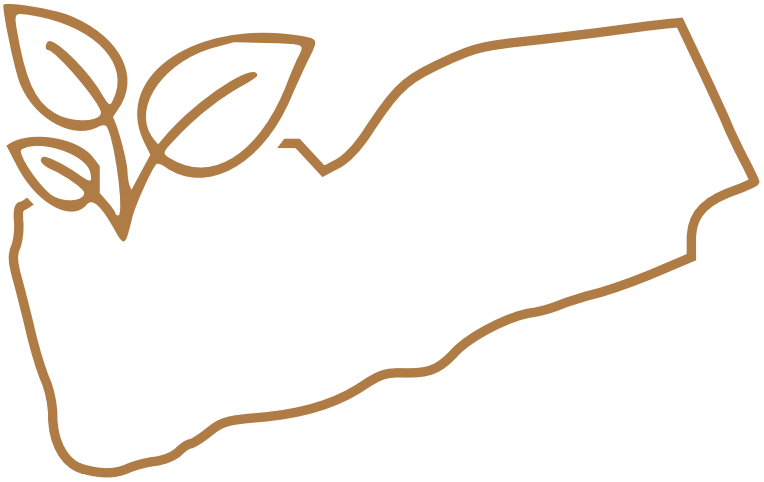

The Wadi and The Displaced

A Post-Conflict Recovery Strategy for **Hajjah, Yemen.**

Rezwan Ibne Zaman
Aalborg University
MSc04 URB (Thesis)
November, 2025

The Wadi and The Displaced:
A Post-Conflict Recovery Strategy for Hajjah, Yemen.

Masters Thesis Project, Fall 2025.

Pages: 92
Appendix: 1
Supervisor: Claus Lassen & Hanna Matilla

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The following report is the result of a masters thesis, as part of the master's degree program in Urban Design at Aalborg University. The project lasted from September, 2025 to November, 2025 with an oral presentation and defence taking place on December, 2025.

Signature

Rezwan Ibne Zaman

Abstract

This thesis explores a post-conflict recovery scenario in the context of the global south, where conflict-induced damage and economic collapse add more burden to an already existing climate crisis. It tries to find a solution for peace, stability, and recovery through taking care of the vulnerable, the degrading landscape, and adopting appropriate adaptation measures to increase communal survivability in a more humane and dignified environment. The principles of land restoration techniques, vernacular built heritage, and water-sensitive design development provide the main foundation for solutions in this post-conflict recovery strategy.

The thesis takes an interdisciplinary approach to examine the major conflict trends, categories, root causes, cycle of violence, and timeframes to depict a comprehensive picture of the problem and identify some contribution opportunities in the earliest post-conflict recovery effort. It develops an understanding of the overwhelming effect of both man-made and natural disasters on the marginalized communities. Analyzing the basics of food, water, shelter, livelihood, and livable environments, it tries to develop a climate-resilient resettlement strategy for the less fortunate along the wadi floodplain of a desert landscape.

A major emphasis is given to climate risk mitigation, adaptation, environmental restoration, and the resultant resilience of the targeted community. Precedents and experiences from similar development programs shed some light on the possible direction of proposed strategies. Grounded and practical strategies were prioritized over lofty goals, since the contextual situation is very much constrained. Efficient utilization and management of available resources, indigenous techniques and infrastructure, and capacity building activities of the targeted population work as a solution to overcome these constraints.

The methodology covers interdisciplinary literature review, case study analysis, digital map creation from datasets for macro analyses, historical satellite imagery analysis, case study analyses, theoretical analyses and finally design proposals. The design tries to include the most appropriate design principles overlapping multiple themes for the best expected outcomes in this context.

Finally, the thesis provides an insight into the post-conflict recovery of a developing nation with multiple political, socio-economic, and environmental challenges. It seeks to find a balance among resettlement, food and water management, ecological restoration, and experience exchange as a system to build resilience and survive together as a community. More than just a usual development, the final resettlement design is scalable, adaptable, and can be adopted as a long-term post-conflict recovery strategy across the region.

Acronyms

ACLED - Armed Conflict Location and Event Data

AFDB - African Development Bank

AUSA - Association of the United States Army

BBC - British Broadcasting Corporation

BCPR - Bureau for Crisis Prevention and Recovery

CIA - Central Intelligence Agency

CSIS - Center for Strategic and International Studies

EIP - European Institute of Peace

ESRI - Environmental Systems Research Institute

FAO - Food and Agriculture Organization

GDP - Gross Domestic Product

GGW - Great Green Wall

GSC - Global Shelter Cluster

HDX - Humanitarian Data Exchange

HRP - Humanitarian Response Plan

IDP - Internally Displaced Person

IDMC - Internal Displacement Monitoring Centre

IEP - Institute for Economics and Peace

IFRC - International Federation of Red Cross and Red Crescent Societies

IOM - International Organization for Migration

IPC - International Food Security Phase Classification

KSA - Kingdom of Saudi Arabia

NASA - National Aeronautics and Space Administration

NRC - Norwegian Refugee Council

OCHA - Office for the Coordination of Humanitarian Affairs

PCR - Post Conflict Recovery/Reconstruction

RCO - Resident Coordinator's Office

RCSI - Rate of Child Stunting Index

| ACRONYMS

SCI - Save the Children International

SDG - Sustainable Development Goals

UCDP - Uppsala Conflict Data Programme

UN - United Nations

UNCCD - United Nations Convention to Combat Desertification

UNCT - United Nations Country Team

UNDP - United Nations Development Programme

UNFPA - United Nations Population Fund

UNHCR - United Nations High Commissioner for Refugees

UNICEF - United Nations International Children's Emergency Fund

USA - United States of America

WBG - World Bank Group

WFP - World Food Programme

WHO - World Health Organization

Reading Guide

It is recommended to read the thesis report in a two-page view format for a better reading experience. The thesis is structured into seven sections with a prologue at the beginning and an epilogue at the end. The prologue contains a personal note, methodology, and thesis timeline. It introduces the context and outline of the report. It also prepares the reader for upcoming content. The first section introduces the key concepts of the thesis, conflicts, conflict types, trends, and introduction to post-conflict recovery. The second section describes the context in detail. The third section has many analyses of the context at macro scale. The fourth section analyses built-forms, its requirements and vernacular systems. The fifth section presents a case study and its summary. The sixth section presents related theories. And the seventh section provides the design at various scales. And the epilogue after that provides a conclusion and some critical reflections about the thesis. Finally, the appendix provides supplementary materials that were used in the thesis.

Referencing

Texts and other external sources are cited in Harvard referencing style. Illustrations belong to the author unless specified otherwise. List of illustrations and references are compiled after the epilogue at the end.

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PROLOGUE

A PERSONAL NOTE

I believe that designing for sustainability in human settlement expansion, livelihood, and socioeconomic growth can inherently counterbalance most of our major global challenges, such as the effects of climate change, disaster resilience, resource management, social justice, and even conflict resolution. Urban design, as an applied discipline, has much to contribute in this regard in the developed and developing world alike. Humanity is facing the same challenges everywhere.

In Urban Design studies, most of the attention and academic engagement are allocated to extend the performance and livelihood of the already well-performing and well-functioning urban centres with advanced theories, aesthetics, principles, policies, or technological applications, whereas the majority of the world's urban life faces basic survivability challenges. The majority's challenges range from urban poverty, pollution, affordability, extreme weather, resource deficit or depletion, to destruction by human-made conflicts. This stark contrast always hits me with a question: are urban designers adequately informed and equipped to help the majority in the global south? Advancing the field is undoubtedly very important, but so is understanding the global big picture.

I feel that the psyche, sensitivity, and humanity of urban designers remain incomplete without reflecting on the less fortunate, who most often reside far away, beyond international borders. This brings a new perspective, mindset, and approach for urban designers who might be working with the same issues in their home ground. But by engaging with humanity's challenges beyond borders, they will be put to the test with 'creative constraints' and forced to develop novel, sustainable solutions. In a way, that also means to extend the boundaries of this discipline.

So, as an urban designer, most often I find myself sympathetic with the have-nots, and that forces me to think about humanity's primordial necessities, food, water, shelter, livelihood, community, etc., even more than the rest. In that realm, beauty and aesthetics originate not from wealth, abundance, or technological superiority, but from survival, resilience, and harmony. This thesis is such an attempt to associate myself with the global majority, understand their challenges, test my skillset, and explore professional relevance in this brutal yet beautiful world.

Lastly, I want to finish by quoting a Bengali poet, Bhattacharya (1947), who best describes my insights and philosophy:

"No use for the soft rhymes, then-
Poetry, you are what I must shed
For this hungry world is just mundane,
And the full moon looks like a charred flatbread."

METHODOLOGY

Phase 1: Research

Literature review: The research started with relevant literature reviews and organization of collected insights based on themes. Reputable peer-reviewed literature, reports from international organizations, and news articles were carefully reviewed and cross-checked to avoid researchers' bias. Multiple cycles of readings were carried out to get a comprehensive understanding of the research subject.

Project Approach: The project research takes a case study approach where the author's interpretations of similar cases are taken into account. Contextual problems were identified and later addressed through design theories, phenomenology, empirical evidence, and real-life examples. Design principles were formulated based on these affirmations and were applied.

Data Collection: Data were sourced online through literature and databases. Multiple peer-reviewed sources were cross-checked to ensure data validity. Qualitative, quantitative, and observational data were collected, thematically grouped, and analyzed in later phases.

Phase 2: Analysis

Dataset Analysis: The research focused on macro analysis at first, since those datasets were widely available. Multiple research articles and reports were used to get valuable insights and interpretations. Collected information was grouped into associated sections in the report.

Mapping: Some datasets provided information that could be mapped. Aerial satellite imageries were also used in mapping that data. Lacking access to the project site made these datasets, images, and mapping processes integral to project site analysis.

Site Selection: Based on the intensity and aggregated contextual challenges, a region was selected as a potential project site. This site represented most of the contextual challenges for the project.

Problem Statement: Upon analyzing site data, problems, and potential solutions, a problem statement was formulated that was used as a guide in the later phases of design.

Phase 3: Design

Precedents and Theories: Real-life examples, precedents, and possible solutions were analyzed and linked with challenges on-site. Relevant design theories were then associated with thematic problems to be used in the design principles and development.

Design Development: Based on the previous phases, a design was developed. It involved sketching, 3d models, physical models, etc. Efforts were made to meet the necessary design requirements and strategies to address the design problems.

Visualization: Finally, the design was visualized and presented through pictures of diagrams, plans, sections, elevations, perspectives, etc. The entire collection was compiled in a final report.

THESIS TIMELINE

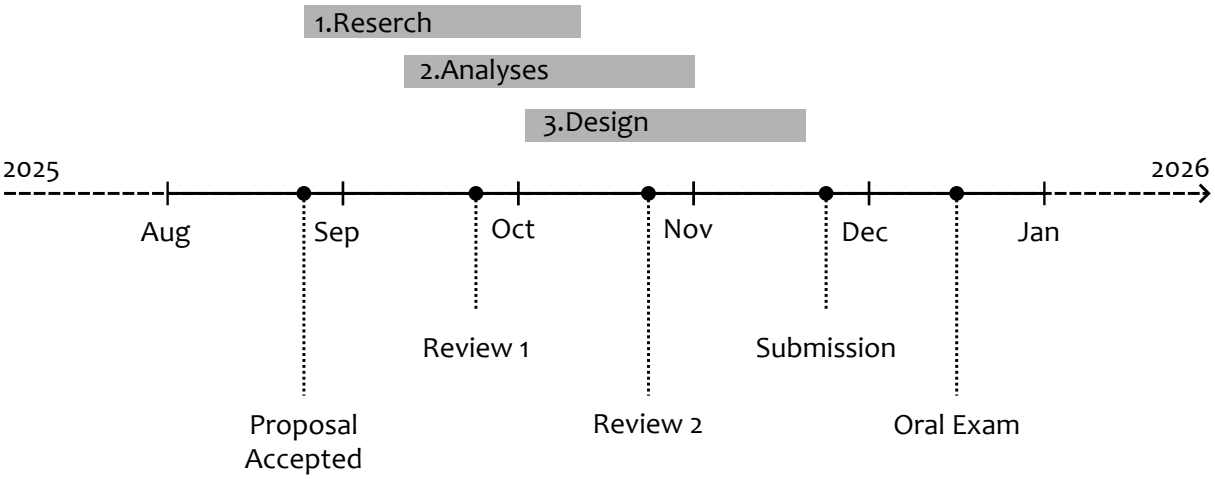
Seminars
The thesis started with thesis briefs and seminars at the beginning of September 2025. Multiple seminars were held to inform about the thesis, good practices, and regulations until October 2025.

Phases
The three main phases of the thesis, Research, Analysis, and Design, are followed chronologically with some overlaps. The phases lasted as such: Research (September), Analysis (October), and Design (November).

Reviews
Reviews from the thesis supervisor at mid-stages were very valuable in guiding the processes and the final output.

Submission
The final submission was given both in digital and printed format at the end of November 2025.

Oral Exam
After the final submission, the final oral exam with posters and models was held at Mid-December 2025.



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CONCEPTS

WADI, IDP, & PCR

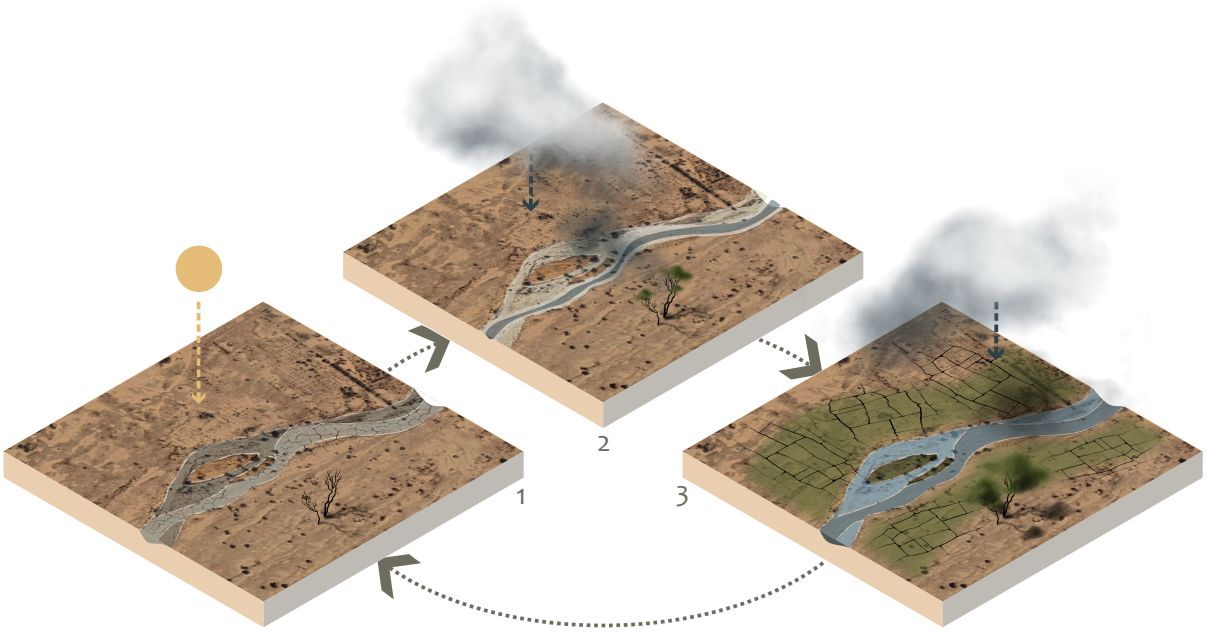
Before I begin to describe the context of this project, it becomes crucial to introduce the reader to the three major components of this study: Wadi, IDP, and PCR. Each term, even though very simple, has some specificity and deeper meaning. Their definitions correspond to some unique features of geography, demography, and socioeconomic processes. Objectively defining these terms will help to understand the premise and the key concepts from the very beginning.

Wadi

An Arabic word, sometimes also spelt 'ouedi', is generally used as a term for ephemeral (transient) river channels in desert areas. Wadis may flow only occasionally, and then sometimes discontinuously, along their courses (Thomas, 2016, p. 559). But it may also become the course of flash floods after heavy rainfalls.

IDP – Internally Displaced Person

"[...] persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or to avoid the effects of armed conflict, situations of generalized violence violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border" (OCHA, 2004).



1.
Dec - May (Dry preriod)
Season - Mild Winter & Spring
Climate - Hot & Dry
Rainfall - April & May (Saif)

2.
Jun - Aug (1st Flood)
Season - Summer
Climate - Hot & Some Rain
Rainfall - Starts in July (Kahrif)

3.
Sep - Nov (2nd Flood)
Season - Fall
Climate - Warm & Rainy
Rainfall - Ends in Sep.

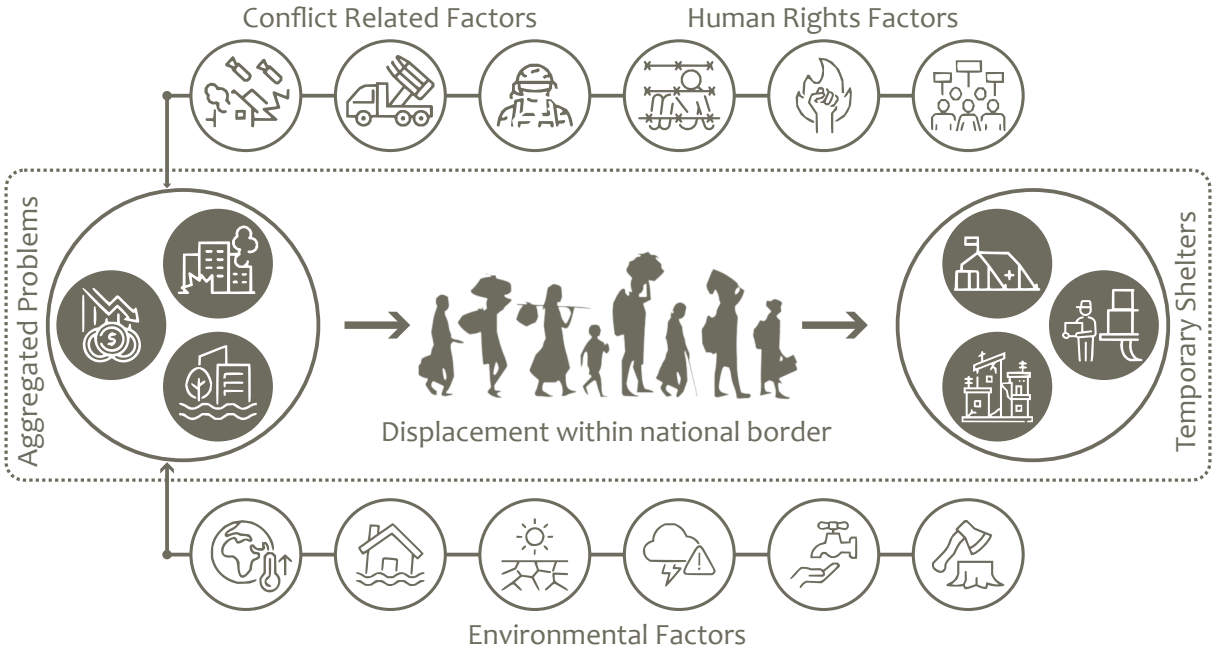


Illustration 1 : Annual Flood and Drought Cycle of Wadis in Tihamah Basin, Yemen (above)
Illustration 2 : Factors that increases IDP related problems (below)

WADI, IDP, & PCR

PCR – Post Conflict Recovery / Reconstruction

Post-conflict recovery is a multi-dimensional recovery process for a war-shattered nation. By aiding the affected population and institutions through national and global actors, it aims to achieve:

Early Phases - The consolidation of peace and security through humanitarian assistance,

Mid Phases - Systematic and gradual recovery of the socioeconomic frameworks,

Late Phases - Acceleration of sustainable development and growth to mitigate the losses.

The term 'Post-Conflict' neither refers to the total resolution of the root causes of the conflict, nor does it imply a complete cessation of all hostilities. It merely refers to a 'window of opportunity', when hostilities have abated to a level that allows significant progress towards peace, recovery, and normalcy in a war-torn society (Hamre and Sullivan, 2002).

'Emphasizing capacity development, UNDP sees 'Recovery' as the process of return from instability and conflict to a 'normal' development trajectory. […] Post-conflict recovery is often not about restoring pre-war economic or institutional arrangements; […] it is not about simply building back, but about building back differently and better' (BCPR, 2008, p. 4-5).

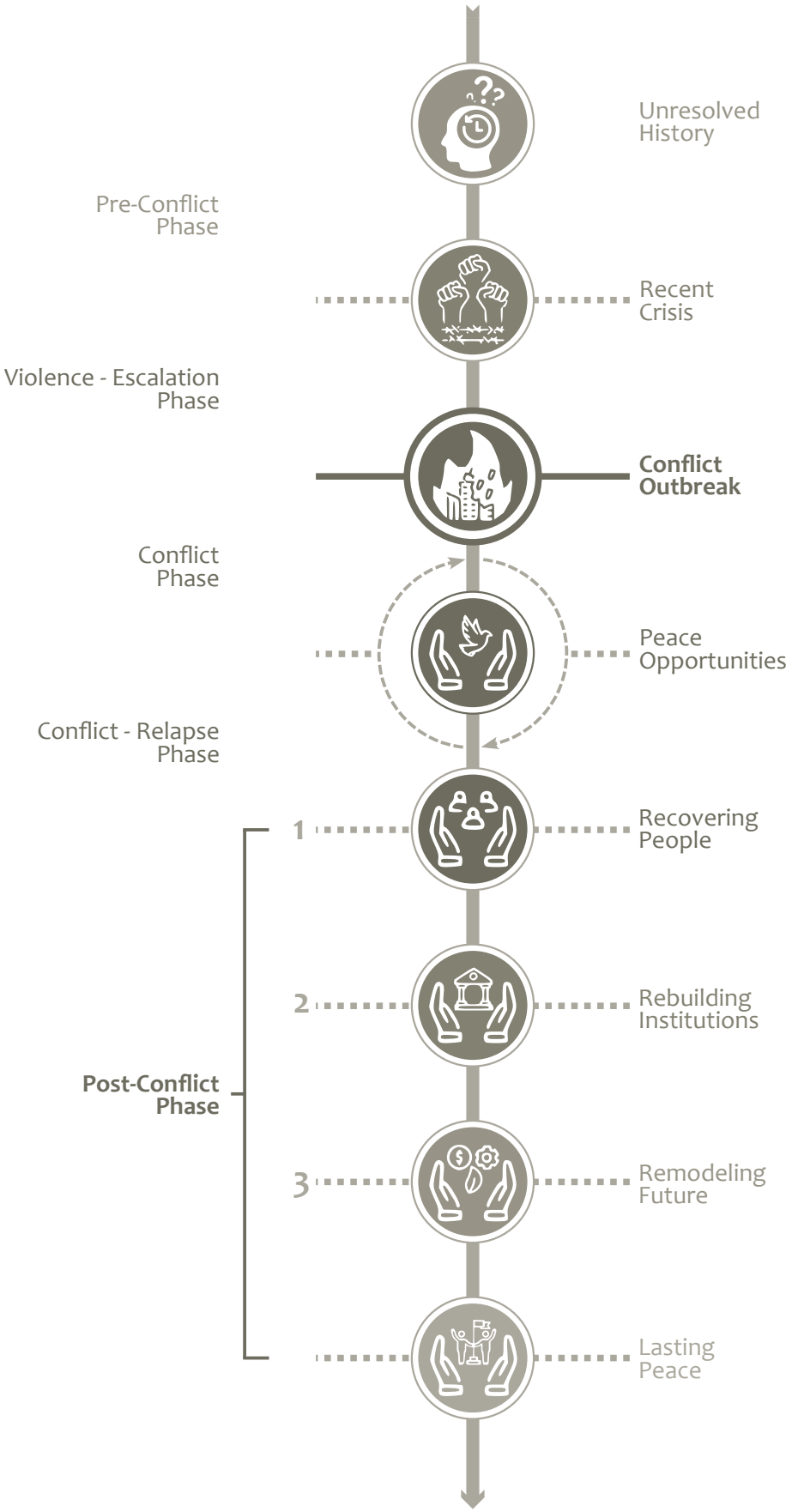


Illustration 3 : Post-Conflict Recovery / Reconstruction phase in a typical conflict timeline

CONFLICTS IN OUR TIMES

Is the world getting more unstable in recent times, and will it continue to do so? The answer is yes, according to the IEP reported Global Peace Index 2024. In recent decades, the geopolitical landscape of the world is shifting from a mono-polar to a multi-polar order, which increases the chance of conflicts among the global powers. Even though engaging in conflicts with powerful adversaries directly is still not expected, the smaller nations pay the ultimate price by becoming their proxies and frontlines.

Since 2008, many regions of the world have become unstable and have been continually decreasing in stability for the last 17 years. In fact, in 2022, battle-related fatalities reached a three-decade peak, and the number of active conflicts was higher than at any point since the end of World War II. Not only conflict-related deaths, which surged by 482%, but also economic losses due to war, non-state terrorism, and population displacement have doubled. Furthermore, we have entered an era where advancements in destructive technologies and asymmetric warfare tactics have allowed the relatively weak to challenge the powerful. As a result, even the most peaceful nations are militarizing, diverting resources that could have otherwise been spent on global humanitarian support systems. In 2023 alone, the global financial loss from violence was USD 19.1 trillion, or USD 2,380 per person worldwide (IEP, 2024).

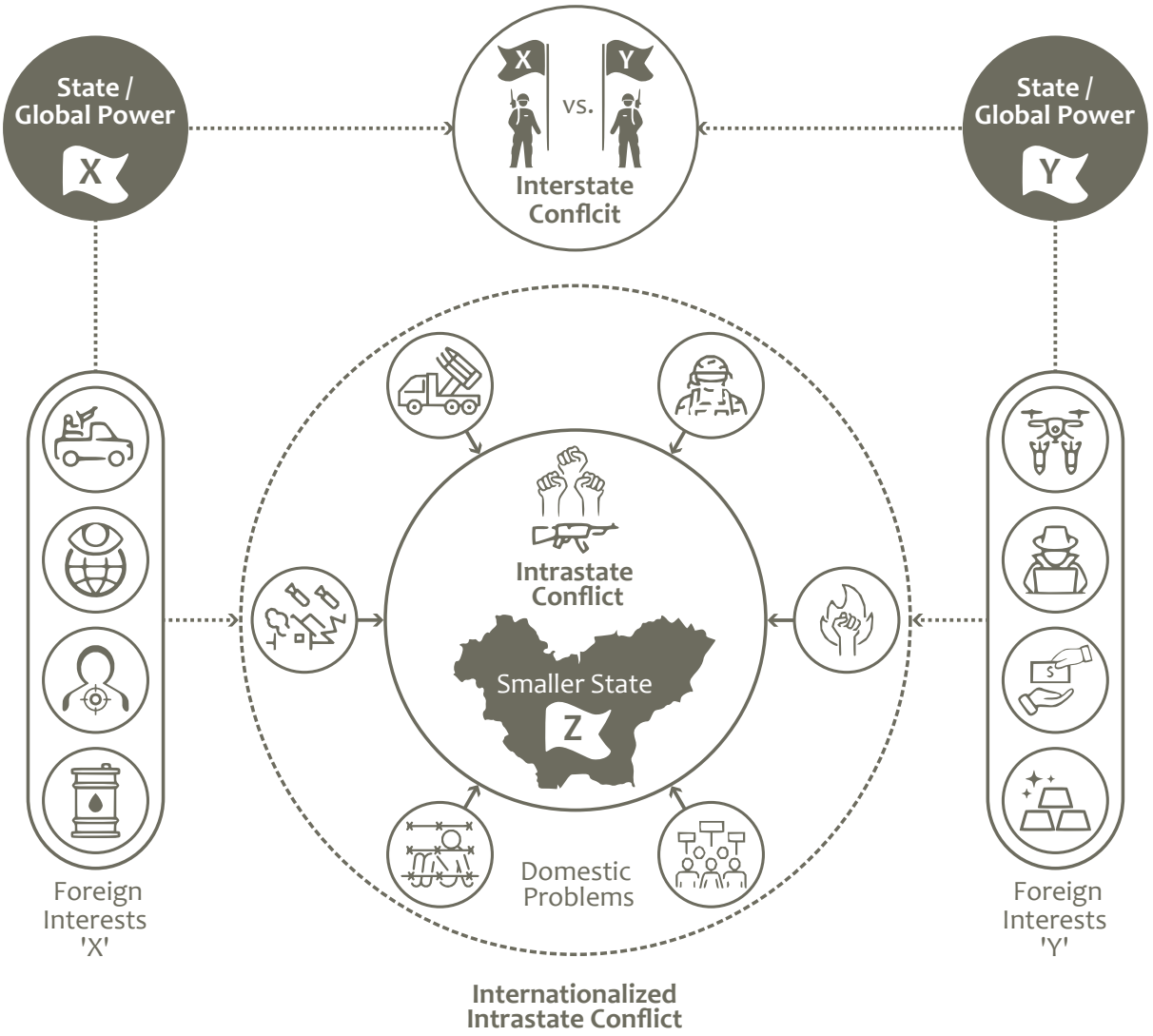
Understanding conflict types is more relevant now than ever to evaluate conflict-related problems and trends. The involvement of multiple national, international, non-state actors and regional power dynamics has been factored into the UCDP conflict categories. The 3 relevant types are:

1. **Interstate** – Conflict between two or more governments or states.

2. **Intrastate** – Conflict between a government and a non-government actor, with no interference from other foreign countries or actors. The common term used for this category is ‘Civil War’.

3. **Internationalized Intrastate** – An intrastate conflict where the government side, the opposing side, or both sides receive support from foreign governments or actors that actively participate in the conflict (UCDP, 2024).

Contemporary conflicts increasingly follow ‘Internationalized Intrastate’ model, where multiple domestic and foreign actors are involved in a nation’s internal conflicts. In 2018-2024 alone, more than 100 countries have directly or indirectly supported governments or factions fighting in foreign lands. This competition among various actors acting upon self-interest results in small-scale conflicts spilling over into a greater region. And the complexity of it makes conflicts increasingly more difficult to resolve. So, it is not surprising that deaths related to this category alone have increased by 475% since 2008. At least 16 countries have more than 5% of their population displaced due to intrastate conflicts. As of 2024, global conflicts have forcibly displaced over 95 million people worldwide (IEP, 2024).



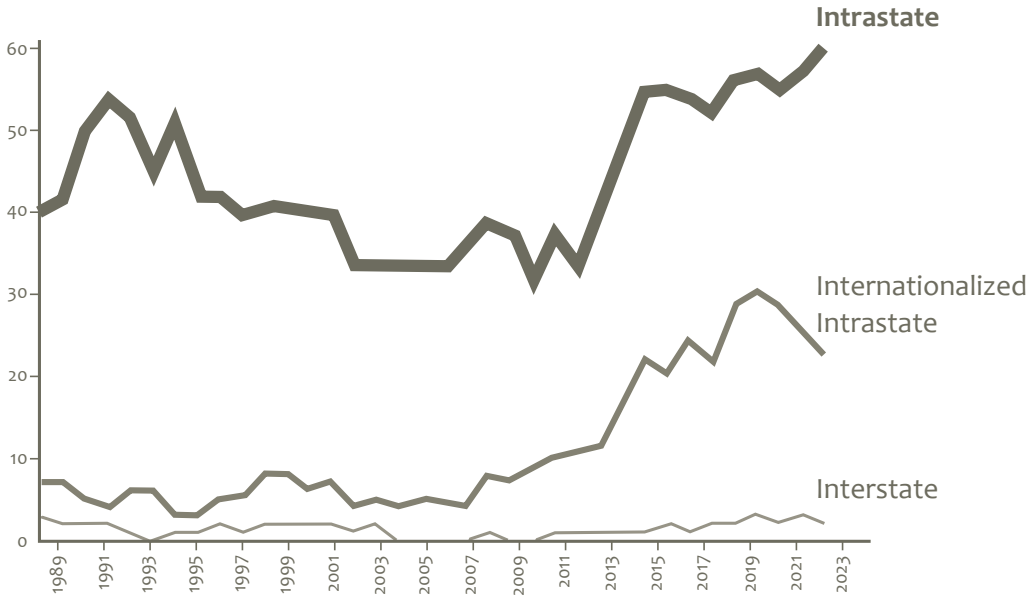


Illustration 4 : A Conceptual Diagram of Conflict Types (above)

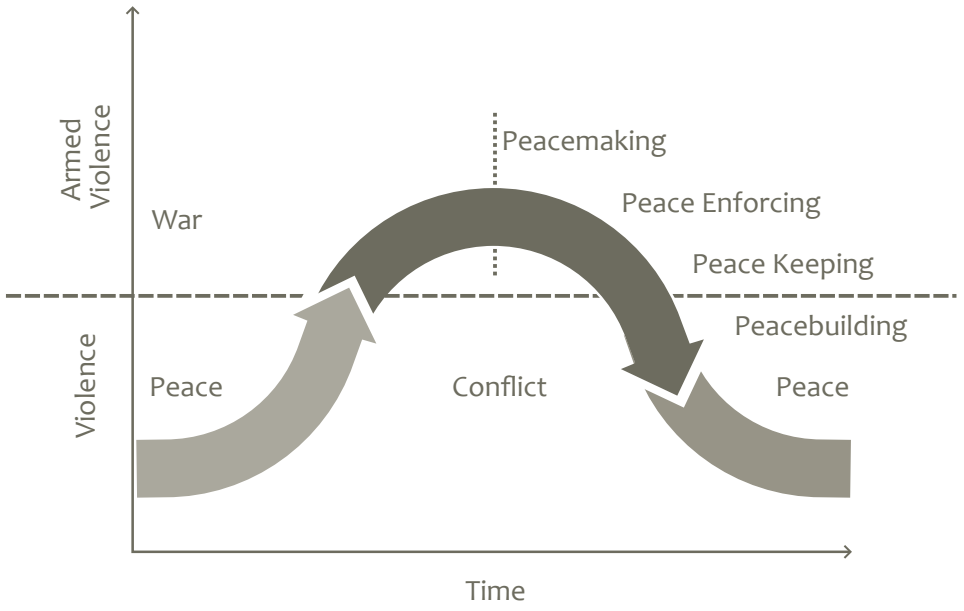
Illustration 5 : Number of Conflicts by Conflict Types 1989-2023 (UCDP, 2024) (below)

THE PHASES OF A CONFLICT

Peace and conflict studies fall in the territory of social science, where it is explained through interdisciplinary lenses. These interrelations go through sociology, psychology, anthropology, political science, economics, history, etc. Therefore, explanations from social scientists about conflict transformation timeframes have become fundamental to the core ideas of this thesis. It clarifies the main focus of PCR at different stages of peace-conflict transformation.

