

DRAFT

Early Recovery Shelter Technical Guidance

This document is work in progress and has been drafted by the Shelter & NFI Technical Working group (TWIG). Its contents are liable to change.

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1. INTRODUCTION

The Technical Guidelines have been drafted by the Shelter Cluster's Technical Working Group, co-chaired by IOM and UN-HABITAT, with the collaboration of several experienced agencies active in the shelter sector in Pakistan.

The Technical Guidelines are in line with the strategies recommended by the Shelter SAG. They take account of the actual experiences of shelter agencies and build on actual designs of shelters tested in the field. These Technical Guidelines shall contribute to ensure technical coherency, socially and cultural adequacy, which respond efficiently to the requirements of humanitarian standards, the beneficiaries, the climate, the hazards etc. They consist of **five** parts:

a) Design Principles:

The Design Principles define an overarching framework that should be considered by agencies when programming shelter support. They include principles on climate suitability, the social / economic situation, the resources, the hazards risks and location. When designing a specific shelter project in a determined location, the following aspects shall be considered:

-**Location:** climate, soil, access, hazards, etc.

-**Availability of materials:** locally available or not, transport costs, skilled labour, etc.

-**Beneficiaries:** community mobilization, degree of expected participation according to vulnerability, etc.

b) Technical Recommendations

Recommendations which should be applied in the design and construction of all shelters responding to the Pakistan floods, in the Early Recovery phase.

c) Disaster Risk Reduction (DRR) Recommendations

With little impact on cost, these recommendations may maximize the lifespan of the shelters by ensuring a better resistance to hazards, such as heavy rains and floods, earthquakes, fire hazards, strong winds (cyclones), hot / cold areas, where applicable.

d) General Recommendations

Aspects to be considered to ensure a coherent programme taking account of the aspects going along with a shelter project.

e) Scenarios for implementation of Shelter strategy

These scenarios include a number of factors which combined will determine the implementation strategy of the Shelter Response.

2a) DESIGN PRINCIPLES		
Indicators	Criteria:	Design Principles:
Climate Suitability	<ul style="list-style-type: none"> - Ventilation - Winterisation 	<p>Design of the shelter to allow adequate ventilation to reduce internal temperatures (especially in the hot areas)</p> <p>Where necessary, due to climate conditions, winterisation of shelters is to be applied. (refer to recommendations).</p> <p>The design should allow a step by step improvement of the climate suitability (e.g. option to include further openings / to add further isolation)</p>
Social/economical Suitability	<ul style="list-style-type: none"> - Adequate materials – locally available and familiar techniques - Options for further improvement - Accessibility 	<p>Preferably material should be purchase in local markets; it involves local economy and reduces transportation costs.</p> <p>Use of well-known materials and techniques will promote the participation of the beneficiaries in the construction process and its maintenance</p> <p>Options for step by step improvement according to rising income generation needs of beneficiaries.</p> <p>Shelters should allow the access of disabled people.</p>
Cultural suitability	<ul style="list-style-type: none"> - Typology according to household activities, privacy and gender. - Integration of beneficiaries' options/capacities of reconstruction. 	<p>Design shelters to meet local needs, household activities, distribution, as well as the local cultural requirements.</p> <p>The design of the shelter should consider a flexible use of the space.</p> <p>Respect design and techniques adopted by beneficiaries when (re)building their own shelter.</p>
Resource effectiveness	<ul style="list-style-type: none"> - Use salvaged materials. - Allow future reuse of materials. - Minimize impact on natural resources 	<p>The use of salvaged materials is encouraged when in good condition (bricks, door/window-frames, roof beams etc.)</p> <p>Consider options to reuse the construction materials of transitional shelters for further permanent solutions.</p> <p>Consider options to dismantle materials for reuse.</p> <p>The choice of materials should avoid increased pressure on natural resources.</p>
Appropriate Location	<ul style="list-style-type: none"> - Location - Land tenure 	<p>When possible, shelters should be constructed at, or near to the existing homestead.</p> <p>Shelter should be constructed at, or near, to the existing homestead, without inhibiting permanent housing</p> <p>Transitional shelter not to prevent (re-)construction of permanent housing.</p> <p>Minimise exposure to hazard: avoid hazardous locations and apply DDR recommendations</p> <p>Take account of access to livelihoods.</p> <p>Ensure proper land rights - by legal documents or agreement with landlord or neighbours' confirmation.</p>
Risk Mitigation	<ul style="list-style-type: none"> - Rains and Floods - Earthquake - Fire Hazards - Hurricane 	<p>Where applicable, shelters' design to include earthquake and/ or hurricane proof techniques Shelters to be built on safe portions of land.</p> <p>Drainage of the area around the shelter to be secured.</p>

