Yugoslavia, Guatemala, Nicaragua, these are only a few of the Third World countries which have suffered catastrophic natural disasters within recent years. In this study Ian Davis, a Principal Lecturer in Architecture at Oxford Polytechnic, analyses the problems faced by the new homeless in these circumstances and the philanthropic motives of the West. Indeed, he questions the validity of much humanitarian shelter provision. The book also attempts to relate the problems of post-disaster shelter in its varying forms to the wider context of the overall development of vulnerable countries, most of which are in the Third World.

Shelter After Disaster also makes humane historical links, for example, with the eruption of Vesuvius (AD 79), the Great Fire of London (1666) and the San Francisco earthquake (1906) relating the historical problems of reconstruction to those experienced today. Ian Davis does not pretend to have the problems of emergency shelter, but he has been able to draw on considerable experience as a member of a UN advisory team, visiting many recent disaster areas during the critical periods of reconstruction. He presents a factual account of what really happens and suggests several alternative approaches to shelter provision. His book will be of great interest to architects and designers and to all those directly or indirectly concerned with the coordination of disaster relief and the provision of all...
SHELTER
AFTER DISASTER

Ian Davis

1978

Oxford Polytechnic Press
To those...
within vulnerable homes, awaiting the next disaster

To those...
who survived the last disaster only to live within sub-standard shelters

And to those...
who are attempting to rectify both situations
CONTENTS

List of Illustrations ix
List of diagrams xi
Illustration Acknowledgements xii
Acknowledgements xiii
Preface xiv
Introduction xv

Part I. A vicious spiral 1
Housing and vulnerability 1
Disaster, poverty and urbanisation 10
Cultural values 15
Casualties and damage 19

Part II. From myth to reality 25
Vulnerability 26
Social attitudes 26
Shelter needs 28
Reconstruction 30
The provision of aid 30

Part III. Filling the gap 33
Three strategies 33
Strategy 1 — Housing survival 34
Strategy 2 — Filling the gap 39
Strategy 3 — Accelerated reconstruction 51

Part IV. Historical perspectives 69
Famine in Judea c. AD 41-54 70

Epilogue 91

References listed alphabetically 93
References listed according to subject 98

Appendix A: Summary charts 99
1) Skopje, Yugoslavia 1963 100
2) Managua, Nicaragua 1972 102
3) Hurricane Fill, Honduras 1974 104
4) Lise, Turkey 1975 106
5) Guatemala 1976 108
6) Friuli, Italy 1976 110

Appendix B: Maps 113
1) The incidence of disasters and the
world's earthquake belts 1920-76 113
2) Map to show vulnerability to disasters 119