Sociologist John Paul Lederach, one of the key figures in conflict and peace studies, explains how conflict goes through certain phases and how each phase has specific characteristics. He provides an integrated timeframe of peace to conflict and conflict to peace transformation (Lederach, 1997; 2010). It shows how conflicts are deeply rooted in a nation's origin, narrative, and unresolved issues in its history, which is the pre-conflict phase. Some contemporary issues and injustice provoke that hidden emotions to come out, in the conflict phase, sporadic violence spirals into a sustained war, and over time, it keeps evolving. Another political scientist, Michael S. Lund (n.d.), reinforces this idea through his 'conflict curve', showing that the frequency, duration, nature, and causes of conflict change over time.

Later, when violence gradually subsides, in the transition to peace, situations generally go through a few phases into normalcy. And these are the phases of post-conflict which can be categorized into three: transforming people, transforming institutions, and transforming future (Lederach, 1997; 2010). Transforming people means recovering communities through humanitarian actions, security, and peace consolidation. Transforming institutions means systematically and gradually recovering the socio-economic infrastructure and governance of the country. And then transforming the future means not bringing back the pre-conflict systems, but guiding the nation towards a more improved envisioned normative scenario in the future. Here, the time duration for each phase varies depending on the context and complexity of the conflict.



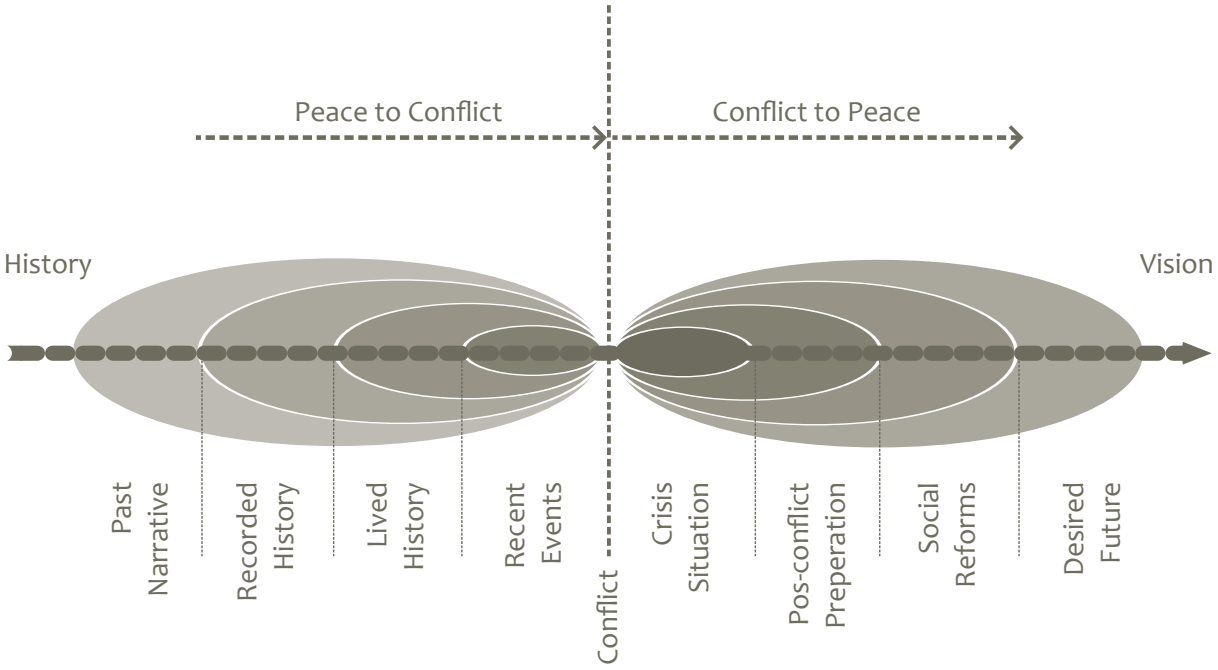


Illustration 6 : Peacebuilding in conflict curve (Lund, n.d.) (above)
Illustration 7 : Peace Transition Timeline (Leederach, 1997) (below)

BREAKING 'THE CONFLICT TRAP'

'Intrastate' or 'Internationalized Intrastate' are 95% of contemporary conflicts, so the issues that caused those conflicts require a close inquiry. By analyzing 14,832 conflict issues of 'Intrastate' nature from 1989-2017, the research provides a clearer picture of those causes. It broadly categorizes those issues into three:

1. **Conflict Goal Issues (33%)** – Consists of a nation's demand for reforms in state structure, political rights, resource distribution, governance, and its territorial issues.

2. **Conflict Dynamics Issues (26%)** – Consists of demands against foreign involvement, violent targeting, and refugee, IDP, or prisoner issues.

3. **Conflict Resolution Issues (15%)** – Consists of disagreements in negotiations, ceasefire, peace agreement, etc. and transitional justice, liability, and reconciliation issues (Johan Brosché and Sundberg, 2023).

As seen above, most of the conflict issues center around people's rights, expectations, and accountability from their governments. They raise their voices to be heard and point out the injustice in their society. But sometimes in the course of containing the situation, governments put disproportionate force on people, and the situation goes out of control. Often in the chaos of conflicts, the people who suffer the most are the poor, already vulnerable, marginalized, ethnic minorities, etc. Afterwards, injustice breeds further injustice and violence persists until complete exhaustion or mediation. Even after conflict resolution, peace can be fragile due to disagreements in negotiations, retributions, or transitional justice. And sometimes this goes on in a hellish loop, often termed as 'The Conflict Trap'.

Researchers suggest that statistically, 'Intrastate' conflicts possess a higher risk of relapse in a short period and put great stress on breaking 'The Conflict Trap'. To be specific, the chance of relapse is 23% during the first 4 years (Suhrke and Samset, 2007). This has serious policy implications for national and international humanitarian institutions and peacekeeping agencies. So during these first four years, the first post-conflict phase, getting out of 'the Conflict Trap' and consolidating peace becomes the top priority. Any effort that reinforces and helps this process increases the chance for PCR many-fold.

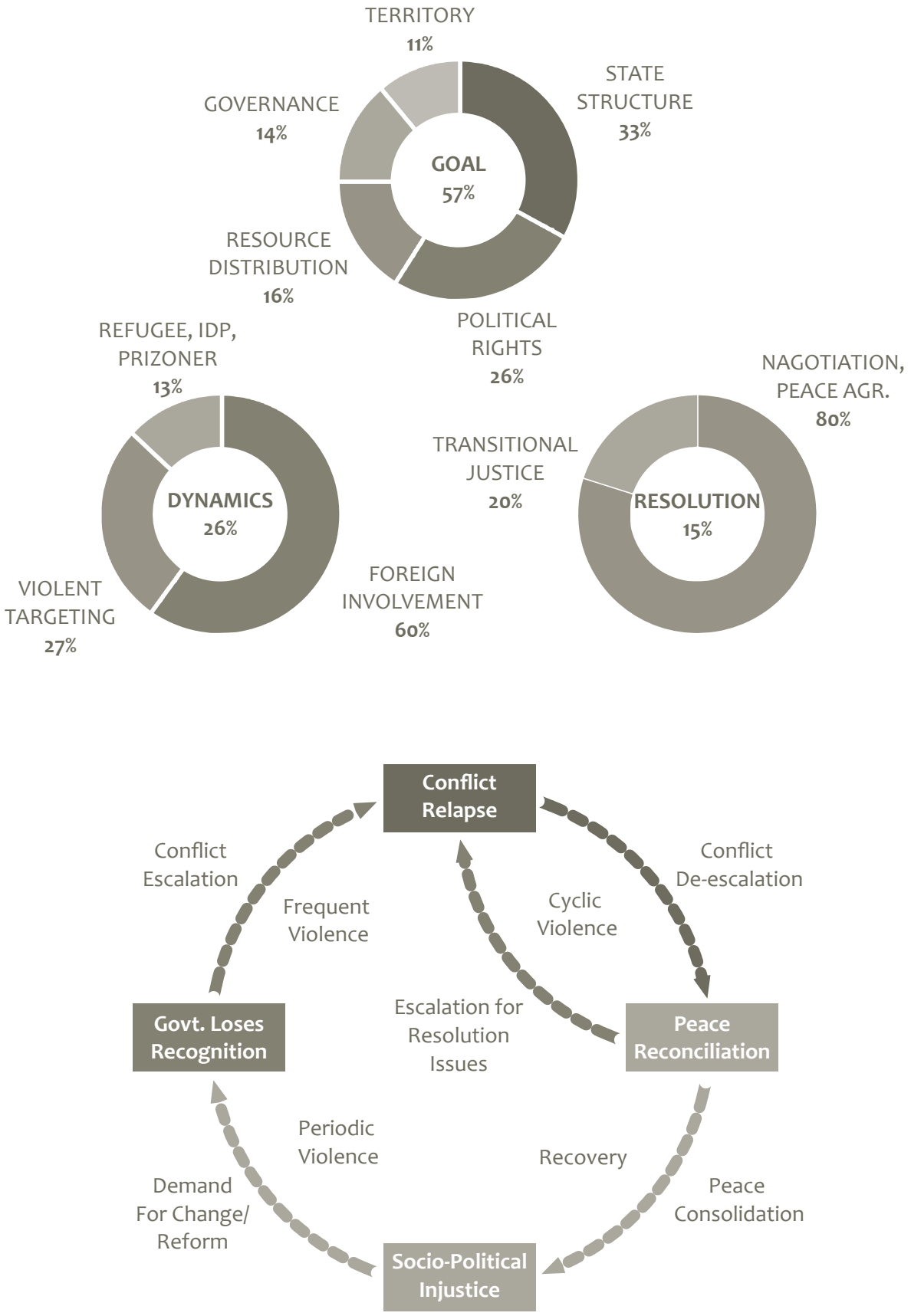


Illustration 8 : Cause of conflict and a diagram of conflict trap

THE PHASES OF PCR

The 'phases of PCR' resonate with the 'phases of conflict' identified by sociologist Lederach. According to his peace transition timeline (section 1.04), the post-conflict situations have three distinct phases with a general timespan: transforming people, institutions, and the future. Similarly, the 'PCR Task Framework' as a guideline defines three conceptual phases of PCR: initial response, transformation, and fostering sustainability (CSIS and AUSA, 2002). The framework places the timeline between the cessation of violent conflict and the return to normalization. So from both viewpoints, it is agreeable that these three phases have different PCR focus and characteristics. However, the timespan for each phase overlaps and is contextual. To remove any confusion about the focus of the phases, they can be renamed and assigned a timespan as such:

1. First Phase: Recovering People (Immediate, 1-5 years)

During conflicts, common people suffer, and the emergency needs in the early phase are addressed through humanitarian intervention. Other than special needs (i.e. peacekeeping troops), most of the necessities remain very basic: food, water, shelter, health, security, etc. So, humanitarian intervention focuses on protecting people, establishing emergency services, coordinating operations with multiple stakeholders, and preparing strategies for the future. Simultaneously, this process relies on building capacities of local actors, communities, individuals, etc., to carry those emergency tasks forward. With these tasks, humanitarian intervention tries to establish safety, security, stability, and peace at this early phase of PCR.

2. Second Phase: Rebuilding Institutions (Decade, 5-10 years)

After establishing the most basic yet vital services, the second phase of PCR focuses on more sophisticated functions, the social, economic, and political infrastructure. Rebuilding the physical and economic infrastructure is easy to comprehend, but that is not the case for governance or social recovery. During 'Intrastate' conflicts, government collapse and social polarization happen, hence reviving trust among the legitimate government, institutions, and various factions of society becomes crucial. Repairing this social fabric with reconciliation, recognition, justice, rehabilitation, inclusion, etc., is often the most overlooked. These mechanisms help to keep sustained peace and increase the nation's organizational and operational capacities to maintain it. International efforts strengthen local capacities by training institutions and the workforce to take the lead in PCR.

3. Third Phase: Remodeling Future (Generation, 20+ years)

The third phase begins with the affected nation exhibiting the capacity to adequately manage and sustain its peace, recovery, and growth without extraordinary foreign intervention. In this phase, governance, economic, and social mechanisms function in a self-sustaining way and plans to achieve long-term recovery or development goals. The remaining humanitarian missions completely hand over the task to the capable institutions and keep some oversight. By upholding the spirit of resilience, the affected nation envisions the course of its future development in the global context and lays its foundation.

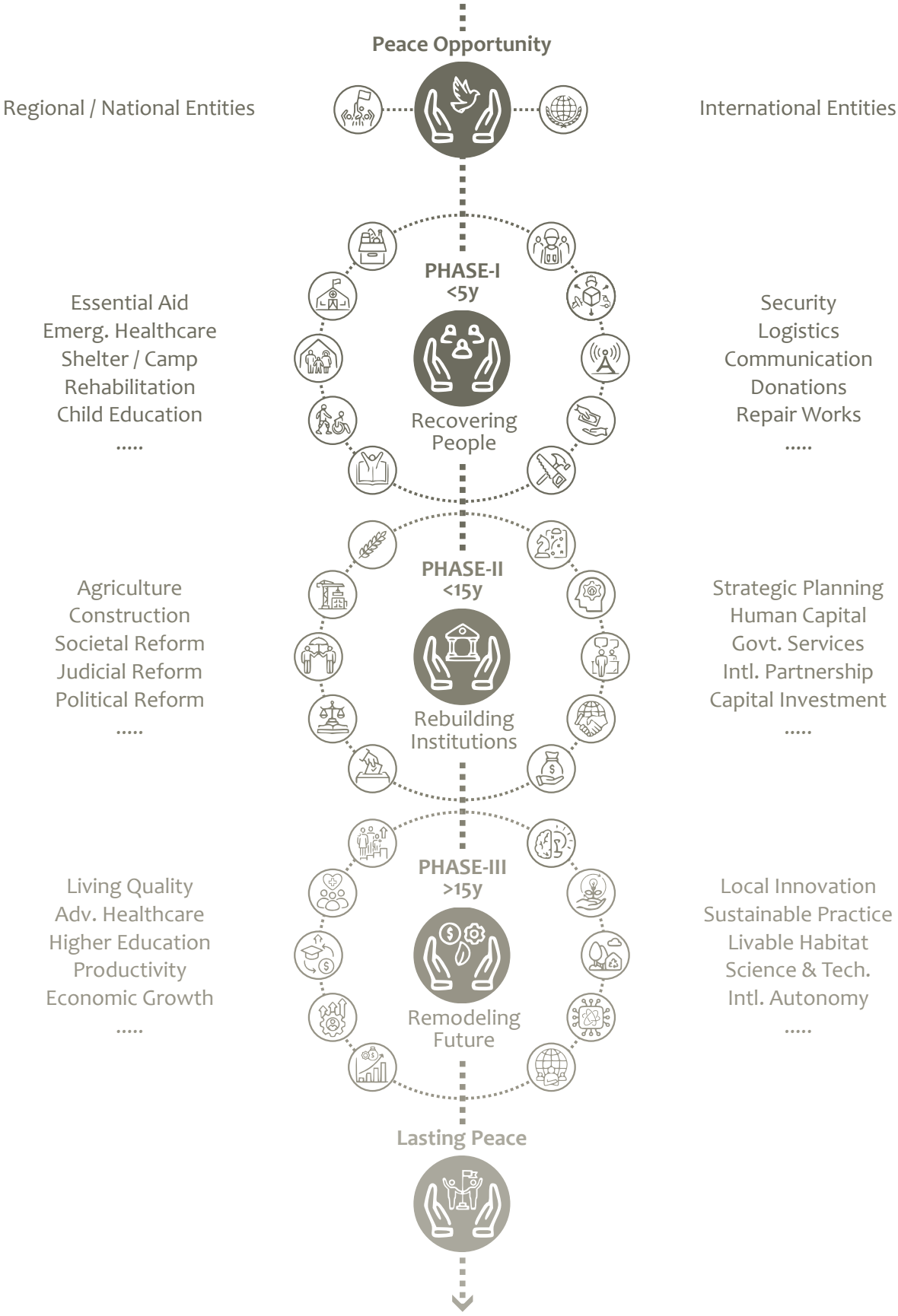


Illustration 9 : A conceptual diagram of Post-Conflict Recovery / Reconstruction Phases

UN ‘CLUSTERS’ DURING CRISIS

Understanding humanitarian response operations during a humanitarian crisis due to conflict is directly related to understanding PCR. Additionally, it provides a clear picture of the scope of sector-specific contribution and the recovery mechanisms. Since 2005, UN-led humanitarian agencies have operated through a system called ‘The Cluster Approach’ (OCHA, 2012).

UNHCR can declare a conflict situation or a disaster as a ‘non-refugee humanitarian crisis’ and mobilize its resources, but certain conditions have to be met. Firstly, the situational needs of affected and/or displaced people must be rapidly deteriorating, but the national or regional capacity to lead, coordinate and deliver humanitarian assistance is insufficient compared to the scale, complexity, and urgency of the situation. And secondly, the scale and complexity of the problem must warrant a multi-sectoral response with the engagement of a wide range of humanitarian actors (UNHCR, 2023).

Under these conditions, multiple emergency ‘clusters’ are activated. UN-designated Humanitarian Coordinator (HC) and the Humanitarian Country Team (HCT) manage the humanitarian response through these ‘clusters’. These ‘Clusters’ are:

Organizations - Groups of humanitarian UN and non-UN organizations in each of the main sectors of humanitarian response, and have clear responsibilities for fast and efficient coordination.

Provisional - They are time-bound bodies that are meant to fill a temporary gap due to the unavailability of government services.

Concentrated - Their objective is to build the capacity of the national systems to respond to humanitarian situations with protection and accountability, and progressively hand over coordination to national and local entities.

Conditional - Single or multiple ‘clusters’ gradually disengage when the situation improves, significantly reducing humanitarian needs and associated response and coordination gaps. And/or national structures acquire sufficient capacity to coordinate and meet residual humanitarian needs in line with humanitarian principles.

The main sectors of humanitarian response and associated cluster lead agencies are:

1. Food Security – WFP & FAO
2. Shelter – IFRC/UNHCR
3. Protection – UNHCR
4. Water, Sanitation, and Hygiene – UNICEF
5. Health – WHO
6. Nutrition – UNICEF
7. Education – UNICEF & Save the Children
8. Emergency Telecommunication – WFP
9. Logistics – WFP
10. Camp Coordination and Management – IOM/UNHCR
11. Early Recovery – UNDP (UNHCR, 2023)

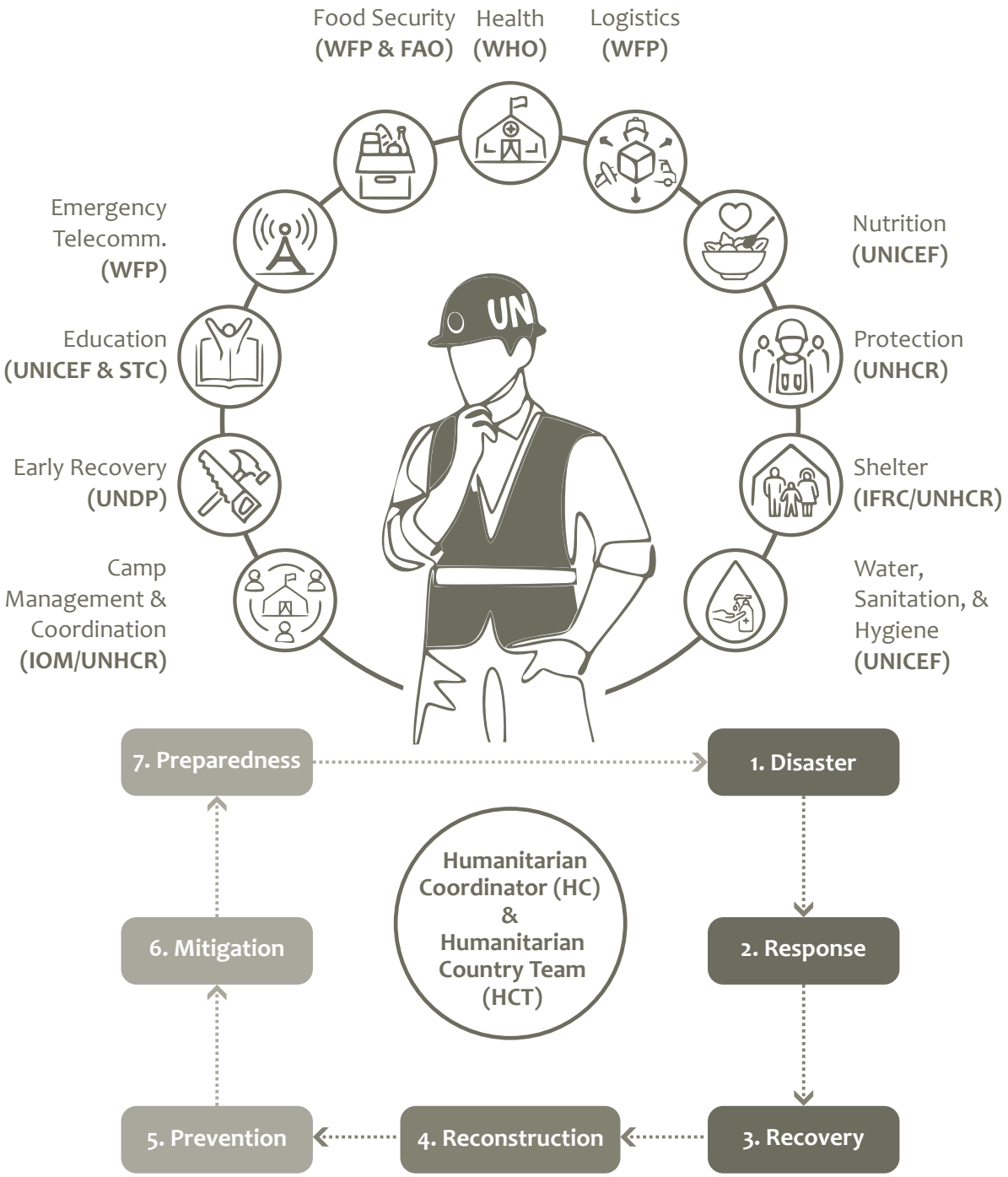


Illustration 10 : Multi-Sectoral Operation of UN Clusters during a Crisis (UNHCR, 2023)

URBAN DESIGNERS IN PCR

In scale and scope, urban designers fall in between planners and architects and can perform a wide range of potential roles to contribute to interdisciplinary PCR research, policymaking, strategic thinking, envisioning, etc. Just like other design-build professions, they can exhibit varied solutions to solve the same problem. This variation in mindsets, perspectives, and approaches results in different 'archetypes' of urban designers.

Having different objectives at each phase, PCR demands a flexible approach to solve problems in stages and as the situation unfolds. So, a random 'archetype' of urban designers will not be suitable to be involved in a PCR effort. Extrapolating from Professor Chralsworth's (2007, p.37) book 'Architects without Frontiers', the following PCR phase-appropriate archetypes can be proposed:

Educator (All Phases) - As educators, urban designers can work in all phases of PCR: before, during, and after a conflict. Inclusion of PCR into design curriculum, conflict/disaster preparedness and shock proofing, research and experiments, capacity building by training communities, etc., are the only way to push urban design beyond its edge and contribute anywhere possible.

Humanitarian (Crisis & Phase 1) - Under humanitarian principles and organizations, urban designers can provide creative solutions to settlements, resources, emergency logistics, makeshift facilities, sustainable strategies, etc., in a critical straining environment. They must think beyond aesthetics, focus on survival basics, and utilize problem-solving methodology in full capacity.

Social Reformers (Phase 1,2,3) - Urban designers as social reformers can address socioeconomic and political challenges and help foster peace in all post-conflict phases. Their use of the design-build process as a transformative tool to change social behaviour is beneficial in PCR. Other contributions can range from advocating for citizens' democratic participation, freedom, rights, consensus, regulations, etc., to addressing issues like poverty, crime, inequality, rehabilitation, etc.

Pathologists (Phase 2,3) - Urban designers as pathologists can critically diagnose ailments rooted deep into social, cultural, political, or economic spheres and propose strategic solutions as their cure. When resources and services are constrained, they can produce explicit designs targeted to resolve the issue, while also taking the limitations into account. Their intervention or innovation can be small and demonstrative, but may have much bigger impacts in a PCR scenario.

Historicists (Phase 3) - Built heritages are rooted in a nation's cultural identity, and protecting these assets with community involvement can be a uniting factor in post-conflict societies. During conflict, many historical elements can get destroyed or heavily damaged. Therefore, in the third phase, urban designers can focus on preserving and renovating heritage sites, further uphold the spirit of resilience, and add another healing factor for the affected community.

Other than these specific 'archetypes', urban designers should find scope in various UN clusters and contribute to other sectoral recovery. Specifically, in an integrated solution for camp coordination and management, shelter, water-sanitation, food security, logistics, and early recovery, urban designers must find suitable roles to play.

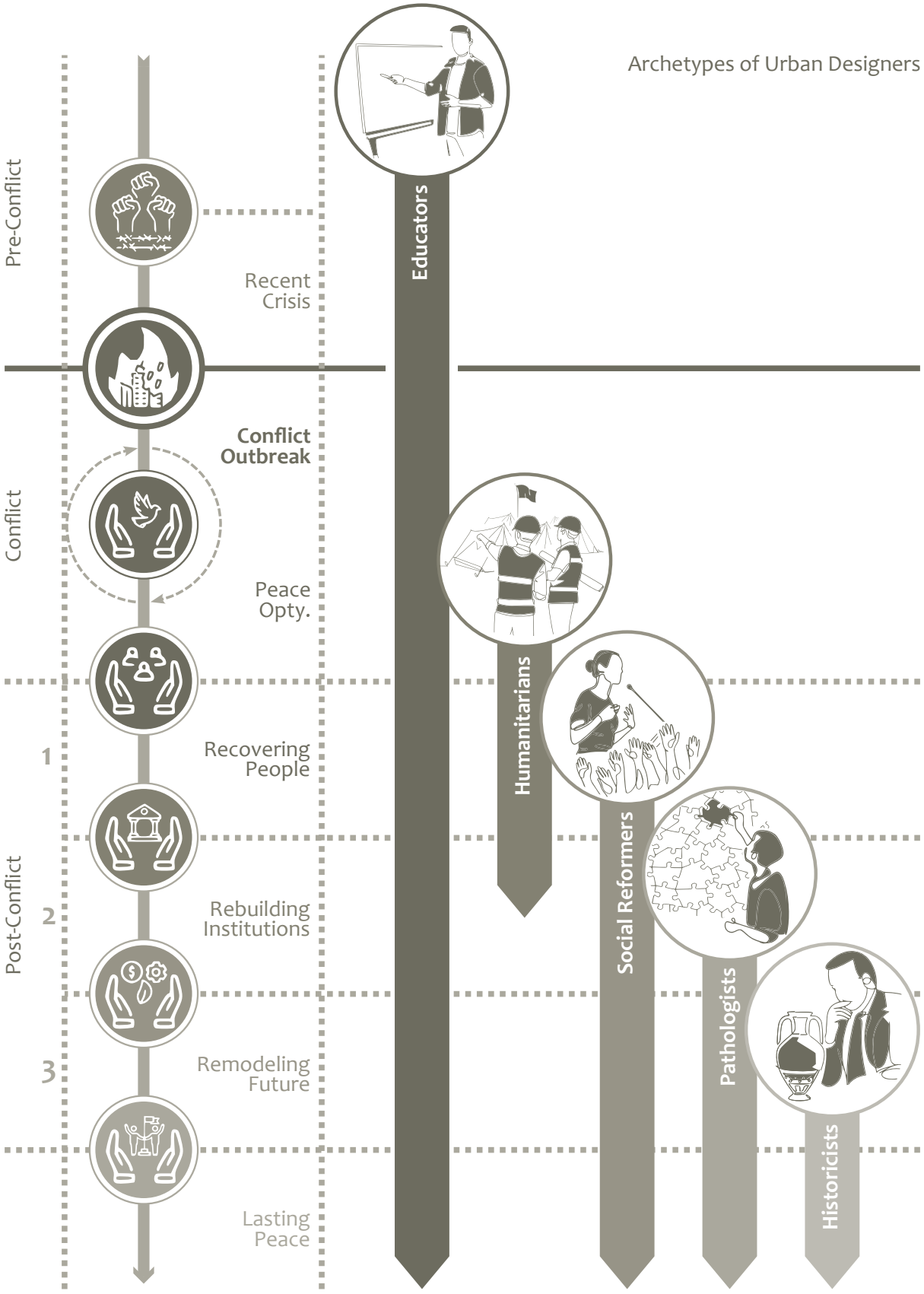


Illustration 11 : Suitable 'Archetypes' of Urban Designers and their approach in PCR timeline

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02

CONTEXT

YEMEN'S CONFLICT TRAP

Once a prosperous Sabaean civilization, Yemen has fallen into a conflict trap in its post-colonial and modern era. It had abundant resources and harmonious desert life made possible by intelligent management of water, agriculture, tall mud dwellings and trade routes. Both the Romans and the Persians competed to control this strategic location. Yemen impressed the Romans so much that they used to call it 'Arabia Felix' or 'Flourishing Arabia'.

Like the Romans or the Persians, Yemen was controlled by multiple global powers throughout history. In the Middle Ages, successive Arab dynasties and finally the Ottomans ruled Yemen. In 1839, the British took control of the port city of Aden and south-eastern Yemen. After the fall of the Ottomans in the early 20th century, Ottoman Yemen became a Shia'ite kingdom, and in 1962, the Yemen Arab Republic, through rebellion and bloodshed in both instances. On the other side, in 1967, the British left Yemen facing insurgency, and the People's Republic of Southern Yemen was created. In 1970, under the influence of the Soviets, Southern Yemen became a communist democracy. Clashes and disputes between North and South Yemen were common, and separately faced periodic violence and civil uprising in the 1970s and 1980s (UN Foundation, 2018).

After the fall of the Soviets, North and South merged into modern Yemen in 1990, but religious divide, ideological differences, and unresolved historical issues evolved into new civil conflicts. In 1994, the government violently suppressed the southern civil rebellion. In 2000, the USA entered the scene to fight terrorism in Yemen. In 2004, backed by the USA and KSA, the government again violently cracked down on the Shia'ite revivalist rebel group called 'Huthi'. This sparked tensions and polarized Yemeni society on ethnic, religious, and nationalistic grounds, resulting in Periodic violence in 2004-2010.

2004-2010 began Yemen's 'Intrastate' conflict, starting with the Huthi rebellion and later became 'Internationalized' in 2015. During 2011-2014, the 'Arab Spring' reached Yemen, and the public erupted in protest over the government's reform on various issues. A National Dialogue Conference (NDC) was set for reforms and transitional government. But during the same period, the Huthi movement expanded. NDC broke after a Shia-Sunni clash in 2014, and the Huthis took control of former North Yemen militarily. In 2015, the conflict entered 'Internationalized' phase after the Huthi takeover. The country was fragmented into three governments. Iran-supported Huthi expansion was tackled with KSA-led airstrikes and naval blockade. USA continued anti-terrorism attacks in Yemen, and just like old times, Yemen's civil conflict became a proxy war of global powers (BBC, 2019).