2b) TECHNICAL RECOMMENDATIONS			
Indicators	Standards	Foreseen Challenges	Remarks
Size	16 – 25m ² in floor plan (covered living space)		
Location	<ul style="list-style-type: none"> - Location on plot shall allow further step by step development of shelter. - Transitional sh. not to prevent space for future permanent structure. - Allow space for DRR measures (e.g. for ditches to redirect floods) 		
Use of salvaged material	<ul style="list-style-type: none"> - Only qualified salvaged materials (e.g. avoid burnt, decayed, swallowed material) - Check amount of salvaged material available to beneficiaries. - Design of shelters not fully to rely on availability of this type of material. 	Ensure quality of salvaged materials	Technical advice campaigns on quality + proper reuse of salvaged materials
Plot preparation	<ul style="list-style-type: none"> - Properly clear site from physical treats caused by the flood (e.g. trees likely to fall, debris, salvaged material, also from neighbouring plots) - Properly prepare site following DRR principles (good compaction of construction site) - Be aware of river silt deposit 		
Foundation	<ul style="list-style-type: none"> - Excavation should be deep enough to reach stable or hard soil type. - Ensure good compaction of earth - When possible ensure PCC layer beneath foundation – min. 6-9” above flood water level. 		
Floor level	<ul style="list-style-type: none"> - Raise floor level to prevent ingress of low surface water - height according to location, min. 10cm 		
Structure	<ul style="list-style-type: none"> - Inform on simple solutions to improve the shelters resistance: e.g. braces, improved joists, ratio length: width, slope and overhang of roof etc.) - Timbers and joists to take loads and not the fixings. - Current practice is to treat bamboo and wood for foundations and roofs with burnt engine oil or paint. - Ensure water drainage from the roofs. - Transitional shelter: Lightweight frame anchored to ground temporarily - The structures of transitional shelter should be demountable to allow the reinstallation of the shelter in a new (or original) location or the reuse of the materials. 		
Construction process	<ul style="list-style-type: none"> - If possible apply traditional, well-know construction methods (existing skills). - Transitional shelter: focus on pre- manufacturing (transitional shelter kits) Construction process to be speedy (pre-manufacturing reduces cutting, drilling on site) and to be simplified to allow participation of semi skilled and unskilled labour. 		
Head height	<ul style="list-style-type: none"> - Flat roofs height should be 9ft (2.75m) - Pitch roofs: -60% of shelter should have min. height of 7ft (2.1m) 		

