

Pakistan Shelter Guide

Design for improved
flood resilience
in Sindh

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Department
for International
Development



ARUP

Contents

ACKNOWLEDGEMENT

INTRODUCTION

- 6 Background
- 8 Scope
- 10 Structure and Functionality

01

DESIGN PRINCIPLES

- 12 **Safe and Resilient**
 - 12 Material Quality
 - 14 Stability and Integrity
 - 16 Water Resilience
 - 18 Buildability, Maintenance and Modification
- 20 **Acceptable**
 - 20 Comfort
 - 21 Space
 - 22 Protection
 - 23 Health and Safety
- 24 **Sustainable**
 - 24 Cost
 - 26 Local Supply Chain
 - 27 Natural Resources

02

DESIGN DECISION TOOL

- 30 How to Use the Design Decision Tool
- 31 Notes sheet
- 32 What wall should I use?
- 33 What roof should I use?
- 34 What foundations should I use?
- 35 Outline Design Evaluation
- 36 Detailed Design Variations

03

DESIGN INFORMATION

38 Foundations

- 38 Loh Kat (improved)
- 39 Loh Kat (basic)
- 40 Mud / Adobe
- 41 Burnt Brick
- 42 Concrete

44 Walls

- 44 Loh Kat
- 46 Layered Mud
- 48 Adobe
- 50 Burnt Brick
- 52 Concrete Block

54 Roofs

- 54 Bamboo
- 55 Timber
- 56 Steel

57 Detailed Design Variations

- 57 Ring Beams
- 58 Windows and Doors
- 59 Raised Platform and/or Plinth
- 60 Seismic Considerations

04

SUPPORTING INFORMATION

- XX Design Decision Tool Assumptions
- XX Design Assumptions
- 62 Specification
- XX Cost

XX Glossary

XX Figures

XX References

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The Pakistan Shelter Guide was developed with the support of the UK Department for International Development (DFID) and the International Organisation for Migration (IOM). The Pakistan Shelter Cluster and Technical Advisory Group contributed invaluable feedback and criticism throughout the process. The authors would like to acknowledge the good faith nature of this collaboration which is critical to collective action in Sindh.

Survey teams in Pakistan and the NED University helped to establish the evidence base which forms the basis of the Pakistan Shelter Guide and associated Research Report. In particular we would like to thank Peda International for coordinating the survey teams and NED University for establishing a new material testing facility as part of this research. Finally, our thanks goes to numerous colleagues at Arup and experts from other organisations who provided input and feedback on the analysis and evaluation of designs to improve flood resilience in Sindh.

Introduction

Background



Figure 01. Impact of flooding in Pakistan

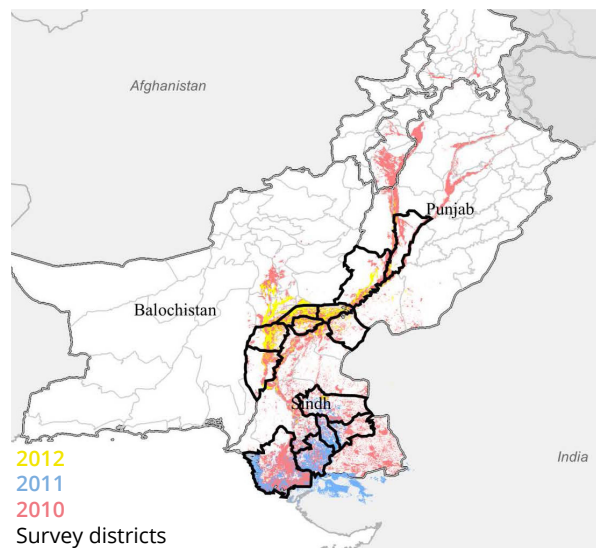


Figure 02. Map of recent flooding in southern Pakistan

Extreme and recurring flooding in southern Pakistan since 2010 has caused damage and destruction to more than 2.5 million homes, affecting in excess of 35 million people in 78 districts (see Figure 02 and 03). The 2010 floods were, at the time, the largest humanitarian disaster on record¹. The response to these floods has mobilised considerable resources, encompassed a wide range of stakeholders both foreign and domestic, and evolved over time. The scale and protracted nature of this ongoing disaster warrants a process of learning and reflection in order to improve the efficiency and impact of response.

In response, the Federal Government initially distributed an unconditional cash / compensation grant of up to US\$ 800 for flood affected families to support recovery. This constitutes the single largest investment by any stakeholder with a total cost of almost US\$ 1 billion. In parallel, it is reported that by mid 2014, at least 200,000 one room shelters were implemented by various shelter organisations in the flood affected districts. These shelters exhibit a wide range of designs, methodologies and costs. The general trajectory has been away from two room shelters (e.g. model villages built during the 2010 response) and toward a one room shelter typology².