Even though multiple ceasefires and peace talks have been reached, Yemen's war is far from over; in fact, it has entered its 'Interstate' phase. In 2019, the USA Senate voted to remove troops from Yemen and stop support to KSA-led intervention (Sukin, 2019). And in 2020 KSA-led coalition also declared a ceasefire following the COVID-19 pandemic. But in the wake of conflict in Gaza in 2023, the Huthi government of Yemen have sparked new conflict in the region. Following Huthi attacks on global shipping routes in the Red Sea, USA-led operations have conducted 430 combined attacks in major cities and ports in 2024-2025, killing at least 285 (Hussein and Chughtai, 2025). In 2025, so far, peace and stability in Yemen continue to remain a pipe dream.

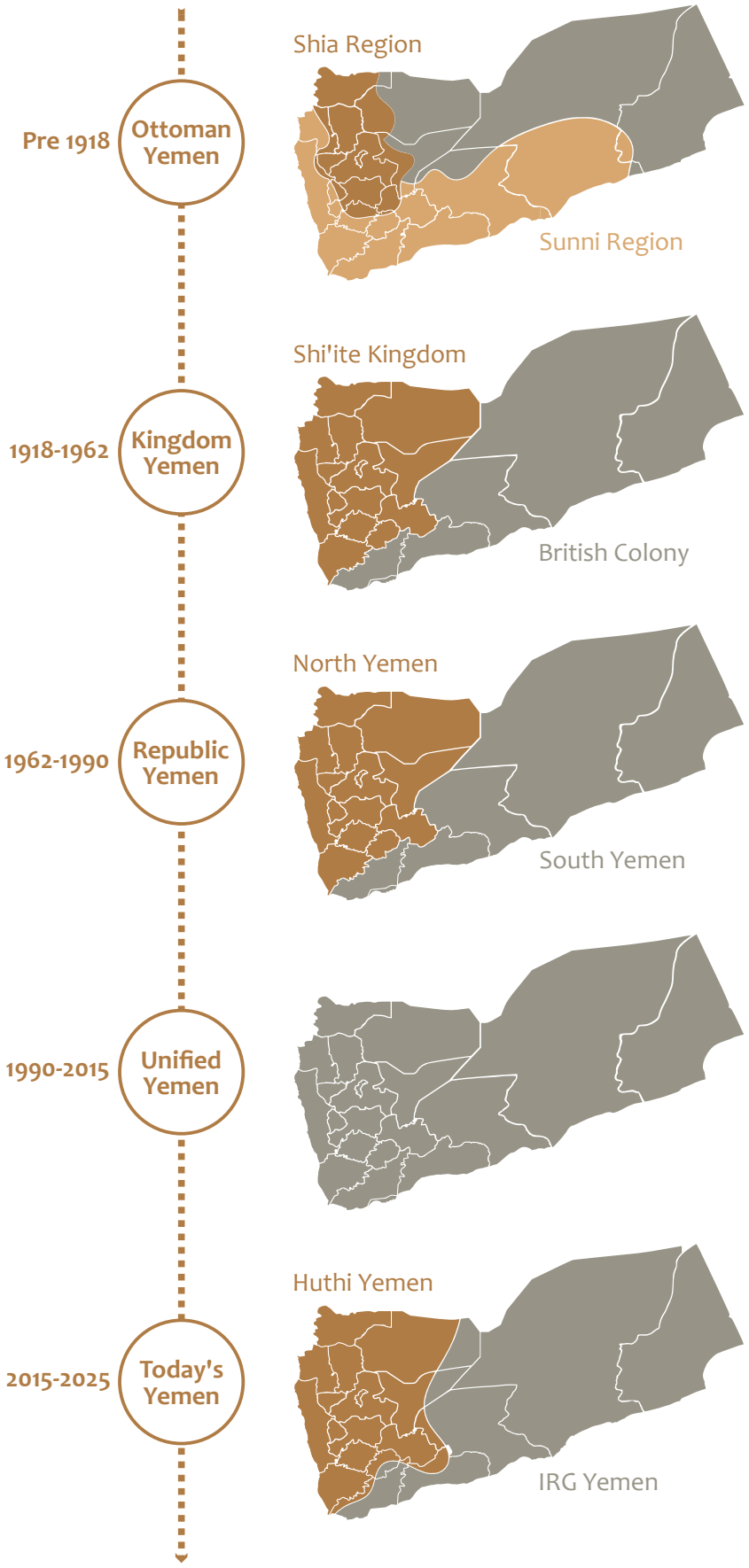


Illustration 12 : Yemen's political divisons througout history

WHAT'S LEFT OF YEMEN IN 2025?

Overall: After 10 years of conflict, Yemen remains one of the world's worst humanitarian crises in 2025. Other than human toll, destruction ranges from infrastructure, critical services, economy, agriculture, healthcare, education, etc. The country experienced a 54% drop in GDP per capita (US$ 126B) since 2015 (WBG, 2024). Out of 38.7M people, 21M (54%) need regular humanitarian aid and protection, of which almost 80% are women and children (UNOCHA, 2024; WFP, 2024).

Death Toll: By 2021, the conflict in Yemen had caused over 377,000 deaths, of which 60% were due to indirect causes like lack of food, safe water, and healthcare (WFP, 2024). More than 11,000 children are known to have been killed or wounded as a direct result of the fighting (UNICEF, 2022). In 2021, one Yemeni child (<5 years) died every 9 minutes, directly or indirectly, because of the conflict (Hanna, Bohl and Moyer, 2021).

Food Insecurity: 17.6M (50%) people face food insecurity, and 90% rely on food imports due to reduced harvests. After 6 years of blockade, recent airstrikes on Seaports and airports are disrupting the import of humanitarian goods and supplies (NRC, 2024).

Poverty & Aid Dependence: Multi-dimensional Poverty (<$2.15/day) jumped from 19.8% in 2014 to 83% (32.6M) in 2024, with 50% of households mostly in the rural areas. 21M (54%) people in Yemen depend on aid to survive (WFP, 2024).

Health Crisis: Over 5M people have disabilities, of whom 21% are children. 40% of health facilities remain functional (SCI, 2024). Of them, only 20% provide child and maternal healthcare. A woman dies due to preventable complications during pregnancy and childbirth every 2 hours (UNFPA, 2023). 55% of children under 5 suffer from severe malnutrition, and 28% of newborns (<1 year) are missing vaccinations. Since 15M (39%) people (9.2M children) are without safe water and sanitation services, preventable waterborne disease situations have become epidemic (UNICEF, 2022).

Climate Change & Agriculture: Seasonal flooding has also continued to kill, injure, and evict people from their homes, as well as destroy property, crops, and livelihoods. For two decades, droughts and floods have reduced the amount of farmable land from 3% to 2%. The conflict has also exacerbated the country's environmental problems, including severe water scarcity (WFP, 2024).

IDP Crisis: Yemen is the 5th largest IDP crisis globally. Today, 4.8M remain internally displaced, 80% of whom are women and children, most displaced multiple times over 10 years. Other than conflict and economic issues, in 2024 alone, 531,000 were newly displaced, mostly due to climate disasters. 40% of IDP sites are at risk of fire or flooding due to Yemen's climate vulnerability (SCI, 2024).

Education Crisis: 3.2M children are out of school, and this number could rise to 6M as 25% of schools have been destroyed or partly damaged (SCI, 2024). 4,000 children were recruited as militants (UNICEF, 2022).

Funding Shortages: Yemen's Humanitarian Needs and Response Plan (HNRP) programs are critically under-funded. In 2024, the response received just over half of what was required. 2025 HNRP seeks $2.47 billion to reach 10.5 million people, but as of March 2025, it is just 9% funded (OCHA, 2025a).

21M Yemenis

54%

Depends on Aid

Essential Supplies & Protection

80% of whom are **Woman & Children**

4.8M IDP

13%

Internally Displaced

Flood, Drought, Poverty, & Conflict

5th in 2024 **World's Largest IDP Crisis**

Conflcit & Climate Change

83%

Multi-Dim. Poverty

Food, Nutrition, Water & Economic Crisis

55% children <5y in **Severe Malnutrition**

6M Children

25%

Schools Destroyed

Generational Loss, Poverty, & Militancy

4000 recruited as **Child Militants**

Children, Mothers, Disabled

60%

Healthcare Facilities Closed

Childbirth, Vaccines, Deseases Outbreak

39% people without **Safe Water & Sanitation**

2.5 B USD Needed

91%

Funding Shortage

Global Instability & Other Emergencies

10.5 M Yemenis will face **Aid Uncertainty in 2026**

Illustration 13 : Yemen's situation at a glance

WORRIES AND RECOVERY PATHWAYS

In 2025, Yemen's conflict is far from over, and the future can be projected with four possible scenarios: conflict continuation, fragmented recovery, integrated recovery, or no conflict scenario. Conflict continuation is not as intense as pre-2021 to suggest that conflict is ongoing, but not yet stable enough to exclude the possibilities of escalating violence. On the contrary, a no-conflict scenario just helps to assess the deterioration of the current situation. An integrated recovery is an ideal situation where all efforts are well coordinated and funded across multiple sectors over a decade. By assessing the current aid situation, this scenario seems a bit too optimistic.

If the situation deteriorates and the conflict continues through 2030, it is estimated that 1.3M will die as a result, with more than 70% of those deaths being from indirect causes. Most of these indirect deaths are children under the age of five. By 2030, a child will die because of the conflict every five minutes. Compared to a scenario without conflict, 22.2M people may potentially be forced into extreme poverty, and 9.2M more people may also experience malnutrition (Hanna, Bohl and Moyer, 2021).

The most grounded future scenario for Yemen seems to be a fragmented recovery, where recovery is not the most efficient, but continues despite challenges. Yemen's conflict has hurt its SDG goals. Even though a fragmented recovery will make up some progress, the country will still fall short of reaching the pre-conflict SDG level in the 2030s. Its GDP will rebound to pre-conflict levels by the 2040s, and poverty and malnutrition will reduce slowly. But still, in this scenario, the lack of access to food, water, and healthcare may kill between 45,000 and 62,000 additional people annually in the next decade as compared to a No Conflict scenario (Hanna, Bohl and Moyer, 2021).

UN's country team for Yemen (UNCT) has adopted a flexible and adaptive plan dividing the recovery effort into two timeframes: immediate humanitarian needs and long-term development goals. It integrates humanitarian support with resilience-building efforts, a sustainable solution that addresses both urgent needs and future challenges (RCO, 2025). The immediate humanitarian needs are managed through UN clusters and their multi-sectoral efforts. UNDP (2024b), UNCT, HRP, WBG, and other organizations prioritize the following sectors, which are the building blocks of Yemen's long-term recovery:

1. Agriculture: Food, nutrition, irrigation, animals, agro-infrastructure, agro-economy.

2. Climate Resilience: Adaptation, climate risk mitigation, disaster management.

3. Ecological Restoration: Water management, drought resistance, climate sensitivity, habitability.

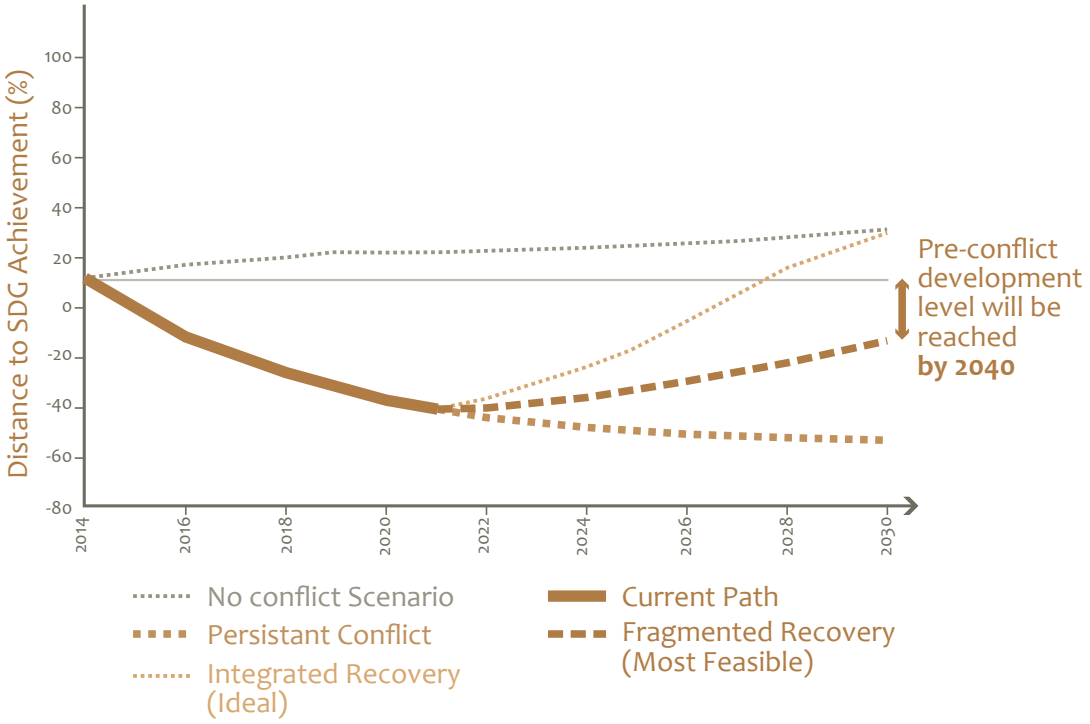
4. Human Capital & Education: Skill, capacity, knowledge, productivity, training.

5. Empowering Women: Women's health, education, communal and economic participation.

6. Economic Revival: Local/micro industries, livelihood, job creation, private sector partnership.

7. Infrastructure: Housing, settlements, institutions, energy, telecommunication, logistics.

8. Governance: Peace, security, human rights, inclusion, community participation, transparency.



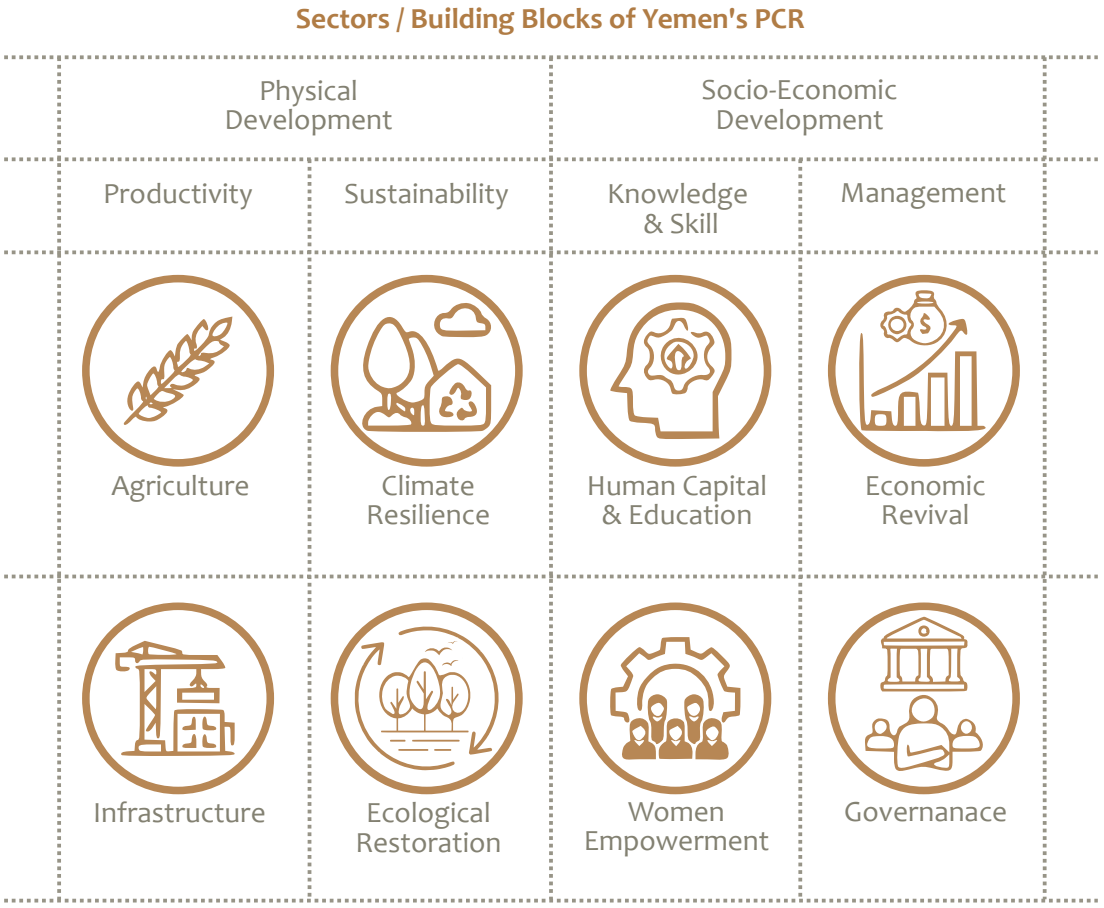


Illustration 14 : Yemen's Recovery Pahthways (Hanna, Bohl and Moyer, 2021)

HINTS TOWARD SOLUTIONS

Yemenis have internal divisions, and their society is polarized today, but some other socioeconomic and environmental issues are aggravating this problem further. Systematically solving these issues may not result in a no-conflict scenario, but it will surely bring some stability, peace, and a return to normalcy in this current fragile situation. The fragmented recovery scenario also strengthens this idea, where recovery comes through a compounded effect of immediate emergency assistance coupled with long-term resilience and indigenous capacity building. By far, this seems to be the most efficient and effective solution.

Yemen's current problems are rooted in conflict-induced poverty and the lack of proper institutional support systems to alleviate this situation. The rural agrarian communities fell under the pressure of force, intensifying violence, infrastructural damage, economic collapse, lack of institutional support, and climate-related challenges during their conflict (UNHCR, 2025). To survive multiple risk factors, the rural poor and the marginalized had to abandon their lives and settlements to look for security, economic opportunities, or access to humanitarian assistance. Thus, they became internally displaced and flocked to the temporary humanitarian shelters or informal settlements in the big cities. But increasing IDP migration in the urban slums, where the living conditions are already poor, is worsening problems in those areas without solving the core issues. The primary needs of IDPs remain about basic survival, food, water, shelter, financial support, and other essential non-food items (IOM, 2023).

Therefore, UNHCR's strategic priorities for Yemen include the strategic use of durable IDP resettlements and improving their living conditions through services and support for self-reliance. This returns IDPs to their original rural setup, where they will be rebuilding resilient livelihoods in a healthy and dignified condition. As conflict and climate-related displacements are the main causes of IDPs in 2024, after securing peace and basic services, efforts should focus on human capital development and adaptation measures for climate-resilience (UNHCR, 2025). Increasing investments and participatory skill sharing in climate-resilient IDP settlements, water management, and agriculture can be the foundation of a durable solution. From conflict and climate-related displacements, to peace and stability through climate resilient living and livelihoods may bring the desired situation reversal and a fragmented post-conflict recovery.

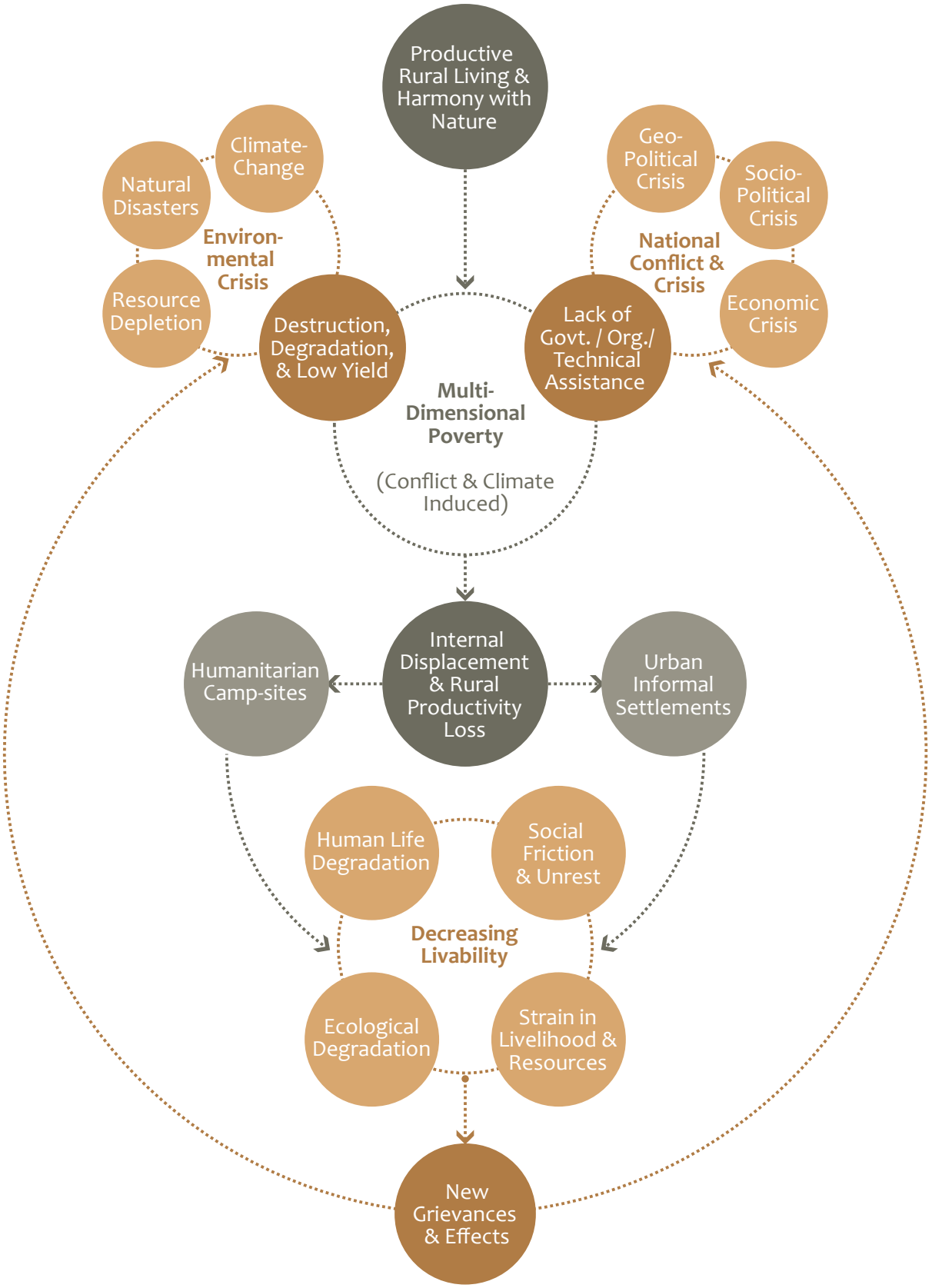


Illustration 15 : Inter-relations of Conflict, Climate, & IDP problems in Yemen

CLIMATE RESILIENCE TO PEACE

European Institute of Peace (EIP) conducted consultations for a project to support locally led sustainable peace by mitigating environmental risks as an entry point and key element of peacemaking. The project builds upon the findings of an initial consultation with 15,870 individuals facilitated through EIP in 2020 – 2021, and then reached a total of 2,463 people across the nine governorates of Aden, Taiz, Marib, Al-Mahra, Al-Hodeidah, Shabwah, Sana'a, Al-Dhale'e, and Hajjah. This project found the following insights:

Climate Risk Awareness: Close to 70% of survey respondents acknowledged that climate change impacts their family and community lives significantly or moderately, while more than 80% reported some degree of concern about it.

Environmental Degradation Concerns: 92% perceived a reduction in the availability of and access to natural resources in the past years, notably in water.

Disputes due to Extreme Climate: Access to water and energy are creating disputes. Over 50% of survey respondents indicated that they are informed of conflicts in their district related to environmental issues, close to 70% of respondents reported tensions and disputes over water resources within their communities.

Solving Environmental Issues for Peace: Local voices want environmental risks and related conflicts to be addressed more comprehensively, including as part of peace efforts. 85% of the Yemenis consulted considered it essential to address climate change in the short-term, and over 60% expressed their support for integrating environmental considerations into conflict (IEP, 2024).

The study suggests a foundation for an accountable local governance structures that would foster peace and stability in communities focusing on climate challenges. The core of that structure lies in three areas:

1. Community Engagement: Engaging affected local communities in climate resilience actions.

2. Developing Local Strategy: Encouragement and facilitation of community participation in developing strategies to address the climate risks and also contextualize this in present ongoing conflict situation.

3. Formalize Institutions: Build effective, responsible and accountable community institutions through this process (IEP, 2024).

Illustration 16 : Climate Rsilience Initiatives reinforcing 'Peacebuilding' in affected communities

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03

MACRO ANALYSIS

LAND AND WATER

Boundaries

Yemen is situated in the southwest corner of the Arabian Peninsula and has strategic geographic importance throughout history. It borders Oman in the east and the Kingdom of Saudi Arabia in the north. The other sides are bounded by water, the West's Red Sea, and the South's Gulf of Aden. The Bab-al-Mandab Strait, situated in Yemen's south-western tip, is an important historical shipping route, providing access to the Mediterranean Sea from the Indian Ocean.

Terrain and Elevation

The western side of the country is significantly mountainous than the rest. The other landforms of the country consist of coastal plains, central and eastern highlands, and finally, eastern and north-eastern deserts, part of Rub al-Khali. The coastal plains range in width from 8-65 km. The highest peak, a few kilometers north-west of the capital Sana'a, is 3,665 m tall. It has several islands off its coasts. Socotra, the largest island, is most famous for its unique biodiversity (Wenner and Burrowes, 2019).

Water Basins

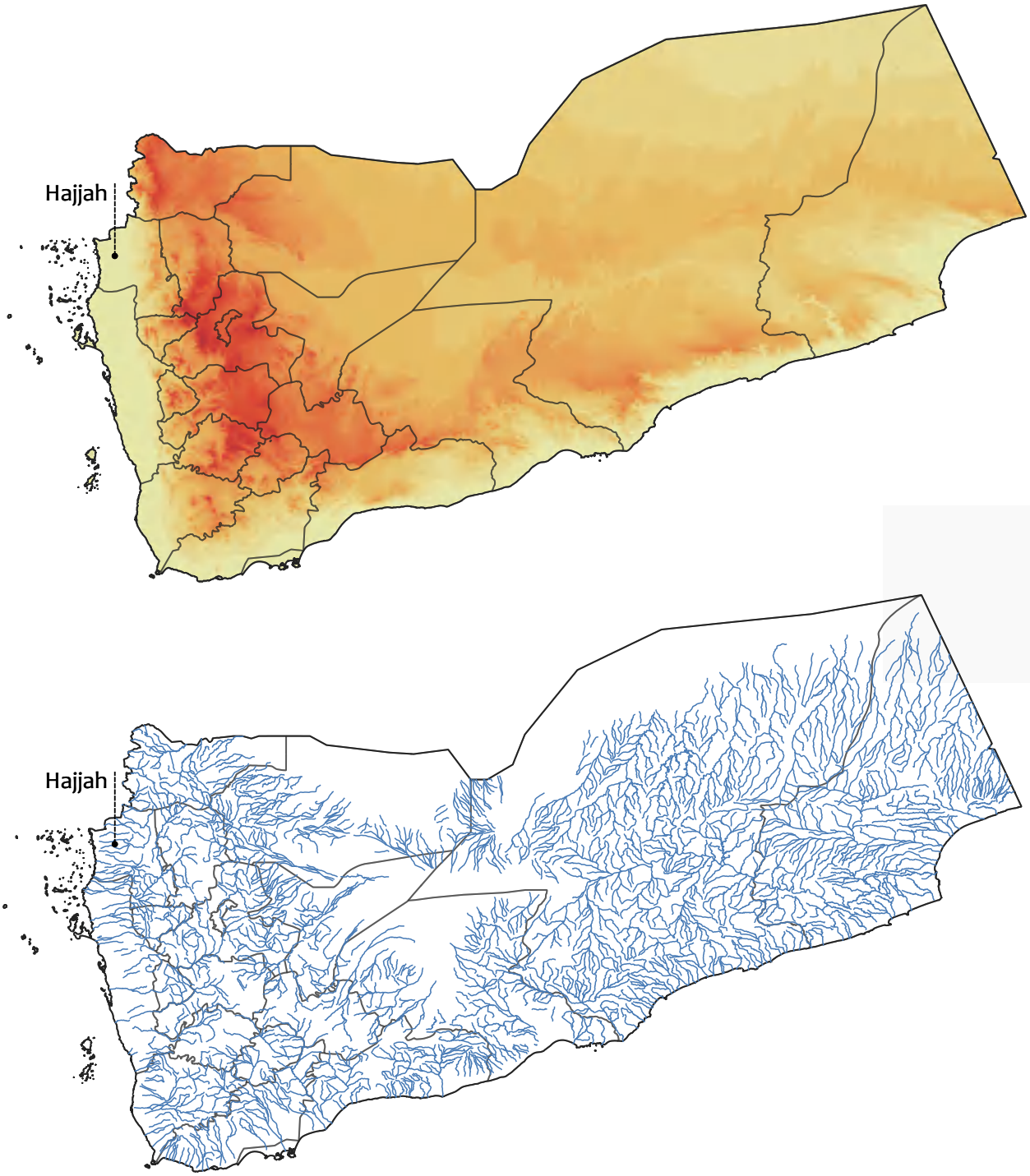
Yemen can be subdivided into 4 main drainage basins: The Red Sea basin (Tihamah), the Gulf of Aden basin, the Arabian Sea basin and the Rub al-Khali basin. These basins collect rainwater and flow downstream through water channels, being the primary source of surface water in Yemen. 30% of Yemen's total freshwater withdrawal is derived from surface water, and the remaining 70% is derived from ground aquifers. Surface water resources are estimated to be about 1,000 MCM/y (Million Cubic Meters/year) and are highly important for agricultural irrigation (Berg et al., 2021).

Wadis in Tihamah

Wadis are seasonal surface water courses that can have a sudden increase in flow and volume of water or can completely dry up depending on multiple hydrological factors. These wadis originate from the water basins in the highlands and carry seasonal rainwater downstream. In Yemen, about 6% of rainwater is captured by Wadis and flows as seasonal floods, which amounts to 2,000 MCM/y.

The Red Sea basin, otherwise known as the Tihamah basin, drains most of the rainwater from the western highlands. It has seven major wadis, each having a catchment area of about 1,000 sq. km. Rainfall in the highlands in spring and summer generates significant runoff in upper and central Tihamah, and the flow of flash floods peaks as the rainfall peaks. Most of the wadi water percolates into the permeable sediments of Tihamah, recharging renewable groundwater. A portion of water reaches the sea by gradual groundwater outflow. The wadis of Tihamah are the most important in Yemen as they contribute to 36% of the country's run-off surface water (Berg et al., 2021).

Map Dataset: NASA (2000), HDX (2014).



Elevation (m)

<= 214	854 - 1068	1708 - 1922	2562 - 2776
214 - 427	1068 - 1281	1922 - 2135	2776 - 2989
427 - 641	1281 - 1495	2135 - 2349	2989 - 3203
641 - 854	1495 - 1708	2349 - 2562	> 3203

Illustration 17 : Terrain (above) and Wadis (below)

POPULATION DISTRIBUTION

Demography

According to 2023 estimates, Yemen has 39.7M people with a projected increase of 80% by 2050. 20.3% of Yemen's population is aged under 15, 76.3% is aged between 15-64 years, and the median age is 22 years. The population growth rate is significantly high, 3.1% annually. Life expectancy at birth is 65.8% (2021), where the world average is 71.4%. Mothers' mean age at birth is 20.8 years. The overall participation of women in education and the workforce is low compared to men (WHO, 2024; CIA, 2025).

Ethnicity & Culture

The people of Yemen are overwhelmingly Arab or Afro-Arab and speak Arabic dialects. Most of the Yemenis follow Islam as a faith, with 65% following Sunni and 35% following Shia doctrine. The Shia population is concentrated in the north-western highlands, since it was a Shi'ite kingdom in the past. Just 1% includes Jewish, Baha'i, Christian, and other faith or ethnic traditions (CIA, 2025).

Urban & Rural

Yemen is predominantly rural, with the urban population being 39.8% and increasing. The annual urbanization rate is 3.71% (2015-2020 est.). The vast majority of the population and urban centers lie in the western highland and the Tihamah plain. The central and eastern regions are very sparsely populated. The major urban areas and governorates by population are Capital Sana'a (3.84M), Hodeidah (3.53M), Ta'iz (3.51M), Ibb (3.32M), and Hajjah (2.68M). The port city and governorate of Aden (1.24M) is historically and geographically important (CIA, 2025).

Map Dataset: Worldpop (2020), HDX (2023, 2025).