2c) DISASTER RISK REDUCTION RECOMMENDATIONS applicable according to effective hazard risk			
Hazard	Standards	Foreseen Challenges	Remarks
Heavy Rains and Floods	<ul style="list-style-type: none"> - Pitch Roofs: slope min 0,5% gradient. - Recommended extension of eaves: min. 6". - Raise plinth level high enough to protect the base of the wall. - For mud or block construction use plaster in external walls to increase life span of wall. 		
Earthquake	<ul style="list-style-type: none"> - Match design of shelter to local seismic risk. - Seismic resistance techniques to be incorporated into site selection, shelter form, the location of openings, foundations, bracing and ring beam connections - Openings can weaken the structural integrity of walls – ensure load above the openings is transferred to other structural components. - Roof beam to overhang min. 6" on each side - Walls to integrate braced structure 		
Fire Hazards	<ul style="list-style-type: none"> - Disseminate information on appropriate safe use of shelter (for reference see annex on Fire Safety for emergency shelter). 		
Hurricane/ Strong Winds	<ul style="list-style-type: none"> - Form of shelter: square type (ratio length to width approx. 1:1) - Secure shelter to the ground (strong foundations, lightweight frame anchored to ground) - Roof structure with adequate strength for proposed roofing material (eventually incl. snow) - Apply metal strapping to reinforce roof structure to withstand hurricanes, earthquakes - Sufficient pitch to withstand winds: 2-pitched roof: min. 30°-45°, 1-pitched roof: 12°-14° 		
HOT Areas	<ul style="list-style-type: none"> - Ensure good insulation of roof – indigenous materials and techniques are preferred. - Location: make good use of shade provided by adjacent shelters, land form, trees etc. - Ensure cross ventilation inside the shelter, especially when covering roof with CGI-sheets. - Plastic sheeting as roofing: apply double-skinned roof with ventilation between the layers. - Do not position door and windows in direction of prevailing wind. 		
COLD Areas	<ul style="list-style-type: none"> Refer to annex with Guidelines for winterization - Ensure minimal but adequate ventilation: account for number of persons, heaters, stoves) - Design door and window openings to minimise draughts. - Appropriate stoves and heaters: consider required space, smoke, fire protection, etc. - Minimise loss of body heat through floor through a) good floor isolation (dry material) and b) insulated sleeping mats, mattresses, raised beds. - Roof resistant to accommodate snow-loading (where applicable). 		

2d) GENERAL RECOMMENDATIONS

Water & Sanitation	- Ensure adequate water provision and sanitation. Refer and coordinate with WASH cluster.		
Vulnerability	-Ensure most vulnerable are included in shelter support.		
Gender	Gender sensitive programming is required and women should be consulted about a range of issues. (refer to Vulnerability Criteria for Shelter Support)		
Cash Grants	-Cash grants or vouchers are considered as an option where market can support demand.		
Participation	-Ensure participation of community throughout the implementation of programs.		

SHELTER PRIORITIES FOR WINTERIZATION

The key shelter priority is to keep the immediate space around bodies warm. This is provided primarily by **warm clothes** and **bedding**. The key needs are for **blankets**.

The secondary shelter priority is to provide protection from the elements, by providing a **waterproof roof**. Adequate Drainage is also needed, so **tools** are needed to help prevent tents from flooding.

Ground insulation and bedding is key in preventing heat loss to the ground, and will help survival through periods of cold. **Providing thick quilts or high quality** blankets can provide personal insulation from the ground, whilst closed cell foam, or raised wooden floors will reduce this heat loss. **Plastic sheeting** is a key basic flooring component preventing rising damp.

To ensure a warm living environment, wind proofing is essential. Draughts can be blocked by **plastic sheeting, canvas, or blankets** over gaps. Draughts can also be blocked at ground level by **building low walls** (or excavating downwards if there is no risk of flooding). Additional **Tools** may be required to complete this.

The use of stoves to heat internal spaces is dependent on the fuel availability, and choice of stove must take into account of where the fuel comes from. Cooking and heating functions of stoves should be considered separately and care needs to be taken with reducing fire risk. Smoke is a common cause of respiratory infections and eye disease. Care should also be taken with toxic exhaust gases such as carbon monoxide build up. (*Selecting NFIs for Shelter, IASC, Emergency Shelter Cluster, 2008*)

SHELTER CLUSTER RECOMMENDED NFI KIT FOR FLOODS RESPONSE 2010

The highlighted items provide winterized support.

HOUSEHOLD KITS – suggested

Jerry cans/ hygiene kits/ mosquito nets etc. are not included as they are covered by the WASH and Health Clusters

High priority	Blankets*	5 single or 2 double (Northern areas)
		2 single (Southern areas)
	Kitchen set	1
Lower priority	Shade net 6m x 6m**	1
	Hurricane lamp***	1
	Fuel efficient cooking stove*** (with access to appropriate fuel)	1
	Clothes*** (fabric and sewing kit preferable to clothes)	1
	Floor sheets or ground mats	

* Fewer blankets are required in southern areas.

** As the temperature is now beginning to fall, the need for shade netting is reduced.

*** In previous emergencies in Pakistan, fire outbreaks in tents and temporary settlements have led to the banning of stove distribution. All stoves and lamp distribution programmes should be accompanied by fire safety public information and preparedness.

