomes

The framework will empower Syrian communities to actively participate in the reconstruction process, build resilience to future challenges, and create vibrant and sustainable urban environments that reflect their unique identities.

## 1.9 Research significance

This research holds potential significance across various domains, particularly in light of the critical situation in post-war Syria:

### 1.9.1 The importance of proactive planning and preparation

proactively developing reconstruction plans for the physical built environment, specifically in regions with elevated disaster risk. This emphasis aligns with frameworks and concepts promoted by international bodies that advocate for the integration of developmental goals, sustainability, and adaptability. Success depends on customizing these plans to reflect the unique environmental, social, and local conditions of each nation or region.

### 1.9.2 Informing policy and practice

#### *1.9.2.1 Tailored approaches*

The research develops a framework specifically tailored to Syria's unique context, considering its war-torn history, cultural heritage, and diverse urban landscapes. This contextualized approach contrasts with generalized guidelines, offering more relevant and actionable insights for policymakers and practitioners working on Syria's reconstruction. [44]

#### *1.9.2.2 Best practices and innovation*

By analyzing case studies and Syrian-specific initiatives, the research identifies best practices, innovative solutions, and lessons learned. This knowledge dissemination can

inform decision-making and improve the effectiveness, efficiency, and ultimately, the social and economic well-being of affected communities. [40]; [43].

### 1.9.3 Bridging knowledge gaps

#### *1.9.3.1 Post-conflict reconstruction*

While extensive research exists on post-disaster reconstruction, the specific challenges and nuances of conflict-affected environments like Syria often receive less attention. This research delves into the complexities of post-conflict physical built environment reconstruction, addressing knowledge gaps and enriching the understanding of this critical field. [43]; [49]

#### *1.9.3.2 Community-centric approach*

Existing research often overlooks the central role of communities in post-conflict reconstruction. This research prioritizes community participation and empowerment, addressing gaps in knowledge and contributing to more inclusive and sustainable reconstruction practices. [47]; [45]

## 1.10 Research scope and limitations

This research acknowledges several limitations inherent to studying post-war reconstruction in Syria, arising from the ongoing conflict and its multifaceted challenges:

### 1.10.1 Limited data access

#### *1.10.1.1 Accessibility restrictions*

The continuous conflict and presence of multiple controlling forces across Syrian regions limit physical access to many areas, hindering data collection efforts [50].

#### *1.10.1.2 Transparency concerns*

The lack of transparency and potential for corruption within various administrations pose challenges in obtaining accurate and verifiable data [51].

### 1.10.2 Data relevancy and availability

#### *1.10.2.1 Scarcity of recent data*

The ongoing conflict often restricts data gathering, resulting in outdated information not fully reflecting the current state of damage caused by war and natural disasters [52].

#### *1.10.2.2 Reliance on secondary sources*

The research necessarily relies on scientific studies, reports from international organizations (e.g., UN Habitat, World Bank), and non-governmental organizations (e.g., NRC, CARE), acknowledging the potential limitations inherent in secondary data sources.

By recognizing and addressing these limitations, the research seeks to contribute valuable insights into post-war reconstruction in Syria, despite the inherent challenges presented by the complex and evolving situation.

## 1.11 Research methodology

This research delves into the intricate task of physical built environment reconstruction in Syria, employing a qualitative, deductive approach informed by a mixed-methods data collection strategy. Recognizing the unique challenges and opportunities presented by the ongoing conflict and its aftermath, the research framework is specifically tailored to the Syrian context. To achieve research objectives, the research establishes a robust conceptual framework defining key terms like "disaster management," "post-disaster reconstruction," and "physical built environment reconstruction (PBER)" within the Syrian context.

By recognizing and addressing limitations, the research seeks to contribute valuable insights into post-war reconstruction in Syria, despite the inherent challenges presented by the complex and evolving situation., the research implements following methodology:

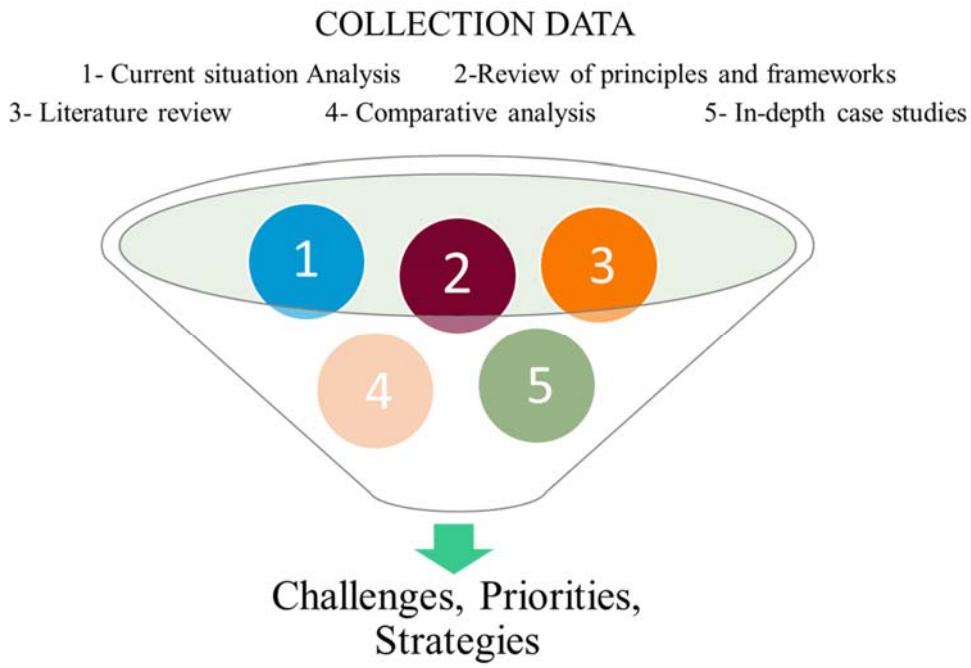



**Figure 1.2** Research methodology (author own work)

- Utilize multiple data sources

By triangulating data from various sources, cross-checking information, and critically evaluating its provenance, the research aims to enhance its reliability and representativeness.

- Acknowledge uncertainties

The research transparently acknowledges the limitations of the available data and the potential uncertainties in its conclusions, promoting responsible and nuanced interpretations. This shared understanding lays the groundwork for a comprehensive and evidence-based analysis. A diverse set of data collection methods are employed:

### 1.11.1 Current situation analysis

By analyzing and reviewing the current situation in Syria, and identifying the deficiency in laws and applications, we get at determining the challenges and priorities. Therefore, we can determine the best solutions and strategies.

### 1.11.2 Review of principles and frameworks

After reviewing the current situation and reviewing the principles, frameworks and concepts governing the management of reconstruction operations in the world, as well as reviewing the classifications, it is possible to reach a clear and comprehensive picture of what can be done in the future, and determine what is best and most appropriate for each region separately.

### 1.11.3 Literature review

A systematic examination of academic literature, policy documents, and relevant reports from NGOs and international organizations provides the theoretical foundation and global context for post-disaster reconstruction practices.

### 1.11.4 Comparative analysis

By comparing and contrasting reconstruction approaches implemented in diverse world cities and regions, the research identifies effective strategies and contextual nuances influencing their success.

### 1.11.5 In-depth case studies

Detailed analyses of select successful reconstruction cases studies in the world offer a deeper understanding of best practices, their strengths and limitations, and their adaptability to different contexts.

Through strategic triangulation of data obtained from these diverse methods, the research aims to achieve a rich and multifaceted understanding of the challenges, strategies, and priorities for managing post-war physical built environment reconstruction in Syria. This comprehensive approach will contribute to evidence-based recommendations for building robust, sustainable, and built environments across the country, ultimately fostering long-term peace and prosperity.

# CHAPTER 2

## LITERATURE REVIEW

A comprehensive review of scholarly studies and research on the topic of reconstruction the physical built environment in the aftermath of war and disaster reveals four main categories of inquiry. The first category includes research efforts aimed at precisely defining the concept of PBER and summarizing the most significant findings of researchers in this field. The second category consists of studies focused on identifying the challenges associated with managing reconstruction operations to developing effective strategies tailored to specific regions and situations. The third category encompasses studies and research related to frameworks, concepts, and methods for establishing priorities in reconstruction operations, with a particular emphasis on the built physical environment. The final category includes studies concerned with formulating and constructing strategies and regulatory frameworks suitable for each country or region in the post-disaster recovery phase, whether the disaster is natural or man-made, and extending to get development, growth, Sustainability, and societal stability.

Through the review of these researches, in the four categories, thesis examined the research that has been done on the reconstruction of the physical built environment in Syria, including the proposals and strategies that have been formulated and built according to the opinions of researchers, while assessing the challenges and priorities that have been reached by others, whether at the rural level, a particular city, or even at the level of the entire country.

### 2.1 Syrian conflict's impact on the physical built environment

Before the 2011 conflict, Syria exhibited a distinct dichotomy between its urban and rural areas, each characterized by unique demographics, economic activities, and challenges.

Syria witnessed rapid urbanization, with approximately 52% of the population residing in cities in 2011 [22]. Major urban centers like Damascus, Aleppo, Homs, Hama, and Latakia served as economic and cultural powerhouses, attracting migrants seeking opportunities in commerce, industry, and services [24].

The pre-conflict urban-rural divide in Syria was a complex issue with historical roots. While urbanization offered economic opportunities and social mobility, it also exacerbated existing disparities and contributed to challenges in rural areas. Understanding this dynamic is crucial for comprehending the social and economic landscape of Syria before the conflict and its lasting impact.

The Syrian conflict, erupting in 2011, has cast a long shadow on the country's physical landscape, leaving scars on both urban and rural areas and crippling its vital infrastructure. This academic analysis examines the key impacts of the conflict, drawing upon supporting statistics and relevant references.

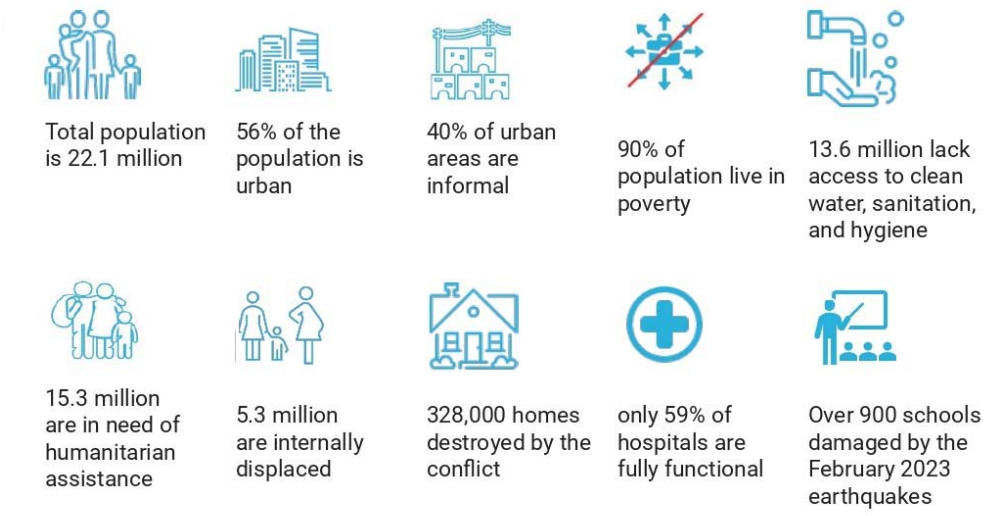



**Figure 2.1** Conflict and earthquake impact on Syrian's sectors [34]

Since 2011, the economy has shrunk by more than 60 % due to a series of massive and successive shocks brought about by the widespread destruction of infrastructure and housing. Over 58% of households reported accessing only three to eight hours of

electricity per day, while almost one million people only had access to their primary water source between two and seven days per month in June [34].

## 2.2 Defining the concept of PBER

The concept of Physical Built Environment Reconstruction has been the focus of numerous studies and research papers in recent years. Post-disaster and post-conflict reconstruction of the physical built environment is a multifaceted concept attracting growing attention from scholars, practitioners, and policymakers. At its core, it encompasses the complex processes of restoring and reinvigorating spaces, structures, and infrastructure following catastrophic disruptions.

Quarantelli in his opinion, the early definitions of built environment reconstruction often centered on technical aspects like re-establishing buildings and infrastructure systems [53]. However, contemporary perspectives have widened, emphasizing a more holistic and human-centered approach [20]. The World Bank (2023), for instance, highlights the interplay of physical structures, social systems, and economic well-being within reconstruction efforts [54].

Modern definitions frequently stress resilience and sustainability. Researchers like Fantilli et al. [55].argue that successful reconstruction cannot merely recreate the pre-disaster-built environment but should build back better, enhancing resilience to future shocks and facilitating long-term sustainability. This paradigm shift underscores the opportunity within reconstruction to improve environmental practices, incorporate disaster risk reduction measures, and address vulnerabilities that may have contributed to the original devastation.