The one room shelter typology has been revised to encourage indigenous materials, vernacular construction techniques and ultimately reduce costs. Average costs are reported to have been reduced from US\$1,200 to US\$ 500 per unit. Over 100,000 units this has enabled twice as many units to be deployed for the same investment³. This scale of implementation is a notable achievement for all stakeholders involved.

However, it is estimated that the agencies response may have only reached 10% of the affected population, which leaves 90% of the affected population to self-recover. According to UNHCR and others, the self-recovery population have "rebuilt basic shelters using materials or methods that still leave them highly vulnerable to future floods."⁴ Achieving scale remains a central challenge to the ongoing response, recovery and reconstruction efforts across southern Pakistan.

In this context, the International Organisation for Migration (IOM) as the national lead shelter agency in Pakistan and with support from the United Kingdom Department for International Development (DFID), commissioned Arup in 2013 to conduct an independent research study to evaluate the effectiveness of the agency implemented shelters in order to inform a consolidated set of shelter designs and guidance on how to select an appropriate design for future shelter programs.

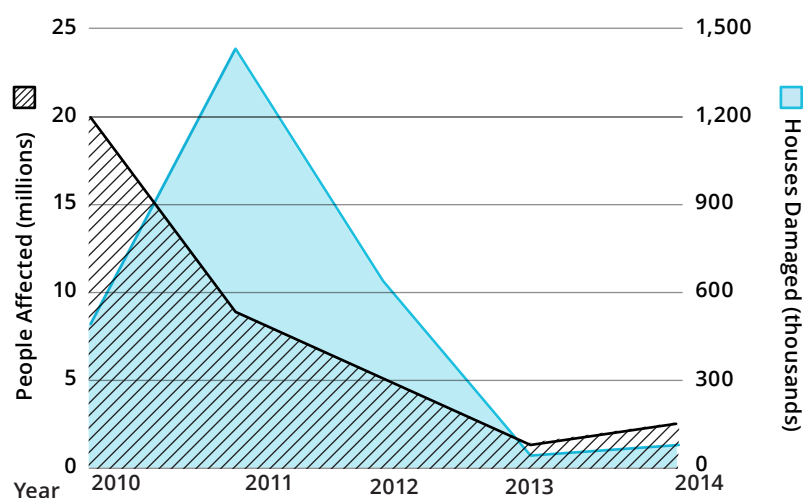


Figure 03. Impact of flooding in southern Pakistan

It is intended that this research should establish a scientific basis for evaluation and enable evidence based decision making.

This Shelter Guide and associated Research Report⁵ are the culmination of extensive research including: data gathering; consultation with government bodies, agencies and residents; sample surveys of 800 shelters; physical testing of key design features; and analysis against the performance criteria (e.g. cost, structure, comfort, etc). Details of the research process and further detail about the evidence base produced by this research can be found in the associated Research Report.

The technical findings of this research primarily relate to material selection, performance and specification. This is a contribution to improving shelter in Sindh. However, there are other factors which must also be considered (e.g. hazard assessments and settlement guidelines). It is also acknowledged that the approach to shelter assistance has changed over time and more effort is required to address self-recovery. It is strongly recommended that these other factors (especially hazard analysis, site selection/planning and enabling self-recovery) be included in future research and guidance to improve shelter in Sindh.

This research has been conducted in collaboration with the shelter working group organisations that are involved in implementing flood resilient shelter in southern Pakistan, and is supported by the National Disaster Management Agency (NDMA). The methodology is recognised as a best practice approach to support improved shelters designs that encourage flood-resistant, sustainable construction techniques in an effort to reduce the impact of flooding and build resilience of affected communities.

¹ UNHCR, IFRC & UN Habitat, 2014, Shelter Projects 2013-14

² Shelter Centre, 2014, Evaluation of the ORS Program

³ Shelter Centre, 2014, Evaluation of the ORS Program

⁴ UNHCR, IFRC & UN Habitat, 2014, Shelter Projects 2013-14 (page 63)

⁵ Arup, 2017, Flood Resilient Shelter in Pakistan: Phase 2 - Evidence Based Research

Scope



Figure 04. Shelter typologies (clockwise from top): loh kat, adobe, burnt brick, concrete block, burnt brick

WHAT is this guide?

The guide presents a series of design principles, a user friendly design decision tool, and a library of recommended designs. All content is based on scientific evidence, physical testing, surveys, and expert analysis. The guide is intended to support improved decision making in the design of shelters and shelter programs in an effort to enhance flood resilience. The guide provides construction tips and notes.

While there may be broader applications of the guide, its specific purpose is to inform best practice in the planning, design and construction of flood resilient 'One Room Shelters' in southern Pakistan. The guide is primarily intended for use in the post disaster context, but is also applicable for disaster risk reduction planning. In this context, the term shelter is used to describe semi-permanent one room houses with a design life of five to fifteen years.