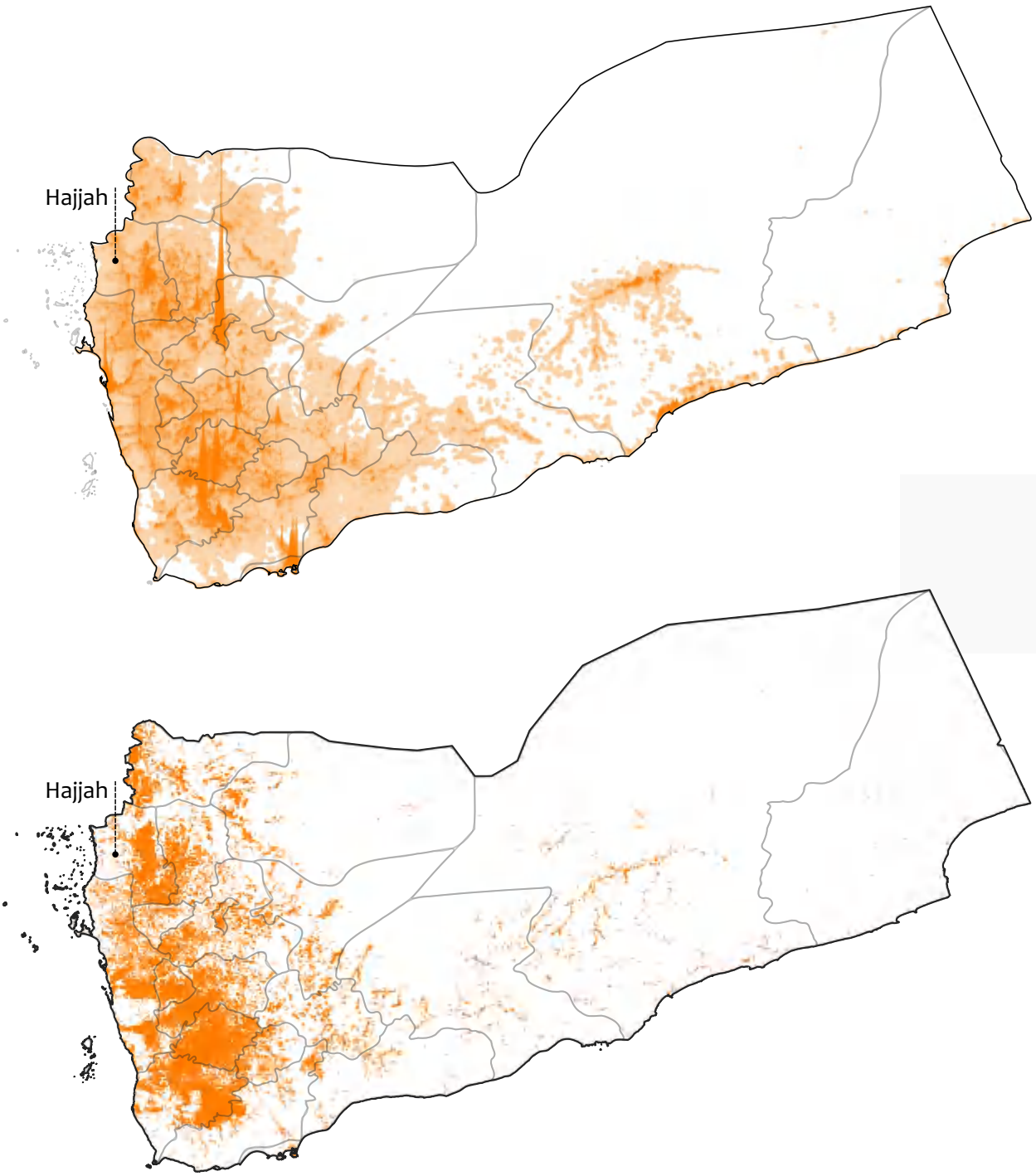


Illustration 18 : Population Distribution (above) & Populated Places (below)

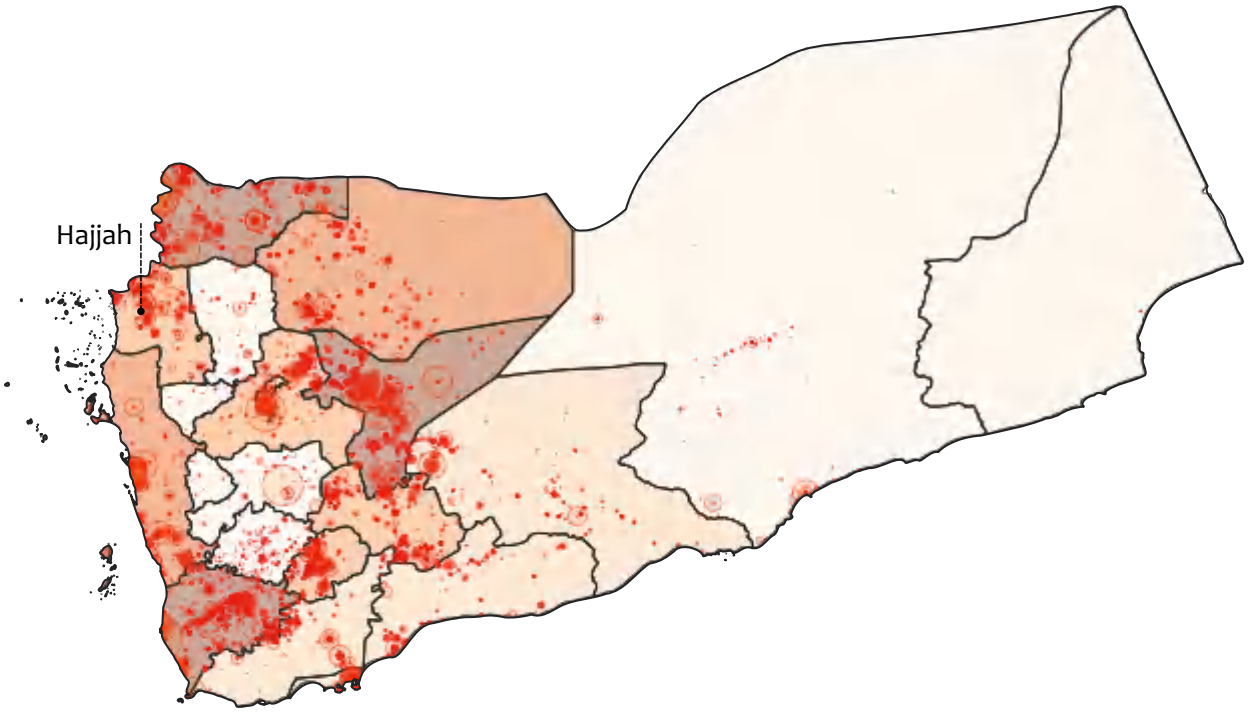
CONFLICT DAMAGE

ACLED (2025) data, collected from 2015-2025 reports that there have been over 78,000 incidents of violence in Yemen during this period. These incidents range from battles, explosions, and airstrikes to violence against civilians, riots, protests, etc., which caused approximately 167,000 fatalities. Out of 78,000, civilian-targeted events were 10,900 and civilian fatality numbers are over 17,000. The most responsible actors for these violent events are Huthi forces (46,500), KSA-led coalition forces (39,800), internationally recognized government forces (22,800), and other forces (14,600).

Disaggregated data suggests that violence at the end of 2022 has subsided and continues to fluctuate within 100-400 violent incidents per month since then. But violence peaked in 2017-2019 when average incidents were 800-1000 constantly. Limited violence subsidence was observed in mid-2015, early 2016, and early 2021, when incidents were limited to 500. But other than that, the bulk of violent incidents continued until mid-2022.

Governorates that faced the most violent incidents are Ma'rib (23,700), Ta'iz (23,500), Sa'dah (21,100), Al Hodeidah (18,300), Al Jawf (15,800), and Hajjah (10,600). Cities that have witnessed the most damage are usually the most populated ones. Sana'a, Taij, Ibb, Hodeidah, Ma'rib, Hajjah, Aden, etc., being the most populous cities, were affected. The port city of Hodeidah was named the most dangerous city in Yemen and remains so whenever airstrikes intensify (Al Jazeera, 2019).

Map Dataset: ACLED (2025)



Conflict Numbers

Conflict Location

10 - 1554

1554 - 4625

4625 - 10600

10600 - 18381

18381 - 23734

Illustration 19 : Conflict Numbers And Locations

IDP FROM CONFLICT AND CLIMATE

IDP - From Conflict

Yemen's IDP crisis, triggered by intrastate conflict, is the 5th largest IDP crisis in the world. Currently, in 2025, the IDP population is close to 4.8 M. The displacement due to conflict started in the wake of KSA-led coalition airstrikes and ground engagement in 2015. Moreover, the coalition imposed a blockade of major ports, triggering a food crisis and starvation. Due to intensified conflict and economic collapse, people left their homes for aid, support and financial opportunities. 2019 and 2021 saw two more waves of IDP. Currently, the largest IDP populations are in the governorates of Ma'rib (1.63M), Ta'iz (465,000), Al Hodeidah (430,000), Aden (279,000), and Hajjah (265,800) (OCHA, 2025b). In 2023, among the displaced population, 48% were women and 30% were children (NRC, 2025).

IDP - From Climate Risk

The second major cause of displacement is floods and climate challenges. The conflict weakened institutions, and people face challenges to survive from floods, drought, reduced agricultural production, lack of aid support, poverty, etc. Seasonal floods triggered 170,000 displacements across the region in 2022. In 2023, this number was 174,300, where 52,200 were displaced from Hajjah alone (IDMC, 2023). In 2024 alone, 531,000 were newly displaced, mostly due to climate disasters. 11.9% and 9.2% of farmlands were affected due to floods in Al-Hodeidah and Hajjah, respectively, in the same year (FAO, 2024a). Many IDPs got displaced multiple times due to floods. They had already fled conflict, were living in vulnerable conditions, and the flood caused more suffering for them.

IDP - Camps

Most of the IDP population moves towards cities and lives in inhumane living conditions in the slums. A portion of IDPs live in temporary campsites for better access to humanitarian aid and services. But 40% of IDP hosting sites overall are prone to flooding and fire (SCI, 2024). Cholera and other disease outbreaks have become common due to overcrowding. Moreover, IDPs lose their house, land, and related legal documents. Thus, prolonged absence from their land makes land disputes complicated, further preventing them from returning home.

Map Dataset: HDX (2025)

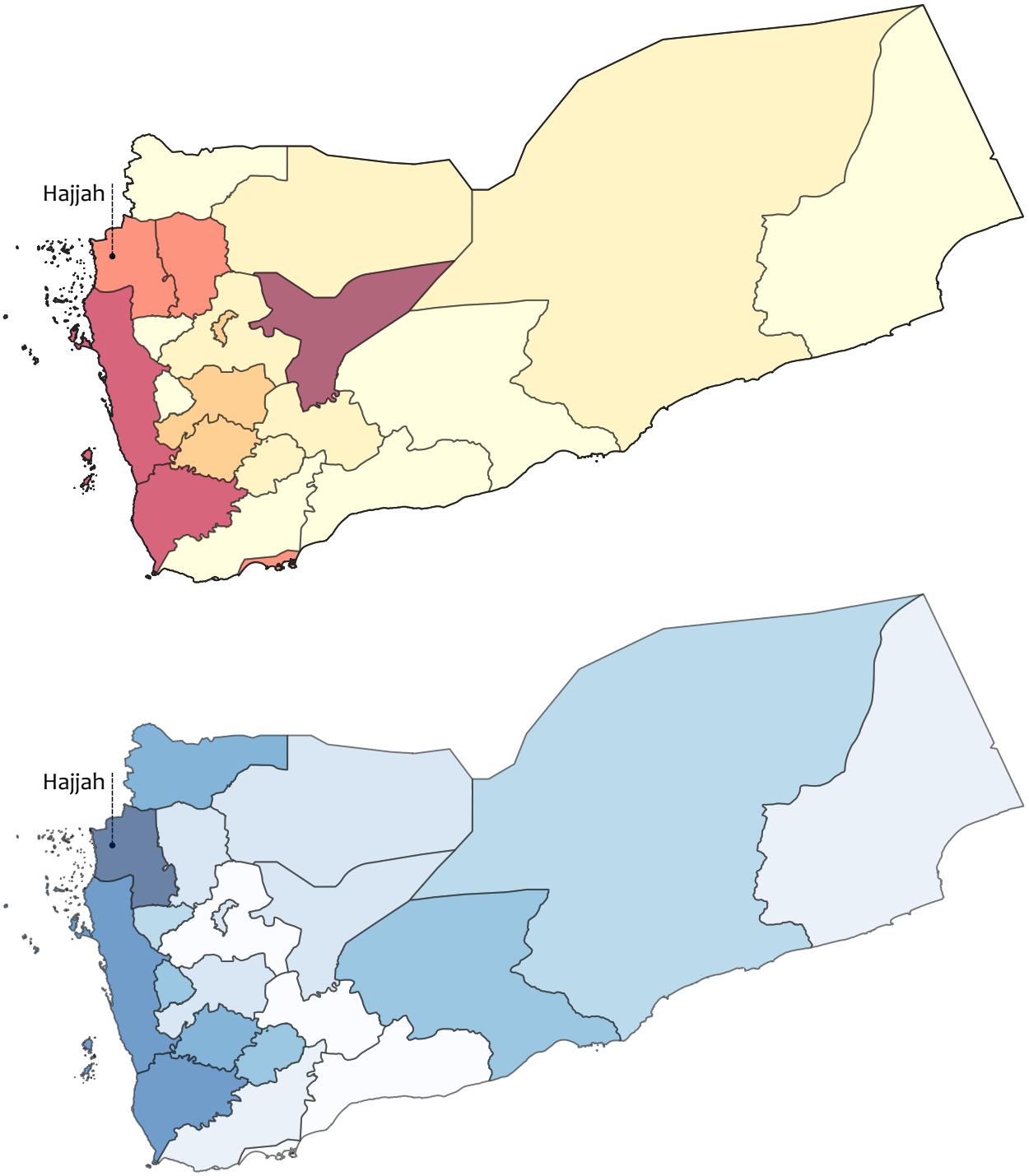


Illustration 20 : IDP Numbers from Conflict (2025) & Floods (2023)

TEMPERATURE & DROUGHT

Climate

Yemen predominantly has a desert climate with arid conditions. It has a hot and humid climate in the coastal regions, and the western highlands have a more temperate sub-tropical climate due to the monsoon. The eastern and inland deserts have extreme temperatures with minimal rainfall.

Temperature

According to WBG (2023), Yemen observed a mean annual temperature of 25.54°C over the recent climatology (1991-2020). The coldest months are November-February, when the national average seasonal temperature has historically fluctuated from 12.93°C (min) - 28.90 °C (max). But in the warm season, which lasts May-September, this temperature fluctuates from 22.45°C (min) - 36.50°C (max). During the same period, the highest observed mean temperatures were in Al-Hodeidah (33.93°C), Aden (33.25°C), and Hajjah (32.90°C). The lowest mean temperatures were in Sana'a (14.92°C), Al-Bayda (15.73°C), and Dhamar (16.04°C).

Climate Change & Drought

Due to climate change, the SSP3-70 scenario projects that Yemen is going to experience seasonal and annual changes in the pattern of extreme heat conditions. Days when the temperature surpasses 35°C are going to increase. The highest shift is going to be experienced in Hajjah (51.4 days). This shift increases drought risk across coastal Tihamah (WBG, 2023).

Yemen is currently the 12th most water-scarce country in the world. Desertification and drought affect agriculture the most. It impacts 3-5% of land each year and is likely to intensify. An extended period of drought creates heatwaves, causes degradation of soil, and worsens livable conditions for people and domestic animals. Weak natural resource management and a lack of restoration initiatives may extend the dry periods further. For example, overuse and depletion of renewable groundwater resources increase the vulnerability to drought. The spring of 2022 was the third driest period for the last 40 years (IOM, 2024).

Map Dataset: WBG (2023)

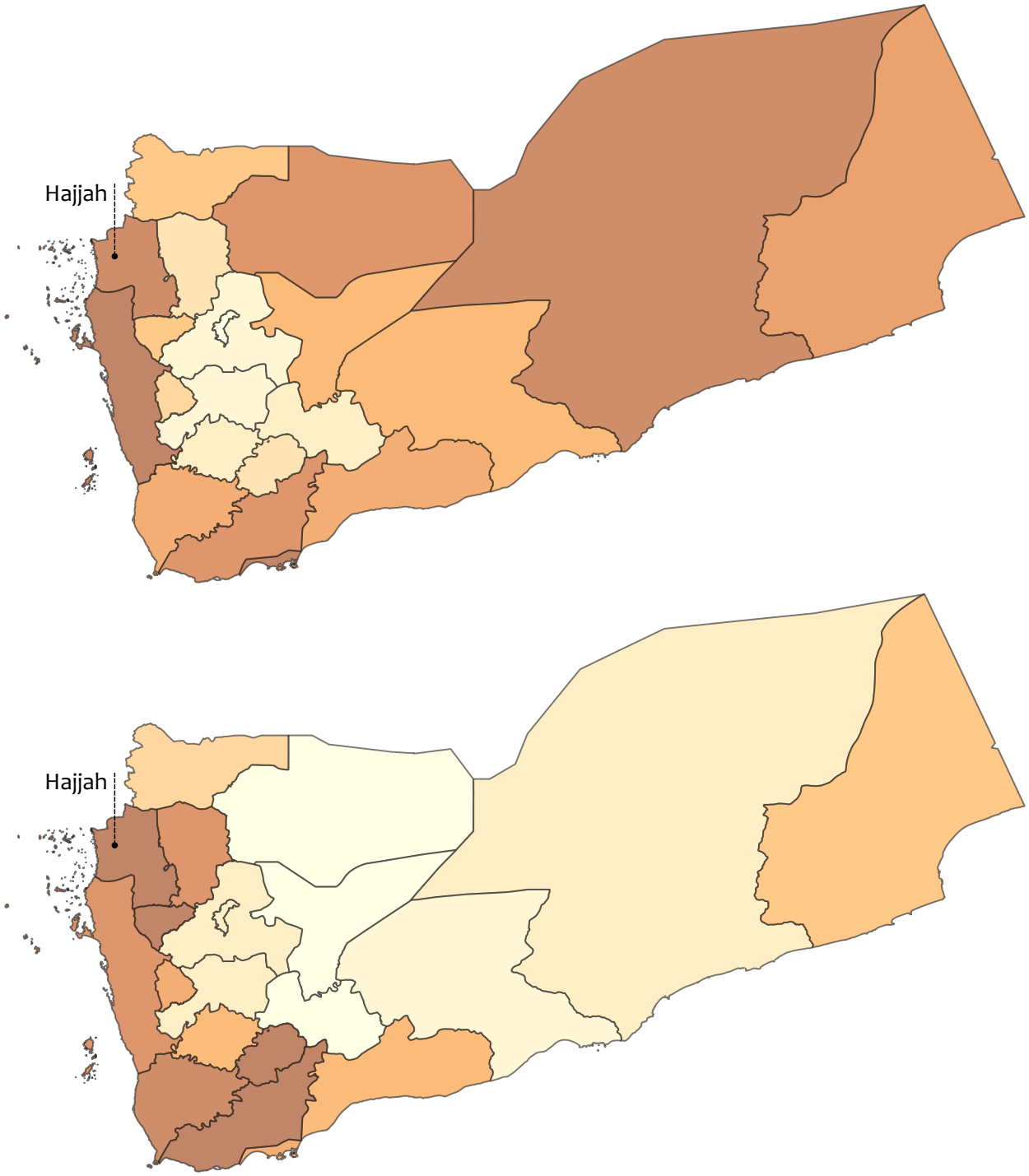


Illustration 21 : IDP Numbers from Conflict (2025) & Floods (2023)

RAINFALL AND FLOODS

Rainfall

Yemen's highlands and coastal regions experience two monsoonal rainy periods and consecutive dry periods annually. Over 1991-2020, mean annual precipitation at the national level totalled 189.81 mm. The first wet months are March-May, when a third of the yearly precipitation occurs, which is 28.15mm of mean precipitation annually. Afterwards, a dip in rainfall follows during June-July, 17.28mm. The second rainfall occurs between July and September, the mean precipitation peaking again at 27.95mm nationally. The dry months are October-March, where December is the driest (3.55mm). Annually, the highest precipitation is experienced in the western highlands, in Ibb, Sana'a, and Dhamar (WBG, 2023).

Climate Change, Flood & IDPs

The SSP3-7.0 climate model (2040-2059) projects that the coastal regions generally will experience increased precipitation. The highest annual increase will occur in Sana'a (13%), and the highest seasonal increase will be experienced in Hajjah (26%) during summer months. The coastal Tihamah and western highlands will experience a 5-10% increase in rainfall in general (WBG, 2023).

Floods are the most recurring annual disasters in Yemen. Its highlands and rainfall patterns make Yemen susceptible to floods twice a year, and climate change is only going to increase their severity and frequency. Heavy rainfall in Yemen has led to flooding, displacement, severe infrastructure damage, and casualties in a few consecutive years since 2020. Prolonged heat makes soil harder and impermeable. Flash floods exceed the soil's absorption capacity, flow over the hard soil, and wash away everything in their course, causing more soil degradation, desertification, agricultural losses, livestock death, disease outbreak, etc. As a result, Yemen retains just 5% of rainfall, much is lost due to evapotranspiration and discharge to the sea (UNDP, 2024a). Floods have led to over 507,000 internal disaster displacements since 2008. In 2023, Hajjah (52,200), Ta'iz (23,600), and Al-Hodeidah (22,700) have seen the highest IDPs due to floods (IDMC, 2024).

Map Dataset: WBG (2023).

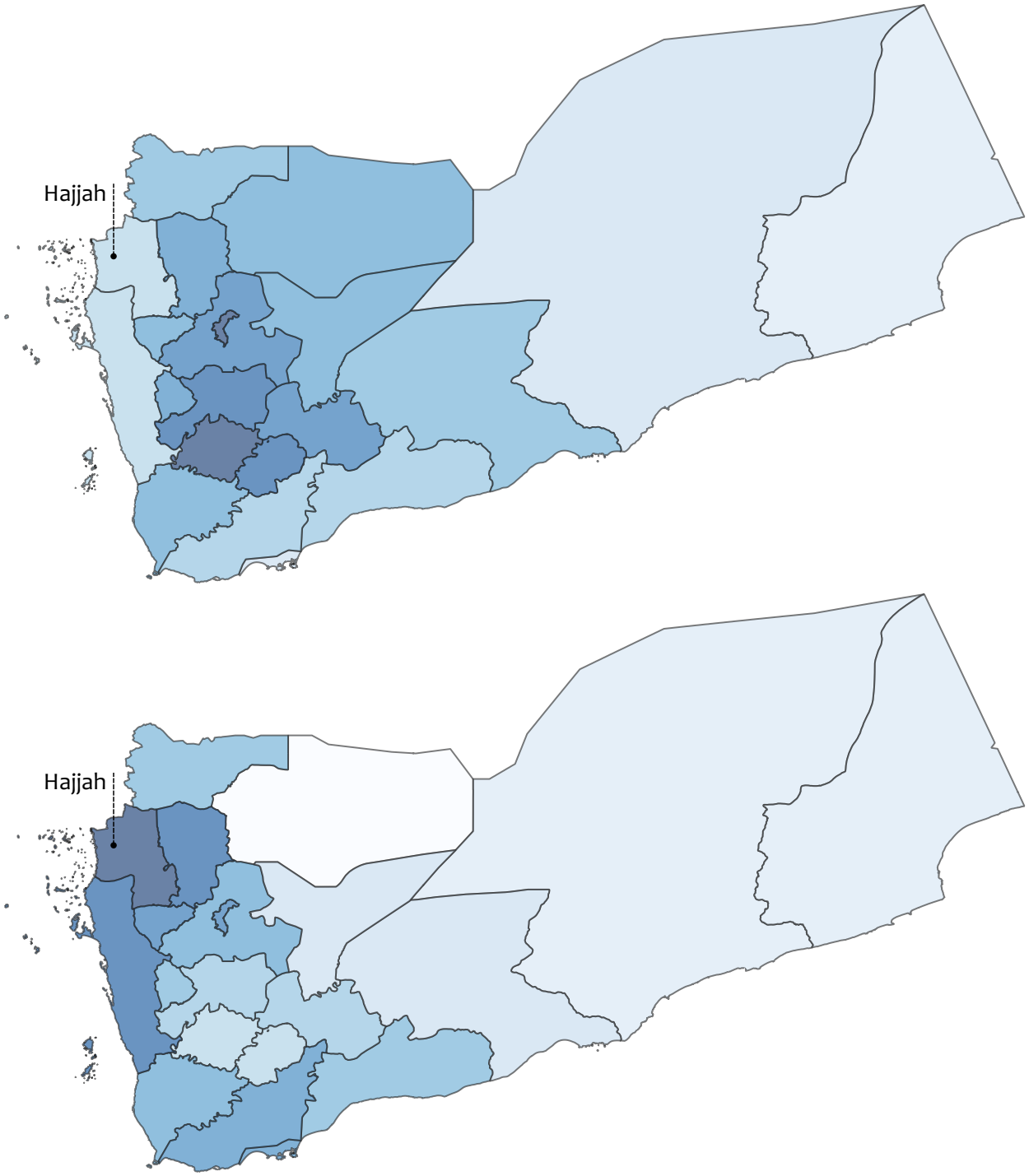


Illustration 22 : Annual Rainfall (1991-2020) and Seasonal Rainfall Change (2040-2059)

FOOD, HUNGER AND MALNUTRITION

Food Production & Climate Change

Years of conflict and the effects of climate change have hampered food production and agriculture in Yemen. It was not self-reliant on food production, had to import a large amount of staple food even before the conflict, and in 2023, it reached 80%. On the other hand, from 1996, total arable land in Yemen reduced from 3.1% to 2.2% in 2022 (WBG, 2025). 90% of the freshwater in Yemen is consumed by agriculture, so water scarcity reduces food production. Annual flood also harms agriculture. Floods in 2024 damaged close to 100,000 ha of agricultural land and 280,000 livestock (FAO, 2024a). Climate change is only going to increase floods, droughts, water scarcity, and land degradation, resulting in more deficit in food production. Where already 80% population live below the poverty line, and 50% are directly involved in agriculture, Yemen's population is projected to increase, overloading the already fragile food production system.

Hunger & Malnutrition

A decade of conflict, blockade, economic collapse, and food shortage has created one of the world's biggest man-made food crises in Yemen. In 2024, 17.6M (50%) people face food insecurity and hunger, but funding for aid has not been sufficient for 3 consecutive years since 2021 (NRC, 2024). The war in Ukraine skyrocketed grain prices in 2022, and critical supplies for Yemen became expensive. Famine-like situations persist in Yemen even in 2025. Children are the worst sufferers in this situation. In Yemen, 55% of children under 5 suffer from severe malnutrition, and pregnant mothers are suffering as well (UNICEF, 2022). Other than food shortage, limited access to safe drinking water, missing vaccinations, and disease outbreaks also prevent improvement in this situation.

From the data of WFP (2025) and IPC (2024), it is observed that part of the western, northwestern highlands and the whole of Tihamah are facing extreme hunger and malnutrition. The RCSI (Reduced Coping Strategies Index) score suggests that hunger is more prevalent in Sana'a (0.49), Hajjah (0.48), and Sa'dah (0.47). The largest population facing malnutrition are in Sana'a (2.1M, 55%), Al-Hodeidha (1.7M, 55%), and Hajjah (1.5M, 61%).

Map Dataset: WFP (2025), IPC (2024).

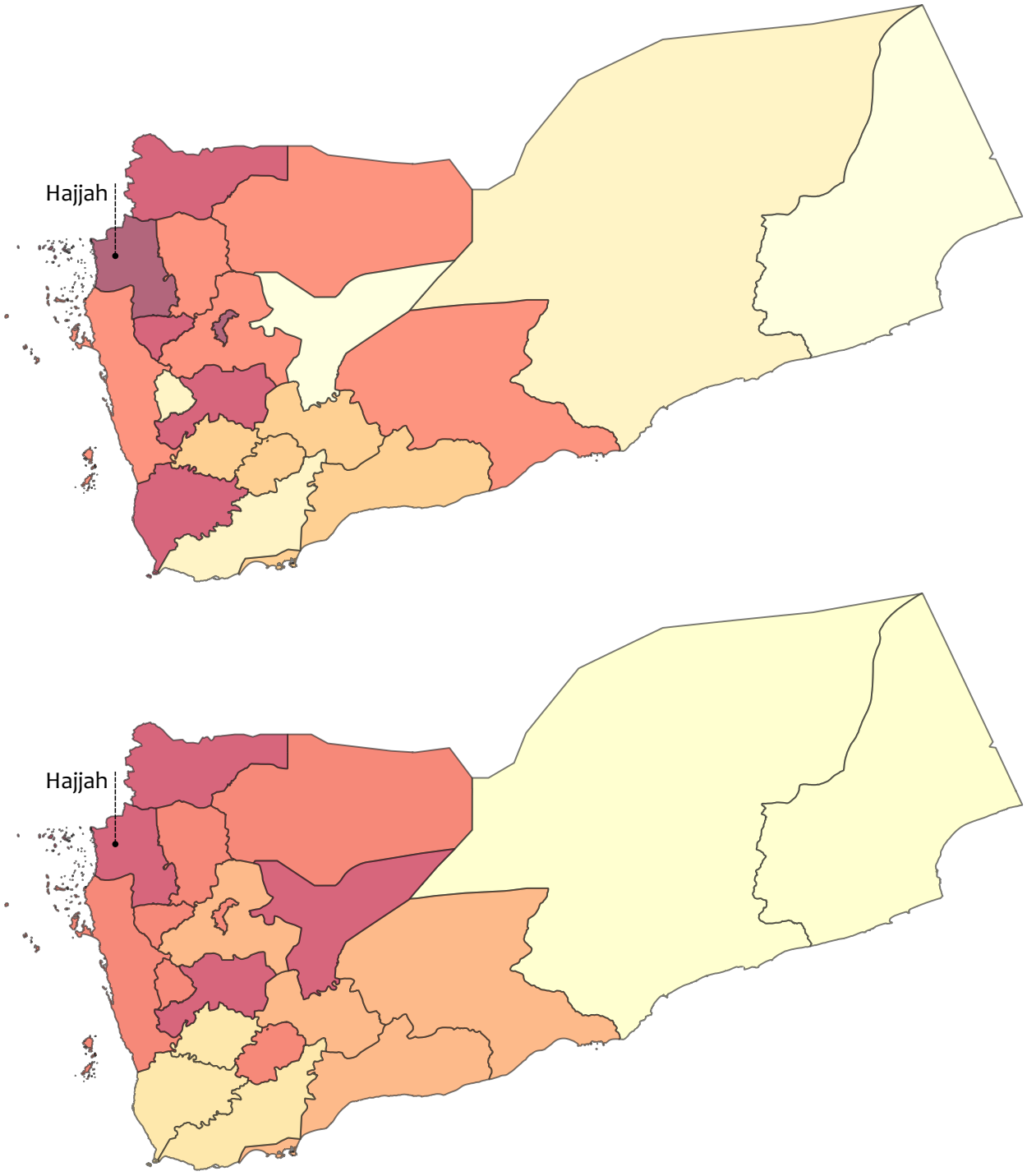


Illustration 23 : Annual Rainfall (1991-2020) and Seasonal Rainfall Change (2040-2059)

THE CASE OF HAJJAH

Geography

The governorate of Hajjah is located in the north-west corner of Yemen, bordering KSA. It lies at the tip of Yemeni Tihamah and is home to 2.68M inhabitants. The western highlands end at the eastern border of Hajjah, and most of the landform is a coastal plain which stretches roughly 50 km. from the highlands to the Red Sea. A cross-section analysis shows that the elevation of the plain reaches up to 150 m. at the bottom of the highlands.

Hajjah in Comparison

Comparative analysis of all 22 governorates across various data sets suggests that Hajjah faces more challenges than others. The problems range from conflict damage, climate change, floods, IDPs, hunger, malnutrition, etc., and Hajjah constantly remains among the first few governorates facing the most difficulties. In fact, climate change, floods, IDP and hunger problems are the most severe in this governorate.

The Problems in Hajjah

Population (2025): 2.68 M (5^{th})

Conflict Fatalities (2018-2025): 10,600 (6^{th})

IDP Population (2025): 265,800, 9.8% (5^{th})

IDP - Flood Displacement (2023): 52,206 (1^{st})

Highest Mean Temperature: 32.90°C (3^{rd})

Annually Highest Heat (>35°C) Days (2040-2059 projection): 51.4 (1^{st})

Highest Increase in Summer Rainfall (2040-2059 projection): 26.3% (1^{st})

Hunger index (RCSI) score: 0.48 (2^{nd})

Population Suffering from Malnutrition: 1.5M, 61% (3^{rd})

Map Dataset: NASA (2000).