Furthermore, increasing emphasis is placed on understanding the socio-cultural dimensions of the built environment. Twigg at 2007 posits that spaces and buildings carry meaning, shaping communities' identities and sense of place. Therefore, effective reconstruction needs to go beyond material rebuilding and include a sensitive understanding of local cultural values and a restoration of the social fabric along with the physical one [56].

Lyons said community participation is highlighted as an essential component of this paradigm. Affected populations possess local knowledge crucial for successful reconstruction. Contemporary theories advocate for inclusive processes that give affected communities agency in shaping their rebuilt environment, fostering agency and social buy-in [57].

In conclusion, the concept of physical built environment reconstruction has evolved considerably. While technical aspects remain vital, a growing consensus positions resilience, sustainability, community participation, and a sensitivity to socio-cultural factors as essential dimensions for successful and transformative outcomes.

## 2.3 Identifying the challenges of PBER managing

The management of reconstruction following disasters and conflicts presents a daunting and complex undertaking. Scholarly works and practitioners' experiences consistently highlight a tapestry of challenges spanning financial, political, coordination, community participation, and technical spheres. These obstacles have the potential to significantly undermine effective rebuilding efforts, according to a lot of researcher and studies.

The OXFAM Annual Report 2022/23, along with the works of Pelling and Dill, point to funding shortfalls as a major impediment to post-disaster or post-conflict reconstruction. Reconstruction often exceeds the financial capacities of affected regions, creating a crucial need for external aid. However, securing and disbursing this aid in a timely and effective manner proves complex. Donor nations may have their own political agendas, which can clash with recipient needs. This, coupled with bureaucratic delays and a lack of transparent tracking mechanisms, can lead to inadequate resources reaching those who need them. [58] [59]. This shortfall leads to incomplete projects and risks prolonging existing vulnerabilities.

The article of Kennedy et al. provides insights into the complex interplay between conflict, reconstruction, and development, highlighting the need for a comprehensive approach that addresses the social, economic, and political dimensions of post-conflict reconstruction. Reconstruction unfolds amid potential political volatility. Competing

power agendas, shifting governmental structures, and opportunistic corruption all serve to derail progress and erode trust in institutions charged with leading rebuilding efforts [60]. While confirming the article by Lizaraldi et al. Fragmented coordination becomes another stumbling block as governments, NGOs and the private sector all seek to rebuild with different goals. The urgency of disaster recovery can conflict with the imperative of comprehensive needs assessments and comprehensive planning, which can lead to unbalanced efforts, waste of resources, and duplication [61].

Furthermore, balancing urgency with the need for genuine community participation poses a substantial challenge. Pressures to rebuild quickly can marginalize affected populations, reducing their influence and leading to solutions that fail to address the root causes of past vulnerability Lyon argues in his article [57]. While Twigg and others have emphasized that meaningful community engagement is vital to incorporate localized knowledge and foster buy-in, achieving this through inclusive processes faces practical constraints such as power imbalances and communication barriers [62].

The 2019 UNDRR report emphasized that reconstruction often involves complex technical and engineering obstacles, especially in disaster-prone areas. Building resilient infrastructure not only requires immediate solutions but also calls for innovation, hazard mapping, and risk assessment to protect against future events [63]. The opinion of Hosagrahar and Jyoti in the UNESCO magazine in the second issue of 2017 emphasized that this must be achieved while balancing environmental sustainability and, wherever possible, the preservation of cultural heritage [64].

In conclusion, the literature clearly demonstrates that managing post-disaster reconstruction is a multi-faceted problem. Financial limitations, political dynamics, inadequate coordination, the bypassing of community voices, and technical hurdles contribute to this inherent complexity. Successful navigation of these challenges demands a comprehensive approach drawing on research findings, evidence-based practice, and lessons from past experiences. It's only through this integrated understanding that policymakers, practitioners, and researchers can foster meaningful recovery.

## 2.4 Defining priorities in PBER operations

Prioritizing objectives within the complex sphere of disaster and conflict recovery constitutes a significant challenge. It's crucial to determine which aspects demand urgent attention in the chaotic aftermath of such disruptive events. Recent literature stresses the need to not only restore the status quo but also to enhance resilience and lay the groundwork for long-term sustainability.

Early scholarship often centered on rebuilding critical infrastructure like roads, power grids, and essential services [53]. While crucial, a solely infrastructure-focused approach can overshadow essential social and environmental considerations. More recent perspectives integrate community well-being into prioritization. Twigg argues that social cohesion, the restoration of local economies, and addressing underlying power imbalances are all key factors that influence resilient and long-lasting recovery [56].

Further emphasizing resilience, Fantilli et al. advocate for integrating disaster risk reduction (DRR) strategies into reconstruction planning [65]. Prioritizing the construction of hazard-resistant buildings and infrastructural upgrades aimed at reducing future impact are key concepts within this paradigm. However, scholars, Lizarralde and partners in them book, note that a balance needs to be struck between building resilient infrastructure and prioritizing swift restoration of services [66].

As shown in the report of the International Federation of Red Cross and Red in 2017,2018, Psychological and social recovery for survivors was recognized as an essential facet of successful reconstruction. Ignoring community trauma can profoundly hinder rebuilding and prevent a full return to normalcy [67]. Therefore, prioritization strategies must address not only physical restoration but also integrate community mental health services, foster collective healing, and offer strategies for addressing post-disaster shock.

United Nations organizations such as UNESCO and the United Nations disaster reduction organization, they stressed in their reports that addressing environmental sustainability in reconstruction is gaining great urgency, as reconstruction provides an

opportunity to implement flexible solutions, integrate environmentally friendly building practices and reduce environmental vulnerabilities in the future [63] [64]. The challenge lies in prioritizing these practices amid an urgent need for rapid restoration.

Community participation throughout the process of both setting priorities and implementation has emerged as a recurring theme in contemporary research. Recognizing that affected populations are the key stakeholders, studies Lyons, and Twigg et al., argue that top-down decision-making can fail to meet needs and create a sense of disenfranchisement. A focus on inclusivity allows for tailoring priorities to community concerns [57] [56].

In conclusion, prioritization in reconstruction is evolving away from purely technical focus on rebuilding damaged infrastructure to incorporate resilience, psychosocial well-being, environmental considerations, and community input. Current research underscores the interlinked nature of these facets, stressing that addressing priorities holistically fosters a more durable recovery capable of withstanding future disruptions while prioritizing a sense of collective community and environmental well-being.

## 2.5 Formulating PBER strategies and frameworks

In the aftermath of disasters or conflicts, the strategic rehabilitation of the physical built environment becomes a central focus for fostering recovery and increasing future resilience. A review of current scholarship highlights a shift away from ad-hoc reconstruction toward well-defined frameworks addressing critical considerations that shape and drive the rebuilding process.

Foremost, according on Lyons article; modern perspectives prioritize community participation in formulating strategies that address the specific needs of affected populations [57]. Integrating local knowledge with reconstruction expertise leads to solutions better equipped to support livelihoods, restore spaces vital to the community's social fabric, and mitigate displacement due to ill-fitting approaches. This participation extends beyond consultation – ideally, frameworks empower communities in driving rebuilding efforts, shaping their environment.

On the other hand, the “Build Back Better” (BBB) concept is frequently integrated into physical reconstruction [62]. It signifies a commitment to strengthening structures against future hazards, minimizing the potential impact of recurring events, and addressing structural weaknesses present before the disaster. This translates into strategies that leverage resilient construction methods, adopt innovative engineering solutions, and incorporate the latest in risk reduction research [68].

Environmental sustainability gains importance in discussions around rebuilding the physical built environment. Strategies now often integrate sustainable construction practices, prioritize disaster-resilient green spaces, and aim to reduce future environmental footprints [69]. The challenges lie in reconciling the potential conflict between urgent rebuilding with potentially slower but more eco-conscious rebuilding techniques, highlighting the need for adaptation within this framework.

A growing appreciation of pre-existing vulnerability guides strategic responses. Physical devastation is often exacerbated by social and economic disparities [70]. Therefore, the formulation of frameworks that recognize and address underlying inequities are essential to minimizing further marginalization during the rebuilding process. This awareness should inform priority decisions related to housing, social service restoration, and infrastructure investment to ensure a just and beneficial reconstruction.

Coordination mechanisms have gained focus as vital components within recovery frameworks. Disasters demand collaboration across government agencies, NGOs, the construction industry, and, as emphasized, local communities. Strategies emphasizing clear communication, well-defined responsibilities, and transparent management structures ensure that efforts are unified, reducing overlap and resource wastage [68].

Finally, Quarantelli informs that contemporary disaster preparedness strategies emphasize integrating pre-disaster planning and preparedness frameworks with those designed for post-disaster response [53]. This integration acknowledges that pre-planned recovery actions, such as streamlined damage assessment protocols, identified alternative supply routes, and even building design, facilitate efficient response actions and ultimately lead to an accelerated rebuilding process.

In conclusion, the research identifies that successful physical built environment reconstruction calls for strategic frameworks that move beyond merely restoring damaged structures. They must foster community-driven action, incorporate resilience, address societal vulnerabilities, prioritize sustainability, streamline coordination, and, where possible, draw from proactive pre-disaster planning. A holistic approach incorporating these considerations sets the stage for the regeneration of safe, livable,

# CHAPTER 3

## RECONSTRUCTION'S APPROACHES, TRENDS

The research in this section intends to review previous literature, providing a comprehensive look at recent research and highlighting the complexities of post-disaster physical built environment reconstruction. It aims to lay the foundation for a strong understanding of this field and establish comprehensive knowledge about the challenges and priorities of reconstruction management. To achieve this, understanding the comprehensive classification, complexity, and inherent dynamics of disasters is crucial. By doing so, researchers, policymakers, decision-makers, and communities can formulate more effective preparedness, response, and recovery strategies tailored to the specific nature of each disaster, leading to building stronger and better reconstruction strategies. Table 3.1 provides a clear and concise overview of the various disaster classifications [71] [72] [73].

The next step, after understanding disaster categories and to gain post-disaster reconstruction goals, is effective disaster management requiring a holistic approach addressing all stages of the cycle. Note that these stages may not always be linear and may overlap or occur simultaneously depending on the specific disaster. The following Table 3.2 provides a clear and concise overview of disaster management stages [74] [75].

In order to mitigate the effects of disasters and to manage them optimally to reach a sustainable built environment that resists and minimizes as much as possible its negative effects and human and material losses, and reduce the time and cost of reconstruction, there were several global concepts and frameworks that laid international foundations for this, we review them here only briefly:

**Table 3.1** Disaster type and categories

| Category | | Subcategories | Examples |
|---|---|---|---|
| **1** | Origin | Natural | Earthquakes, Tsunamis, Volcanic eruptions, Landslides, Mudslides, Avalanches, Hurricanes, Cyclones, Typhoons, Tornadoes, Blizzards, Heatwaves, Cold waves, Floods, Flash floods, Storm surges, Droughts, Water scarcity, Pandemics, Epidemics, Pest infestations, Algal blooms, Meteor impacts, Solar flares |
| | | Man-made | Chemical spills, Nuclear accidents, Oil spills, Explosions, building collapses, Dam breaks, Power outages, Transportation accidents, War, Terrorism, Cyberattacks, Sabotage, Overfishing, Deforestation, Air pollution, Water pollution |
| **2** | Scale | Global | Climate change |
| | | Regional | Major earthquakes |
| | | Local | Flash floods |
| **3** | Speed of Onset | Sudden onset | Earthquakes, Tornadoes |
| | | Slow onset | Droughts, Famines, Sea-level rise |
| **4** | Complexity | Single hazard | Hurricane |
| | | Multiple hazards | Wildfire fueled by drought and strong winds |
| | | Cascading disasters | Earthquake causing dam collapse and flooding |
| **5** | Additional Categorizations | Technological | Cyberattacks, Power outages, Space debris impacts |
| | | Socioeconomic | Economic crises, Food insecurity, Political instability |
| | | Public health | Disease outbreaks, Mass poisoning, Mental health crises |

**Table 3.2** Overview of disaster management stages

| Stage | | Phase | Key Elements | Importance |
|---|---|---|---|---|
| 1 | Pre-Disaster | Prediction | • Weather forecasting<br>• Seismic monitoring<br>• Data analysis and modeling | • Early warnings<br>• Resource allocation<br>• Reduced impact |
| | | Preparedness | • Developing emergency plans<br>• Conducting drills & exercises<br>• Strengthening infrastructure | • Swift & effective response<br>• Reduced fear & anxiety<br>• Built community resilience |
| | | Mitigation | • Building codes & land-use planning<br>• Early warning systems<br>• Public education & awareness<br>• Environmental protection | • Reduced risk<br>• Cost-effectiveness<br>• Empowered communities |
| 2 | During/post -disaster | Immediate Response | • Search & rescue<br>• Emergency relief<br>• Damage assessment & infrastructure restoration<br>• Coordination & resource | • Saving lives<br>• Reducing suffering<br>• Laying foundation for recovery<br>• Honoring heroes |
| 3 | Post-Disaster | Recovery & Rehabilitation | • Cleanup Infrastructure reconstruction<br>• Housing & shelter reconstruction<br>• Livelihood restoration & economic recovery | • Restoring hope & dignity<br>• Building back stronger<br>• Celebrating human spirit |
| | | Reconstruction | • Urban & rural planning<br>• Public buildings & infrastructure<br>• Cultural heritage & identity preservation<br>• Environmental restoration & sustainability | • Building back better<br>• Boosting economic activity<br>• Fostering resilience & unity |

- **Disaster reduction framework (Yokohama strategy):** 1994's Yokohama Strategy set 10 principles for global disaster risk reduction, emphasizing risk assessment, prevention, community participation, and international cooperation. It paved the way for future frameworks and continues to guide efforts for safer communities.