Key Pakistan Shelter Cluster organisations collaborated in the development of the guide, and this process has been encouraged by the National Disaster Management Agency (NDMA).

⁶ Heritage Foundation, 2011, Build back safer with vernacular methodologies: DRR-driven post-flood rehabilitation in Sindh

⁷ Shelter Centre, 2014, Evaluation of the ORS Program

⁸ Shelter Centre, 2014, Evaluation of the ORS Program

WHY is the guide needed?

The scale of the disaster and response in southern Pakistan has resulted in a wide variety of approaches to shelter. This is potentially very beneficial as it provides flexibility, but there is evidence of duplication and inefficiencies¹⁰. Therefore, the guide seeks to provide a consistent approach across sector actors.

Similarly, a wide range of technical solutions have been implemented in southern Pakistan. Some of these techniques were un(der)tested⁶. The surveys conducted as part of this research reveal significant inconsistencies and examples of underperformance. Therefore, this guide seeks to provide an evidence based approach to decision making.

An important sub-set of these technical solutions was a concerted effort to include Disaster Risk Reduction (DRR) measures in 50% of all shelters.⁷ The surveys and physical testing conducted as part of this research identify severe underperformance of several DRR measures. In effect, additional funding and expectations were assigned to deficient technical solutions.

Therefore, this guide seeks to reduce the risk of inadequate or ineffective resilience measures being implemented.

Unsurprisingly there have been observations and complaints about the equity and transparency of the disaster response⁸. This guide seeks to outline an objective and transparent decision making process in an effort to reduce the risk of hostility from residents due to perceived unfairness.

WHERE & WHEN should the guide be used?

While much of the research, analysis and recommendations presented here are widely applicable in Pakistan and beyond, the guide is specifically for flood resilient one room shelters in Sindh province, Pakistan.

The anticipated primary use of the guide is during the emergency response and early recovery phases, which is generally the first six to nine months, of the humanitarian response. However, these timelines will vary and the inherent nature of flooding makes it difficult to identify day zero of the response. The guide should also be useful for development agencies and can be applicable to pre-disaster risk reduction programs.

WHERE can the guide be found?

The guide is freely available through the Humanitarian Library and should be made available through the websites of NDMA, IOM, and Shelter Cluster.

WHO is the guide for?

The guide is primarily for technical or program personnel and organisations responsible for the design, planning and implementation of shelters and shelter programs. It may also be a useful reference for government departments, policy makers, contractors or builders and design consultants. The guide is not intended for use by residents or homeowners of shelters but has benefitted from, and been informed by, consultation with residents and homeowners. However, it can be assumed that the recommended designs will be used by residents and homeowners. There may be opportunities to develop additional guides, tools and training for other audiences in the future, e.g. a construction guide or training aimed at local builders and craftsmen to enhance the quality of material selection and workmanship.

LIMITATIONS of the guide?

The guide is not a program planning or program design guide. It does not include guidance on the different implementation approaches, and does not include recommendations regarding direct cash contribution, materials provision, the level of beneficiary input, level of construction monitoring etc.

The guide is not a building code or regulatory document. It does not attempt to supersede any existing regulatory processes but may hopefully influence future revisions to the regulatory framework.

The guide is not intended for direct use by residents and homeowners. It would be beneficial to adapt this guide into some form of manual or training that could be used directly by 90% of the population who self-recover without assistance from the shelter agencies.

The guide does not include specific guidance or performance standards for seismic design. Seismic loads would need to be factored into the requirements for all shelters, and their designs adjusted accordingly, for all areas exposed to seismic hazards. Some considerations are presented within the design information in chapter three to improve the seismic performance in comparison to the baseline design but these considerations are by no means meant to make the shelter “earthquake-proof”.

The guide does not include site selection or site planning guidance which could mitigate site specific risks, e.g. flooding. A variety of hazard assessment methodologies are available that could be used to determine the risk profile and geo-spatial hazard locations which would assist in overall site selection. Village or neighbourhood level site planning guidance should also address non-shelter items (e.g. community facilities, roads etc).

The guide cannot prevent flood damage and the designs included do not attempt to do so. However, the designs are intended to increase resilience to flooding by reducing the damage caused. It is strongly recommended that further research, to complement this guide, be conducted in relation to hazard analysis, site selection/planning and enabling self-recovery.