**** In the immediate aftermath of the flooding, clothes are a significant need. However to reach coverage of the largest number of families there will be delays in distribution.

Suggested clothing package:

- Winter Jacket Adult (M or L)- 3 units
- Winter Jacket Children (children M)- 4 units
- Winter undergarments for Children (children M)-4 sets
- Socks Adults- 6 pairs
- Socks for Children (children S-M) 8 pairs
- Warm Cap Adults- 2 units
- Warm Cap Children (children S-M)- 4 units
- Ladies winter shawl- 2 units

WINTERIZED TENT*

A winterised tent must be made of waterproof canvas, and must have a strong supporting frame. It must provide a minimum of 12m² (130sq.ft.) covered area.

Additionally, a winterised tent has the following components:

Fly sheet

Separate fly sheet, usually made from canvas, which fits over the inner tent.

Flue manifold:

The inner tent and flysheet each have a metal plate with a hole in it. These plates are sewn in or fixed into a canvas pocket. This allows for a stove with a chimney to be placed inside the tent without the risk of the flue pipe igniting the canvas when hot.

Structural supports:

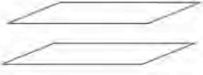
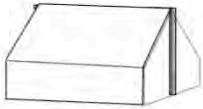
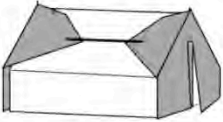
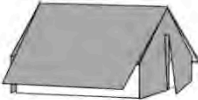

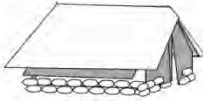
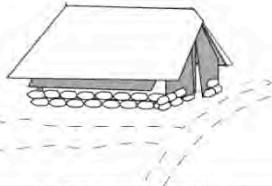
The poles which form the vertical supports and the ridge beam should be made of a thick gauge steel (min 1.5mm) and with an external diameter of 35-50mm. This gives suitable structural resistance to both high winds and snow loading.

Inner lining:

The inner tent may have a light cotton ('desouti') lining.

Mud flaps / valences:

The tent must have rot proof mud flaps of suitable quality and length to allow the tent to be dug into the ground.

Basic steps for insulating a ridge tent with plastic sheeting (This is an example only – there are many ways of insulating a tent)		
		
1. Select a well-drained and suitable site, noting prevailing wind and other features.	2. Lay ground sheet with insulation underneath or with mats on top	3. erect inner tent
		
4. Fold plastic sheeting over ends of tent tie the "ears" together	5. Cover the roof with a sheet of plastic (min 6mx4m)	6. Put on the flysheet
		
7. Cover the mud flaps with earth or with filled sand bags (20kg bags easiest)	8. Dig drainage ditches.	

Example of how plastic sheeting, rope and sand bags may be used to winterize a tent

BENEFICIARY ADAPTATION OF TENTS

Beneficiaries have been observed to upgrade tents in many ways. Sensible adaptations should be encouraged. Observed strategies adopted by beneficiaries include:

- Raising floors with timber or stone to reduce draughts and increase insulation.
- Digging in of valences /mud flaps to reduce drafts and risk of flooding.
- Construction of low walls, potentially head height walls to increase thermal mass and reduce drafts.
- Use of plastic sheeting or blankets over closed ends of tent to reduce drafts.
- Use of stoves for cooking and heating at key times of the day when cold is most intense.
- Excavating the interior space of tents to reduce ground level drafts where there is adequate drainage.

TENT WINTERIZATION UPGRADE KIT CONTENTS

The basic materials required to winterise a tent are plastic sheeting and rope with blankets and floor insulation for personal shelter. Below are the priority items that a family will need to provide for tent winterisation. The remaining materials to be distributed will depend on what families have already possess:

Quantity	Material	Use
First priority		
2 per person	Blanket or quilt - high quality*	Personal shelter - ground insulation and personal cover
60m ²	plastic sheet**	covering - waterproofing / flooring
20m	20m Rope – UV stabilised	structural -support / fixing sheeting
	warm clothes. ***	Personal shelter
Second priority		
1x	Needle and 20m thread	structural - basic tent repairs and draught proofing
25m	5mm cord	structural - support / fixing sheeting
Third priority		
4mx4m	plastic straw mats / 10mm closed cell foam / carpet underlay****	Flooring
Fourth priority		
1	Cooking stove, heating stove 4 months fuel	Cooking – higher priority than heating. Type of stoves dependent on fuel availability.
2-2.5m	chimney pipe with bend for stove. Valve on flue to control flow	Chimney for stove if appropriate, 1.5mx1m chicken wire to prevent metal from touching tent.
Structural support – if required		
1 set	2m Steel Metal tent pole set – 1.5" diameter, 1.5mm min wall thickness	Replacement of damaged poles. – 2 upright, 1 cross piece jointed in middle. Alternatively, replacement tents may be provided for those most in need.
Community support		
1 per 20 families	Spade and pick axe	Community toolkit to help with digging of drainage and construction of low tent walls

* minimum 2 high quality wool blankets **per person** (minimum TOG value of 2.0). If high quality synthetic blankets (generally brightly patterned fleece type material) or thick quilts are used, fewer than 2 may be used. Mattresses are the preferred form of ground insulation, but are subject to logistics constraints.

sphere NFI standard 1 guidance note 3: "Provision of insulated sleeping mats to combat heat loss through the ground may be more effective than providing additional blankets"

** clothes **must be winter clothes**, clean, compressed, sorted by age/size and gender and culturally appropriate.

sphere NFI standard 1 guidance note 3: "Changes of clothing: individuals should have access to sufficient changes of clothing to ensure their thermal comfort, dignity and safety. This could entail the provision of more than one set of essential items, particularly underclothes, to enable laundering"

*** plastic sheeting - (OXFAM/MSF quality preferred, reinforced with bands) to wrap the tent and cover the floor. This corresponds to two or three 6mx4m plastic sheets.

**** general ground insulation reduces ground heat losses. Partially flooring a room with blankets and plastic sheeting will allow people to sit reducing direct conductive heat loss.

Note that sandbags may also be used in the construction of basic walls.

* from Technical Guidelines for Winterization Strategy, Pakistan - Dec'05-Jan'06

TECHNICAL PARAMETERS FOR CONSTRUCTION OF TRANSITIONAL SHELTERS*

Size

Above 5000ft: More adequate space than the 170sq. ft. (16m²) covered space that a 4mx4m tent offers should be provided. The sphere suggested minimum of 38 sq. ft. (3.5m²) covered area per person should be aimed for.

Below 5000ft: More adequate space than the 130sq. ft. (12m²) covered space that a 3mx4m tent offers should be provided. The sphere suggested minimum of 38 sq. ft. (3.5m²) covered area per person should be aimed for.

However, agreed covered areas should not prevent people from being left in the cold due to logistic constraints. Where less material is provided privacy, health and dignity issues will arise and further interventions may be required to support arising protection, health, and psychosocial issues.

Shape

Practically, shape and dimensions are dependent upon sheeting or roofing materials available.

Rectangular structures have smaller roofing spans than comparable area square structures. And regular squarer shaped structures are preferred on earthquake resistance grounds.

Foundations

Foundations should be a minimum of 1'6" ft. (450mm) deep, and be fixed in solid soil.

Lean-to shelters must be securely connected to foundations above the terrace wall to prevent the roof from sliding off in aftershocks.

Frame

The walls should be braced diagonally.

There should be a ring beam at the top of the wall for lean to shelters.

Roof

The roof should be tied into the walls.

The roof should be pitched to allow rain to drain away.

It is advisable to diagonally brace the underside of the rafters.

Walls

Walls are built within the frame, preferably with locally available material. This may be material such as timber planks, metal sheeting, sandbags or rubble.

Unless masons are aware of earthquake resistant building techniques (through stones, well laid walls, corner ties, etc), traditional dry stone walling or sand bags should not be built to a height greater than 1m (to minimize injury should after shocks occur).

Rubble walls should not be used to support the roof.

Plastic sheeting should be used to seal the mountain wall from the inside of the shelter for shelters that use the terrace as one wall.

Flooring

Compacted rubble and straw can be used to provide alternative but limited insulation. Plastic sheeting may also form a waterproof floor membrane. If available, timber planks can be used to provide insulated decking for the floor.