- **Hyogo framework of action (HFA):** In 2005, the Hyogo Framework united 168 countries to strengthen resilience against disasters over a decade. It prioritized reducing losses, addressing vulnerabilities, promoting proactive risk reduction, and fostering international cooperation. The five key action areas were national & local DRR priority, risk identification & assessment, building a culture of safety, reducing underlying risk factors, and strengthening disaster preparedness.

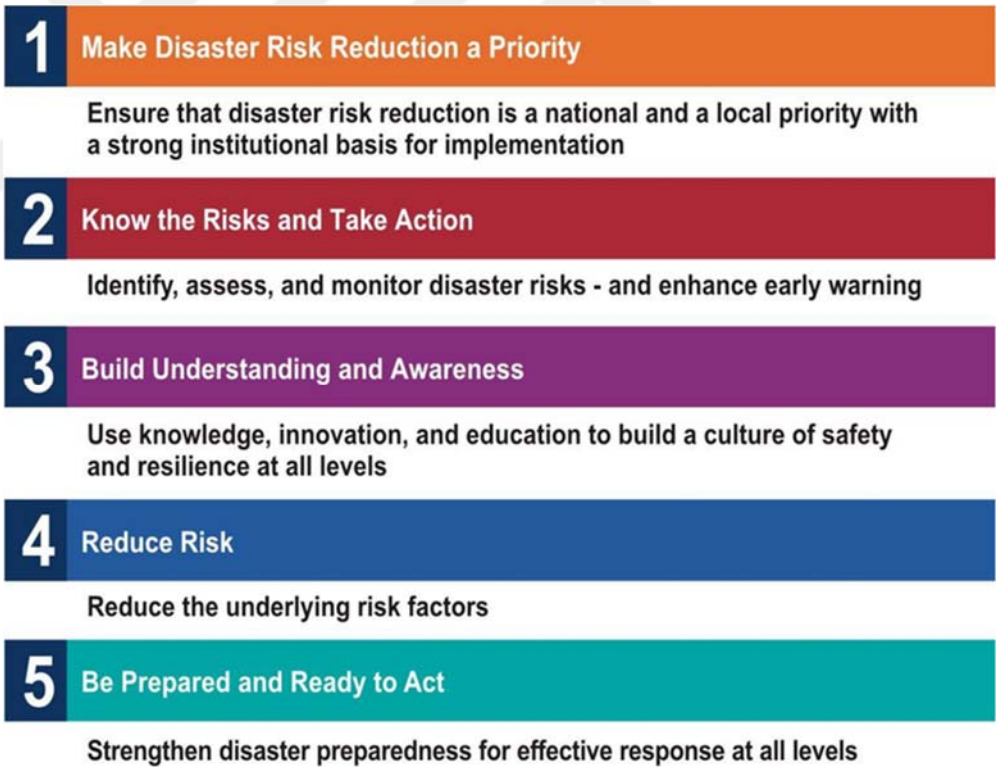



**Figure 3.1** Hyogo framework priorities for action

The HFA's legacy includes increased global DRR awareness, national & local DRR strategies, enhanced international cooperation, and paving the way for the

Sendai Framework. Although the timeframe has ended, its principles continue to guide global efforts towards building a more resilient world.

- **The Sendai framework for disaster risk reduction (2015-2030):** A landmark agreement ratified by 189 countries, provides a global blueprint for reducing disaster-related losses [37]. Building on the Hyogo Framework, it introduces critical paradigm shifts. These include an emphasis on proactive prevention, integrating disaster risk reduction (DRR) into sustainable development goals, empowering communities, and addressing climate change's amplifying effects [76]. It outlines seven targets and four priorities: targets focus on reducing mortality, losses, and enhancing early warning systems and international cooperation; priorities center on data-driven understanding of disaster risk, strong governance, proactive resilience-building investments, and enhanced preparedness [37].

The Sendai Framework specifically highlights the reconstruction phase. It prioritizes the "Build Back Better" principle, advocating for reconstructing not simply for a return to pre-disaster conditions, but to establish communities that are better equipped to withstand future disasters. This focus promotes incorporating elements of disaster-resilient building techniques, updated hazard mapping, and sustainable building practices. With its preventive focus, emphasis on local knowledge, and acknowledgement of interconnected drivers of vulnerability, the Sendai Framework signifies a shift toward a more holistic and proactive approach to disaster risk reduction aimed at safeguarding both lives and sustainable development gains.

## 3.1 Reconstruction policies

While post-disaster reconstruction has traditionally focused on restoring materially damaged infrastructure and Housing to enable the immediate resumption of livelihoods, it represents a unique opportunity to go beyond mere reconstruction. By adopting the principle of" rebuilding better", reconstruction can be used to improve living conditions, reduce the risk of future disasters, and reduce the vulnerability of society to specific risks [77]. However, navigating this complex endeavor requires careful consideration of various factors, including community preferences, available

resources, and the extent of damage. This section reviews the approaches to post-disaster reconstruction and implementation models, with their projection on the Syrian situation, with the aim of achieving a choice of the best in building the proposed strategy at the end of the research.

## 3.2 Reconstruction approaches

After disasters, choosing the right reconstruction approach is crucial. Many options exist, each with advantages and disadvantages. The best approach depends on factors like available aid, community involvement, and private sector potential. Key considerations include costs, safety, livelihoods, politics, culture, and community goals. Careful evaluation leads to a more effective, sustainable, and inclusive recovery.

For reconstruction Approaches a range of options exists, each with its own strengths and limitations:

### 3.2.1 Cash approach (CA)

The Cash Approach (CA) empowers individuals and communities in post-disaster reconstruction by providing direct financial assistance. This fosters ownership and flexibility in addressing diverse needs, but requires careful implementation to mitigate potential misuse and ensure equitable distribution. While CA may not directly contribute to large-scale infrastructure projects, its speed, economic stimulus, and adaptability make it a valuable tool for empowering communities and fostering sustainable recovery. [78]

In Nepal's 2015 earthquake reconstruction, the Cash Approach (CA) empowered families through direct financial aid, facilitating rapid repairs and fostering local economic recovery. While concerns like misuse of funds existed, careful implementation and community involvement mitigated risks, showcasing CA's potential for post-disaster empowerment and ownership. [79]

In conclusion, in the Syrian context, utilizing the Cash Approach (CA) solely for rural housing reconstruction within a mixed methodology holds potential for empowering communities and driving localized recovery. However, broader applicability across the

complex Syrian landscape requires careful analysis and integration with complementary reconstruction strategies.

### 3.2.2 Owner-Driven reconstruction (ODR).

Owner-Driven Reconstruction (ODR) stands out as a post-disaster approach prioritizing community agency and local knowledge. By placing homeowners at the decision-making forefront, ODR fosters ownership, cultural sensitivity, and accountability [80]. However, resource constraints, coordination challenges, and limited technical expertise pose potential hurdles [81], ODR can contribute to not only rebuilding homes, but also rebuilding lives [82].

In Nepal's 2015 earthquake, Owner-Driven Reconstruction project empowered over 800,000 families to rebuild homes, fostering ownership and cultural sensitivity [83].

ODR's potential in Syria sparks debate. While empowering and culturally sensitive, resource constraints, complex coordination, and varied technical expertise across regions raise concerns. So, the ODR approach it's not suitable for the specificities of the Syrian context.

### 3.2.3 Community-Driven reconstruction (CDR).

Community-Driven Reconstruction (CDR) prioritizes collective action and shared responsibility in post-disaster recovery. Communities actively participate through committees, managing rebuilding efforts and developing skills in construction and project management [80]. This fosters ownership, engagement, and ultimately, sustainable outcomes [84]. While capacity building and community organization require investment, CDR's long-term benefits for empowerment, inclusivity, and social cohesion make it a valuable approach [81]

Post-tsunami Aceh, Indonesia, utilized CDR, empowering communities to rebuild homes and infrastructure, fostering ownership and social cohesion [85].

While CDR's emphasis on community participation holds promise for Syria, its success hinges on addressing pre-existing divisions and building trust [86]. Tailored approaches within regions, considering local governance and social dynamics, will be crucial for effective implementation and equitable outcomes [87].

### 3.2.4 Agency-Driven reconstruction in-situ (ADRIS)

Agency-Driven Reconstruction In-Situ (ADRIS), though not yet operational, offers a hypothetical approach for post-disaster recovery. Led by external agencies, it focuses on in-situ reconstruction leveraging expertise and resources. While promising efficiency and coordination [20], concerns arise around limited local involvement and potential cultural insensitivity [84]; [86]. Despite these drawbacks, ADRIS presents opportunities for infrastructure upgrades, knowledge transfer, and faster implementation [88]. Ultimately, its effectiveness depends on context, community engagement, and addressing potential challenges. So, collaborative approaches like Community-Driven Reconstruction (CDR) might be more sustainable and community-driven in practice [81].

Following the Lebanese Civil War (1975-1990), Beirut's central district lay in ruins. Solider, a private firm with government backing, led reconstruction through an Agency-Driven Reconstruction In-Situ (ADRIS) approach. While praised for speed and efficiency, critiques emerged - limited community involvement, homogenized architecture, and disregard for cultural heritage [89]. This example highlights the potential benefits and pitfalls of ADRIS: efficiency with potential homogenization and community alienation. Balancing both in culturally significant areas like Beirut would be crucial for a successful implementation [80]

While ADRIS offers potential efficiency, applying it in Syria demands careful consideration. Limited local agency and cultural sensitivity concerns persist, as seen in Beirut's reconstruction [89]. Community-driven approaches might be more sustainable and inclusive for long-term recovery [81]. However, to speed up the process of reconstruction and recovery, the research suggests that this methodology

can be used to rebuild the destroyed infrastructure and city centers, including historical centers, but in partnership with local authorities.

### 3.2.5 Agency-Driven reconstruction in relocated site (ADRRS).

Agency-Driven Reconstruction in Relocated Sites (ADRRS) approach a hypothetical approach focusing on rebuilding in a new location. While promising comprehensive planning, infrastructure upgrades, and risk reduction [22], concerns arise about community resistance, cultural disruption, and limited local involvement [80]; [86]. While it could foster environmental benefits and economic development [81], displacement, infrastructure costs, and legal hurdles pose significant threats [84]. Ultimately, the context, community engagement, and addressing potential challenges are crucial for success [81]. Community-driven approaches like Community-Driven Reconstruction (CDR) might be more sustainable in practice [84].

let's consider a similar approach - the Aceh Reconstruction and Rehabilitation Board (BRR) post-2004 tsunami. Though not driven solely by external agencies, it involved significant international support and relocation of communities to safer areas. While praised for efficiency and improved infrastructure [20], critiques emerged around limited community agency and cultural insensitivity [80]. This example highlights the potential benefits of relocation combined with concerns about top-down approaches, underlining the importance of community engagement and cultural sensitivity in any reconstruction effort.

Applying ADRRS in Syria's complex context is fraught with challenges. Limited local agency and cultural sensitivity concerns remain, Community-driven approaches might offer more sustainable and inclusive solutions for long-term recovery.