Structure and Functionality

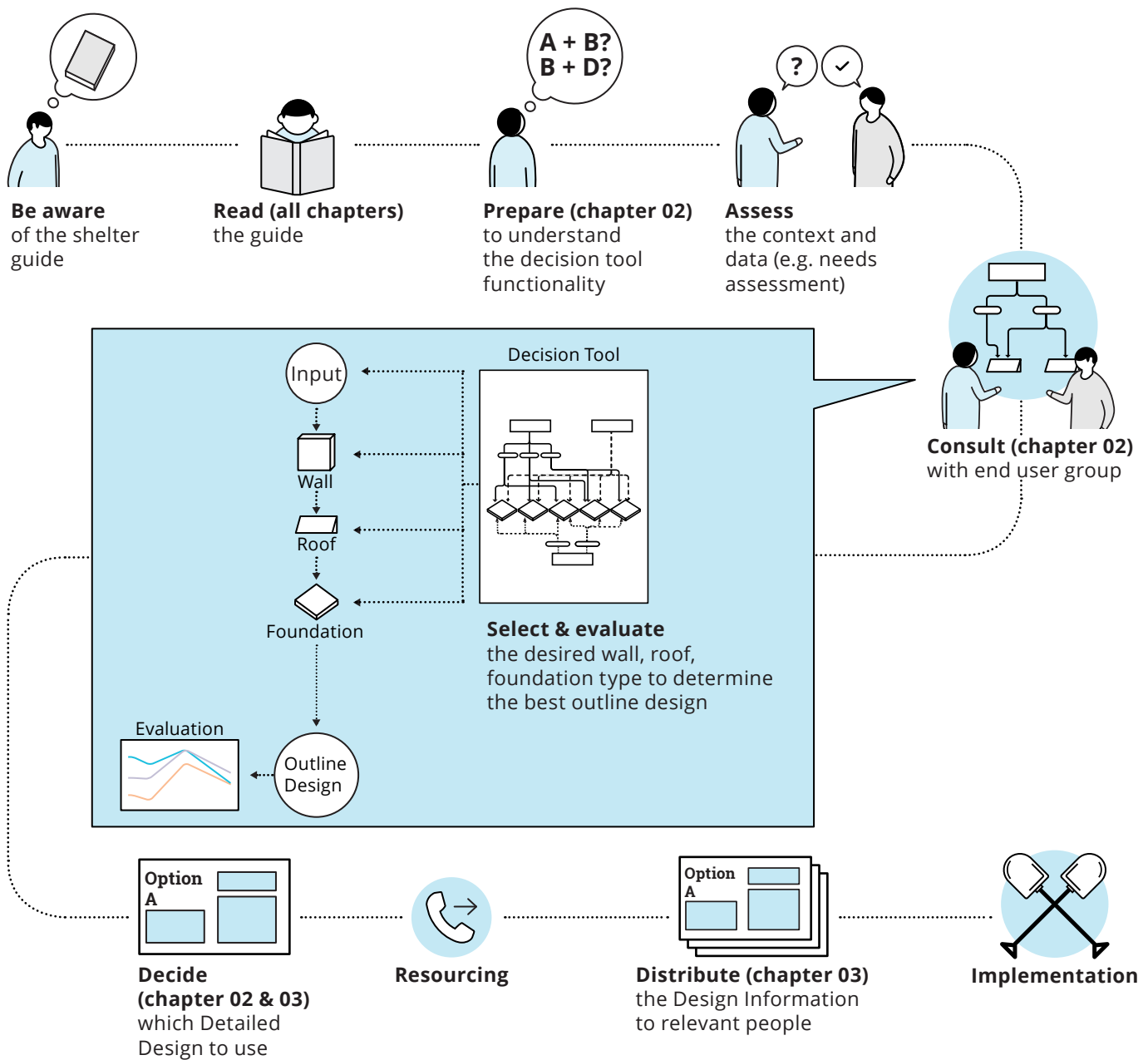


Figure 05. User journey and functionality of the shelter guide Compatibility

The guide is organised into four main chapters. The first chapter, design principles, explains the high level considerations which govern the performance of shelter and upon which the recommendations of the guide are based. The design decision tool is the second chapter which guides users through the process of selecting an appropriate shelter design by making informed decisions. Outline design options are identified by answering several key questions. Decisions on outline and detailed designs can be made based on a performance criteria assessment of each component.

The third chapter, design information, provides a library of flood resilient shelter design components which can be combined into a detailed shelter design package. The final chapter, supporting information, provides references and additional information to complement the guide.

The guide functions differently depending on the user, purpose and setting. It can be read in isolation for general knowledge and to improve understanding of the topic by program designers, policy makers and those generally interested in shelter. The practical user, notionally a technical or program officer within an agency, can read the guide in isolation to improve general knowledge of the topic, but can also extract the design decision tool to guide discussion and decisions in the field. For the researcher, the technical guidance and assessments are referenced throughout the guide to encourage and enable further testing and analysis in an effort to re-evaluate and expand the evidence base.

Linkages between chapters, to the research report and external resources are highlighted throughout to enable fluid use of the guide by all users.