Drainage

Drainage must be dug around the shelter.

Insulation

Local available insulation material should be added to the floor, walls and ceiling

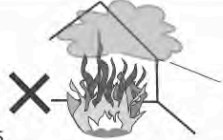

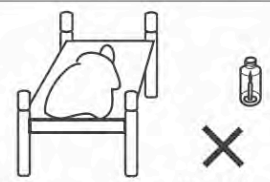
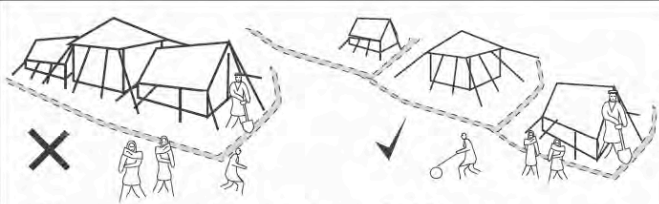



Priority 1 draught exclusion: use plastic sheeting, blankets or timber to stop draughts.

Priority 2 insulation: use pine needles, leaf bags or sheeting to insulate the walls and roof.

* from Technical Guidelines for Winterization Strategy, Pakistan - Dec'05-Jan'06

FIRE SAFETY




PREVENTION

 <p>- NO open fires or bare flames inside tents</p>	 <p>- Candles must be placed in lamps or in jars</p>	
 <p>- Never leave a candle lit while sleeping or when leaving the tent.</p>	 <p>- Tents walls must be a minimum of 16 feet apart.</p>	
 <p>- Stoves must not touch tent walls. - Chimneys should go through a solid wall or through a fire-proof plate.</p>	 <p>- Do not smoke inside tents.</p>	 <p>- Electric light bulbs must be at least 6 inches from the tent canvas.</p>