## 3.3 Intervention trends for reconstruction

Post-disaster reconstruction is not simply about rebuilding bricks and mortar; it is about shaping the future identity of a place and the lives of its residents. As Alexander (2004) reminds us, planners must consider "people's physical, emotional and economic attachment to the place" when charting the course for reconstruction. While the

specific trends may differ depending on the disaster and context, broadly speaking, four guiding principles emerge: memory, oblivion, conservation, and new development [75]. These principles translate into four distinct reconstruction approaches:

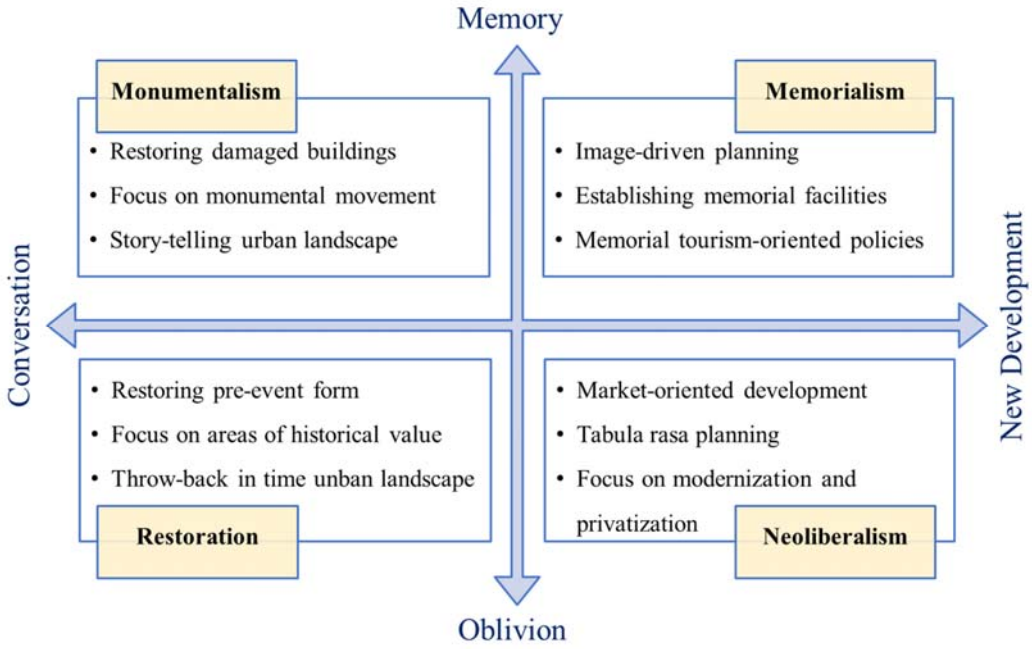



**Figure 3.2** Drivers to recovery and reconstruction restoration [75]

### 3.3.1 Restoration

Following disasters, restoration offers a unique approach, meticulously reconstructing damaged structures and landscapes to their pre-disaster state. This resonates with communities seeking to preserve cultural heritage, reconnect with their roots, and maintain a sense of identity [90]. Accurate documentation of architectural styles, construction techniques, and historical significance is crucial for faithful reconstruction, aided by advanced technologies like 3D laser scanning [91].

Warsaw's old town serves as a powerful case study. Launched in 1949, this project meticulously reconstructed 85% of the historic buildings, reviving Polish architectural heritage while aiming to remove war-imposed Western influences. However, critiques highlight the potential drawbacks of restoration, including cost, time constraints, and

neglecting present community needs. Additionally, focusing solely on the past might hinder adaptation to contemporary societal evolution.



**Figure 3.3** Warsaw's old town (1945-2020) [92]

Given Syria's intricate reconstruction challenges and the historical significance of its heritage sites, this research advocates prioritizing the "restoration" approach, particularly for UNESCO-listed sites. Unlike general reconstruction, restoration meticulously replicates pre-disaster states, preserving cultural legacies and identity. Viewing these sites as distinct from other sectors, like Aleppo's Old City, necessitates prioritizing this approach to rebuild structures, heal wounds, and honor the past.

### 3.3.2 Monumentalism

Post-disaster reconstruction extends beyond restoring the physical; it can involve the symbolic transformation of destroyed sites into monuments commemorating the past and its lessons. This "monumentalism" approach, distinct from restoration's focus on physical reconstruction, aims to heal communities, strengthen identity, and educate future generations through preserved remnants of destruction.



**Figure 3.4** From the west Berlin side, Berlin wall in 1986. (left) Berlin wall in 2023. (right) [173]

The Berlin Wall Memorial exemplifies this. The remaining 1.4 km stretch serves not just as a historical artifact, but a potent reminder of division and human cost [93]. An open-air museum fosters reflection and engagement with this divisive period. However, concerns exist regarding commercialization and overshadowing individual stories.

Selective remembering of some places in Syria provides the potential to warn of the ugliness of conflicts and war, as this trend can be applied to specific buildings in the central squares of destroyed cities or historical buildings around the Aleppo Citadel as a living example, which can evoke memory, enhance identity, and promote peace for future generations.

### 3.3.3 Memorialism

Instead of rebuilding what was lost, this approach creates dedicated spaces, like memorials or museums, to remember the disaster and honor its victims. While it allows communities to acknowledge and grieve, it might not address the immediate practical needs of rebuilding lives and infrastructure.

This approach is represented in Hiroshima Peace Memorial Park. Instead of replicating the destroyed district, Hiroshima created a dedicated space for remembrance, embodied by the skeletal Genbaku Dome, a stark reminder of the bombing's power.



**Figure 3.5** Hiroshima promotion hall after attack (left) and now (Right) [174]

Encircling this core stand memorials, museums, and peace education initiatives, fostering collective reflection and global understanding. This model prioritizes memory alongside healing and progress, offering a space for individual grief, collective reflection, and a global call for peace.

Though navigating Syria's intricate reconstruction challenges and interwoven sectors is difficult, selective memorialization offers potentials. Preserving selected sites, like

Deir ez-Zor's ruined bridge, could evoke memory, solidify identity, and promote peace for future generations.

### 3.3.4 Neoliberalism

Post-disaster reconstruction often adopts models influenced by neoliberal ideologies, prioritizing urban renewal for economic growth and efficiency [94]; [95]. This entails demolishing damaged structures to create wider streets, expansive green spaces, and a seemingly "blank slate" for optimized city planning [96].



**Figure 3.6** New Orleans during and after recovered from Hurricane Katrina [97]

Concerns center around displacement of residents, particularly marginalized communities, along with the severing of historical and cultural ties [96]. Additionally, anxieties exist regarding the potential for profit-driven reconstruction, where transparency and accountability become obscured within the rush for investment [98]. While supporters highlight rapid infrastructure rebuilding and economic revitalization, critics point to the exacerbation of social inequalities and prioritization of financial gain over genuine community well-being [99].

Such as Hurricane Katrina's impact on New Orleans [100], the "land swap" policy in post-earthquake Christchurch, or the privatization of infrastructure in Puerto Rico after Hurricane Maria [101], reveals the multifaceted nature of this model. Each instance

underscores the complex interplay between rebuilding efforts, economic drivers, and the needs of diverse communities.

According to unofficial data and statistics, given the complete destruction of many Syrian cities of various sizes or entire neighborhoods, resorting to the trend of liberalism in the reconstruction of these neighborhoods and cities is an opportunity to develop the built physical environment considering the challenges and considerations of the Syrian situation in general and for each case individually.

In conclusion: Navigating the intricate landscape of post-conflict reconstruction in Syria demands a nuanced approach that carefully balances memory preservation, immediate necessities, and long-term sustainability within the built environment. Understanding the diverse reconstruction trends and their underlying motivations empowers communities to partake in shaping their future. Integrating these approaches based on the specific level of physical damage, geographical context, and destruction intensity can foster community satisfaction and build a more peaceful future for generations to come. This requires a thoughtful blend of restoration, memorialization, and urban renewal, tailored to each locality's unique tapestry of needs and aspirations.

## 3.4 Physical built environment reconstruction as an opportunity

### 3.4.1 Physical built-environment development

Post-disaster physical built-environment development (PBED) necessitates a nuanced approach transcending mere reconstruction. This complex process demands a holistic framework encompassing comprehensive planning, implementation, and revitalization across physical, social, economic, and environmental domains [102]. Earthquakes, floods, hurricanes, and conflicts necessitate such transformative interventions, aiming to rebuild not just structures but resilient, sustainable, and inclusive communities [37].

Central to this approach is the distinction between PBED and traditional greenfield development. While the latter focuses on undeveloped land, PBED tackles the unique challenges of revitalizing pre-existing urban fabric ravaged by disaster [103]. Both share goals like improved living conditions and infrastructure [104], but PBED requires a nuanced understanding of disaster-specific impacts and a tailored response

that goes beyond simply rebuilding what was lost [105]. Success in PBED hinges on several key requirements:

- Prioritizing resident needs and fostering community engagement: This ensures solutions align with lived experiences and empowers communities to shape their future [106].
- Promoting environmental sustainability: Integrating green infrastructure and resource-efficient practices fosters long-term resilience and well-being [107]; [108].
- Building resilience against future disasters: Disaster risk reduction measures and forward-thinking planning mitigate future vulnerabilities [77].

Examining these intricacies unlocks a pathway to crafting successful built-environment development strategies across Syria, and to navigate the complexities of Syrian reconstruction, we require a context-specific approach informed by multiple urban development paradigms. This may involve selectively employing restoration to preserve cultural heritage, incorporating sensitive memorialization while resisting top-down approaches, resisting neoliberal models which exacerbate inequities, and maintaining a central focus on resilience throughout reconstruction. Phasing projects, embracing scalable solutions, and fostering community dialogue amidst differing priorities will be key due to inherent tensions and resource constraints within the Syrian context.

### 3.4.2 Build back better (BBB)

The Build Back Better (BBB) principle, enshrined within the Sendai Framework for Disaster Risk Reduction (DRR), has become a cornerstone of post-disaster reconstruction. It signifies a paradigm shift from reactive disaster response to a proactive and transformative approach, emphasizing the potential to not just "rebuild," but to "build better" [37]. This goes beyond simply restoring pre-disaster conditions; it involves enhancing disaster preparedness, minimizing vulnerabilities, and ultimately improving living conditions for affected communities [109]. By embracing BBB,

communities can build more resilient and sustainable futures, better equipped to face future challenges. The BBB approach comprises three key pillars:

#### *3.4.2.1 Building back stronger*

emphasizes disaster-resistant design in reconstruction. This includes incorporating design principles that enhance the ability of buildings and infrastructure to withstand disasters [8], adhering to stringent structural codes [107], choosing resilient construction materials [103], and considering future risks like climate change [77]. Community engagement is crucial, ensuring residents understand the importance of disaster-resistant design and are involved in the process [106]. Additionally, regulations mandating disaster-resistant design and continuous investment in research and innovation are essential [110]. By prioritizing this pillar, communities can significantly reduce the impact of future disasters, protecting lives and property while contributing to long-term sustainability.

#### *3.4.2.2 Building back faster*

highlights the importance of expeditious and efficient reconstruction to minimize disruptions to daily life. This involves swift reconstruction efforts, focusing on economic recovery by restoring livelihoods and businesses [111]. Providing immediate and effective temporary shelter solutions, creating job opportunities through reconstruction projects, and rapidly restoring critical infrastructure are also crucial [105]. Strong governmental support and coordination, alongside community involvement in the reconstruction process, are key enablers [94]. Additionally, financial assistance, exploring innovative construction methods, and integrating risk reduction measures into reconstruction plans further expedite the process while enhancing resilience [37]. Building Back Faster recognizes the critical need for a prompt and effective response to minimize the social and economic impact on affected communities, seeking to restore normalcy and improve living conditions swiftly.

#### *3.4.2.3 Building back more inclusively*

emphasizes ensuring comprehensive and equitable reconstruction that reaches all affected individuals and communities. This necessitates comprehensive strategic

planning covering all affected areas and prioritizing vulnerable groups [106]. Equitable resource allocation is crucial to prevent discrimination and disparities [111]. Active community engagement and participation in planning and decision-making processes empower communities to shape their future [103]. Prioritizing the needs of vulnerable and marginalized groups, incorporating cultural sensitivity into reconstruction plans, and ensuring accessibility for all in reconstructed infrastructure and facilities are essential aspects of inclusivity [108]. Furthermore, fostering social inclusion and cohesion among diverse community members, integrating gender-responsive approaches, and providing education and awareness programs all contribute to building a more equitable and resilient society [37]. Building Back More Inclusively aims to create a society that recognizes and addresses the diverse needs of its population, fostering sustainable and equitable communities that thrive in the aftermath of disaster.

Finally, the research applied the BBB principle as a comprehensive framework for the reconstruction of the physical built environment in Syria after the war. By adopting its three pillars-stronger reconstruction so that new buildings in both rural and urban areas and infrastructure are more durable and resistant to natural disasters, and faster reconstruction so that it contributes to the return of refugees and displaced people to their places and revives the wheel of life to society and the economy, except that reconstruction more comprehensively helps to create a more resilient and sustainable future for future generations to overcome the challenges of war and its negative effects.

# CHAPTER 4

## CASE STUDIES ANALYSIS

This chapter embarks on a global journey through diverse case studies, each offering a unique perspective on navigating the multifaceted world of reconstruction.

Rotterdam's Netherlands post-second world war (WWII) transformation exemplifies the power of modern urban planning. Its vibrant streets, green spaces, and pedestrian-centric design showcase how disaster can catalyze the birth of resilient, livable cities [112]. L'Aquila, Italy struck by a 2009 earthquake, presents a contrasting narrative. Here, a delicate balance between historical preservation and earthquake-resistant rebuilding unfolds. Innovative retrofitting and community participation offer valuable lessons in safeguarding heritage while ensuring future safety [113].