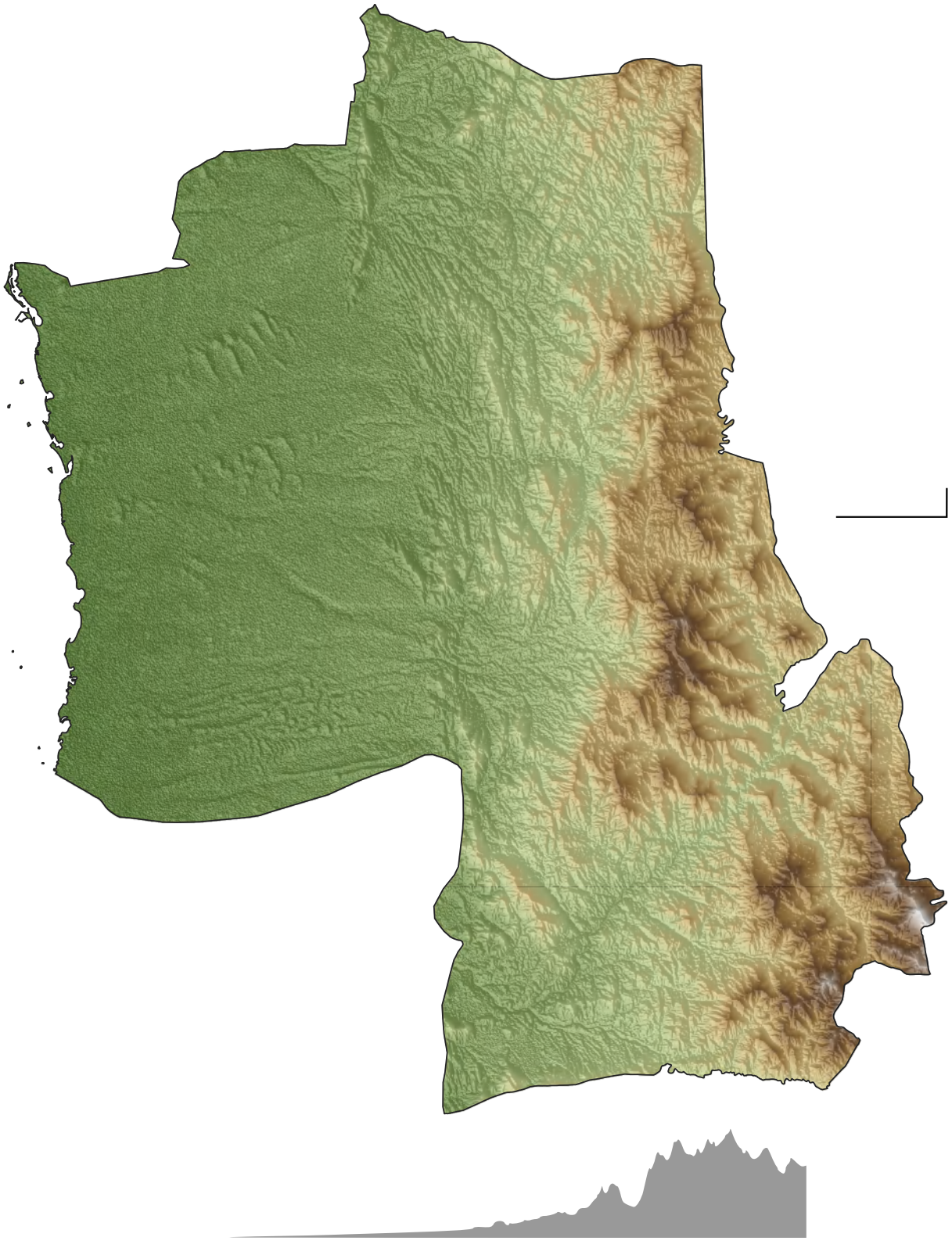


Illustration 24 : Hajjah Terrain

WADIS & SETTLEMENTS OF HAJJAH

Wadis

Originating from the highlands, several wadis flow through Hajjah's 50 km wide coastal plain and discharge into the Red Sea. Many large wadis converge or branch out in several places along their course. The major wadis in Hajjah are Harad, Midi, Haytan, and Mawr. The other smaller wadis have local names. Wadi Harad and Wadi Mawr are the largest in this region.

Settlements

Most of the settlements in Hajjah are located in the highlands, and the rest of the coastal plains are very sparsely populated. The settlements follow the course of the wadis and are more thinly spread as the wadis get closer to the sea. The presence of settlements indicates the availability of water in the wadis, and satellite images clearly show activities of agriculture in recent years.

IDP Resettlement in Hajjah

IDPs from Hajjah were displaced by conflict, flood damage, climate crisis, etc. To restore their rural lives, livelihood, and human dignity, they must be resettled. If an IDP resettlement project were to be placed in Hajjah, it would have to consider settling along one of the larger wadis to have access to water for survival and agriculture. A relatively vacant land has to be selected to accommodate future expansion possibilities for both settlement growth and food production. The number of settlements further downstream has to be taken into account since the placement of a resettlement may reduce water availability for others. By careful assessment of these factors, multiple vacant sites along the major wadis can be chosen to assess resettlement scenarios and further investigation. In short-

1. Settle along one of the major wadis for water availability.

2. Select a relatively vacant area for growth and expansion opportunity.

3. Consider the number of existing settlements downstream to avoid future water disputes.

Map Dataset: OpenStreetMap (2023), HDX (2014).

Illustration 25 : Hajjah Wadis and Settlements

LIVELIHOOD IN HAJJAH

Rural Hajjah is an agrarian economy, and the livelihood of households depends on agricultural production. Agro production includes crops, vegetables, fruits, livestock, animal fodder, honey, etc. (FAO, 2024b). Households rely on these agricultural practices and animal rearing for food consumption and financial requirements. Paid labour is popular for agricultural activities, but people also travel to the nearest big cities or cross the border for better employment opportunities.

There are differences in livelihoods among the agrarian households based on income levels. The impoverished households mostly live off paid labour for wealthier families. They earn some additional income from little crop sales and livestock. But not owning land restricts them from having enough food production for themselves and sales. They have to rely on food purchases from the market. Sometimes they get a portion of the crop as compensation for labour. The better-off household's incomes come from larger crop sales and livestock sales.

The major agricultural production in Hajjah is sorghum, millet, vegetables, sesame, animal fodder, and fruits. Households keep a portion of sorghum, millet, and vegetables and sell the rest in the market. Sorghum is also used as fodder for livestock, which makes this area an important hub for fodder production and export to other governorates. Apart from this, beekeeping proves to be very profitable in this region. Sheep, goat, cow, camel, and chicken are the main livestock. Livestock and related products are also sold in the local markets (FAO, 2024).

The main challenges for agrarian livelihood in this zone are conflict, insecurity, flood, drought, plant and animal diseases, and an increase in groundwater salinity. Conflict has displaced many people from this region. In 2021-2022 lack of rain, crop and livestock diseases harmed production. In 2023 lack of rain and then flood damage affected this area. A rise in water salinity levels decreased crop yields (FAO, 2024). Agricultural sales are also affected by damaged road connections and market access. This is why many labours migrate to other governorates for better economic opportunities and become IDPs.

Poor Households: Labour, Small Crops Sales, Livestock Sales, Seasonal Migration to Big Cities

Wealthy Households: Large Grain Sales, Livestock Sales, Livestock Product Sales.

Agricultural Production: Sorghum, Millet, Vegetables, Sesame, Fruits, Animal Fodder.

Livestock: Sheep, Goat, Cow, Camel, Chicken.

Challenges: Conflict, Insecurity, Flood, Drought, Plant & Animal Diseases, Groundwater Salinity.

Illustration 26 : Livelihood, agrarian, and economic activities in Hajjah

PUBLIC OPINIONS IN HAJJAH

European Institute of Peace, EIP (2023) conducted a public opinion survey and consultations with nearly 16,000 people in nine governorates in Yemen, including Hajjah, between October 2020 and October 2021. In Hajjah, the survey engaged with 2,326 individuals, 297 interviews, 19 community dialogues, and 19 focus groups. This bottom-up engagement sheds light on public opinion in Hajjah about the urgent problems, long-term priorities, peace obstacles, ways and expectations about reconciliations, etc. The result of the key findings of the survey is as follows:

1. Urgent Needs: Ending the main conflict (25%), Environment (21%), Improving Basic Services (20%)

2. Long Term Priorities: Basic Services (16.8%), Compensation (14.1%), Job Opportunity (13.6%)

3. Types of Compensation: Financial (60%), Rehabilitation (26%), Moral (13.6%)

4. Obstacles to Peace: No income sources (15.4%), No disarmament incentives (14.6%), Tribal revenge issues (14.6%)

5. Meaning of Reconciliation: End of violence (22.4%), Restitution (27.3%), Respecting political differences (13.8%), Trust in institutions (12.8%)

6. Ways to address political or economic marginalization: Strengthening the rule of law (39.2%), Giving greater opportunities to the local community to manage their own affairs (33.2%), Creating a new way for power and wealth distribution (26.6%).

7. Responsible actors for violations: KSA-led Coalition (33.7%), Unidentified Militia (12.6%), Government Forces (11.7%), Terrorist Organization (5.3%).

To summarize the findings, the people of Hajjah want peace, environmental risk mitigation, and the establishment of basic services at first, and then expect economic compensation in the form of financial help, rehabilitation, and job opportunities. They think lack of income sources, lack of incentives to forgo weapons, and tribal revenge issues are stifling the peace process. Holding foreign powers responsible for violations, they believe that strengthening security and providing greater opportunities to local communities to manage their own affairs will result in an equitable society.

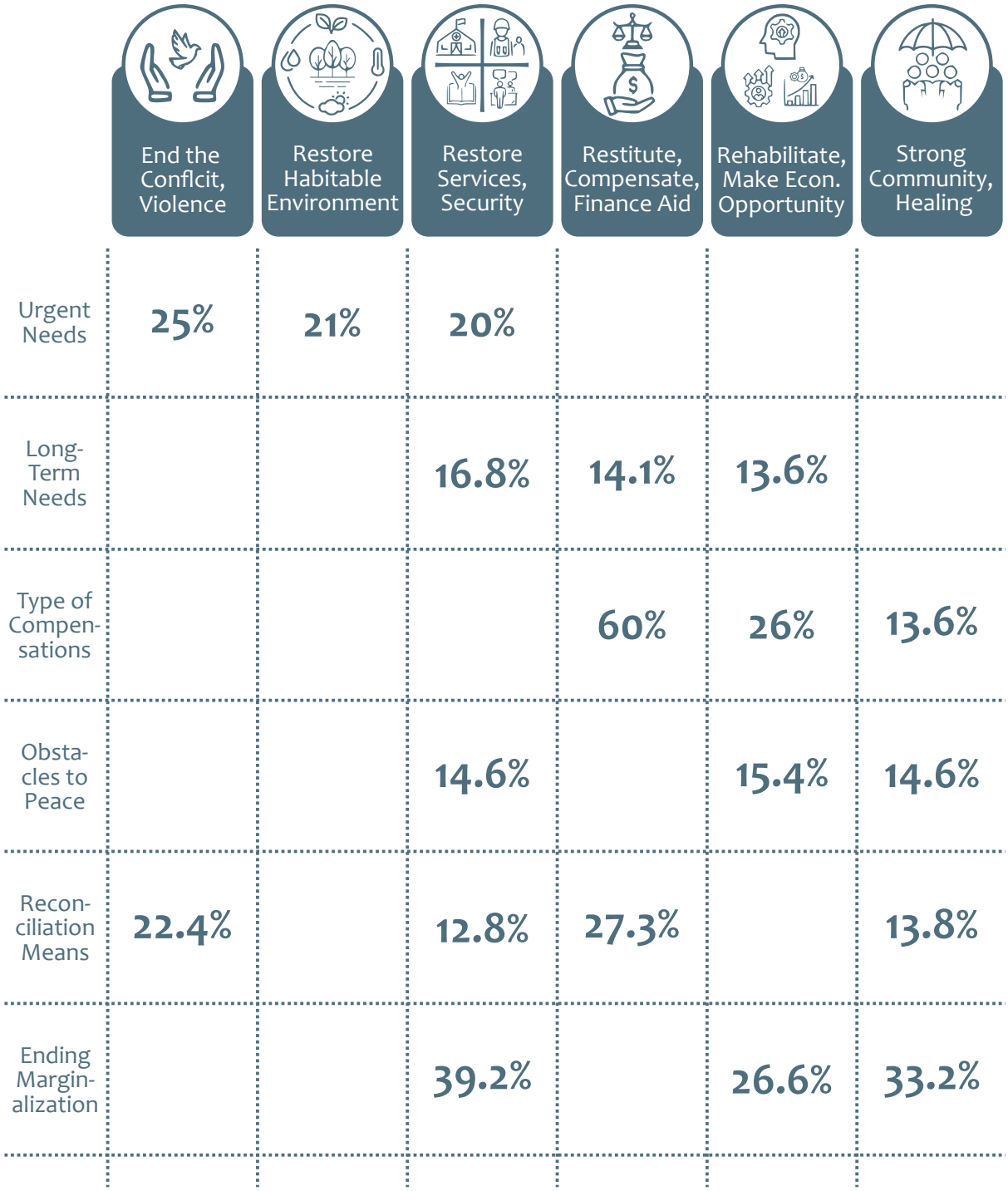


Illustration 27 : Public Opinion towards peace in Hajjah

VULNERABLE GROUPS

In the context of Hajjh, Yemen, categories of vulnerable groups have been created by studying the reports, analyses and recommendations mentioned by various humanitarian and development organizations. The categories have been sorted by given age ranges, and common issues include all age groups.

Infants/Children (<5 years) - Malnutrition, no vaccination, mortality risk.

Minors (5-18 years) - Child soldiers, child labour, lack of education, gender based violence.

Displaced Women (18-60 years) - Lack of maternal healthcare, lack of economic participation.

Poor farmers (18-60 years) - Lack of economic opportunities, destroyed farmlands & infrastructure.

Elderly (>60 years) - Untreated chronic diseases, no families.

Disabled (All ages) - Social exclusion, lack of assistive devices, lack of healthcare.

IDPs in Camps (All ages) - Flood risk, diseases, no land tenure, resettlement needs.

All - Poverty, food shortage, water shortage, multiple displacements, lack of security and protection, lack of economic opportunities, and compensation for conflict-induced suffering.

Children (<5y)

- Malnutrition
- No Vaccination
- Child Mortality

Minors (5-18y)

- Child Soldier
- Child Labour
- No schools
- GBV

Disp.Women (18-60y)

- No Maternity Care
- No Healthcare
- No Economic Participation

Elderly (<60y)

- No Family
- Chronic Disease
- No Healthcare

Poor Farmers

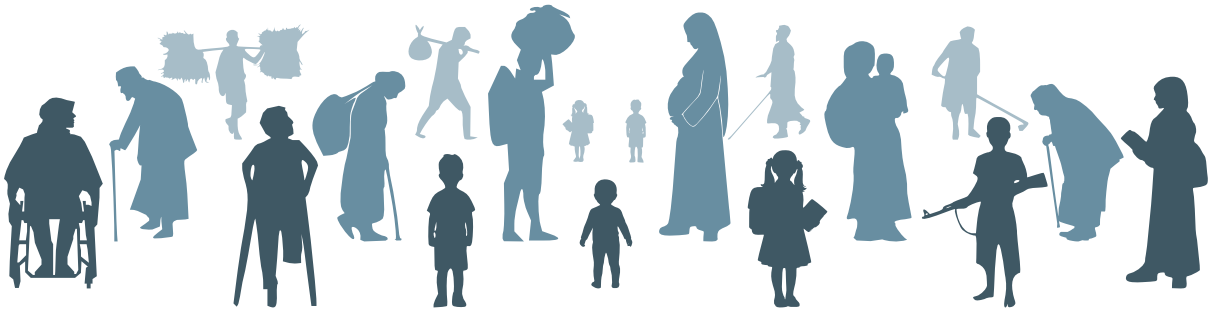
- No Economic Opp.
- Ruined Farmlands
- Damaged Infra.

Disabled

- Social Exclusion
- No Assistive Devices
- No Healthcare

IDPs

- Flood Risk
- Diseases
- No Land Tenure
- Resettlement Needs



Everyone

- Poverty
- Water Shortage
- Food Shortage
- Displacements
- No Security & Protection
- No Economic Opportunities
- Compensation Needs
- No Hope

Illustration 28 : Vulnerable groups in Hajjah

THE PROBLEM STATEMENT

After the analysis of multiple factors, a problem statement can be formulated by objectively answering key thematic questions. The overall theme of this thesis is post-conflict recovery in the context of a country which has experienced immense setbacks due to a decade of war. The location of the project is not just in a region damaged by conflict, but also a harsh desert environment suffering from climate risks, environmental degradation, food crisis, disruption of the lives of the poor and their displacement as a result.

Intuitively, the solution this time should be a resettlement effort by mitigating the primary contributing factors of the displacement and several other issues originating from that. This time, the resettlement should be well adapted to survive through future climate risks like increased floods, droughts, etc. It should integrate efficient water management to increase survivability. It should adopt new techniques to diversify food, resource collection, and restore the degrading environment at the same time. Community engagement and human capital development must remain at its core for sustainable growth and self-reliance. Finally, the solution should be scalable with contextual adjustments so that the benefit can reach the larger population and, over time, bring peace and normalcy in the region.

Accordingly, the following problem statement has been formulated:

'How to design a durable, climate-resilient, and scalable re-settlement system that would ensure both immediate and long term post-conflict recovery and survival of the impoverished vulnerable displaced population in a challenging desert region by integrating community participation, water management, environmental restoration, local resource utilization, and economic opportunity creation, to re-establish human dignity, self-reliance, and peace.'

'How to design ...

What? a **durable, climate-resilient,** and **scalable** re-settlement strategy

Purpose? that would ensure both **immediate** and **long-term** post-conflict **recovery** and **survival**

End-User? of the **impoverished** vulnerable **displaced** population

Location? in a challenging **desert** region

Process? by **integrating community** participation, **water** management, **environmental** restoration, local **resource** utilization, and economic **opportunity** creation,

Hope? to re-establish **human dignity, self-reliance,** and **peace.'**

Illustration 29 : Problem Statement

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04

BUILT-FORM ANALYSIS

IDP CAMP UNIT HIERARCHY

UN camps for displaced populations are a formal solution for IDP problems, but are rarely used as a temporary solution. As conflict persists, the scale and operation of IDP camps gradually become larger and host IDPs for the long term if peace is not achieved. Here, freedom of movement and opportunities for self-reliance are extremely limited.

Therefore, UNHCR stresses that a camp approach should be formulated toward a human settlement one (UNHCR, 2025b). It should take into account the long-term livelihood opportunities, social integration, and gradual independence from aid dependence of the affected population. This perspective demands a transition of camp-sites to gradually evolve into an inclusive human settlement.

To make this process easier, a modular hierarchy is used by humanitarian organizations to manage, estimate, and allocate resources for the affected population. It uses an average family as its unit and scales up toward a human settlement. The units are as follows:

1 Family = 1 Unit

1 Community = 16 Families

1 Block = 16 Communities

1 Sector = 4 Blocks

1 Settlement = 4 Sectors (UNHCR, 2025a)

This hierarchical organization will help estimate the scale and size of the resettled communities and allocate spaces and functions accordingly in Hajjah.

 Units	 House / Family	 Persons
1 Family (1 House)	**x 1**	**~ 5-6**
1 Community (16 x Families)	**x 16**	**~ 80-100**
1 Block (16 x Communities)	**x 250**	**~ 1,250**
1 Sector (4 x Blocks)	**x 1,000**	**~ 5,000**
1 Settlement (4 x Sectors)	**x 4,000**	**~ 20,000** (max)

Illustration 30 : Hierarchy and Size of IDP Camp Shelter Blocks (UNHCR, 2025a)

CAMP'S FUNCTIONAL REQUIREMENTS

Hosting IDPs in camps is a long-term task, and they must be provided with basic services. The scale of the service and resource allocation has to be proportional to the camp unit hierarchy. Therefore, UNHCR has specific guidelines and standard regulations for camp functions. With the increased scale of the community new function is added to better serve and manage hosted IDPs.

The functional requirement starts from one individual to the community, block, sector, and settlement, gradually taking into account the needs of a larger population. Here, initially area is allocated for an individual's private spaces, and a gross area is measured for access, drainage, open spaces, etc., to limit the density of the camp. Then, according to the camp unit hierarchy, new functions are added. According to UNHCR (2025a), they are the following:

Per Individual - Covered area, household garden area, and storage area.

Per Community - Shelter units, toilet and shower, communal spaces, and warehouse.

Per Block - water tap, sports area, religious facilities, and security facilities.

Per sector - School, community center, distribution center, and administrative offices.

Per Settlement - Feeding center, market space, healthcare center, registration & transition center.

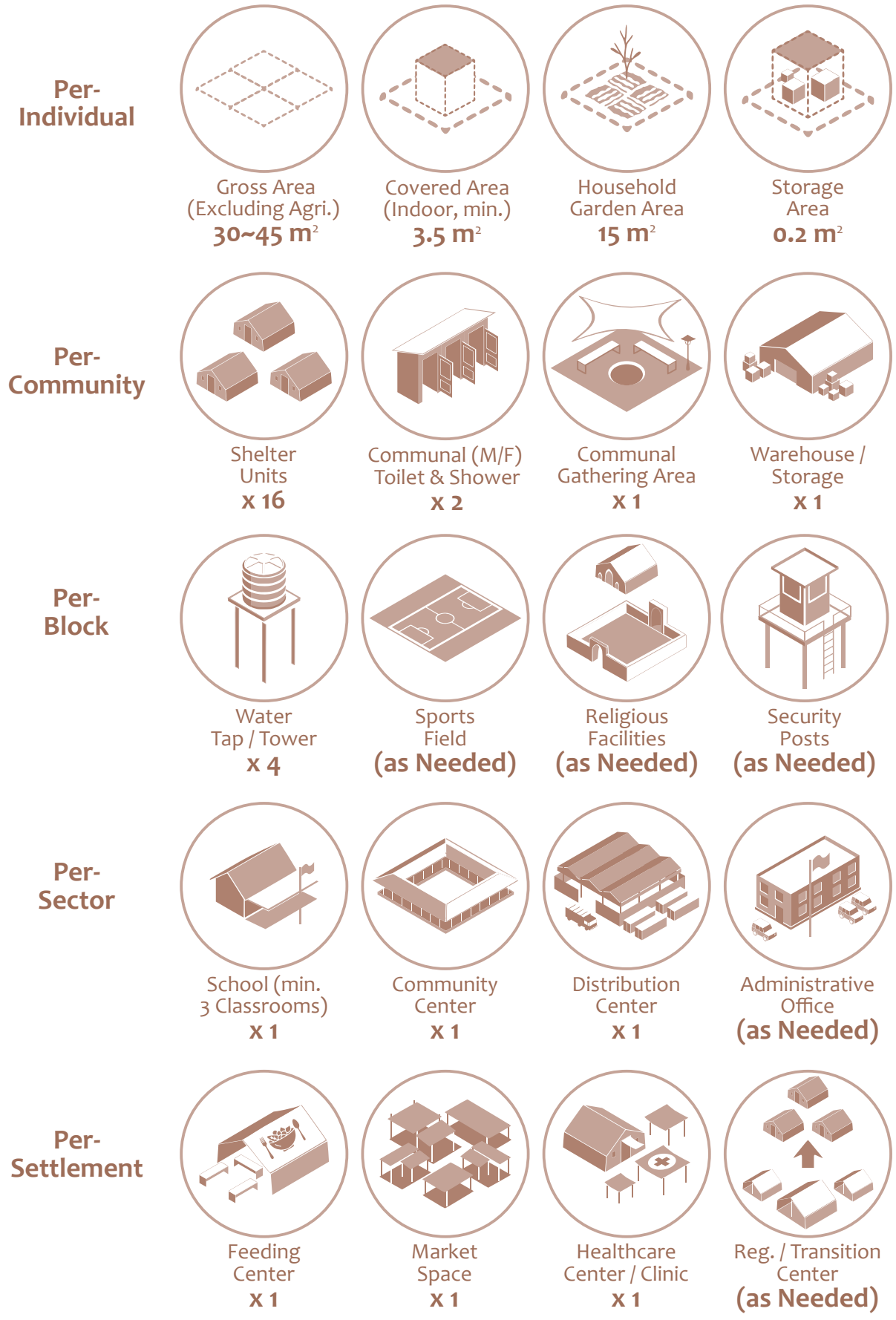


Illustration 31 : Space Allocation and Functional Requirements of IDP Camps (UNHCR, 2025a)

VERNACULAR HOUSING TYPOLOGIES

Understanding the vernacular typologies will provide a glimpse into ordinary people's lives. Yemen has a strong building tradition and provides valuable insights about its housing clusters and their organization, facilitating many functionalities. From Serjeant and Lewcock (1983, pp.436–500) and Nicoletti (1985, pp.174–175), three major housing typologies can be found in Hajjah. They are:

1. Tower Houses

Yemeni tower houses are famous for their 6-7 storied towering scale and intricate expressive styles. It can host one family or an extended family. The ground floor serves many functions that include courts, food and grain storage, water well, grinding mill, animal shelters, etc. The immediate upper levels serve guests and visitors. Then the upper floors are private rooms. The roof and terraces are used as private living rooms, kitchens, women's wardrobes, gathering spaces, etc. The functions are arranged vertically, where they transition from public, various household functions, to more private and intimate spaces.

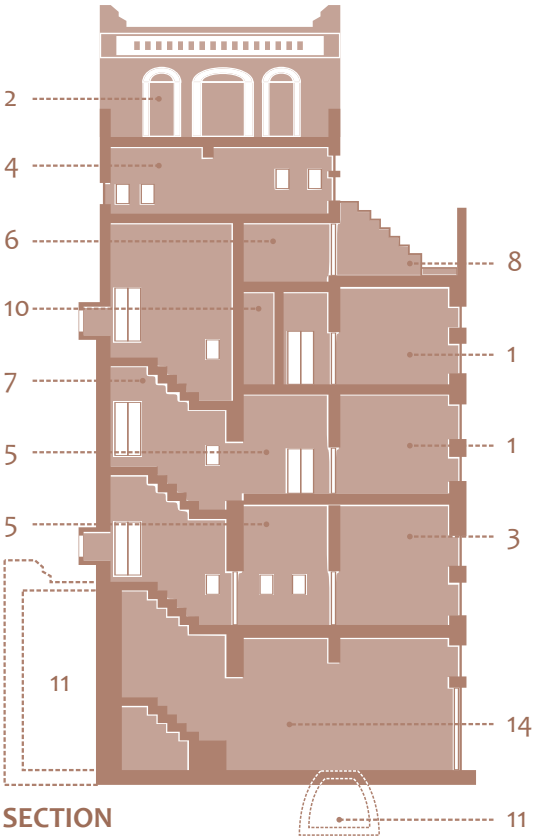
2. Courtyard houses

Courtyard houses or merchant houses are organized around a court. They are typically 2-3 storey tall. The ground level usually serves various functions such as grain storage, grinding mill, animal shelter, etc. The upper level may also have a court around which private rooms are organized. It also separates the public and private functions vertically.

3. Rural reed houses

These are typical homesteads found in rural Hajjah. Here, each room is constructed separately, and the in-between spaces serve various rural functions. Both round and rectangular forms can be found in the area, though the rectangular form looks contemporary and is made with mud bricks instead of reeds.

In the IDP resettlement in Hajjah, house typology has to be selected keeping incremental development in mind. Since there can be spatial limitations, housing can grow vertically, which is very much the traditional practice. The socio-economic situation may not allow people to afford tower houses, but the courtyard type can be a suitable choice.



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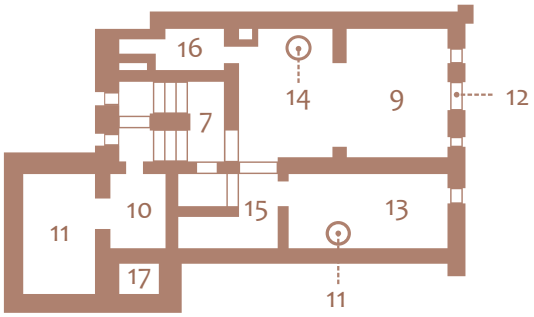
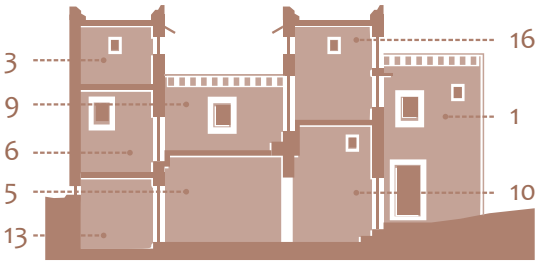


PLAN

A. Tower Houses (4-7 s.)



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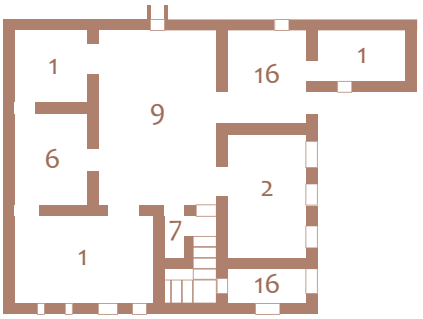
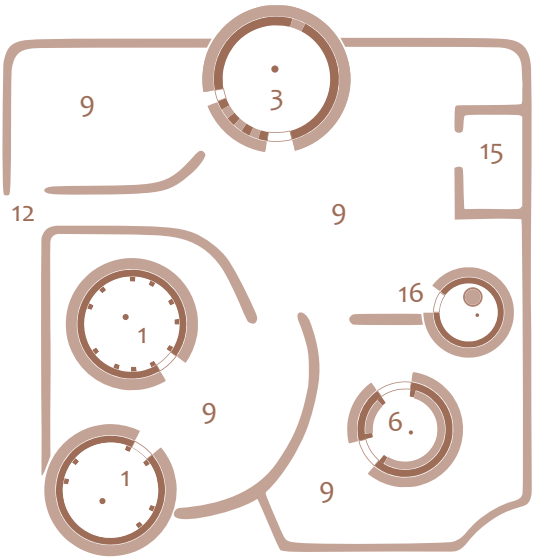


PLAN

B. Courtyard Houses (1-3 s.)



PLAN

C. Rural Reed Houses (1 s.)

Legends

1 - Room / Bed (General)
2 - Living Room (Private)
3 - Reception Room (Visitor)
4 - Women's Room
5 - Lobby
6 - Kitchen
7 - Stairway
8 - Terrace
9 - Court
10 - Storage (General)
11 - Storage (Fruit/Grain)
12 - Entrance
13 - Grinding Mill
14 - Well
15 - Animal Pen
16 - Bathroom / Toilet
17 - Shaft (multi-function)

Illustration 32 : Hajjh Vernacular Housing Typologies (Serjeant & Lewcock, 1983; Nicoletti, 1985)

TYPICAL COMMUNITY LAYOUTS

Satellite imagery observation and analysis suggest that a typical rural community layout in Hajjah consists of multiple homesteads, gathering space, entrances, and a thick earth berm around the periphery. Individual homesteads have boundary walls defining land ownership. The homestead layout is organic, and setbacks between boundary walls are used as pathways and passages.

A unique characteristic of community housing clusters is their tall and thick earthen boundary that surrounds the entire community. Satellite imagery suggests that this building practice is very common in Hajjah region. This peripheral earth berm may serve many functions, such as maintaining privacy, providing security, land demarcation, and protection from environmental hazards like sandstorms, floods, etc. However, the flood protection aspect is an assumption since these clusters are very close to their wadi.

Around the community cluster, the landscape has some general characteristics. Keeping the wadi valley in the middle, a sectional analysis suggests that one bank usually has a relatively higher elevation than the other side. This makes the side with lower elevation and a gentle gradient a floodplain, which is fertile and suitable for irrigation and cultivation. The other side usually has a steep slope and is higher for the wadi water to reach naturally. Therefore, the higher wadi bank is a semi-arid savannah with almost no cultivation.

Even though the higher banks of wadis are intuitively more suitable for communities to settle, both banks of the wadi course show housing clusters. In some instances, they have agricultural lands in proximity; in other places, it shows the land totally barren around the settlements. Some natural vegetation appears in those lands which seem suitable for animal herding but not conventional agricultural practices.