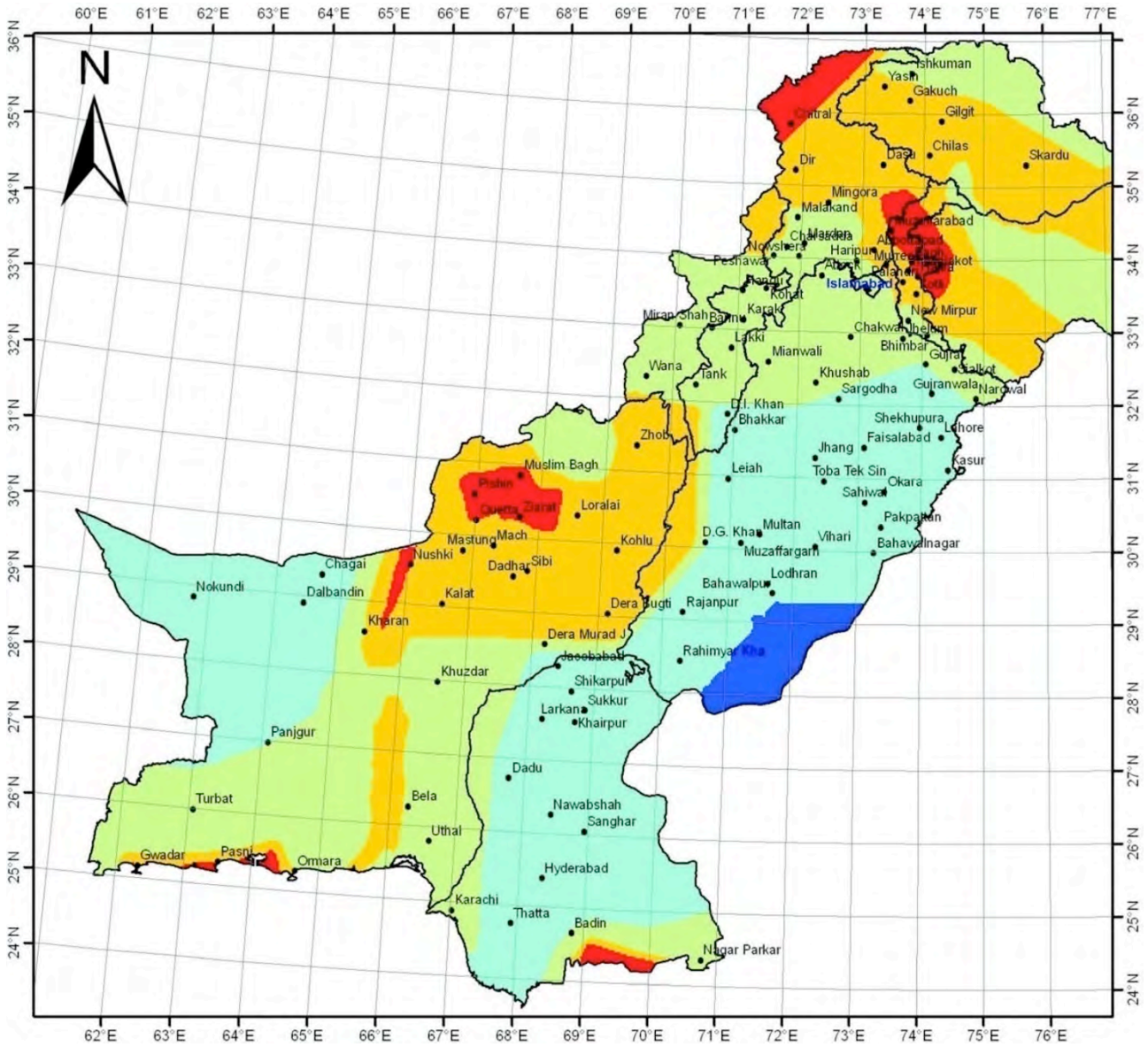
PREPAREDNESS

 <p>- Set up community fire committees, for training and fire fighting.</p>	 <p>- Make fire stations with buckets, sand, fire beaters and fire extinguishers.</p>
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IN CASE OF FIRE

<p>clothes on fire</p>  <p>STOP, DROP AND ROLL. If your clothes are on fire, STOP where you are, DROP to the ground and ROLL to extinguish the flames</p>	<p>tent on fire</p>  <p>- Check that there is no-one inside. THEN knock down the tent. This will help stop the fire from spreading.</p>	<p>burns</p>  <p>- Cool the burn area with cold water or a wet cloth immediately.</p>
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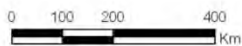
SEISMIC ZONING MAP OF PAKISTAN *in Pakistan Building Code*



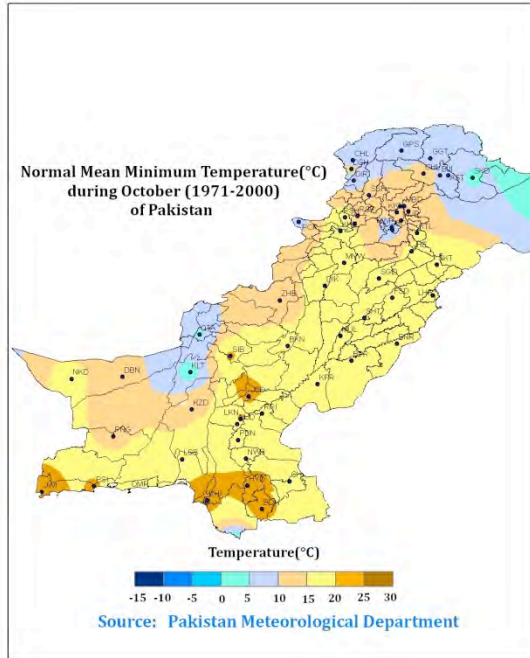
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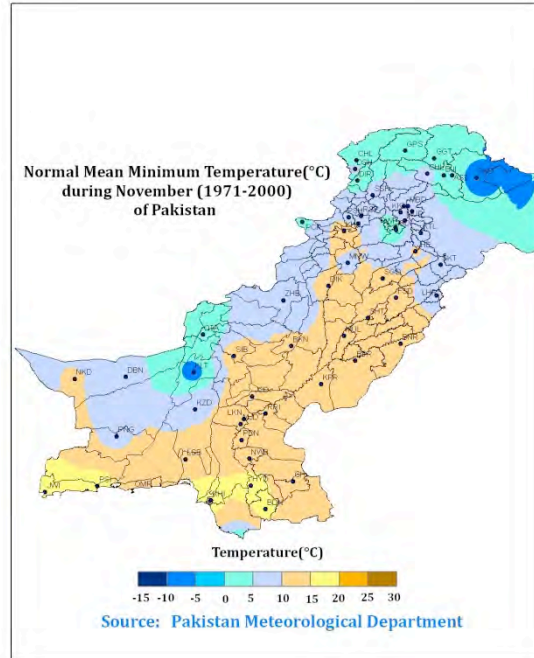
For enlargement of this map refer Figs. 2.2 to 2.5