The transformative reconstruction of Erzincan, Turkiye, following the devastating 1939 earthquake offers a critical case study for examining the reshaping of the built environment and provides valuable insights into the interplay between seismic resilience, historical circumstances, and urban development for regions with high seismic risk.

Shifting to Latin America, Valdivia's, Chile 2010 earthquake and tsunami highlight waterfront resilience. Earthquake-resistant construction, sustainable infrastructure, and a focus on coastal resilience offer insights into integrating disaster preparedness into the fabric of reconstruction [37]. Turning to Kobe, Japan present contrasting yet equally rich narratives. Kobe, rising from the 1995 earthquake, is a global leader in seismic technology and infrastructure design. Its emphasis on community needs and open spaces provides a blueprint for human-centered reconstruction [114].

The case study of the Gujarat earthquake in India (2001) highlights the potential benefits of an owner-driven reconstruction program for post-disaster recovery. This approach prioritizes community participation, provision of essential support, and careful attention to quality and cost-effectiveness. Digital solutions further indicate

that empowering homeowners can be a pivotal factor in ensuring successful reconstruction outcomes. Analyzing this case study sheds light on the importance of empowering affected communities for the long-term resilience and sustainability of post-disaster reconstruction efforts.

Global case studies of post-disaster reconstruction, despite their inherent contextuality, offer transferable insights applicable to diverse settings like Syria. These carefully chosen examples showcase a range of successful approaches and outcomes in rebuilding the built environment. By meticulously comparing and contrasting their strengths and weaknesses, we gain valuable practical knowledge. This comparative analysis can inform reconstruction initiatives in Syria, shaping national frameworks and strategies toward building a resilient and sustainable future.

## 4.1 Case study 1: Rotterdam, Netherlands

### 4.1.1 Background

On May 14th, 1940, Rotterdam's heart lay smoldering after German bombardment. Over 70% of the city center lay in ruins, with 1,150 lives lost and 85,000 displaced [115].



**Figure 4.1** A painting of Rotterdam in 1895 (left) Rotterdam's city centre after the bombing (right) [116]

### 4.1.2 Reconstruction approach

Rotterdam's post-war rebirth wasn't a singular feat, but a multifaceted concerto of collaboration. Local authorities, spearheaded by the Rotterdam city council, skillfully

orchestrated resource management and project coordination [115]. Architectural maestro Cornelis van Traa composed the city's "Basic Plan," a groundbreaking symphony of modern urban planning principles that resonated with residents actively shaping their future through town hall forums [117]; [118].

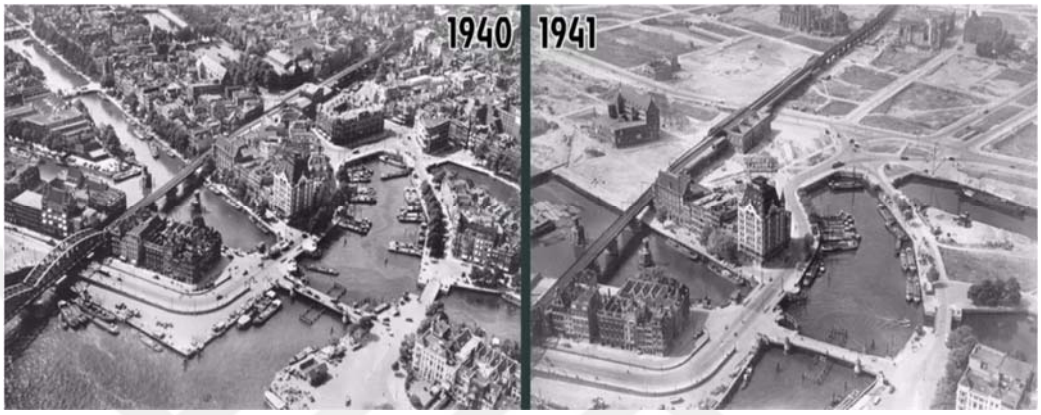



**Figure 4.2** Rotterdam before and after 1940 German bombing [122]

The national government harmonized with local authorities, establishing the "Commissie Algemeen Herstelplan Rotterdam" to oversee the reconstruction [116]. International expertise, came from renowned architects and generous aid from countries like the United States [119]; [120]. Finally, the private sector, akin to instrumentalists translating plans into built infrastructure, drove the city's economic revival [121].



**Figure 4.3** Rotterdam ’s main high-rise district (left, photo by Rijskoverheid) and a more residential neighborhood (right photo by Jeroen Musch). [123]

### 4.1.3 Reconstruction impact on physical built environmet

Rotterdam's post-WWII urban development was marked by: The devastation prompted a shift to modern urban planning, favoring larger, open streets and spaces over narrow ones. Reconstruction prioritized integrating green spaces and waterways for a more livable and resilient urban environment. The city emphasized pedestrian-friendly design, featuring connected cycle paths, wide pavements, and safe crosswalks, enhancing vibrancy.

Rotterdam's transformation into a modern metropolis showcases resilience, driven by a focus on long-term vision and innovative reconstruction.

### 4.1.4 Reconstruction trends

Emerging from WWII's ashes, Rotterdam embraced a transformative urban development strategy [115]. Modern planning principles redefined the city, replacing narrow streets with open spaces for increased resilience and livability [116]. Green spaces and waterways seamlessly integrated into the fabric, prioritizing environmental sustainability [117]. Pedestrian-centric design, with extensive cycle paths and safe crosswalks, fostered vibrant human connections [118]. This unwavering commitment to long-term vision and innovative reconstruction propelled Rotterdam into a thriving modern metropolis, showcasing the power of resilience in shaping sustainable urban futures [121]. By analyzing this remarkable transformation, we gain valuable insights into the potential of post-disaster planning to nurture resilient and vibrant communities.

### 4.1.5 Applying the Rotterdam methodology on the Syrian case

Syria, facing devastating conflict like Rotterdam after WWII, can learn from its remarkable rebirth. A collaborative approach combining local governance, visionary planning, and citizen engagement is a key. Inspired by Rotterdam's "Basic Plan," Syria needs a long-term reconstruction strategy prioritizing disaster resilience, sustainability, and cultural preservation. Open spaces, green infrastructure, and pedestrian-friendly designs can foster community and well-being. International cooperation, modern building technologies, and economic revitalization are vital for a

prosperous future. By adopting these principles, Syria can rise from the ashes, building not just infrastructure, but a vibrant and resilient society.

## 4.2 Case study 2: L'Aquila, Italy

### 4.2.1 Background

The April 6th, 2009 L'Aquila earthquake left 70% of the historic center reduced to rubble, the quake's immediate human and physical costs were severe [116]; [115].. Reconstruction estimates exceeding €10 billion underscored the economic ramifications [124].

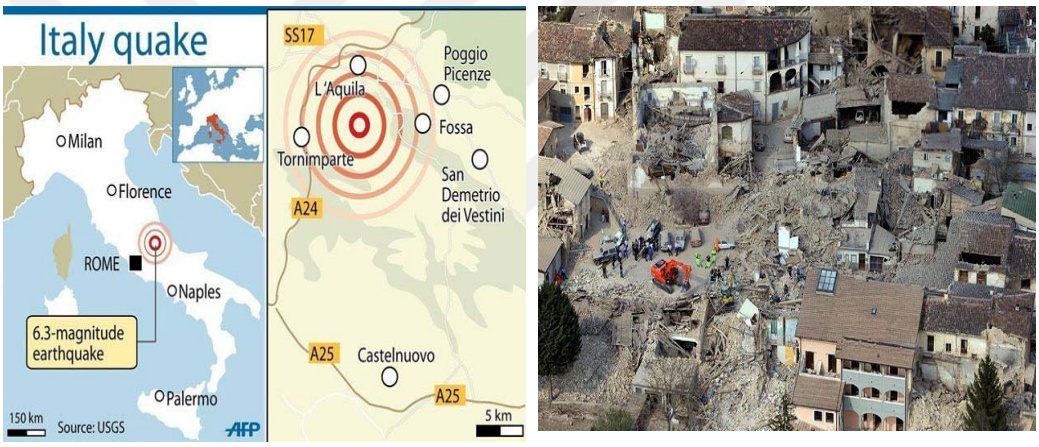



**Figure 4.4** The April 6th, 2009 L'Aquila earthquake impacting map (left), the scale of the devastation in the L'Aquila. (right) [125]

Beyond the tangible devastation, L'Aquila faced a unique cultural dilemma. As a UNESCO World Heritage Site, it needed to reconcile its treasured past with earthquake-resistant reconstruction [126]. This challenge spurred innovation in architectural engineering and heritage preservation, with novel retrofitting techniques blending seismic reinforcement with discreet interventions [127]. Extensive public forums and participatory workshops ensured residents' voices were heard, shaping the city's future with both respect for its past and resilience for its future [128].

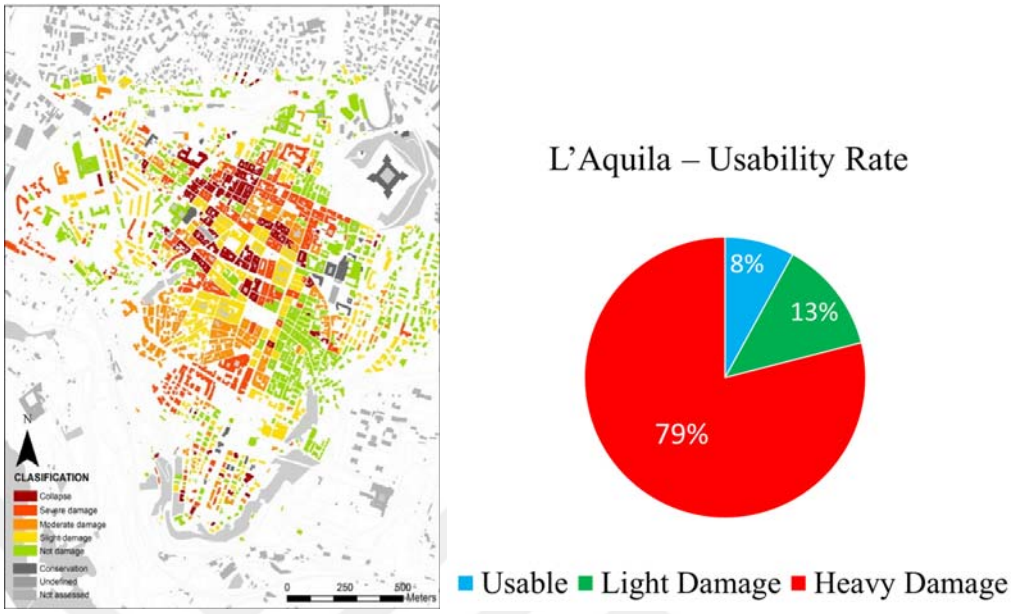



**Figure 4.5** Degree of damage and its spatial pattern in L′Aquila after the earthquake in 2009 [129].

### 4.2.2 Reconstruction approach

The 2009 L'Aquila earthquake presented a unique challenge: reconstructing a historic city while ensuring future earthquake resilience. Striking a balance between heritage preservation and safety, the "conservative restoration with seismic improvement" strategy aimed to minimize visible interventions while strengthening structures through hidden reinforcements [127]; [130]. This sparked debate and necessitated extensive public consultation to reconcile historical authenticity with seismic safety [128].

Flexible plans adapting to each building's historical context proved crucial [131], while advanced technologies for seismic analysis and retrofitting ensured both heritage preservation and structural stability [132].

### 4.2.3 Reconstruction impact on physical built environmet

The 2009 L'Aquila earthquake triggered not just tremors, but a transformative shift in the city's urban trajectory. "Conservative restoration" guided reconstruction, yet its impact on development echoed far beyond historic preservation [133].



**Figure 4.6** L'Aquila city center, the Piazza San Pietro, after earthquake. Pho.: Christian Sinibaldi

Spatially, L'Aquila reshuffled. Reconstruction prioritized the historic center, but also carved out space for green areas and revamped infrastructure, subtly altering the city's morphology [134]. This sparked economic regeneration, attracting investment in earthquake-resistant buildings and cultural industries [119].

Beyond L'Aquila itself, the city's experience offers potent lessons for urban planning in seismic zones. Its model of integrating heritage preservation with earthquake resistance provides valuable guidelines for other vulnerable urban centers [127]; [131].

### 4.2.4 Reconstruction trends

L'Aquila's post-earthquake reconstruction isn't just rebuilding, it's a groundbreaking experiment in balancing heritage, safety, and community. The "conservative restoration" approach subtly strengthens historic structures while sparking debate on innovative earthquake-proofing solutions [127];[119]. Public forums and volunteer networks empower residents, ensuring their voices shape the city's future [128]; [134]. Greening the city center prioritizes sustainability and livability [133]. L'Aquila's flexible approach, informed by advanced technologies, offers a valuable model for seismic risk mitigation in other historic cities [131]; [132]. This dynamic reconstruction offers crucial lessons for disaster-stricken cities globally, demonstrating the power of community engagement, innovative engineering, and sustainable urban development in rebuilding not just brick and mortar, but resilient futures.