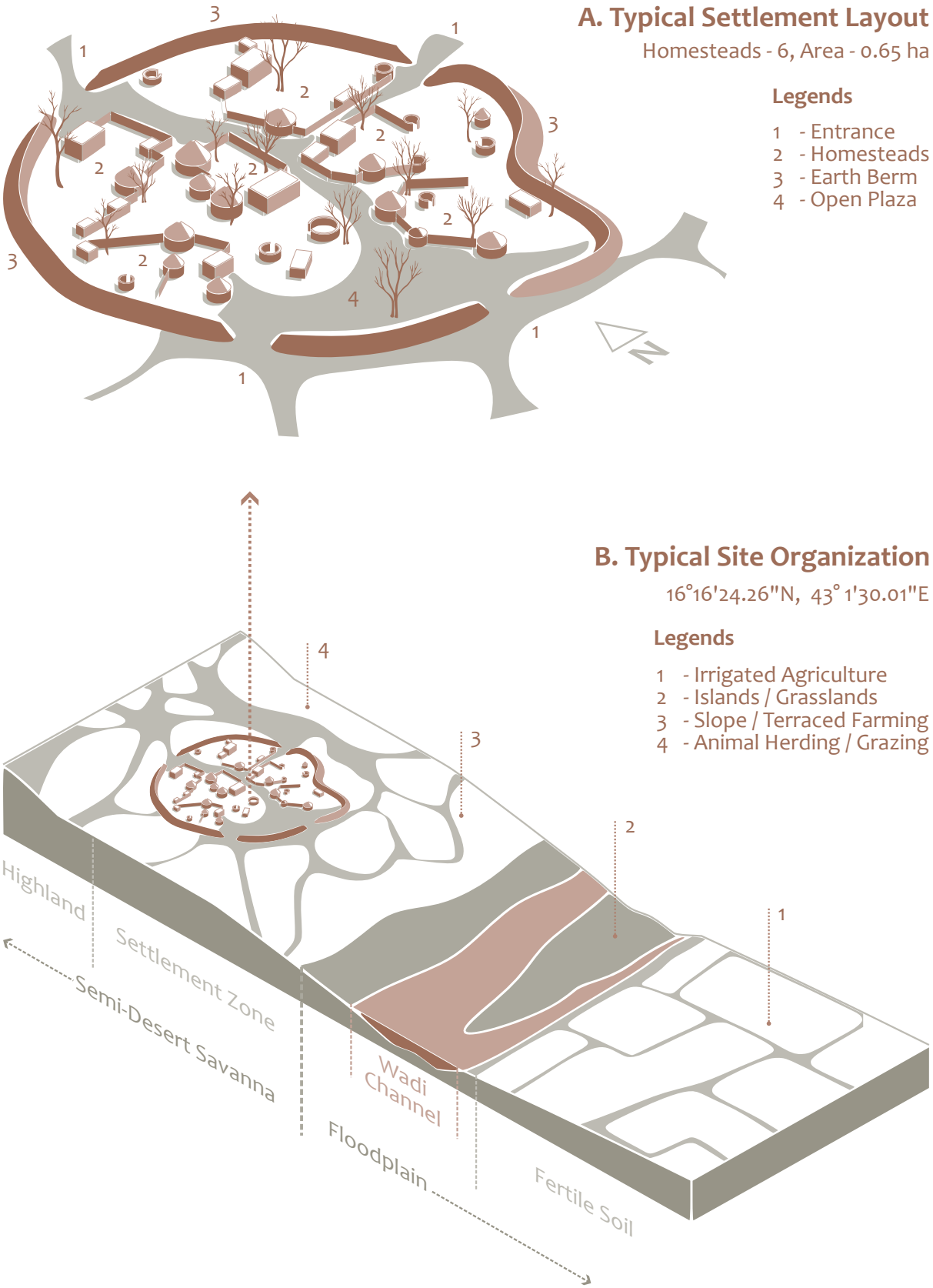


Illustration 33 : Typical Settlement Layout and Site Organization

VERNACULAR WATER MANAGEMENT

Yemen has age-old practices of water management in the desert, allowing it to sustain human habitats for millennia. They are different according to the elevation, topography, and collection techniques. Not all practices can be applied in the relatively flat regions of the Tihamah plain, but there are a few. Satellite imagery, along with FAO published resources of Steenbergen et al. (2010), provides some categories of water management infrastructures practised in the flat plains of Yemen.

The primary sources of surface water are the wadis. Water harvested from the wadis is diverted and distributed at various scales through these water infrastructures. They are the following:

1. Large Diversion Infrastructures

Large diversion infrastructures are typically built with government and administrative help. They are large dams and channels used to control flooding and divert water to drier regions. But even then, there are instances that local communities have built mid-sized weirs, gabions, stepped spillways, diversion channels, etc., learning from traditional knowledge. Even if the knowledge is rooted in the past, the construction systems are contemporary.

2. Small Diversion Infrastructures

Small diversion infrastructures seem to be built by communities as they show some temporal characteristics. Communities build diversion spurs to redirect wadi water to their desired course to irrigate agricultural land. Diversion spurs are raised linear mounds placed in an oblique orientation with the wadi course to divert a portion of wadi water to a desired location. They are built with sand, gravel, and stones. Other than the spurs, diversion canals, inlet gates, spillways, retention ponds, etc., are part of this water management system.

3. Spate Irrigation

Spate irrigation is a technique where water is distributed across multiple layers of agricultural land to irrigate agricultural zones sequentially, following the grade of the landscape. Water enters through inlets from the diversion canal, irrigates one land, then, after it is saturated, water spills and overflows into another land through inlets. This continues until water reaches the last field. The access water is then stored in retention canals or drained to its source canal.

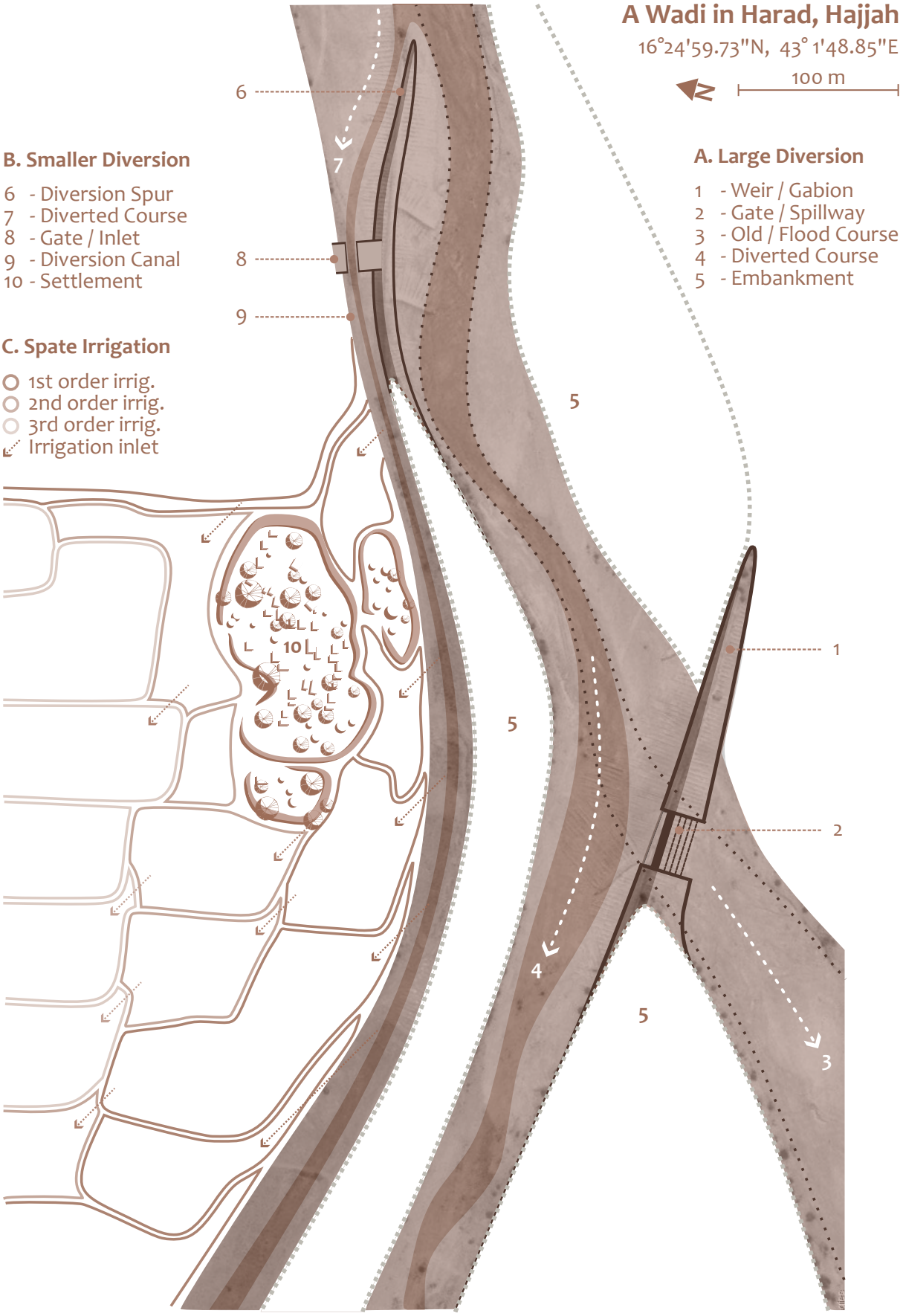


Illustration 34 : Traditional Water Management System & Infrastructure

MATERIALITY & CONSTRUCTION

Analyzing materiality and construction systems gives valuable insights into in-situ material usage techniques and the finished work. This knowledge can be applied in design approach, affordability, construction techniques, material recycling, supply chain analysis, task scheduling, work hour estimation, etc. A comparative analysis of the construction method will also be useful in this regard.

Building materials in Hajjah can be categorized by their usage frequency within traditional and contemporary practices. The current socio-economic situation in Hajjah suggests that traditional materials will be available over contemporary industrial materials due to expense and conflict-induced disruption. The most frequent materials are the traditional ones: soil, sand, reed, gravel, stone, timber, and lime. Even if water is not considered a building material, its importance and availability concerns give it a significant place among other traditional materials.

Keeping housing affordability for a post-conflict community in mind, a comparative analysis of four different earth-based construction systems: mud bricks, rammed earth, earth bags, and stabilized blocks has been carried out. The comparison indicators were the use of exclusive ingredients, the sophistication of tools, usage versatility, water usage, relative cost, required material preparation and construction time, and complexity or skill requirement of the construction process.

For a post-conflict resettlement plan for Hajjah, rammed earth and earth bag systems should be very appropriate for its low water usage, construction speed, simplicity, and availability of tools. Between these two, the rammed earth process uses only traditional materials. Although the earth bag system uses contemporary and industrially made earth bags, its cost-benefit comes from its construction speed and potential application to large-scale infrastructures.

Stabilized earth blocks use less water than traditional mud brick making. But it falls short in specialized block-making tools and cement usage. Even then, it can be used for special buildings or key installations that require a more formal construction. Mud bricks can not be used for rapid construction as the brickmaking process longer time, brick drying space, and uses a lot of water in a region prone to water scarcity. Mud bricks are suitable for a relatively slow phased private construction where affordability is more prioritized than construction speed or emergency response.

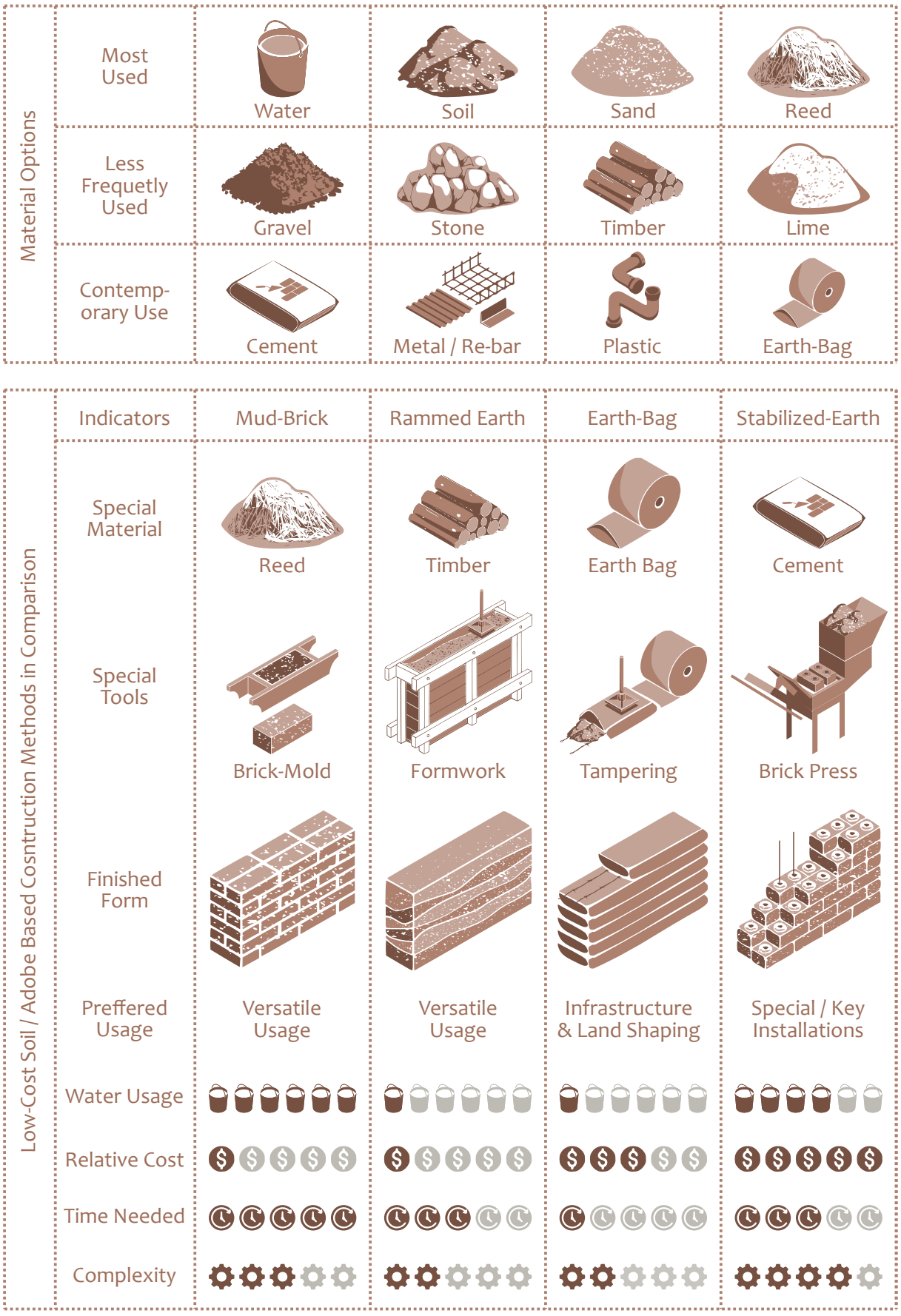


Illustration 35 : Materials & Low-Cost Erath / Adobe Based Constrcution Methods in Comparison

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05

CASE STUDY

THE ‘GREAT GREEN WALL’ OF AFRICA

The ‘Great Green Wall’ (GGW) is an initiative launched in 2007 by the African Union to restore degraded landscapes and prevent the expansion of the Sahara Desert in the North African savannah. Across 8,000 km of the African continent, 22 countries are collaborating on this ambitious project to implement environmental restoration, enhance soil fertility, promote water conservation, improve food security, foster climate resilience, and promote sustainable economic growth. Its objective was to restore 100 million hectares of degraded land in the arid savannah of central Africa, sequester 250 million tons of carbon, and create 10 million green jobs by 2030 (UNCCD, 2023).

A special aspect of the GGW initiative across multiple countries is that it trains and includes IDPs and refugees in degraded land restoration, innovative agricultural practices, and provides them with economic opportunities to lead a life of dignity. It does so by reducing poverty and increasing access to restored natural environments. The distressed population’s collective efforts gradually reduce aid dependency and recover their productive lives with a relatively small external intervention. Other than restoring degraded land, this process also improves food and water security, shares knowledge and skills, allows democratic participation of communities, and inherently builds resilience. Mali, Niger, Chad, Sudan, Nigeria, Cameroon, Burkina Faso, and Ethiopia are examples of IDP or refugee involvement in the GGW initiative, and evidence suggests that the initiative works in recovering their lives.

For example, the GGW responsible agency in Chad recruited refugees from neighbouring Sudan and involved them in this restoration effort around the refugee camp sites. During the 2023 interstate conflict in Sudan, over 10M people became refugees and 600,000 crossed the border into Chad (Tanis, Shapiro and Fadel, 2024). GGW initiative trained the local Chadian communities as well as Sudanese refugees in its restoration efforts. Other than training and awareness campaigns, ANGMV supports volunteers, provides seeds, tools, nurseries, etc., to facilitate the work in the field. So far, ANGMV has contributed to the restoration of more than 36,000 hectares of land and has created thousands of green jobs for locals and refugees alike (Mbadinga, 2024).

The GGW initiative applies very simple and affordable land restoration and water harvesting techniques to achieve its goal. There are different regional variations to these techniques, but in principle, they are soil moisture retention techniques to help vegetation thrive. AFDB (2008) provides the technical details, and upon studying various reports and resources, the main land restoration techniques are the following:

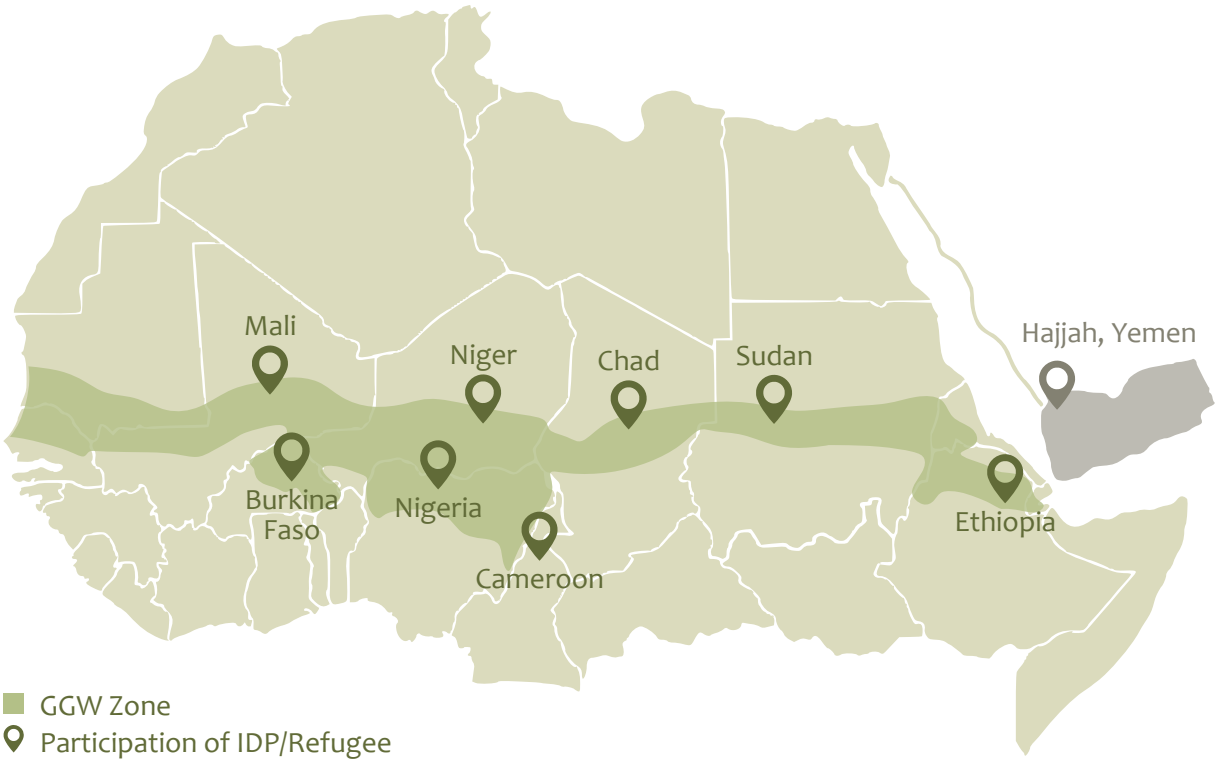
1. Rainwater harvesting with half-moons (<2~5% slope)

2. Rainwater harvesting with contour bunds (>5% slope)

3. Water conservation with Gabions on streams or canals

4. Farmer Managed Natural Regeneration (FMNR) with Silvopasture

5. Diversifying agricultural practices like Syntropic Farming with Agroforestry



Restoration of Degraded Land and Environment

Innovative Agricultural Practices

Increasing Food and Water Security

Reduce Poverty Through Economic Opportunities

Knowledge and Skill Development

Community Participation (including IDP & Refugee)

Sustainability and Resilience Against Climate Change

Illustration 36 : Regions of GGW in Central Africa

SOIL MOISTURE RETENTION PRINCIPLE

Degraded soil in an arid environment becomes hard, sun-baked, and hydrophobic over time, losing its moisture retention capacity. As a result, rainwater is not effectively absorbed by the ground. Instead, rain accumulates on the surface, and during the monsoon, flash floods become extreme. In fact, flash flood washes away the organic nutrient-rich topsoil, making the land less favourable for vegetation growth. Without vegetation, the soil degrades further, and the vicious cycle continues. A total reversal of this process becomes essential to restore the land to green.

Increasing the capacity of degraded soil to retain more moisture over time is the key principle to environmental restoration and re-greening the arid landscape. Every version of the technique follows this principle. Each technique breaks up the hard arid soil with digging and helps water get absorbed by the ground. The 'dig and mound' method shapes the topography where the mound slows down runoff water, and the ditch collects the water on site and slowly allows it to percolate into the ground easily. The pits also collect organic nutrients and plant seeds. This creates an opportunity for seeds to absorb the collected water and nutrients. Soon, vegetation starts to grow, providing shade, collecting more moisture, adding more nutrients to the soil, and a reversal of the degradation takes place.

Over time, the ground can hold more moisture and slowly recharge the groundwater table. After many cycles, the ground holds enough moisture to sustain vegetation year round needing less and less human intervention. Finally, various forms of cultivation become possible to sustain a sizable human population.

A. Degraded Land Issues

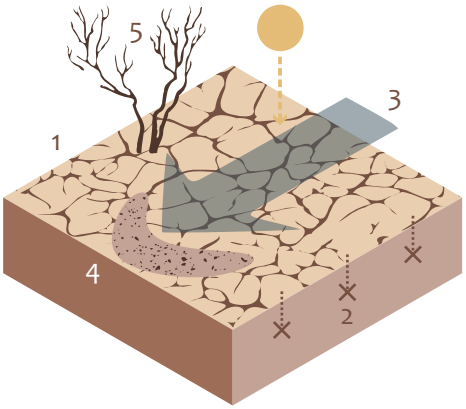
1 - Sun baked, hard, impermeable soil

2 - No water retention capacity

3 - Flash floods intensifies

4 - Soil nutrients washes away

5 - Environmental degradation

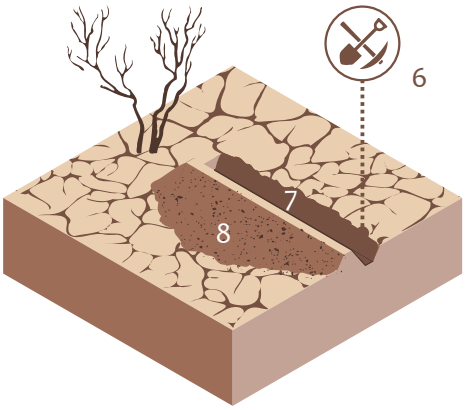


B. Simple Dig & Mound

6 - Digging Breaks up crust

7 - Ditch is created

8 - Soil mound is created



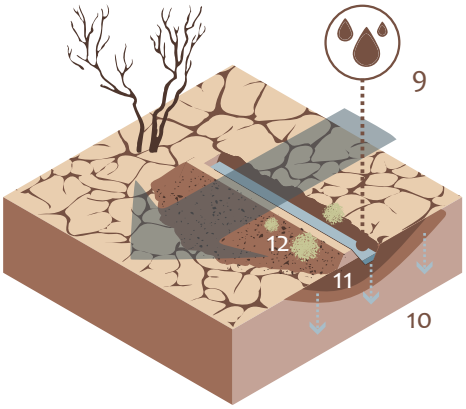
C. Flood / Runoff / Rain Capture

9 - Ditch traps water & nutrients

10 - Water percolates easily

11 - Constant moisture presence

12 - Plants grow in nutrient rich soil



D. Vegetation Retains More

13 - More vegetation grow

14 - Shade slows evaporative loss

15 - Moisture retention accelerates

16 - Floods become less extreme

17 - Environment starts healing

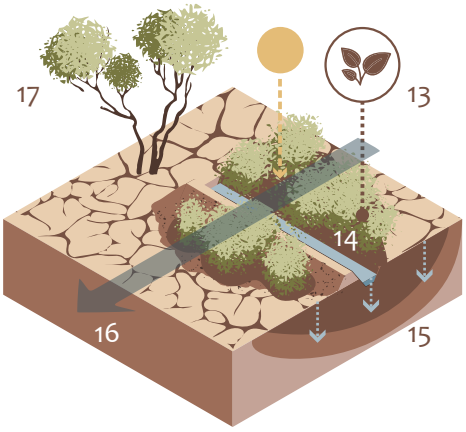


Illustration 37 : Land Restoration Strategy by Increasing Soil Moisture Retention Capacity

DESERT HALF-MOON

A popular in-situ micro water harvesting system is to cover arid lands with a ‘Half-Moon’ shaped dig and mound formation. Because of its simplicity and effectiveness, there are many versions of this system across the GGW regions. Communities can learn and adopt this system very quickly.

These half-moons are 2-2.5 m in diameter and are stacked 5-6m apart in a staggered formation to collect the maximum amount of water. It can be applied in a relatively flat landscape having up to 5% slope. One person can dig one half-moon per day. The labour cost can vary in different regions, but it can be approximated at 150USD per hectare of land. They can be used for cultivation, animal fodder production, forestry, etc. (AFDB, 2008).

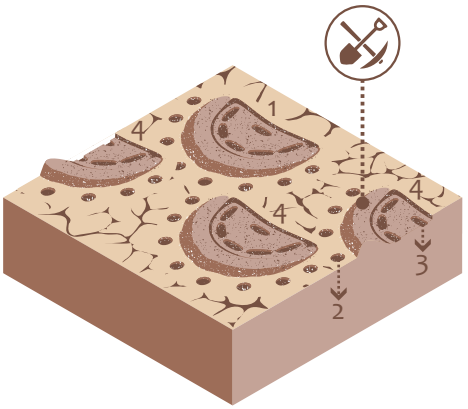
A. Digging Half-Moons (<5% Slope)

1 - Half-moons are dug (2.5m radious)

2 - Small pits to collect seed/nutrients

3 - Small pits for better percolation

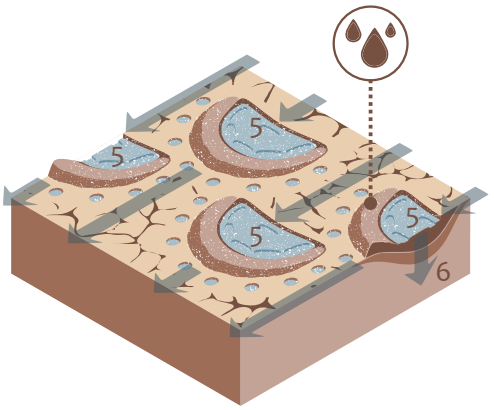
4 - Multiple Half-moons are staggered



B. Rain / Runoff / Flood Capture

5 - Water is trapped in half-moons

6 - Water percolates slowly

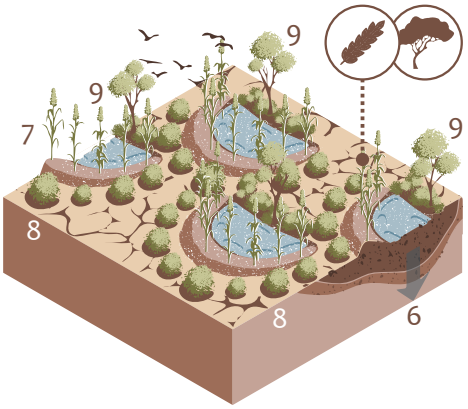


C. Agriculture & Planting Trees

7 - Half-moons are cultivated

8 - Bushes & shrubs retain moisture

9 - Trees are planted



D. Land Restored With Vegetation

10 - Constant moisture presence

11 - Vegetation provides shade

12 - Surplus fodder for animals

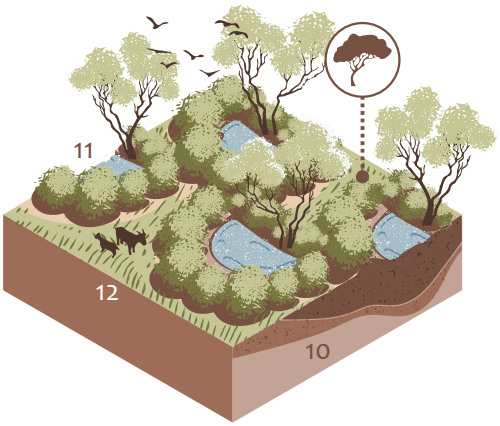


Illustration 38 : Micro-catchment system with Half-Moons

CONTOUR BUND, GABION, & SAND DAM

With increased slope, different ‘dig and mound’ techniques are used, such as ‘Countour Bunds’. Unlike modular units such as half-moons, contour bunds can be both modular and linear that following the contour lines of the natural topography of the landscape. Similar to half-moons, it collects water and restores degraded land. Due to its application on steep landscapes (>5% slope), contour bunds are suitable for layered agricultural practices where trees, bushes, shrubs, etc., are layered to diversify food production and increase soil fertility.

Gabions are gravel and stone-made structures that are permeable and slow water flow. Unlike dams, they allow water to pass through but provide resistance for it to flow downstream. This holds water temporarily, and the water-soaked soil gets a chance to absorb the water. Gabions can be used with contour bunds wherever appropriate to slow down flash floods or heavy rain.

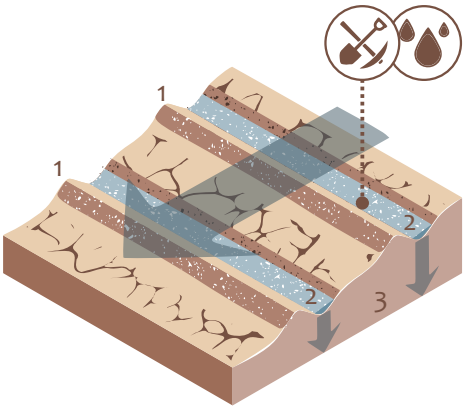
A Sand dam with gabion is another technique to force water to flow sub-surface. If a gabion is strategically placed, it can cause sedimentation upstream. Over time, sand and sediments accumulate, and water flows sub-surface. This prevents evaporative loss due to extreme desert heat and solar radiation. But to accelerate water conservation a sand dams can be built depending on urgency.

A. Digging Contour Bunds (>5% Slope)

1 - Contour bunds in regular intervals

2 - Bunds capture water

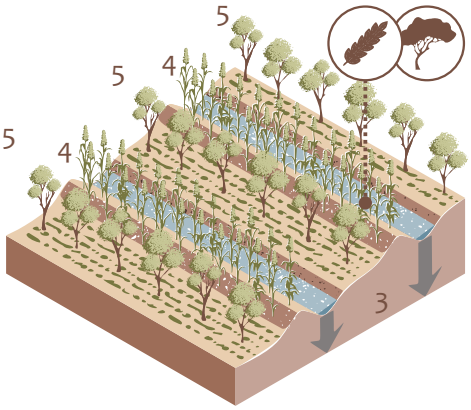
3 - Water percolates slowly



B. Layered Cultivation

4 - Cultivation is diversified

5 - Trees give shade and resist erosion



A. Gabions on Streams

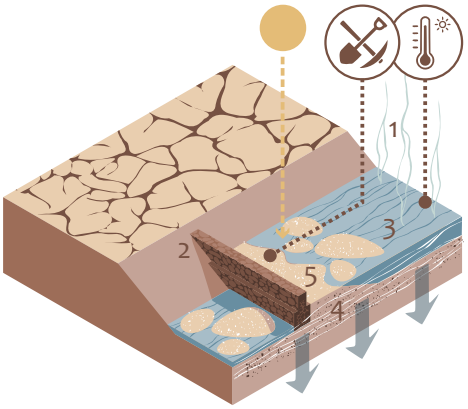
1 - Evaporative loss in streams

2 - Gabion is constructed

3 - Stream slows down

4 - Water flows sub-surface

5 - Sedimentaion occurs



B. Sedimentation & Sub-Surface Flow

6 - Sand/sediment accumulates or filled

7 - Sediment slows stream further

8 - Ground water is recharged slowly

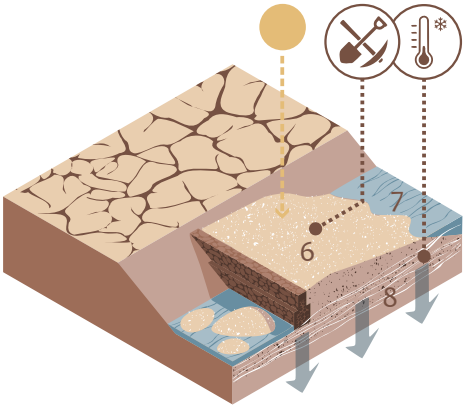


Illustration 39 : Micro-Catchment with Contour Bunds & Water Conservation with Gabions

FMNR & SILVOPASTURE

Farmer Managed Natural Regeneration (FMNR) is a very affordable way to restore patches of degraded land where vegetation and tree saplings grow naturally. Even if it is called ‘Farmer Managed’, in practice, teenagers, students, or adults from all demographics can participate in this.