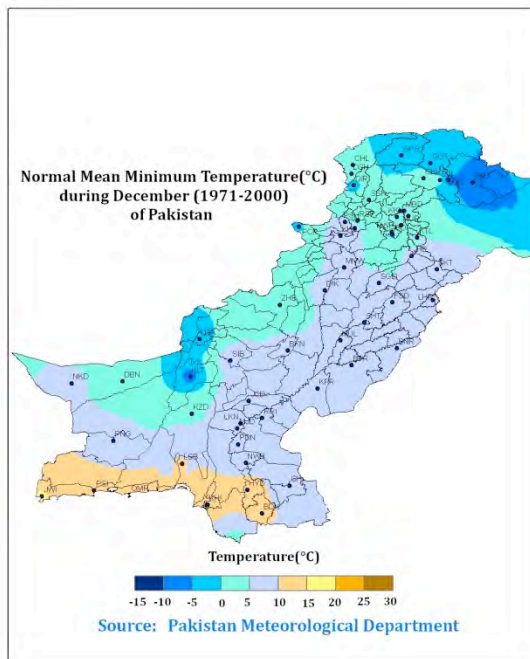
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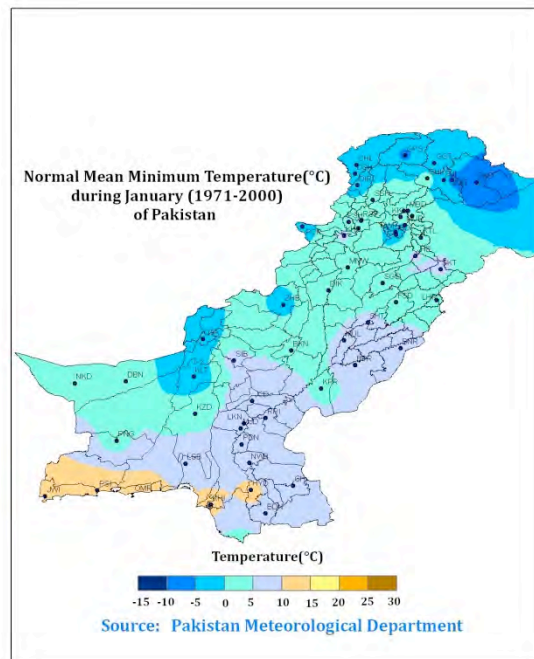
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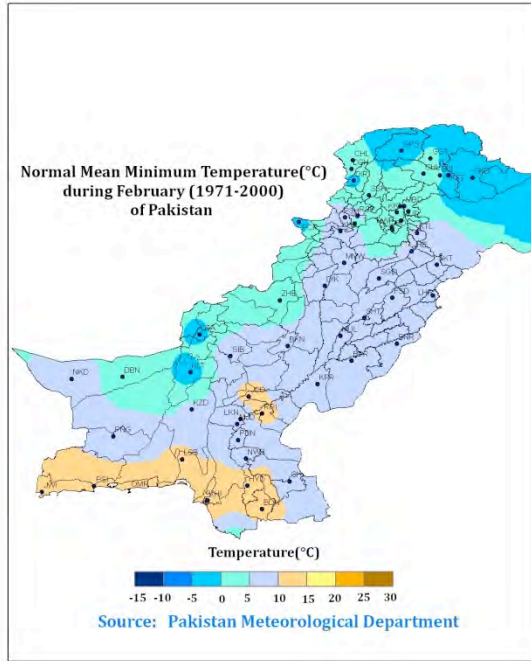
DECEMBER



JANUARY



FEBRUARY



MARCH