### 4.2.5 Applying the L'Aquila methodology on the Syrian case

War-scarred Syrian cities face reconstruction akin to L'Aquila's post-earthquake struggle. Adapting key L'Aquila methodologies offers promising pathways:

Heritage-centered: "Conservative restoration" with seismic improvements strengthens structures while minimizing interventions, respecting Syria's historical tapestry [127]. Advanced technologies can facilitate discreet retrofitting, drawing inspiration from L'Aquila's innovations.

Sustainable urbanism: Integrating green spaces and improved infrastructure, following L'Aquila's lead, prioritizes environmental sustainability and enhances urban livability and resilience.

Flexible planning: Adaptable plans tailored to individual buildings and historical contexts, inspired by L'Aquila's flexible approach, allow for nuanced reconstruction.

By applying L'Aquila's lessons, Syrian reconstruction can prioritize heritage, community engagement, sustainability, and flexible planning. This holistic approach paves the way for resilient, war-ravaged cities that honor their past while building a stronger future for generations to come.

## 4.3 Case study 3: Erzincan, Turkiye

### 4.3.1 Background

On December 27, 1939, a devastating 7.8 magnitude earthquake struck Erzincan, Turkiye, leaving a legacy as the 20th century's deadliest natural disaster in the country. With over 32,000 lives tragically lost, countless others injured, and entire towns demolished (resulting in over 116,000 destroyed buildings), the disaster's impact was profound [135]. Disrupted infrastructure due to earthquake damage and harsh winter conditions further challenged rescue efforts [136].




**Figure 4.7** Erzincan city center after earthquake 1993 [137]

### 4.3.2 Reconstruction approach

The 1939 Erzincan earthquake catalyzed a multifaceted reconstruction approach in Turkiye, prioritizing both immediate rehabilitation and long-term seismic resilience. This involved a blend of modern engineering principles, seismic-resistant construction techniques (using materials like reinforced concrete), and sensitivity to traditional building methods [138]. In a landmark decision, the Turkish government relocated the entire city of Erzincan slightly north to a geologically stable site, aiming to reduce future earthquake vulnerability [139]. The reconstruction further encompassed the restoration of essential infrastructure, modernization of the urban layout, and integration of the region's architectural heritage [139].

### 4.3.3 Reconstruction impact on physical built environment development

The 1939 Erzincan earthquake prompted a transformative reconstruction process, fundamentally reshaping the city’s-built environment. New, stringent building codes mandated seismic-resistant construction techniques and materials, notably using reinforced concrete [138]. Additionally, Erzincan was relocated to a site with decreased seismic susceptibility, aiming to reduce future risks [139]. The redesign incorporated modern urban planning principles, creating a more functional, organized layout [139]. While embracing modernization, conscious efforts were made to incorporate elements of Erzincan's traditional architectural heritage, preserving a sense of continuity [140]. Ultimately, these measures rebuilt Erzincan into a safer, more

resilient city, improving its efficiency and livability without compromising its historical identity. Despite these efforts, Erzincan's inherent seismic vulnerability persists, and concerns existed regarding uneven distribution of modernization between the city center and rural areas [138]; [139].

### 4.3.4 Reconstruction trends

The Reconstruction led by the Turkish government has prioritized seismic resilience and modernization. The entire city was moved to a geologically stable location to significantly reduce future risks [139]. Modern urban planning principles have shaped reconstruction, which has led to the creation of more efficient functional planning [138]. Despite this emphasis on progress, elements of traditional architectural heritage were incorporated to maintain contact with the city's past [140]. Through these multifaceted measures, Erzincan was transformed into a safer and livable urban environment, demonstrating the value of disaster-resistant reconstruction in a historical context.



**Figure 4.8** Erzincan city now [141]

### 4.3.5 Applying the Erzincan reconstruction approach on the Syrian case

The Erzincan reconstruction offers valuable insights for post-war reconstruction in Syria. Prioritizing strategic relocation of heavily damaged settlements may be necessary where geological conditions contribute significantly to vulnerability. Modern urban planning principles can create functional cities with improved services and infrastructure. Incorporating elements of traditional Syrian architectural heritage could foster a sense of continuity and cultural connection for Syrian communities. However, equitable distribution of these measures across both urban and rural areas is necessary, unlike Erzincan, to avoid creating disparities.

## 4.4 Case study 4: Valdivia, Chile

### 4.4.1 Background

The 2010 Chile earthquake's impact on Valdivia was multifaceted. Stricter building codes minimized earthquake casualties, yet the 7-meter tsunami devastated the city, claiming lives, damaging homes, and crippling infrastructure [142]; [143].

The fishing industry, vital to livelihoods and food security, suffered immense losses. While reconstruction was swift, social disruption, economic decline, and unequal damage distribution, particularly in areas with vulnerable soil, lingered for years [144]. Valdivia's experience highlights the complexity of post-tsunami recovery, showcasing the need for resilient infrastructure, economic diversification, and equitable reconstruction strategies that address pre-existing vulnerabilities.

### 4.4.2 Reconstruction approach

Valdivia's response to the 2010 tsunami unveiling a multifaceted approach to recovery and reconstruction. Key pillars included:



**Figure 4.9** Resilience Infrastructure reconstruction after earthquake (left: Photograph Trabajo propio, right: Photograph Gideon Long)

Prioritizing Essentials: Recognizing the vital role of functional infrastructure, Valdivia swiftly restored bridges, communication networks, and utilities, ensuring basic needs were met and preventing further economic and social decline [145].

Building Resilience, Not Just Walls: Valdivia's reconstruction went beyond rebuilding. It actively incorporated risk mitigation strategies.

Revitalized Public Spaces: Parks and public spaces were reimagined as vital gathering points for emergency response and communication in future disasters, while also enhancing livability and social interaction [144].

### 4.4.3 Reconstruction impact on physical built environmet

The 2010 earthquake and tsunami triggered significant reconstruction efforts in Valdivia, which undeniably impacted the city's urban development. Stringent post-disaster building codes led to safer infrastructure, but also potentially increased housing costs and displaced some residents [145]. New public spaces and revitalized waterfront areas fostered social interaction and economic activity, while concerns persist about potential gentrification and displacement of historical urban character [144]. Additionally, improved transportation networks aimed at enhancing disaster preparedness also reshaped land use patterns and accessibility within the city [146].

Analyzing the positive and negative impacts of these changes will be crucial for Valdivia's future urban planning, ensuring a balance between resilience, sustainability, and equitable development, focused on resilient waterfront development, earthquake-resistant construction, and sustainable infrastructure. Key lessons: Integrating disaster risk reduction into reconstruction, prioritizing sustainable practices.

### 4.4.4 Reconstruction trends

Valdivia's post-tsunami recovery extended beyond rebuilding infrastructure. Recognizing the need for long-term resilience, the city prioritized three key trends:

1- Resilient Infrastructure: Investments in sophisticated early warning systems and disaster-resistant public spaces aimed to prevent future losses and facilitate effective response [147]; [144].

2- Community Resilience: Empowering residents through disaster preparedness programs and fostering social cohesion strengthened the city's collective response capacity [147].

3- Sustainable Revitalization: Reimagined public spaces not only enhanced livability but also served as vital gathering points during future emergencies [144].

Valdivia's multifaceted approach demonstrates a shift from simply rebuilding towards proactively constructing a more resilient future for its communities. This model offers valuable lessons for other disaster-prone cities seeking to build back not just stronger, but wiser.

### 4.4.5 Applying the Valdivia's methodology on the Syrian case

The physical built environment reconstruction in Valdivia after the 2010 tsunami offers valuable lessons for reconstructing war-torn Syrian cities. Applying key Valdivia methodologies could pave the way for a sustainable and resilient future:

1- Prioritize Resilient Infrastructure: Invest in early warning systems for natural disasters and earthquake-resistant public spaces, considering Syria's vulnerability to both

2- Revitalize Public Spaces: Reimagine public spaces as multi-functional hubs for social interaction, daily life, and emergency gathering points, enhancing both livability and resilience.

By adapting Valdivia's multi-faceted approach, Syrian reconstruction may Prioritize sustainable infrastructure which can lay the foundation for a future where Syrian cities are not just rebuilt but built back stronger and more resilient in the face of future challenges.

## 4.5 Case study 5: Kobe, Japan

### 4.5.1 Background

The 1995 Kobe earthquake's 7.3 magnitude left an indelible mark. Over 6,400 lives lost, 43,000 injured, and 240,000 buildings destroyed paint a tragic picture [148]; [149]. Fires incinerated 70 city blocks, leaving 300,000 homeless. Economic losses topped $100 billion. Crippled infrastructure, from collapsed bridges to severed lifelines, disrupted vital services. The Kobe quake serves as a stark reminder of nature's power and a testament to the human spirit's unwavering desire to rebuild. By studying these figures, we learn crucial lessons about preparedness, mitigation, and the vital role of community in overcoming immense adversity.

### 4.5.2 Reconstruction approach

The 1995 Kobe earthquake's devastation sparked a paradigm shift in urban resilience. Grounded in seismic safety, Kobe prioritized earthquake-resistant technologies and stricter building codes [150]. Community-driven planning empowered residents, ensuring the rebuilt city reflected their needs [151]. Initiatives like port modernization and economic zones fostered economic revival [148]. Meanwhile, green spaces, expanded public transportation, and sustainable technologies prioritized environmental wellbeing [152]. Kobe's story transcends rebuilding infrastructure; it

exemplifies a holistic approach to resilience, weaving seismic preparedness, community engagement, economic dynamism, and environmental responsibility into the fabric of its future. This transformative model offers invaluable lessons for cities worldwide to navigate disaster recovery and build not just stronger, but also more sustainable and inclusive urban environments.



**Figure 4.10** widespread fires after Earthquake (left) The Hanshin Expressway Bridge (right, photographer: Philip Esper) [153]

### 4.5.3 Reconstruction impact on physical built environmet

The 1995 earthquake undeniably reshaped Kobe's urban landscape, forcing a pivotal moment of reconstruction. This process wasn't just about rebuilding pre-existing structures; it was about reimagining the city with resilience at its core.

Transformative Infrastructure: Ground zero for change was infrastructure. Kobe implemented an ambitious earthquake-resistant design strategy, with elevated highways, base-isolated buildings, and improved bridge technologies [152]. This not only protected lives but also enhanced connectivity and disaster preparedness. Public transportation became the focus, with a revamped subway system and expanded green spaces, fostering a more sustainable and pedestrian-friendly environment [151].

While challenges remain, Kobe's physical built environment development serves as a testament to the transformative power of post-disaster reconstruction. By prioritizing resilience, innovation, and community engagement, Kobe emerged stronger, more

sustainable, and better equipped to face future challenges. Its story offers valuable lessons for disaster-prone cities worldwide, demonstrating how tragedy can inspire transformative urban renewal.

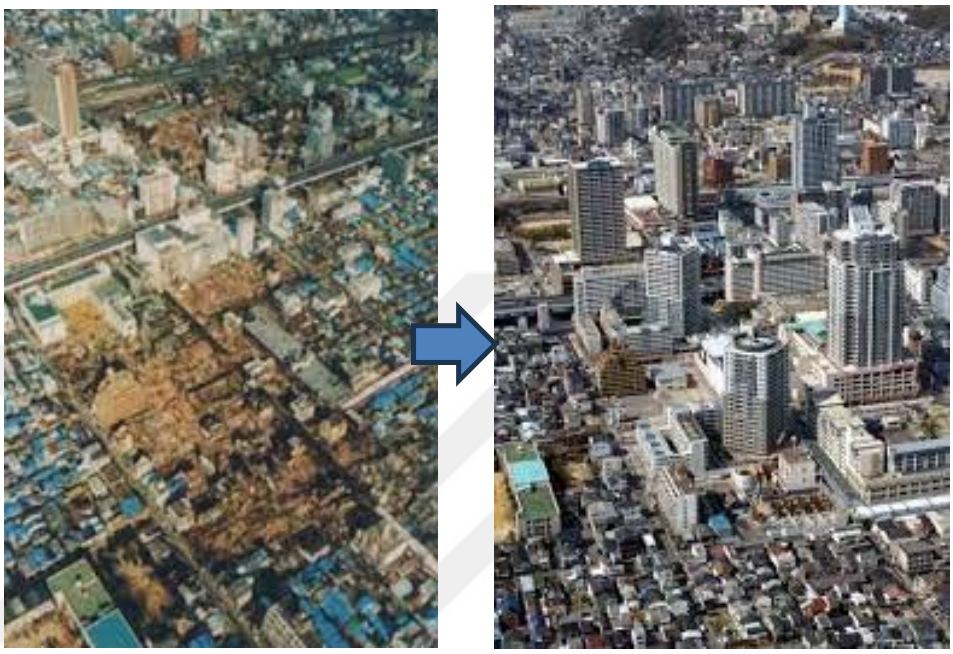


**Figure 4.11** Kobe city urban recovery project [154]

### 4.5.4 Reconstruction trend

Kobe's 1995 reconstruction went beyond rebuilding, prioritizing:

Resilient Infrastructure: Earthquake-resistant buildings, base-isolation systems, and improved bridges for future preparedness [152]; [150].