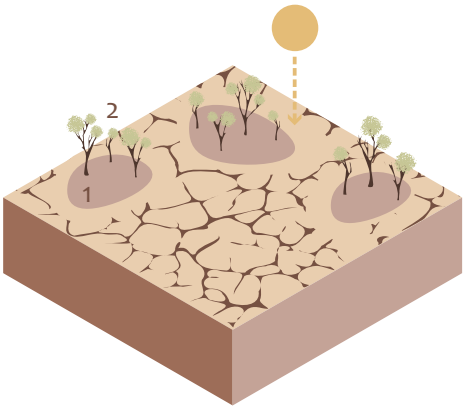
First, participants search the landscape and try to find patches of naturally growing tree saplings. Usually, they grow in groups and have deeper roots than planted trees. Participants then select a relatively healthier tree and chop other saplings. This eliminates the other competitors for water and nutrients, increasing the survivability of a single tree. The chopped organic materials are then gathered at the base of the selected tree, providing mulch. The mulch slowly degrades and provides nutrients to the tree, and also helps to preserve moisture. This gives a stronger chance of a tree's survival in the degraded landscape. Over time, the tree matures, preserves more moisture, and provides shade for other vegetation to grow. Slowly, the land becomes a greener savannah and later a forested landscape.

FMNR-restored landscapes are suitable for pastoralists to grow their animals, as these lands are not actively shaped for water harvesting and agriculture. Instead, the land becomes suitable for ‘Silvopasture’, an integrated agroforestry system that uses grazing domesticated animals in a mutually beneficial way. Domestic animals like goats, cows, and camels graze on vegetation unsuitable for human consumption and spread dung and seeds across the soil. This helps the soil become more fertile and extends the boundaries of restored patches. By the ‘Silvopasture’ practice, the patches of FMNR restored landscapes get connected over time.

A. Naturally Growing Tree Saplings

1 - Pockets of moisture in land

2 - Tree sapling clusters

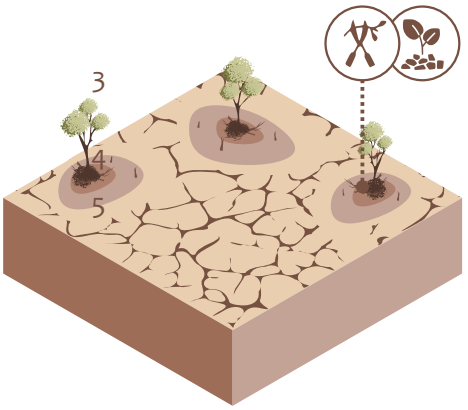


B. Selection, Pruning & Mulching

3 - Healthy trees selected

4 - Pruning other trees, mulching

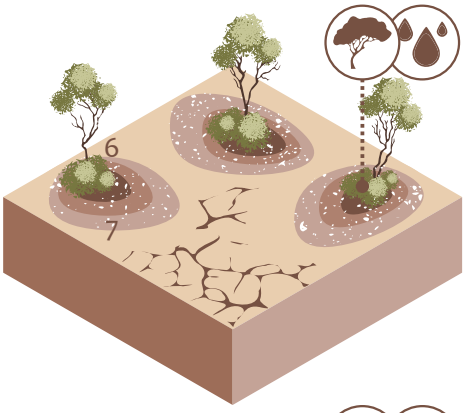
5 - Mulching helps moisture & nutrients



C. Soil Moisture Retention

6 - Vegetation covers soil

7 - Vegetation retains more moisture



D. Fodder Growth & Silvopasture

8 - Trees mature & provide shade

9 - Vegetation covers ground

10 - Land used for feeding animals

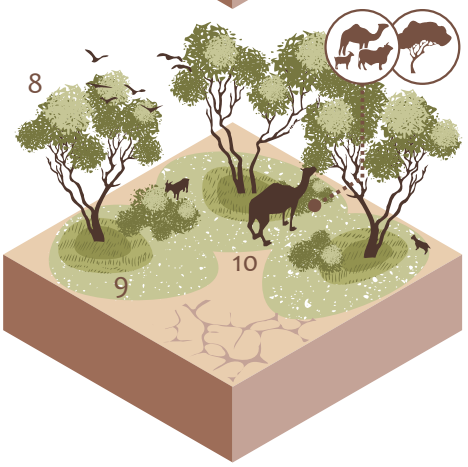


Illustration 40 : Large-Scale Area Restoration with FMNR & Silvopasture

FOOD FORESTS

'Food Forest' is a popular name for a diverse system of 'Syntropic Agroforestry' or 'Permaculture'. It aims to recreate the natural ecosystems of the forests that create a much more resilient ecosystem of forestry and agricultural practices. It layers multiple kinds of food-producing trees that produce a lot more than conventional agriculture in the same area of land. When matured, the system becomes passive and can sustain with minimal intervention.

In a degraded land, it takes a lot of effort to cultivate as the soil has lost its top fertile organic layer. Food forest starts with native support trees at first. The support trees serve multiple functions. They preserve moisture, provide shade, circulate nutrients, fix soil nitrogen, control pests, add soil biomass, and increase soil fertility. They have to be strategically pruned, and their organic fixes the soil for the next generation of layers, which increases food production gradually.

In a mature food forest, many different layers yield different food or other useful resources year-round. Even though this system cannot sustain communities all by itself, communities benefit from its production capacity, resilience, diversity of products, soil fertility, moisture retention and its micro-climatic effects in the surrounding human habitats.

Support Plant Functions

- Fixing nitrogen in soil
- Circulate nutrients
- Preserve moisture
- Control pests
- Add biomass to soil
- Increase fertility

Early Phase

Food Producing Plants - 10%
Support Plants - 90%

Overall Resource Production

- Fruits & vegetables
- Roots & tubers
- Leafy greens
- Herbs & spices
- Nuts & berries
- Medicinal ingredients
- Firewood & timber

Later Phase

Food Producing Plants - 90%
Support Plants - 10%

Food Forest Layers

1 - High Canopy
2 - Understory
3 - Bush & Shrub
4 - Perennials
5 - Herbaceous
6 - Ground Cover
7 - Roots
8 - Climbers

Illustration 41 : Growing Food Forest Systems

INCREASING ‘CARRYING CAPACITY’

The GGW initiative is a role model to understand how to increase the ‘Carrying Capacity’ of the land. ‘Carrying Capacity’ in this context is the environment’s ability to provide a balanced accommodation of the increasing number of people, animals and vegetation without degrading the environment itself. The GGW initiative does this in a systematic way that replaces the loop of environmental degradation with a positive feedback loop of recovery and restoration.

In the GGW initiative, carrying capacity is linked to four elements in a positive feedback loop: human resilience, land shaping, water harvesting, and agricultural practices. The loops start with human presence and their collective actions for survival. They shape the land strategically to harvest natural resources, primarily water in this case. This collection allows them to produce other essential items like food and animals. The survival capacity increases, and human creates more resilient systems around their habitats with land shaping, water conservation, diverse agriculture, etc., in the next cycle. This process, if repeated over time, keeps increasing the habitats by sustaining more people, animals and trees with a mutually beneficial symbiotic relationship.

To summarize, applications of the GGW initiative are a practical example of land restoration with the help of conflict-stricken communities, where both heal each other. It gives some clear pathways for post-conflict Hajjah. It solves some key problems concerning how to resettle and nurture a post-conflict community and build it from the ground up.

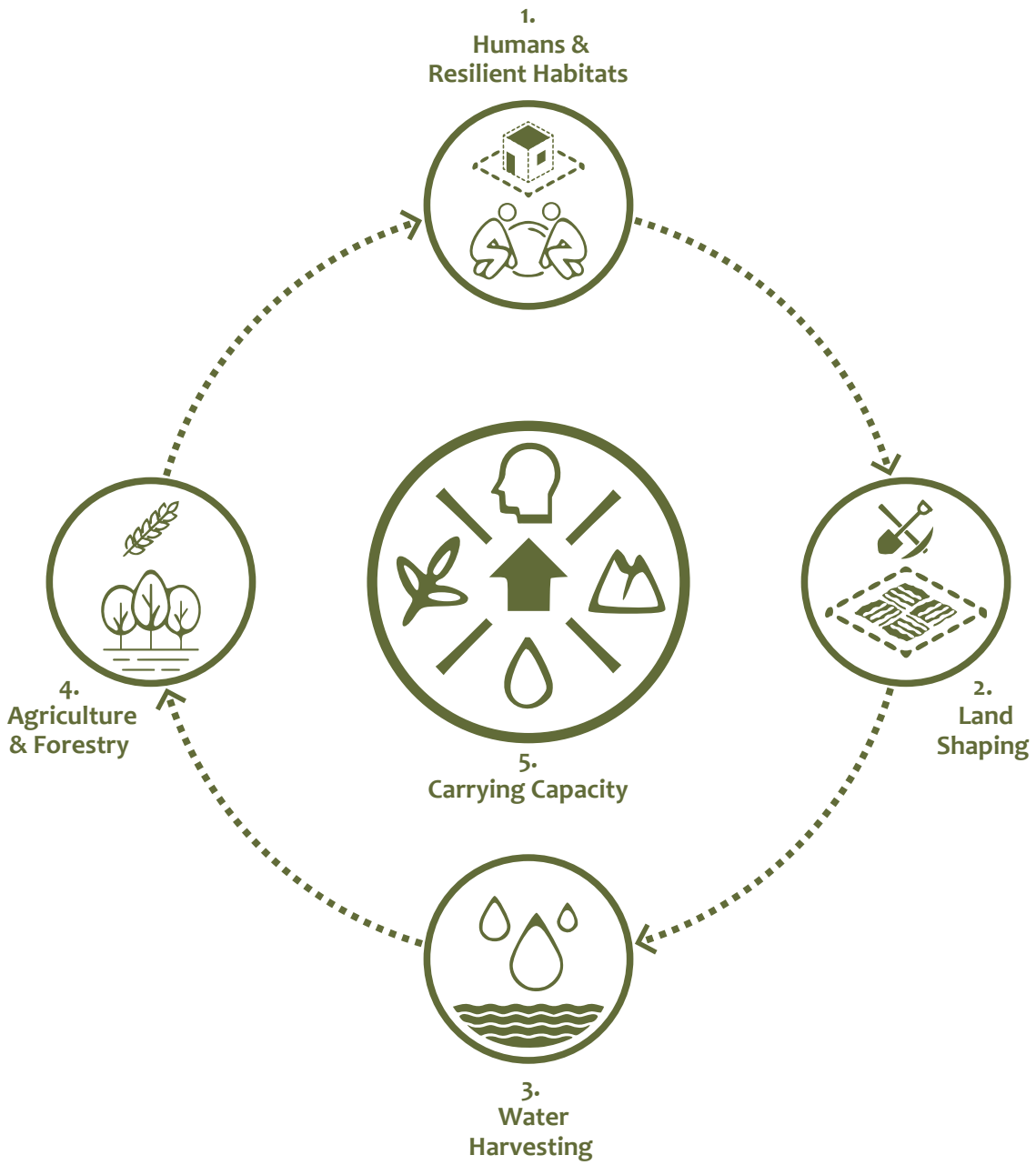


Illustration 42 : Carrying Capacity Positive Feedback Loop

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06

THEORIES

LAYERS OF SOLUTIONS

The design problems in Hajjah, Yemen, are multifaceted, nuanced, and cover a number of broader themes. The population, environment, and overall post-conflict recovery and reconstruction require different types of solutions. The problems have overlapping themes; therefore, the solutions are also expected to have some overlaps. But identifying such broader themes will help optimise duplicated efforts for a post-conflict society. To design a durable, climate-resilient, and scalable resettlement strategy in Hajjah, five broad categories of themes can be proposed, and associated theoretical frameworks can be assigned. The layers or themes are as follows:

1. Vision

Post-conflict societies remain fragmented on many levels. Uniting them under a common purpose and showing them an achievable future vision will become effective for peacebuilding and societal recovery in the early phases. It will also help direct the strategies towards their materialization.

2. Resilience

Integrating sustainability and balance in the overall system brings resilience, which is crucial to thrive in a harsh desert environment. People must harness the resources sustainably and make the environment favourable in return to accommodate more people. Establishing these balanced interrelations among the system's elements will result in overall resilience.

3. Ruralism

The productive lives of post-conflict societies will be centered on shared spaces and common activities for collective survival. Their way of living in the countryside will shape the fabric of the landscape. Characterizing their habitats and special functions will help materialize the long-term survival strategy and scalability. Built upon their success, a new rural-urban continuum will emerge.

4. Design Language

Built spaces are a powerful expression of societies' cultural identity, values, resources, geography, etc. To produce an appropriate local human-centric design, a design approach must be critically evaluated and applied.

5. Community Engagement

Communities must be involved in the design-build process of their own habitats. Increasing engagement in self-determination opportunities boosts morale, restores dignity, fosters satisfaction and peace in a society that needs healing after conflict. As a result, rehabilitation efforts also become successful.

Assigning appropriate theories to these broad themes will provide the necessary frameworks and guidelines for possible solutions.

VISION: Scenario Planning

'Scenario Planning' analyzes the current conditions and tries to produce a tangible vision of the future. Then it works to set up strategies and policy frameworks towards that agreed-upon goal. It essentially deals with the following questions: 'Where do communities envision themselves in the future?' and 'How to chart a course towards that agreed-upon vision?' Thus, some possible scenarios are produced and applied it the policies and strategies that have a potential impact towards shaping that future.

'Scenario Planning' have two approaches, 'Normative' and 'Exploratory'. The 'Normative' approach takes the values and aspirations of the community into account and prepares policies towards the goal of the future. Its stages are:

1. Community Values - Eliciting people's opinions about the future.

2. Policies - Take a major policy decision towards that value.

3. Possible Scenario - Impact of these policies on the future form of the community.

'Exploratory Scenario Planning' is the opposite; it envisions the scenario first and then anticipates its impact on communities along the way and creates robust strategies to reach that future. Its stages are:

1. Possible Scenarios - Anticipate different future conditions based on external factors.

2. Policies, Values - Impact the goals that have been established.

3. Planning Strategy - Determine a robust strategy to achieve these goals despite external factors (UN-Habitat, 2012).

In Hajjah, people's aspirations and the achievable future based on current circumstances both have to be assessed. Therefore, both 'Normative' and 'Exploratory' approaches are valid. However, the 'Exploratory' approach can overcome the limitations of a war-torn population, struggling to survive, in informative decision-making and hopeful imaginations. The 'Exploratory Scenario Planning' approach can restore morale and uplift the dignity of the population. Taking people's aspirations as a primary guide, the future 'Scenario' can be understood by assessing the indigenous way of life, projected future changes in climate, and the strategy to adapt to those changes in future.

RESILIENCE: Socio-Ecological Symbiosis

Many design-build frameworks stem from 'Socio-Ecological Symbiosis' that emphasizes a deeper relationship between human and natural resources, for instance, Symbiotic Design, Circular City, etc. This sustainability approach is much more holistic and includes mutually beneficial interrelations and dependence with human life and their surrounding environments.

'Resilience Thinking' is a framework that also focuses on the symbiotic relations of socio-ecological systems. It acknowledges humans as active participants in the system and how humans can build capacity to deal with any imbalance in the system. Simonsen et al. (2015) have developed their seven key principles:

1. Maintain diversity and redundancy

Systems with various components are much more resilient as each reacts differently to the other during change and imbalance. Failure of one element will not become extreme and catastrophic.

2. Manage connectivity

An organism's ease of movement, dispersion, migration, and interaction across different habitats in the system increases resilience and safeguards the overall system.

3. Manage slow variables and feedback loops

Dampening or speeding up a variable in the system, even if very slowly, accumulates over time. At a certain point, a positive feedback loop takes effect, and the system sustains longer if not disturbed.

4. Foster complex adaptive systems thinking

A complex system has many dynamic elements. Therefore, accepting unpredictability, uncertainty, and thus adaptability has to be incorporated in the framework.

5. Encourage learning

Acquiring new knowledge and experiences through a hands-on approach will help decision-making in future while dealing with changes. There will always be a need to critically revise existing knowledge to enable adaptation.

6. Broaden participation

Increased involvement of diverse stakeholders in the system can foster trust, informed decision-making, legitimacy, better management, etc.

7. Promote polycentric governance

Polycentric institutions can act swiftly according to needs and emergencies. Therefore, it achieves the best collective outcomes during disturbances and change.

RURALISM: A ‘Sponge’ Countryside

Pioneered by Professor Kongjian Yu, the ‘Sponge City’ concept focuses on integrated water management and mitigating the risk of extreme weather. It tries to increase a landscape’s ability to absorb, store, and slowly release large quantities of water, just like a sponge. It is a nature-based solution that can be applied across rural-urban blue-green infrastructure at various scales. The ‘Sponge City’ concept covers many ideas, such as water-sensitive design, low-impact design, water conservation, ecological restoration, etc.

A ‘Sponge Countryside’ is conceptually an extension of ‘Sponge City’ principles applied to the rural-urban continuum fabric. In concept, ‘Sponge Countryside’ focuses on building community resilience with integrated water management & flood control, green infrastructure, and ecosystem restoration. Tarek (2025) highlights the five key components of ‘Sponge City’:

1. Water-sensitive design

Incorporation of different strategies that simulate hydraulic processes, collect and manage storm water, help the water cycle through the system, prioritize water sensitive practices to enhance resilience, etc.

2. Green infrastructure

Use of vegetation and green infrastructure to manage water effectively, designed to absorb, infiltrate or purify storm water, create multi-functional spaces, etc.

3. Permeable surfaces

Use of porous materials and surfaces allows water to percolate easily into the ground or reach its desired place.

4. Ecosystem restoration and connectivity

Restoring natural bio-networks and pockets improves connection, enhances biodiversity, and improves water quality.

5. Community engagement

Ensuring participation of the local community in planning and implementation to promote a sense of belonging and meet the different needs of the community (Tarek, 2025).

In a desert environment like Hajjah, the ‘Sponge’ system can be implemented to decelerate and distribute wadis, store and conserve water, design and manage green-blue infrastructure, and build up resilience around water-related rural activities and livelihoods. In the rural-urban continuum, this approach will give certain characteristics to the resettled habitats and engrave water harvesting and management as a valued culture.

DESIGN LANGUAGE: Critical Regionalism

As a resistance to global culture, 'Critical Regionalism' becomes a design philosophy that seeks to improve the vernacular for contemporary time and place. Developed by Kenneth Frampton, this is a theoretical framework that is not merely an imitation of the past built heritage but a critical understanding of the tradition translated into a modern design language.

'Critical Regionalism' is a thoughtful analysis of local context, climate, materials, and culture to find an appropriate design expression. Frampton (1983) developed his six principles, and these points can be summarized as follows:

1. Promote the local, resist the global

Any traditional built heritage has developed over many years and inherently possesses immense value. Therefore a vernacular traditions are more suitable for specific regions than a global trend.

2. Learn from the past for contemporary needs

Following a vernacular tradition for the built environment is not just the replication of the past. The age-old traditions need to be critically analyzed to draw inspiration from and apply that acquired knowledge to meet contemporary necessities.

3. Regional culture as a part of world culture

Regional culture is also a valuable addition to world culture. It is very suitable for its region and locality and can contribute to the diversity of the built heritage of the world.

4. Emphasise place, tactility, and materiality

Places express what type of design and the process of design-built environment is suitable for a specific locality. What kind of colour, texture, and building methods are possible comes from that identity of the place.

5. Respond to climate and topography

Design should respond to the regional climate, topography. In that way, sustainability can be achieved easily and results in a more suitable design for local people.

6. Value the 'tectonic', not only the 'visual'

Design should be felt through all the senses, not just with the eye. Therefore, a design should be evaluated not just for the visual appeal, but also needs to be felt with touch, sound, smell, etc.

In the case of post-conflict Hajjah, the 'Critical Regionalism' design philosophy is very suitable. It respects local culture and built heritage, and the design will be relatable and familiar to people. They will sense a belonging and adopt their new habitats quickly. It will also help with the sustainability and economics of large-scale rehabilitation projects.

COMMUNITY: Participatory Design

Emerging from a social movement in the Scandinavian region, 'Participatory Design' is an inclusive way of engaging all the stakeholders, especially the end-users, in the process of creation and development. It is a democratic process where the end-users take part early in the process and have their necessities taken into account, as they know them better. This helps to develop much more effective, sustainable, and equitable solutions. It empowers people as co-creators. Thus, this approach is also known as Co-Creation, Collaborative Design, Cooperative Design, etc.

According to Simonsen and Robertson (2013, p.33), participatory design has the following guiding principles:

1. Equalizing power relations

Find ways to share power and give a voice to the voiceless in the power hierarchy. Allowing people with less fortune and influence increases the success of a system.

2. Democratic practices

A well-informed and engaged community will act on their own interest and the interest of common goods, thus increasing the success of initiatives.

3. Situation-based actions

Rather than through formal abstractions, initiatives must be put into action in their actual place of implementation to realize the situation.

4. Mutual learning

Encourage and enhance the mutual understanding of different stakeholders. This allows the technical experts and the end-users to have a chance to learn from each other.

5. Tools and techniques

Different type of active engagement programs, like mock-ups, prototypes, and workshops, helps develop a range of techniques that help materialize the vision.

6. Alternative visions about technology

Through the expression of equality and democratic practices, some alternative technical choices emerge and help both the community and expertise to produce better results.

In Hajjah, multiple sectors can implement the 'Participatory Design' approach to take informed decisions, seek out innovative solutions, and restore people's dignity through constructive actions. Water management, agricultural practices, habitat management, etc., will benefit from this approach.

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07

DESIGN

DESIGN PRINCIPLES

1 - Placemaking for Community & Protection

2 - Prioritize In-Situ Resource Usage

3 - Increase Affordances of Structures

4 - Maximize Water Harvesting and Conservation

5 - Diversify Agricultural Practices

6 - Connectivity, Proximity, and Symbiosis

7 - Modularity & Scalability

MASTERPLAN

Key Elements

1 - Water diversion canal
2 - Housing Structures
3 - Internal Food Forest
4 - Agricultural Land
5 - Central Community Services

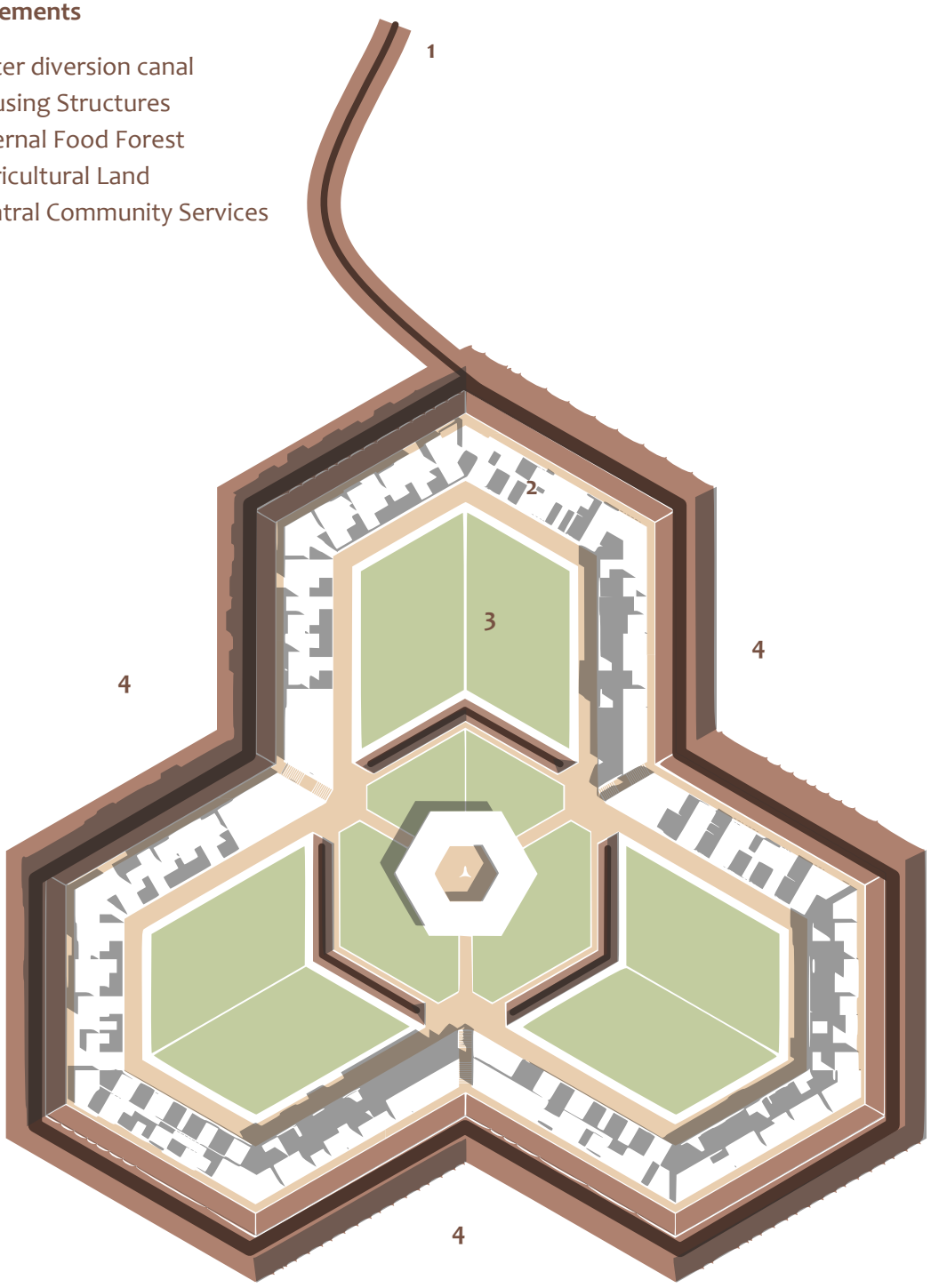


Illustration 43 : Plan of 3-Community unit (1:1000)

MASTERPLAN

Legends

1 - Water collection pit
2 - Flood protection berm
3 - Pathways
4 - Entrances
5 - Community Functions
6 - Community Food Forest
7 - Services

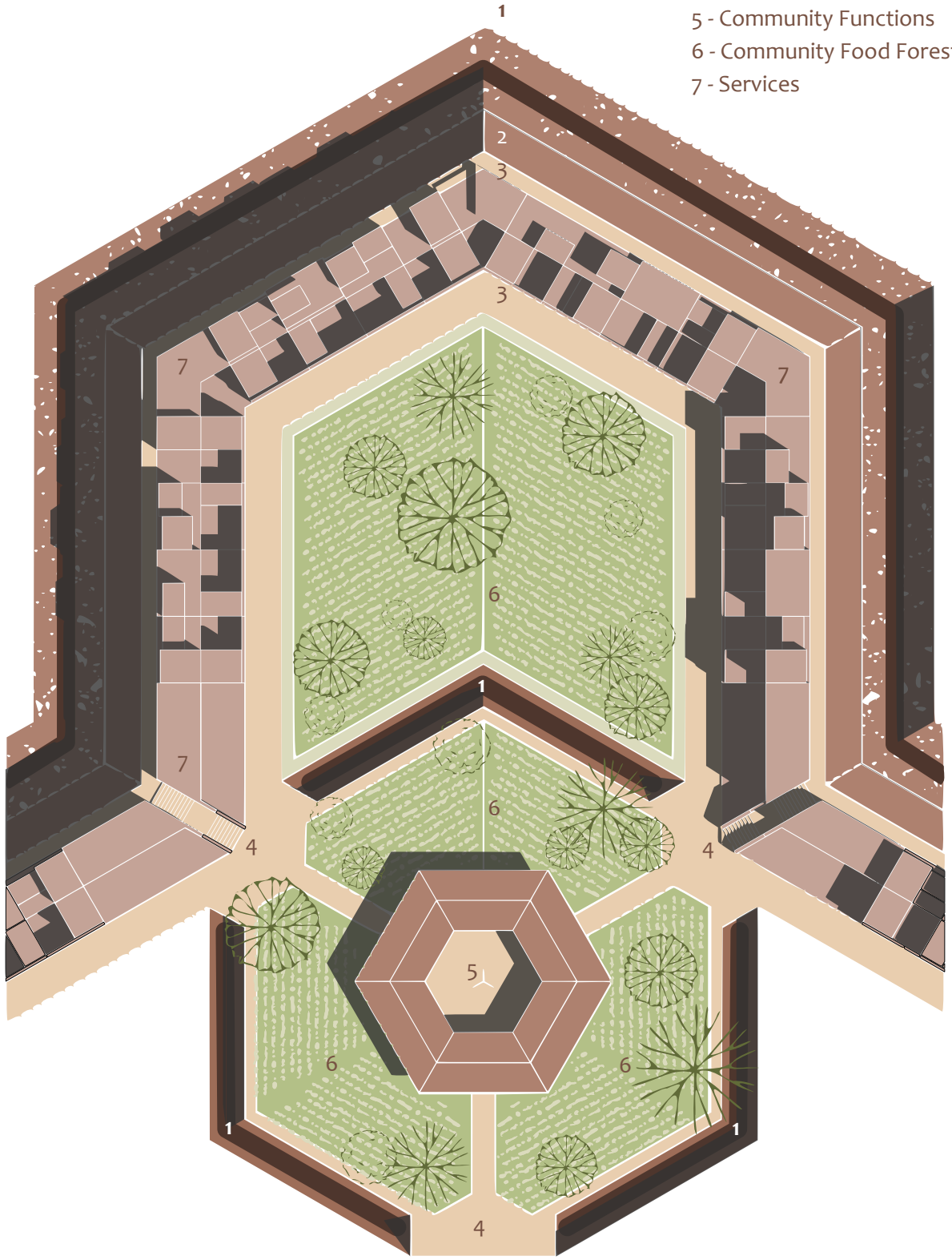
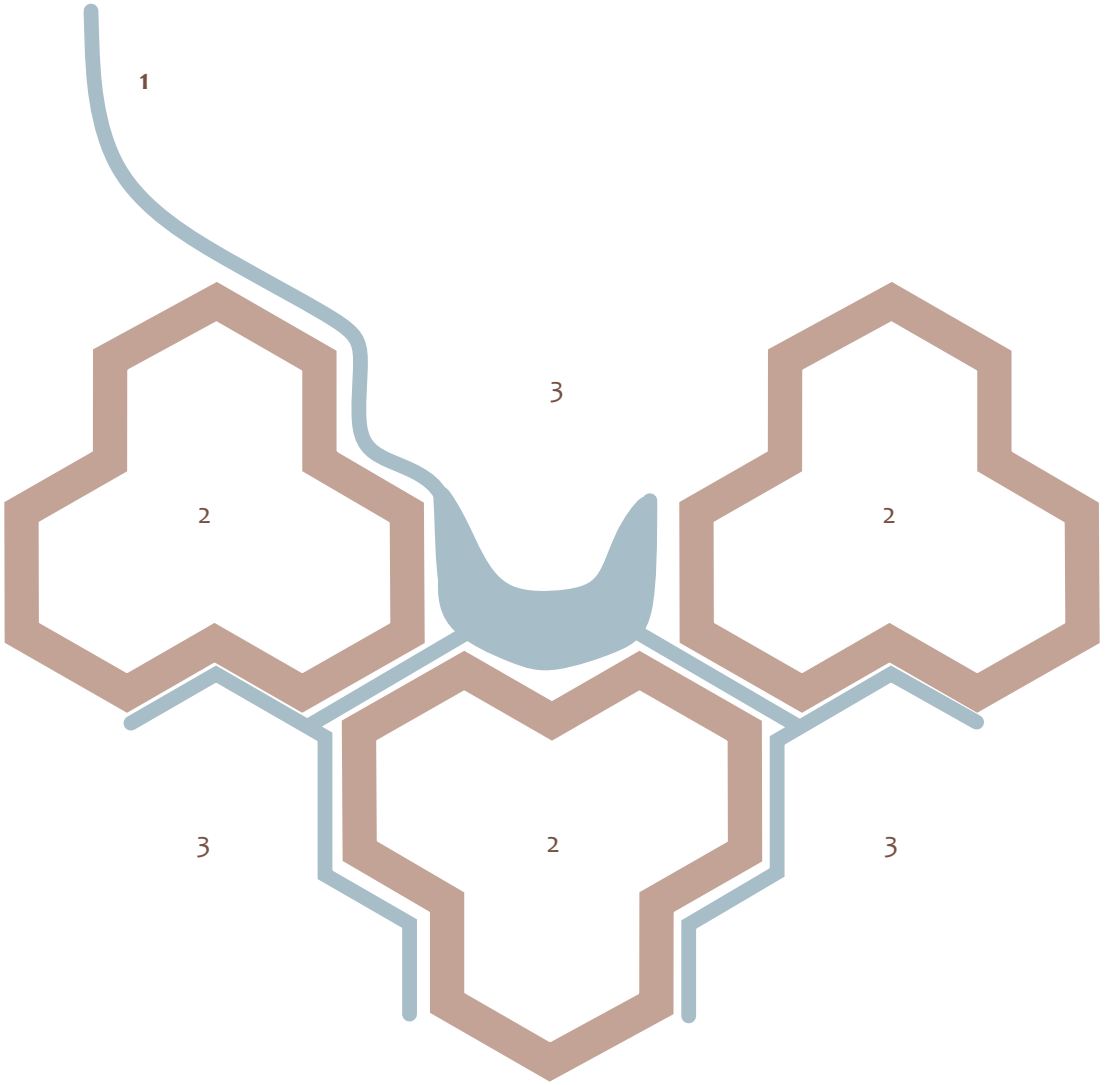


Illustration 44 : Plan of 1-Community unit with central community functions (1:500)

MODULARITY & SCALABILITY



Key Elements

1 - Water diversion canal
2 - Communities
4 - Agricultural Land

Illustration 44 : Plan of 1-Community unit with central community functions (1:500)

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EPILOGUE

REFLECTION

1. Criticism of Current Design Curriculum

The current design teaching and curriculum prepare design professionals very little about post-conflict recovery as a contemporary design exercise. This is not a very common topic in undergraduate studies, or maybe in graduate studies in the design-built faculty. But it should have been a very common exercise as the current global situation demands more professionals having good knowledge and professional skills to get engaged in PCR efforts. Introducing some inter-disciplinary subjects from social sciences or development studies might help in this regard.