Green Urbanism: Expanding public spaces and promoting sustainable transportation like pedestrian-friendly areas and revamped subways [151].

Community Empowerment: Involving residents in rebuilding decisions, fostering ownership and social cohesion [150].

### 4.5.5 Applying the Kobe's methodology on the Syrian case.

Syria's reconstruction can take inspiration from Kobe's multifaceted approach, prioritizing two key areas: (1) seismic-aware infrastructure with earthquake-resistant

technologies and retrofits; and (2) sustainable urban development with green spaces, energy-efficient technologies, and resilient public transportation; building a future that is not merely rebuilt, but structurally sound, environmentally responsible, economically vibrant, and socially inclusive.

## 4.6 Case study 6: Gujarat - India

### 4.6.1 Background

The 2001 Bhuj earthquake, a 7.6 Mw tremor in western India's Gujarat state, left a devastating mark. Over 13,800 lives lost, 166,800 injured, and millions displaced paint a grim picture [155]; [156]. Kutch district, with its capital Bhuj, suffered the brunt, witnessing 90% of fatalities and 85% of asset losses [157]. Bhuj's historic walled city lay in ruins, alongside infrastructure, villages, and vital industries like agriculture and tourism [155]; [158]. Economic losses topped $3.5 billion, and environmental consequences like soil liquefaction added long-term challenges. This quake serves as a stark reminder of the immense human and environmental cost of natural disasters, demanding preparedness and resilient reconstruction strategies in disaster-prone regions.




**Figure 4.12** Map of intensity of 2001 Gujarat earthquake. (right, source: (Hough and Martin 2002)- houses damaged due to the earthquake (left)

### 4.6.2 Reconstruction approach

The 2001 Gujarat earthquake, a devastating natural disaster, spurred a transformative approach to housing reconstruction: The Owner-Driven Reconstruction (ODR) program. Born from a collaboration between the Gujarat State Disaster Management Authority (GSDMA) and the World Bank, ODR empowered homeowners to rebuild their lives, not just their houses [159].

Financed by a $197.2 million World Bank investment, ODR provided crucial financial and technical support to homeowners affected by partial or complete house damage [160]. Its impact was staggering: by 2006, over 911,000 homes were repaired and 201,000 rebuilt, reaching 82% of affected households [161]. Importantly, this community-driven approach fostered ownership and satisfaction [162].

ODR's success lay in its efficiency 70% of houses were repaired or rebuilt within two years – while simultaneously improving construction quality and reducing costs [162]. While other models like ADRRS and ADRIS existed, ODR became the dominant and demonstrably effective strategy.

Gujarat's ODR model offers a powerful global lesson. By prioritizing community participation, providing essential support, and ensuring quality and cost-effectiveness, ODR demonstrates that empowering homeowners can be the key to successful post-disaster reconstruction.

### 4.6.3 Reconstruction impact on physical built environment development

The 2001 Gujarat earthquake's reconstruction transcended mere rebuilding; it was a "restoration" that aimed to build back better [162]. Key to this monumental effort was individualized planning through "Area Development Authorities" in affected cities, fostering community engagement and tailored solutions [161]. Earthquake resilience, safety, and quality of life were prioritized with improved infrastructure, open spaces, and a permanent housing stock [163]. Dramatic improvements in sanitation, disaster awareness, and women's employment showcase the program's impact. Gujarat's "restoration" offers a global model for disaster recovery, demonstrating the power of

proactive planning, community engagement, and resilience in building back better for a future-proofed society.

### 4.6.4 Reconstruction trend

Area Development Authorities' were a key trend in community-driven planning, enabling local solutions to take root [161]. Resilience was prioritized with earthquake-resistant infrastructure and open spaces [163].. Housing became permanent, sanitation access improved, and disaster awareness skyrocketed, showcasing holistic development beyond the bricks and mortar [163]. This "restoration" model, emphasizing community and resilience, offers a global lesson for building back better and future-proofing societies against natural disasters.

### 4.6.5 Applying the Gujarat's methodology on the Syrian case.

Syria's reconstruction can draw inspiration from Gujarat transformative "restoration" approach, prioritizing four key areas: Community-driven planning, especially in countryside areas, Resilience-focused infrastructure by Investing in earthquake-resistant technologies and building codes, Holistic development through Integrating sustainable technologies alongside housing reconstruction

## 4.7 Case studies analysis

In-depth analysis of relevant case studies in post-disaster/crisis physical urban reconstruction

### 4.7.1 Comparison and evaluation of different approaches and outcomes

- Nature of the Disaster: Each case study differs in the type of disaster faced, leading to specific vulnerabilities and challenges. Earthquakes dominate, but the analysis of L'Aquila also considers reconstruction in a historical context.

- Regional and Cultural Context: The specific cultural, social, and economic background of each region shapes the response and reconstruction dynamics.

### 4.7.2 Lessons learned from case studies and their implications for practice

Research collected some key lessons learned from the management of subsequent disasters and urban architecture reconstruction in the six case studies reviewed:

#### *4.7.2.1 Importance of a comprehensive reconstruction plan*

- Rotterdam: The "Basic Plan" provided a long-term vision for a modern, functional, and resilient city, prioritizing open spaces, pedestrian-friendliness, and green infrastructure.
- Kobe: The "Phoenix Plan" emphasized disaster mitigation, infrastructure repair, economic redevelopment, and social recovery, creating a multifaceted roadmap for the city's future.
- Valdivia: "Plan Valdivia" focused on physical infrastructure, economic revitalization, social cohesion, and cultural heritage preservation, ensuring a holistic approach to recovery.

#### *4.7.2.2 Balancing modernity and heritage preservation*

- L'Aquila: Minimizing interventions while strengthening structures preserved the historical fabric and authenticity of the city.
- Rotterdam: Salvaged materials and architectural references to the pre-war city integrated historical elements into the modern reconstruction.
- Kobe: Urban regeneration revitalized historical areas and the waterfront, boosting cultural identity and tourism potential while incorporating earthquake-resistant infrastructure.

#### *4.7.2.3 Prioritizing community engagement and participation*

- Valdivia: Public consultations and collaborative workshops ensured reconstruction met local needs and fostered ownership.

- Gujarat: Owner-Driven Housing Reconstruction empowered households with choice and participation in rebuilding their homes, fostering dignity and ownership.

### 4.7.3 Summary

Based on the evaluation of the six case studies, we can draw some general conclusions about effective reconstruction processes:

#### *4.7.3.1 Strengths*

- Holistic Approach: Successful reconstruction goes beyond rebuilding physical infrastructure and considers social, economic, and cultural aspects.
- Community Engagement: Engaging residents in decision-making processes fosters ownership, increases project relevance, and builds trust.
- Long-Term Vision: Having a clear and comprehensive plan that addresses immediate needs while considering future challenges ensures long-term sustainability.
- Innovation and Flexibility: Adapting approaches to local contexts, utilizing new technologies, and embracing innovative solutions can improve efficiency and effectiveness.
- Public-Private Partnerships: Collaboration between government, private sector, NGOs, and international organizations leverages diverse resources and expertise.

#### *4.7.3.2 Weaknesses*

- Bureaucracy and Delays: Complex administrative processes and funding delays can impede progress and cause frustration.
- Social Inequality and Gentrification: Rapid development risks exacerbating existing inequalities and displacing vulnerable communities.

- Balancing heritage and modernity: the preservation of historical and cultural identity with the integration of modern development requires careful planning and community participation. This principle, although important and despite the need to apply it, somewhat hinders the reconstruction process in terms of the speed of implementation and the multiplicity of bodies responsible for monitoring, follow-up, documentation and the adoption of appropriate mechanisms.

- Transparency and accountability: maintaining transparency in the allocation of resources and the implementation of projects builds trust and prevents corruption, increases the level of bureaucracy and the multiplicity of bodies responsible for approval and accreditation, but this does not prevent the importance of adopting and applying the principle of accountability and transparency to prevent corruption and in order to reach the highest degrees of reliability and accuracy in implementation.Long-Term Funding and Sustainability: Securing sustained funding and commitment is essential to maintain post-reconstruction momentum and prevent backsliding.

Overall, these case studies demonstrate that successful reconstruction requires a multifaceted approach that prioritizes community engagement, long-term planning, risk reduction, and social equity. While challenges remain, the lessons learned from these experiences can offer valuable guidance for future disaster response and reconstruction efforts.

### 4.7.4 Further points to consider:

- The role of individual leaders and architects in shaping the city's future deserves further exploration.

- Comparing these cases with reconstruction efforts in other contexts (e.g., war-torn cities) can provide additional insights and broaden understanding.

- The long-term consequences of reconstruction, particularly regarding vulnerable populations, require continued analysis and monitoring.

Prioritizing community participation, resilience, inclusive development, and holistic reconstruction strategies is essential for Syria's post-war recovery. This approach transcends mere physical rebuilding, facilitating the return of displaced populations, fostering societal reconciliation, and catalyzing the revitalization of Syria's built environment. This revitalization must encompass physical soundness, economic well-being, and the preservation of natural resources. Ultimately, these principles empower the nation to establish a foundation for long-term stability, prosperity, and social cohesion. Continuous analysis and reflection on reconstruction projects are critical to refine these strategies, promoting greater resilience and equity when facing future challenges. These conclusions and recommendations form the basis for developing an effective and comprehensive reconstruction strategy for the Syrian built environment, as outlined in the subsequent sections of this research.

# CHAPTER 5

## RESULTS

The complex reality of post-conflict reconstruction in Syria demands a holistic and responsive approach to rebuilding damaged physical environments. Prioritizing rapid construction alone risks sacrificing resilience, fostering inequity, and undermining cultural heritage. Successful rehabilitation will require a multifaceted strategy prioritizing local participation, integrating a blend of urban development theories, and maintaining an unwavering focus on long-term resilience. Selective restoration can preserve historic landmarks, fostering identity, while thoughtfully incorporated memorials recognize loss and aid collective healing. Avoiding harmful neoliberal models necessitates equitable economic planning that protects vulnerable populations while nurturing local economies. Moreover, embracing resilient construction, sustainable practices, and climate-aware designs strengthens communities against future crises. Importantly, a successful rebuilding process requires ongoing community dialogue to reconcile evolving needs in a resource-constrained setting. This necessitates flexible, multi-phased project implementation with scalability and adaptability serving as guiding principles.

Main Research Outcome**:** While Syrian rebuilding is urgent, this urgency mustn't compromise resilience, equity, and cultural sensitivity. It mandates a tailored strategy drawing on principles of inclusive participation, heritage preservation, sustainable practices, and future-focused resilience.

### 5.1 Conclusions

#### 5.1.1 Policy and recommendations for future Syria

The Syrian context, scarred by over a decade of turmoil, faces intertwined challenges of governance, scarce resources, and the need for comprehensive post-conflict reconstruction strategies. The following recommendations seek to provide a roadmap for transformative action:

#### *5.1.1.1 Institutional frameworks*

1- National Reconstruction Authority: Establish a centralized body explicitly focused on post-disaster planning and reconstruction under transparent civilian leadership. This independent authority will streamline decision-making, coordinate actions across sectors, and prioritize long-term resilience.

2- Damage Assessment Matrix: Develop a multi-tiered approach from individual dwellings to national infrastructure. This matrix, updated regularly, enables data-driven prioritization, optimized resource allocation, and monitoring of progress.

3- Anti-Corruption Safeguards: Implement robust monitoring, transparent procurement, and independent auditing of all reconstruction funds. International partnerships can bolster these efforts for public trust and accountability.

#### *5.1.1.2 Community capacity and resilient strategies*

1- Participatory Reconstruction: Engage displaced Syrians and local stakeholders directly in project planning, design, and monitoring. This ensures needs-based rebuilding and fosters a sense of ownership over the future of communities.

2- Skills Development for Future Labor Force: Provide livelihood training programs aligned with reconstruction needs, empowering Syrians to be both beneficiaries and agents of recovery.

3- Climate-Adaptive and Mitigation Strategies: Integrate renewable energy solutions, green infrastructure, and disaster risk reduction principles into all reconstruction efforts, building towards a more sustainable and climate-resilient Syria.

#### *5.1.1.3 Prioritizing further research*

To strengthen policy development and future action, we prioritize the following additional research directions:

1- Syrian Diaspora Engagement: Examine the potential of engaging Syrians abroad in knowledge transfer, investment, and collaborative rebuild initiatives.

2- Pilot Projects: Conduct well-documented pilot reconstructions in varied Syrian geographies and social contexts. These testbeds will yield valuable lessons transferable to a national scale.

3- Contextual Sustainability Strategies: Investigate locally suitable, climate-adapted, and cost-effective approaches to sustainability – maximizing impact with limited resources.

4- Stakeholder Mapping: Analyze the current interests and capacity of all potential stakeholders—governmental, non-profit, private sector, and community-based – to guide collaboration strategies.

Syria's future hinges upon strategic reconstruction planning. The path ahead demands an inclusive approach, addressing immediate needs while nurturing resilience and the aspirations of the Syrian people. Each region offers unique circumstances; flexibility and contextually informed initiatives are key to sustainable solutions. The above recommendations lay a foundation for progress, fostering accountability, and building a Syria better equipped to confront future challenges.

The success of these recommendations is closely tied to a broader context of political stability, economic reform, and humanitarian aid. The goal is not merely physical restoration but an integrated rebuild towards social cohesion, equitable economic recovery, and sustainable national development. We must acknowledge the potential long-term effects of displacement and its impact on community identity and well-being.

### 5.1.2 Defining priorities for Syrian physical built environment reconstruction

The complex dynamics of Syria necessitate a prioritization framework focusing on the built environment's reconstruction. Key priorities include:

#### *5.1.2.1 Resilience-focused urban planning:*

1- Emphasize seismic retrofitting and resilient construction. Consider climate adaptation into future-proofing structures. This mitigates long-term risk in a disaster-prone context.

2- Integrate 'Build Back Better' principles - enhancing structures beyond pre-disaster standards.

#### *5.1.2.2 Historical preservation and community identity:*

1- Prioritize heritage restoration initiatives alongside new builds to promote continuity and sense of place.

2- Incorporate salvaged materials, where possible, to link the future with historical identities.

#### *5.1.2.3 Sustainable reconstruction:*

1- Invest in green infrastructure (parks, green roofs) and water-efficient systems. This aligns recovery with environmental concerns and addresses potential resource scarcity.

2- Embrace sustainable materials and minimize embodied carbon for long-term ecological responsibility.

#### *5.1.2.4 Inclusivity and community empowerment*

1- Develop needs-based housing with culturally sensitive, flexible designs to serve all demographics equitably.

2- Establish reconstruction decision-making mechanisms ensuring representation of displaced and marginalized groups.

3- Provide skills training, targeting livelihood creation and fostering an engaged, invested rebuilding workforce.

#### *5.1.2.5 Efficient infrastructure restoration:*

1- Prioritize critical lifeline systems: water, energy, roads, hospitals. Prioritize accessibility for all.

2- Adopt decentralized models (e.g., localized power systems) for robustness and reduced vulnerability.

#### *5.1.2.6 Economic & livelihood restoration*

1- Revitalize commercial zones and public markets as drivers of economic recovery in diverse urban settings.

2- Facilitate investment opportunities in small-scale enterprises, boosting local economic capacity.

#### *5.1.2.7 Effective coordination and capacity-building*

1- Prioritize local leadership and capacity-building to support long-term sustainability and management of reconstructed areas.

2- Coordinate local governance structures with international aid groups for transparency and streamlined processes.

#### *5.1.2.8 Important considerations:*

1- Holistic Approach: These priorities are interconnected. Successful PBER demands addressing physical, social, economic, and environmental needs in tandem.

2- Phased Implementation: A flexible approach, staged according to resource availability and shifting needs, is vital in the dynamic Syrian context.

3- Conflict Sensitivity: PBER processes must be conflict-sensitive to avoid exacerbating existing divisions and promote cohesion.

This prioritization framework offers a pathway to Syrian PBER focused on resilience, sustainability, and the restoration of both physical structures and social fabric.

### 5.1.3 Desired PBER approaches & trends for Syria

Successful adaptation of methodologies observed in case studies and relevant literature demands a deep understanding of Syria's specific context. This includes its unique cultural heritage, geographical variations, diverse demographics, and the complex interplay of war-related devastation and natural disaster impacts.

Therefore, based on the results and recommendations, we reach the conclusion that it is not possible to apply a ready-made methodology to all of Syria. Rather, the work and stages must be divided into different levels, according to the region, climate, and other considerations mentioned above, provided that the community has the most important part in making the appropriate decision, which must be It falls within the general and main guidelines that will be decided by the National Reconstruction Committee, so the mixed methodologies that will be created must take into account the following points that were deduced from the research:

#### *5.1.3.1 Prioritize heritage*

Several cases (Italy, Netherlands) illustrate the vital role of historic preservation in fostering community identity and resilience. Syria should similarly conserve architectural treasures while integrating salvaged materials into rebuilds.

#### *5.1.3.2 Sustainable and resilience*

Learning from Chile & Japan, Syrian reconstruction must incorporate seismic resilience, hazard-resistant infrastructure, 'green' urban designs (parks, efficient systems), and decentralized models for robustness.

#### *5.1.3.3 Community as core*

India and Rotterdam underscore the power of empowering local communities throughout the PBER process. Syrians must be involved in decision-making, with ownership models (where viable) promoting a vested interest in successful and enduring outcomes.

#### *5.1.3.4 Flexibility is key*

Case studies indicate that reconstruction necessitates flexible, adaptable plans able to evolve alongside Syria's dynamic needs. A phased approach addressing the most urgent issues first provides structure within an uncertain context.

## 5.2 Strategic plan Syrian PBER

### 5.2.1 Mission statement

To guide the rehabilitation of Syria's built environment in a manner that prioritizes sustainability, resilience, social equity, heritage preservation, and empowers communities to shape their future.

### 5.2.2 Overarching principles

#### *5.2.2.1 Community-centric*

Inclusive decision-making and participatory processes engage local stakeholders at all stages, respecting unique needs and aspirations of differing communities.

#### *5.2.2.2 Flexibility & adaptability*

The plan anticipates change, prioritizing phased implementation strategies that are responsive to shifting resources, evolving priorities, and the unpredictable nature of Syria's context.

#### *5.2.2.3 Resilience-first*

Focuses on seismic retrofitting, sustainable design, disaster risk reduction, and climate-adapted infrastructure for longevity and to combat future hazards.

#### *5.2.2.4 Heritage conscious*

Prioritizes restoration where feasible, integrates historic aspects into new builds, and leverages architectural identity to solidify a sense of place and foster continuity.

#### *5.2.2.5 Equity-driven*

Ensures the reconstruction benefits all sectors of society, particularly the vulnerable. This includes needs-based housing and livelihood supports.

### 5.2.3 Structure

#### *5.2.3.1 National-level:*

1- National Reconstruction Authority (NRA): A dedicated, independent body coordinating reconstruction. Ensures transparency, long-range focus, and avoids politicization of the rebuilding process.

2- National Damage & Resource Assessment: Rigorous, continuously updated information that includes all geographical scales (village to nation) is essential for prioritization and effective resource allocation.

#### *5.2.3.2 Regional implementation:*

1- Provincial/Regional Reconstruction Units (PRU): Sub-units of the NRA with localized understanding of needs and contexts. Engage directly in project management, working collaboratively with community-level leadership.

2- Context-Specific Methodologies: PRUs are empowered to create localized reconstruction plans while following broad NRA guidelines. This ensures strategies effectively address the unique aspects of each region.

#### *5.2.3.3 Community engagement & co-creation:*

1- Local Councils & Forums: Facilitate transparent decision-making processes. This ensures buy-in and ensures reconstruction genuinely reflects community needs.

2- Skills Training & Economic Revitalization: Integrate construction workforce capacity building with local enterprise development. This aims to minimize dependence on external labor and fosters self-sufficiency.

## 5.3 Framework for reconstruction strategic plan

Drawing upon a synthesis of theoretical research frameworks and relevant case studies, this thesis generates a set of recommendations aimed at structuring a comprehensive strategy for Syrian physical built environment reconstruction (PBER). Crucially, the recommendations must be implemented with sensitivity to scale. Top-level actions

will center on establishing national policies, coordinating inter-agency efforts, and securing domestic and international resources. Concurrently, lower-level actions must embrace localized strategies addressing distinct regional needs. This necessitates empowering communities, local authorities, and civil society actors to contribute to decision-making and execute smaller-scale projects that reflect immediate priorities within their unique context.

Top-down Approach: Establishes national guidelines and structures. We can see this in the National Reconstruction Authority and guiding principles, which are essential.

Bottom-up Input: Planning success *relies* on local-level information and context (hence Regional Units and Community Councils). The flow of information, ideas, and priorities goes both ways – a constant dialogue.

With that in mind, here's the framework with phases:

### 5.3.1 Phase 0: Preparatory action

1- Establish NRA: This central authority leads, monitors, and coordinates. This avoids fragmented, less effective rebuilding efforts.

2- Launch National Assessment: Data-driven action plans depend on this robust picture of damage, resources, potential for local materials use, etc.

3- Engage stakeholders: Identify international, domestic NGOs, government bodies, and most importantly, community-level representation structures.

### 5.3.2 Phase 1: Urgent stabilization

1- Critical Infrastructure: Immediate rehabilitation of vital lifelines (water, basic power, health facilities, major roads).

2- Temporary Housing: Transitional solutions that bridge the gap while addressing safety and basic needs. This prioritizes the most vulnerable.

3- Basic Economic Revival: Reopening markets, small business recovery – the groundwork for a functioning local economy.

### 5.3.3 Phase 2: Early reconstruction

1- Heritage Assessment Focus: Identify sites for prioritization. Where feasible, start careful restoration in parallel with new builds – these aids psychological recovery and a sense of continuity.

2- Scaled Housing Solutions: Mix of repair where possible, new-build focusing on needs-based design. Local participation in shaping these is key.

3- Livelihood Development Sync with construction needs. Early training in relevant trades gets locals skilled and involved in their community's rebuilding.

### 5.3.4 Phase 3: Adaptive consolidation

1- Learning & Iteration: PRUs analyze early efforts, adjust localized tactics. NRA shares lessons throughout the system. Reconstruction as a process, not a single fixed plan.

2- Green Infrastructure: Incorporating parks, urban greening, etc, starts now. Not an afterthought but part of livable, climate-ready spaces.

3- Memorialization & Healing: Spaces for loss acknowledgement aid a nation's processing, while fostering community. Done sensitively over time.

### 5.3.5 Phase 4: Resilience & revitalization (Overlaps with prior phases)

1- Mainstreaming Resilience: Every new build/retrofit is disaster-informed. This is costlier upfront but saves vastly down the line.

2- "Ownership" Model Housing: Where sustainable, move from purely state-built towards residents holding a stake in their homes - this fuels care, upkeep.

3- Decentralized Systems: (power, water) where possible, make communities less brittle.

### 5.3.6 Important considerations

1- Security: Reconstruction can't outpace conflict resolution. Areas under active fighting cannot see sustained rebuild; a tragic reality to manage.

2- Capacity-Building: Throughout, empowering local leadership for ownership of the process is key to sustaining gains long after NGOs move on.

3- Donor Fatigue: A long-term plan must diversify funding to avoid a crisis situation if funds suddenly run out.

## 5.4 Future work

This research offers a foundation for further exploration of policy development within the context of post-disaster physical built environment reconstruction. Notably, there is a pressing need to examine how frameworks can be established to proactively aid governmental institutions in mitigating the effects of natural or human-caused disasters. Such frameworks – grounded in context-specific lessons and principles of resilience, inclusion, and heritage preservation – would bolster effective long-term recovery efforts.

Given the recent devastating earthquakes in Turkiye, it is recommended that future research urgently prioritizes a comparative case study approach between Syria and Turkiye. This approach will identify similarities and differences, yielding valuable insights into how reconstruction policies could be adapted for immediate application in the Turkish context. Such analyses may reveal actionable steps to minimize future loss and accelerate the rebuild towards increased resilience, safety, and social well-being during this challenging time.

Finally, it can be said that by pursuing these future research directions, we can advance knowledge, inform policy and practice, and contribute to more effective and sustainable post-disaster/crisis physical urban reconstruction processes. These research areas have the potential to address emerging challenges, incorporate new perspectives, and enhance the resilience and well-being of communities in the face of disasters and crises.

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# CURRICULUM VITAE

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## EDUCATION

- **Aleppo University- Faculty of Architecture**

  Bachelor's Degree in Architecture (1997-2002)
- **Ankara Yıldırım Beyazit University, Ankara**

  Master student of Post War/Disaster Rehabilitation and Reconstruction Programme (2018-present)

## WORK EXPERIENCE

- **Designer, Supervisor :** Everest Engineering Consultant L.L.C./ United Arab Emirates, (Sharjah, Ajman) (2002-2015)
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## TOPICS OF INTEREST

- Disaster Management
- Physical Urban Environment
- Reconstruction Management
- Urban Improvement, Development