2. PCR Inter-relations with Design Theories

Post-conflict recovery has a lot of overlapping interests with urban design and design theories. It may be because urban designers or architects, as professionals, work with human-centric necessities from basic survival needs to abstract phenomenological relations.

3. Restrictions as part of the process

In a real post-conflict scenario, access to project sites and site-specific information may remain restricted, but design processes have to go on despite those hurdles. Limited access to information, a lot of educated guesses and designers' intuitions become a part of this design process. This also makes proper sourcing of information and processing of datasets very important in the data collection and analysis phase.

4. Open Access to GIS Information & Up-to-Date Databases

This design process was impossible without freely accessible country based GIS information, databases, research findings, and reports from international humanitarian organizations. The value of centralized data repositories and open access policies are extremely valuable since information collection becomes limited in conflict situations. This allows a form of preparedness before any conflict erupts, and helps us prepare better strategies even before conflict ends.

5. Unutilized Humanitarian Roles

A broader humanitarian role or contributions from urban designers are possible in the context of the global south, where resources are limited and challenges are high. Humanitarian principles with design innovations can provide efficient, sustainable, and resilient solutions that may help millions of vulnerable groups across the world.

CONCLUSION

At a time when global conflict trends are rising, post-conflict recovery projects for design professionals provide very important lessons about human lives, peace and wellbeing. Urban designers have a crucial role to play in this recovery effort, not just for the developed nations, but also for those who need it the most, the less fortunate.

Only physical reconstruction is not enough, as the process of PCR involves some non-physical aspects such as social recovery, inclusion, and community participation. Therefore, the design and building processes of PCR must also include these social mechanisms to increase the overall chance of success. All efforts were made to maintain this approach in the design of this thesis project.

Developing the final design was a refreshing experience as it deviates from the conventional lofty ideas of a radical grand design approach and remains grounded in the harsh reality of both natural and man-made disasters. The effects of a decade-long conflict over an already existing climate crisis were opening and raising the question of a broader role of an urban designer. This thesis will remain a personal inspiration for a lifetime.

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LIST OF REFERENCES

ACLED (2025). Yemen Conflict Observatory - ACLED [data set]. [online] ACLED. Available at: https://acleddata.com/yemen-conflict-observatory/#1704880181324-36ae5d3a-c483 [Accessed 24 May 2025].

AFDB (2008). Rainwater Harvesting Handbook - Assessment of Best Practises and Experience in Water Harvesting. [online] Rural-water-supply.net. African Development Bank . Available at: https://www.rural-water-supply.net/_ressources/documents/default/268.pdf [Accessed 16 Nov. 2025].

Al Jazeera (2019). Flashpoint City of Hodeidah 'most Dangerous Place in Yemen'. [online] Al Jazeera. Available at: https://www.aljazeera.com/news/2019/12/12/flashpoint-city-of-hodeidah-most-dangerous-place-in-yemen [Accessed 24 May 2025].

BBC (2019). Yemen Profile - Timeline. BBC News. [online] 18 Feb. Available at: https://www.bbc.com/news/world-middle-east-14704951 [Accessed 18 May 2025].

BCPR (2008). Post-Conflict Economic Recovery Enabling Local Ingenuity. [online] United Nations Publication, pp.4–5. Available at: https://www.undp.org/sites/g/files/zskgke326/files/migration/tr/Post_Conflict_Economic_Recovery_Report.pdf [Accessed 1 May 2025].

Berg, H. van den, Meijeren, S.J. van , Gevaert, A. and Bazin, J. (2021). Water Availability in Yemen. [online] www.undp.org, pp.11–12. Available at: https://www.undp.org/sites/g/files/zskgke326/files/migration/ye/Water-Availability-Study-in-Yemen.pdf [Accessed 23 May 2025].

Charlesworth, E. (2007). Architects Without Frontiers. Routledge, pp.37–51.

CIA (2025). Yemen - The World Factbook. [online] www.cia.gov. Available at: https://www.cia.gov/the-world-factbook/countries/yemen/#people-and-society [Accessed 23 May 2025].

CSIS and AUSA (2002). Post-Conflict Reconstruction Task Framework. [online] Available at: https://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/media/csis/pubs/framework.pdf [Accessed 13 May 2025].

EIP (2023). Pathways for Reconciliation in Yemen. [online] www.eip.org. Available at: https://www.eip.org/pathways-for-reconciliation-in-yemen-full-page-v2/ [Accessed 22 May 2025].

EIP (2024). Environmental Pathways for Reconciliation in Yemen. [online] epfryemen.org. Available at: https://epfryemen.org/wp-content/uploads/2025/04/EIP-EPFR-Environmental-Peacemaking-Consultation-in-Yemen-2024-15-May-24.pdf [Accessed 21 May 2025].

ESRI (2025). World Imagery. 16°15'9.44"N, 42°59'33.62"E, elevation 60m. Available at: https://www.arcgis.com [Accessed 25 May 2025].

FAO (2024a). Rapid Assessment of Flood Impacts on Yemeni Agriculture - August 2024 - Yemen. [online] ReliefWeb, p.4. Available at: https://reliefweb.int/attachments/e92cd319-c6fb-4dfc-afc5-6d56908574d5/Flood_Impact_Assessment_Aug24_.pdf [Accessed 24 May 2025].

| LIST OF REFERENCES

FAO (2024b). REVISION OF THE NATIONAL LIVELIHOOD ZONES MAP (GOVERNMENT OF YEMEN). [online] fscluster.org, p.36. Available at: https://fscluster.org/sites/default/files/2024-07/Yemen%20Final%20LZ%20revision%20workshop%20report%20Final%2025062024%20HA10%2004072024_3.pdf [Accessed 22 May 2025].

Frampton, K. (1983). Towards a Critical Regionalism - Six Points for an Architecture of Resistance. [online] osaejournal.nl. Available at: https://oasejournal.nl/en/issue/critical-regionalism-revisited/towards-a-critical-regionalism-six-points-for-an-architecture-of-resistance/ [Accessed 29 Sep. 2025].

Francis, C.A. and Porter, P. (2017). Multicropping. [online] ScienceDirect. Available at: https://www.sciencedirect.com/science/article/abs/pii/B9780123948076000241.

Google Earth (2023). Hayran, Hajjah, Yemen. 16°15’9.44"N, 42°59’33.62"E, elevation 60m. Available at: earth.google.com [Accessed 25 May 2025].

GSC (2022). Yemen Shelter Profile - Local Building Cultures for Sustainable and Resilient Habitats. [online] Global Shelter Cluster. AlSobari. Available at: https://unhcr-sheltercluster-static.s3.eu-west-1.amazonaws.com/public/docs/Yemen_Shelter%20Response%20Profiles_en_version_220930%20v2%20-%20Final.pdf?VersionId=cyal3B__Rj9UnBOk6M8.rIAJljKeI4un [Accessed 12 Nov. 2025].

GSC (2023). Guidelines for Sustainable Resource Management of Building Materials Yemen. [online] Global Shelter Cluster. AlSobari . Available at: https://unhcr-sheltercluster-static.s3.eu-west-1.amazonaws.com/public/docs/20231218_guidelines%20sustainable%20management%20of%20resources%20Yemen.pdf?VersionId=W6xRwu2F_ko8bmTxO4LyFAtm4KVFiJXP [Accessed 12 Nov. 2025].

Hamre, J.J. and Sullivan, G.R. (2002). Toward Postconflict Reconstruction. The Washington Quarterly, [online] 25(4), pp.89–90. doi:https://doi.org/10.1162/016366002760252554.

Hanna, T., Bohl, D.K. and Moyer, J.D. (2021). Assessing the Impact of War in Yemen: Pathways for Recovery. [online] www.undp.org. Available at: https://www.undp.org/publications/assessing-impact-war-yemen-pathways-recovery# [Accessed 20 May 2025].

HDX (2014). Yemen - Water Courses [data set]. [online] Humdata.org. Available at: https://data.humdata.org/dataset/yemen-water-bodies [Accessed 24 May 2025].

HDX (2023). Yemen Populated Places - Humanitarian Data Exchange [data set]. [online] data.humdata.org. Available at: https://data.humdata.org/dataset/yemen-populated-places [Accessed 23 May 2025].

HDX (2025). Yemen: Population Estimates [data set]. [online] data.humdata.org. Available at: https://data.humdata.org/dataset/yemen-population-estimates [Accessed 24 May 2025].

Hussein, M.A. and Chughtai, A. (2025). Animated Maps Show US-led Attacks on Yemen. [online] Al Jazeera. Available at: https://www.aljazeera.com/news/longform/2025/5/1/animated-maps-show-us-led-attacks-on-yemen [Accessed 8 May 2025].

| LIST OF REFERENCES

IDMC (2023). GRID-2023. [online] www.internal-displacement.org. Available at: https://www.internal-displacement.org/sites/default/files/publications/documents/IDMC_GRID_2023_Global_Report_on_Internal_Displacement_LR.pdf [Accessed 24 May 2025].

IDMC (2024). IDMC Data Portal. [online] Internal-displacement.org. Available at: https://www.internal-displacement.org/database/displacement-data/ [Accessed 24 May 2025].

IEP (2024). Global Peace Index. [online] Institute for Economics & Peace. Available at: https://www.economicsandpeace.org/wp-content/uploads/2024/06/GPI-2024-web.pdf [Accessed 5 May 2025].

IOM (2023). IOM YEMEN DTM - Area Assessment round 39. [online] dtm.iom.int/yemen, p.4. Available at: https://dtm.iom.int/node/31421 [Accessed 21 May 2025].

IOM (2024). Report on Migration, Environment, and Climate Change in Yemen. [online] environmentalmigration.iom.int. Available at: https://environmentalmigration.iom.int/sites/g/files/tmzbdl1411/files/documents/2024-03/yemen-desk-review.pdf.

IPC (2024). Yemen: Acute Malnutrition [data set]. [online] Humdata.org. Available at: https://data.humdata.org/dataset/yemen-acute-malnutrition [Accessed 25 May 2025].

Johan Brosché and Sundberg, R. (2023). What They Are Fighting for – Introducing the UCDP Conflict Issues Dataset. Journal of Conflict Resolution, [online] 68(10). doi:https://doi.org/10.1177/00220027231218633.

Kamran, S. (2022). Designing Food Forest. [online] ResearchGate. Available at: https://www.researchgate.net/publication/357974909_Designing_Food_Forest [Accessed 26 May 2025].

Lambert, P. (2024). Justdiggit: Reviving sub-Saharan landscapes with earth smiles. [online] globalsociety.earth. Available at: https://www.globalsociety.earth/post/justdiggit-reviving-sub-saharan-landscapes-with-earth-smiles.

Lawton, G. (2013). Wadi Mukheris and the Wonder of Gabions (Jordan). [online] Greening The Desert Project. Available at: https://www.greeningthedesertproject.org/wadi-mukheris-wonder-gabions-jordan/ [Accessed 26 May 2025].

Lederach, J.P. (1997). Building Peace: Sustainable Reconciliation in Divided Societies. [online] United States Institute of Peace Press. Available at: https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.defence.lk/upload/ebooks/John%2520Paul%2520Lederach%2520-%2520Building%2520Peace_%2520Sustainable%2520Reconciliation%2520in%2520Divided%2520Societies-United%2520States%2520Institute%25200f%2520Peace%2520(1998).pdf&ved=2ahUKEwjHqp39v7KKAxUUFBAIHWWyD28QFnoECBkQAQ&usg=AOvVaw3-NHzBH2uvqQ8sO9b3czKU.

Lederach, J.P. (2010). The Moral Imagination: The Art and Soul of Building Peace. Oxford University Press.

| LIST OF REFERENCES

Lund, M.S. (n.d.). Curve of Conflict. United States Institute of Peace. Available at: https://www.usip.org/public-education-new/curve-conflict.

May, J. and Reid, A. (2010). Buildings without architects : a global guide to every day architecture. New York: Rizzoli International, pp.78–79.

Mbadinga, F.E. (2024). Great Green Wall: Chad's Fortress against the Desert. Trtafrika.com. [online] 21 Oct. Available at: https://trtafrika.com/insight/great-green-wall-chads-fortress-against-the-desert-18222826 [Accessed 26 May 2025].

NASA (2000). NASA Shuttle Radar Topography Mission Global 1 Arc Second V003. SRTM. Available at: https://search.earthdata.nasa.gov/search/granules?p=C2763266360-LPCLOUD&pg[0][v]=f&pg[0][gsk]=-start_date&g=G2821046523-LPCLOUD&sb[0]=40.30267%2C11.18861%2C55.76199%2C19.51497&tl=950702399.5!2!!&lat=15.165656974237974&long=46.94321503257618&zoom=6.496191319834772 [Accessed 24 May 2025].

Nicoletti, M. (1985). Architettura e paesaggio nello Yemen del Nord. Rome: Laterza & Figli, pp.174–175.

NRC (2024). Millions of Yemenis Will Bear the Brunt of Attacks on Yemen's Critical Civilian Infrastructure. [online] Norwegian Refugee Council. Available at: https://www.nrc.no/news/2024/december/millions-of-yemenis-will-bear-the-brunt-of-attacks-on-yemens-critical-civilian-infrastructure [Accessed 18 May 2025].

NRC (2025). NRC in Yemen. [online] NRC. Available at: https://www.nrc.no/yemen.

OCHA (2004). Guiding Principles on Internal Displacement. [online] United Nations Publication , p.1. Available at: https://www.unhcr.org/media/guiding-principles-internal-displacement [Accessed 1 May 2025].

OCHA (2012). OCHA on Message: the Cluster Approach. [online] Available at: https://www.unocha.org/sites/unocha/files/dms/Documents/120320_OOM-ClusterApproach_eng.pdf [Accessed 13 May 2025].

OCHA (2025a). Yemen: Addendum to the 2025 Humanitarian Needs and Response Plan (HNRP): Urgent Funding Requirements [EN/AR]. [online] Unocha.org. Available at: https://www.unocha.org/publications/report/yemen/yemen-addendum-2025-humanitarian-needs-and-response-plan-hnrp-urgent-funding-requirements-enar [Accessed 20 May 2025].

OCHA (2025b). Yemen: Population Estimates. [online] data.humdata.org. Available at: https://data.humdata.org/dataset/yemen-population-estimates.

OpenStreetMap (2023). Yemen Populated Places [data set]. [online] data.humdata.org. Available at: https://data.humdata.org/dataset/yemen-populated-places.

Oxfam (2025). Yemen Faces Economic Freefall and Devastating Aid Crisis after a Decade of Conflict - Oxfam | Oxfam International. [online] Oxfam International. Available at: https://www.oxfam.org/en/press-releases/yemen-faces-economic-freefall-and-devastating-aid-crisis-after-decade-conflict-oxfam [Accessed 18 May 2025].

RCO (2025). UNCT Annual Report 2024. [online] yemen.un.org. United Nations. Available at: https://yemen.un.org/en/download/182649/293369 [Accessed 20 May 2025].

Sacande, M., Guarnieri, L., Maniatis, D., Marchi, G., Martucci, A., Mollicone, D., Morales, C., Oubida, W.R. and Sanchez Paus Diaz, A. (2022). Africa Open Data for Environment, Agriculture and Land (DEAL) and Africa's Great Green Wall. [online] Food & Agriculture Org., p.9. Available at: https://openknowledge.fao.org/bitstreams/257e955a-e522-4f0b-96bc-2c55775b52ba/download [Accessed 14 Nov. 2025].

SCI (2024). Yemen. [online] Save the Children International. Available at: https://www.savethechildren.net/yemen [Accessed 19 May 2025].

Serjeant, R.B. and Lewcock, R.B. (1983). Ṣanʻā', an Arabian Islamic City. London: The World of Islam Festival, pp.436–500.

Simonsen, J. and Robertson, T. (2013). Routledge International Handbook of Participatory Design. New York: Routledge, p.33.

Simonsen, S.H., Biggs, R., Schlüter, M., Schoon, M., Bohensky, E., Cundill, G., Dakos, V., Daw, T., Kotschy, K., Leitch, A., Quinlan, A., Peterson, G. and Moberg, F. (2015). Principles for Building Resilience : Sustaining Ecosystem Services in social-ecological Systems. [online] Cambridge: Cambridge University Press. Available at: https://www.stockholmresilience.org/download/18.10119fc11455d3c557d6928/1459560241272/SRC+Applying+Resilience+final.pdf#:~:text=They%20present%20a%20set%20of%20seven%20principles,participation%2C%20and%207)%20promote%20polycentric%20governance%20systems. [Accessed 22 Nov. 2025].

Steenbergen, F. van, Lawrence, P., Haile, A.M., Salman, M. and Faurès, J.-M. (2010). Guidelines on Spate Irrigation. [online] Rome: Food and Agriculture Organization of the United Nations. Available at: https://www.fao.org/4/i1680e/i1680e.pdf [Accessed 8 Nov. 2025].

Suhrke, A. and Samset, I. (2007). What's in a Figure? Estimating Recurrence of Civil War. International Peacekeeping, [online] 14(2), pp.195–203. doi:https://doi.org/10.1080/13533310601150776.

Sukin, G. (2019). Senate Votes to End U.S. Military Support for Saudi-led War in Yemen. [online] Axios. Available at: https://www.axios.com/2019/03/13/senate-vote-yemen-saudi-arabia-war [Accessed 18 May 2025].

Tanis, F., Shapiro, A. and Fadel , L. (2024). Sudanese Refugees Fled to Chad with hope. What They Found Is a Bitter Irony. [online] NPR. Available at: https://www.npr.org/sections/goats-and-soda/2024/09/25/g-s1-24318/sudan-refugees-malnutrition-hunger-chad [Accessed 26 Sep. 2024].

Tarek, S. (2025). Sponge Cities Framework for Achieving Ecological Development in Egyptian Cities. Civil Engineering and Architecture, [online] 13(4), pp.2847–2861. doi:https://doi.org/10.13189/cea.2025.130404.

The Telegraph (2019). Africa's Great Green Wall: Can an Ambitious Project Bring Life Back to the Scorched land? The Telegraph. [online] 14 Jun. Available at: https://www.telegraph.co.uk/news/great-green-wall/ [Accessed 9 May 2020].

Thomas, D.S.G. ed., (2016). The Dictionary of Physical Geography. 4th ed. [online] John Wiley & Sons, Incorporated, p.559. Available at: http://www.wiley.com/WileyCDA/WileyTitle/productCd-111878233X.html [Accessed 1 May 2025].

| LIST OF REFERENCES

UCDP (2024). UCDP Definitions - Uppsala University. [online] www.uu.se. Available at: https://www.uu.se/en/department/peace-and-conflict-research/research/ucdp/ucdp-definitions.

UN (2020). Sahel, Lake Chad Region Walking 'Tightrope of Survival' as Result of Environmental Degradation, Humanitarian Organization President Tells Security Council | UN Press. [online] press.un.org. Available at: https://press.un.org/en/2020/sc14307.doc.htm [Accessed 14 Nov. 2025].

UN Foundation (2018). Yemen: a Brief Background . [online] United Nations Foundation. Available at: https://unfoundation.org/what-we-do/issues/peace-human-rights-and-humanitarian-response/yemen-a-brief-background/ [Accessed 18 May 2025].

UN Habitat (2012). Scenario Planning - an Overview. [online] UN Habitat. Available at: https://habnet.unhabitat.org/sites/default/files/documents/OVERVIEW%20-%20Scenario%20Planning%202012_0.pdf [Accessed 22 Nov. 2025].

UNCCD (2023). Great Green Wall Initiative | UNCCD. [online] www.unccd.int. Available at: https://www.unccd.int/our-work/ggwi.

UNCCD (2025). Spate Irrigation. [online] UNCCD. Available at: https://www.unccd.int/best-practice/spate-irrigation [Accessed 26 May 2025].

UNDP (2021). Water Availability in Yemen. [online] www.undp.org. Available at: https://www.undp.org/sites/g/files/zskgke326/files/migration/ye/Water-Availability-Study-in-Yemen.pdf [Accessed 26 May 2025].

UNDP (2024a). Land Degradation and Human Development in Yemen. [online] www.undp.org. Available at: https://www.undp.org/sites/g/files/zskgke326/files/2024-12/land_degradation_in_yemen_en-11dec24.pdf [Accessed 25 May 2025].

UNDP (2024b). UNDP Yemen – Strategic Direction (2023 – 2025) Page 2. [online] www.undp.org. Available at: https://www.undp.org/sites/g/files/zskgke326/files/2024-02/undp_yemen_-_strategic_direction_-2023-2025.pdf [Accessed 21 May 2025].

UNFPA (2023). Yemen: the World's Largest Humanitarian Crisis. [online] www.unfpa.org. Available at: https://www.unfpa.org/yemen [Accessed 19 May 2025].

UNHCR (2018). Refugees in Cameroon Build 'Great Green Wall' to Combat Desertification. [online] UNHCR. Available at: https://www.unrefugees.org.au/our-stories/refugees-in-cameroon-help-build-great-green-wall-to-combat-desertification/ [Accessed 14 Nov. 2025].

UNHCR (2023). Cluster Approach. [online] UNHCR. Available at: https://emergency.unhcr.org/coordination-and-communication/cluster-system/cluster-approach [Accessed 13 May 2025].

UNHCR (2025a). Principles & Standards for Settlement Planning. [online] UNHCR. Available at: https://emergency.unhcr.org/emergency-assistance/settlement-and-shelter/guidance-settlements/principles-standards-settlement-planning [Accessed 31 Oct. 2025].

UNHCR (2025b). Settlement Typologies in Emergencies | UNHCR. [online] UNHCR. Available at: https://emergency.unhcr.org/emergency-assistance/settlement-and-shelter/guidance-settlements/settlement-typologies-emergencies [Accessed 23 Nov. 2025].

| LIST OF REFERENCES

UNHCR (2025c). Yemen. [online] reporting.unhcr.org. Available at: https://reporting.unhcr.org/operational/operations/yemen [Accessed 21 May 2025].

UNICEF (2022). More than 11,000 Children Killed or Injured in Yemen. [online] www.unicef.org. Available at: https://www.unicef.org/press-releases/more-11000-children-killed-or-injured-yemen [Accessed 18 May 2025].

UNOCHA (2024). Yemen. [online] OCHA. Available at: https://www.unocha.org/yemen.

WBG (2023). Yemen Climate Risk Country Profile 2023. [online] climateknowledgeportal.worldbank.org. Available at: https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/16696-WB_Yemen%20Country%20Profile-WEB.pdf.

WBG (2024). Yemen Faces Mounting Economic Challenges as Conflict Continues, Regional Tensions Escalate. [online] World Bank. Available at: https://www.worldbank.org/en/news/press-release/2024/10/31/yemen-faces-mounting-economic-challenges-as-conflict-continues-regional-tensions-escalate [Accessed 18 May 2025].

WBG (2025). Yemen, Rep. - Environment [data set]. [online] Humdata.org. Available at: https://data.humdata.org/dataset/world-bank-environment-indicators-for-yemen-rep [Accessed 24 May 2025].

Wenner, M.W. and Burrowes, R. (2019). Yemen - Land. In: Encyclopedia Britannica. [online] Available at: https://www.britannica.com/place/Yemen/Land [Accessed 23 May 2025].

WFP (2024). What's Happening in Yemen? an Explainer on the Conflict and Its Impact on Civilians. [online] World Food Program USA. Available at: https://www.wfpusa.org/articles/whats-happening-yemen-explainer-conflict-impact-civilians/ [Accessed 19 May 2025].

WFP (2025). Yemen - HungerMap Data [data set]. [online] Humdata.org. Available at: https://data.humdata.org/dataset/wfp-hungermap-data-for-yem [Accessed 25 May 2025].

WHO (2024). Yemen data | World Health Organization. [online] data.who.int. Available at: https://data.who.int/countries/887.

Worldpop (2020). The Spatial Distribution of Population Density in 2020, Yemen [data set]. [online] Worldpop.org. Available at: https://hub.worldpop.org/geodata/summary?id=44666 [Accessed 23 May 2025].

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APPENDIX-1

Yemen Projected Population, IDP numbers, 2025 (HDX, 2025)			
ADM1_EN	Number of IDP	P.Total Population 2025	Percentage
Abyan	43492	631013	6.89
Ad Dali'	96893	861614	11.24
Aden	279144	1248228	22.36
Al Bayda	71573	823313	8.69
Al Hodeidah	430764	3531706	12.19
Al Jawf	109340	701864	15.57
Al Maharah	25856	199304	12.97
Al Mahwit	40464	841568	4.8
Amran	261199	1252713	20.85
Dhamar	197894	2382513	8.3
Hadramawt	89660	1744079	5.14
Hajjah	265877	2688497	9.88
Ibb	230750	3329147	6.93
Lahj	64459	1169594	5.51
Ma'rib	1639142	1771017	92.55
Raymah	58269	616000	9.45
Sa'dah	55751	1306831	4.26
Sana'a	110819	1617970	6.84
Sana'a City	202133	3849871	5.25
Shabwah	45881	720901	6.36
Socotra	11266	75725	14.87
Ta'iz	465357	3515550	13.23

Yemen Conflict fatalities (2015-2025) (ACLED, 2025)	
ADM1_EN	Fatalities
Abyan	3503
Ad Dali'	9742
Aden	3549
Al Bayda	9531
Al Hodeidah	18381
Al Jawf	15834
Al Maharah	28
Al Mahwit	73
Amran	622
Dhamar	661
Hadramawt	1083
Hajjah	10600
Ibb	1554
Lahj	4222
Ma'rib	23734
Raymah	50
Sa'dah	21108
Sana'a	7859
Sana'a City	2234
Shabwah	4625
Socotra	10
Ta'iz	23564

Yemen Flood Displacement 2023 (IDMC, 2024)	
ADM1_EN	Flood Displacement 2023
Abyan	49
Ad Dali'	7525
Aden	21
Al Bayda	77
Al Hodeidah	22750
Al Jawf	2072
Al Maharah	1428
Al Mahwit	4452
Amran	2415
Dhamar	2541
Hadramawt	5978
Hajjah	52206
Ibb	12404
Lahj	1057
Ma'rib	2086
Raymah	7560
Sa'dah	15323
Sana'a	168
Sana'a City	2317
Shabwah	8337
Socotra	0
Ta'iz	23625

Yemen Malnutrition Percentage (IPC, 2024)		
ADM1_EN	Number of People	Percentage
Abyan	348500	53
Ad Dali'	503000	58
Aden	567500	51
Al Bayda	422000	52
Al Hodeidah	1736000	55
Al Jawf	350500	56
Al Maharah	64500	33
Al Mahwit	439000	55
Amran	701500	56
Dhamar	1373500	60
Hadramawt	548000	33
Hajjah	1587500	61
Ibb	1474000	45
Lahj	505500	45
Ma'rib	672500	63
Raymah	319000	54
Sa'dah	633500	63
Sana'a	608500	53
Sana'a City	2127500	55
Shabwah	367000	52
Socotra	39500	55
Ta'iz	1523000	48

Yemen Climate Data (1991-2020) & SSP3.70 Projection (2040-2059)(WBG, 2023)								
ADM1_EN	Temp_ High (1991-2020)	Temp_ Low (1991-2020)	Precip_ High (1991-2020)	Precip_ Low (1991-2020)	Precip_ Annual (1991-2020)	High-Heat Days >35°C Annual (2040-2059, ssp3.70)	Annual_Precip Anomaly (2040-2059, ssp3.70)	Seasonal_ Precip Anomaly (2040-2059, ssp3.70)
Abyan	30.23	21.49	30.34	3.4	197.59	29.88	8.57	16.38
Ad Dali'	25.32	16.83	82.3	6.09	497.54	47.49	4.93	11.83
Aden	33.25	25.18	16.46	3.59	80.3	33.59	9.7	17.96
Al Bayda	24.83	15.73	73.82	6.33	462.79	2.77	5.14	12.08
Al Hodeidah	33.93	25.03	17.07	6.79	128	38.7	6	20.66
Al Jawf	31.31	17.88	45.48	3.78	290.91	0.01	1	3.47
Al Maharah	30.81	19.62	14.06	1.46	79.87	23.14	0.68	3.84
Al Mahwit	29.07	20.23	45.07	7.39	293.35	47.25	5.95	20.41
Amran	26.65	16.41	52.66	6.27	347.47	38.89	6.65	21.25
Dhamar	24.77	16.04	82.33	7.38	494.55	9.97	2.12	12.57
Hadramawt	31.64	19.11	20.47	2.49	122.17	12.1	1.39	3.99
Hajjah	32.09	22.65	22.98	7.59	169.4	51.4	6.72	26.3
Ibb	25.17	16.81	88.1	6.95	518.75	26.12	2.08	11.87
Lahj	31.01	22.6	35.98	5.7	197.59	50.37	7.89	17.8
Ma'rib	29.27	18.29	45.48	3.78	290.91	0	1.58	4.11
Raymah	27.94	19.46	62.32	6.28	379.3	33.1	3.54	13.42
Sa'dah	28.3	16.21	40.95	4.69	268.42	17.42	3.61	13.61
Sana'a	24.51	14.92	73.79	7.57	459.23	9.25	13.18	16.73
Sana'a City	22.63	13.07	83.67	8.92	515.46	9.25	5.3	20.3
Shabwah	29.85	19.43	33.6	2.8	217.4	7.53	4.36	11.11
Socotra							4.85	12
Ta'iz	30.78	22.19	48.56	5.95	299.77	45.1	6.61	16.98

Yemen Hunger Index 2025 (WFP, 2025)					
ADM1_EN	#population +total	#population +fcs	#indicator +fcs +prevalence	#population +rcsi	#indicator +rcsi +prevalence
Abyan	628930	440788	0.700853831	256230	0.40740623
Ad Dali'	805687	583352	0.72404296	314789	0.390708799
Aden	1247011	759897	0.609374737	500103	0.40104137
Al Bayda	830253	670204	0.80722864	326099	0.392770637
Al Hodeidah	3401069	2081314	0.611958769	1449566	0.426208936
Al Jawf	686013	483431	0.704696558	287757	0.419462896
Al Maharah	198057	111889	0.564933327	60446	0.305194969
Al Mahwit	839054	406208	0.484126171	376242	0.44841214
Amran	1269951	831685	0.654895346	532034	0.418940573
Dhamar	2401814	1581025	0.65826288	1116809	0.464985632
Hadramawt	1741215	1213417	0.696879478	584717	0.335809765
Hajjah	2465838	1645771	0.667428679	1192057	0.483428757
Ibb	3354584	2410580	0.718592827	1348576	0.402009906
Lahj	1132962	787641	0.69520444	409340	0.361300732
Ma'rib	1752670	1137582	0.649056582	529108	0.301886836
Raymah	618293	433411	0.700979956	221251	0.357841671
Sa'dah	1152498	746153	0.647422382	544169	0.472164811
Sana'a	1583775	812193	0.51282095	690362	0.435896513
Sana'a City	3780347	1854056	0.490445983	1890173	0.499999868
Shabwah	722603	523546	0.724527853	316309	0.43773552
Socotra	75474	52596	0.696875745	25344	0.335797758
Ta'iz	3475930	2211956	0.636363793	1585323	0.456085997

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