Index 123
# LIST OF ILLUSTRATIONS

*Frontispiece* Refugees from Bangladesh, April 1971  
1 Managua destroyed by an earthquake, December 1972  
2 Simulation of Parliament Square, London, under flood  
3 Flood risk area, Thames basin  
4 Artist's impression of Thames barage  
5 Lice, Turkey, following the earthquake  
6 Fishermen's houses on the bank of a river in Seoul  
7 New housing in Lice  
8 Traditional house in Lice  
9 Han river stumps, Seoul, Korea  
10 Housing on raised plinths, Trinidad, Bolivia  
11 Palace of Minos at Knossos, Crete  
12 Kurdish man claiming Lice earthquake was the will of Allah  
13 Katsura Imperial Villa In Kyoto, Japan  
14 The ruined town of Lice  
15 Badly constructed housing in Guatemala city  
16 Ravine housing in Guatemala city  
17 Houses with thick adobe walls in Tecpan, Guatemala  
18 Two-storey squatter houses in Ankara suburbs  
19 Squatter housing in Rio de Janeiro  
20 Construction of temporary housing in Trassghis, Friuli, Italy  
21 Nueva Jutiapa, Honduras, built after Hurricane Fifi  
22 New and old construction types in Skopje, Yugoslavia  
23 Text in use one year after Lice earthquake  
24 Prefabricated housing in Lice  
25 Modified prefabricated housing in Lice  
26 Bayer polyurethane igloos in Masaya, Nicaragua  
27 EPICOR house in Bangladesh, based on indigenous housing  
28 Lice: fertile valley characteristic of earthquake fault locations  
29 Central area of Skopje thirteen years after the earthquake  
30 Centre of Managua three years after its earthquake  
31 New squatter housing on safe land in Guatemala  
32 Tent built in the ruins of a house  
33 Village crushed in Friuli earthquake  
34 A family sorting through ruined home in San Martin  
35 Panicking crowds attempting to escape from San Francisco  
36 Family after 1965 earthquake in Greece  
37 Emergency shelter in Managua  
38 Inflatable grain warehouse  
39 Reconstruction in Guatemala four days after earthquake  
40 Oxfam Emergency House-Making Unit in Lice  
41 Safe building techniques shown in Turkish wall chart  
42 Model house built by Oxfam and World Neighbours  
43 New lightweight roof to replace collapsed tile roof  
44 Rural housing in eastern Turkey, built of adobe with heavy roofs  
45 Family survey their home after Turkish earthquake of 1976  
46 Transport plane unloading at Guatemala airport  
47 Air photograph showing effects of the Guatemala earthquake  
48 Night-time home in Guatemala
being dismantled so that truck can be used
49 Cardboard and tarpaulin homes in Guatemala
50 Temporary use of convent after flooding in Trinidad, Bolivia
51 Loading Oxfam supplies at RAF Brize Norton
52 Emergency shelter devised by Mr. Perri
53 First-year: student project at Oxford Polytechnic
54 Floating emergency shelter for Bangladesh
55 Bayer polyesterdom igloos in Massaya
56 Field testing of Oxfam hexagonal units in Pakistan
57 Polyesterdomes modified by families in Nicaragua
58 Further examples of modified polyesterdomes
59 Carnegie-Mellon 'A' Frame housing under construction
60 Further examples of modified polyesterdomes
61 Completed 'A' Frame housing at Demra, Bangladesh
62 Nomad tents in eastern Turkey
63 Tents in use in Lice eight weeks after the earthquake
64 Japanese woven polythene tents
65 Regimented layout of tents at San Pedro, Sacatapequez
66 Sears High Wall Challet tents in use in Massaya, Nicaragua, designed by Fred Cuny
67 Layout of tents at Massaya, Nicaragua, designed by Fred Cuny
68 Emergency camp in Chimaltenango
69 Emergency camp in Bula, Friuli, four months after the earthquake
70 Evacuation of Darwin following Cyclone Tracy
71 Rebuilding a home in Guatemala city
72 Man in Guatemala replacing his collapsed tile roof with iron sheeting
73 Historic facades in Gemona, Italy, shored up prior to reconstruction
74 Family in Patzicia, Guatemala, reconstructing their house
75 A shored-up arch in Gemona
76 Homeless after the Great Fire of London
77 Wren's plan for the reconstruction of the City of London
78 The destruction of Lisbon
79 Lisbon rebuilt after 1755 earthquake
80 The spread of the fire after the San Francisco earthquake
81 An improvised home in San Francisco
82 A further example of improvisation in San Francisco
83 Improvised homes in Golden Gate Park
84 Harbor View emergency camp with Akbar in the background
85 Emergency camp in San Francisco
86 The Park Presidio Drive Site
87 Lobos Square camp
88 Huts in Park Presidio Drive
89 Temporary house being moved to a permanent site
90 Mestiza reconstructed after the earthquake of 1906
91 Improvised shacks in Yokohama cemetery
92 Improvised homes in Tokyo, 1923
93 Wooden shacks in Tokyo
94 Emergency housing in bomb-damaged Berlin
95 Temporary homes en route to their destination
96 C'tasphon huts built in vast quantities prior to D Day
97 Squatter homes in Dacca, Bangladesh
98 House improvised after Chimbote earthquake of 1970

LIST OF DIAGRAMS

Diagram 1. Hazards and vulnerability 3
Diagram 2. London Rebuilding Act 1667 4
Diagram 3. Geographical variables 11
Diagram 4. Casualty and damage projection: San Francisco 20
Diagram 5. Casualty and damage projection: Tokyo 20
Diagram 6. Three strategies for shelter and housing following disasters 34
Diagram 7. Map of Turkey indicating vulnerability to earthquakes 35
Diagram 8. Map of Turkey indicating construction types within the risk zones 35
Diagram 9. A page from a comic book in use in Guatemala providing guidance on the correct sitting of houses 36
Diagram 10. Modes of shelter and housing provision 42
Diagram 11. The ratio of refugees in extended families, and in a refugee camp in Masaya, Nicaragua 45
Diagram 12. The Moss air-drop shelter 48
Diagram 13. Field drawing of erecting tents 59
Diagram 14. Graph to show relationship of construction period to national wealth 62
Diagram 15. Map of Lisbon indicating reconstruction following the earthquake 76
Diagram 16. Design of World War II emergency shelter by Alva Aalto 87

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Within the text I have tried to credit all those whose ideas have contributed to my own, but where I have failed to do so, I offer my apologies.

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Jan Davis
Oxford

January 1977

PREFACE

This book was written during the autumn of 1976. This was the worst year since 1927 for earthquakes, with fifteen major disasters of over 7.5 on the Richter scale, the worst European earthquake in Italy since Skopje in 1963, the most devastating earthquake in 500 years in Guatemala, and possibly 700,000 killed in China — a truly horrifying list.

But just as I was completing the text, a further major earthquake took place on 24 November in eastern Turkey. I have made corrections to the manuscript to include references to this new disaster, but it is still too early to digest the lessons from the tragedy. This is particularly tantalizing since it is the first major disaster of the last five years where winter and high altitude exposure problems have become the dominant concerns of those involved in the relief operation. And since this topic has always been one of the crucial questions in such research, it is particularly frustrating to put the cap on my pen when many of my statements will be challenged in the light of these events.

This, however, is the nature of the problem: events will teach us lessons and these lessons will overturn our tidy conclusions, and, I hope, lead to better solutions.
INTRODUCTION

Any consideration of emergency shelter provision following disasters prompts the immediate observation that there must be few subjects in the whole field of building on which so much effort has been expended, so much money spent, and yet, paradoxically, where so little is really known.

This modest study is an attempt to redress this situation. It comes at a time when there has been the most concentrated analysis of this problem ever attempted. The Office of the United Nations Disaster Relief Coordinator (UNDRO) in Geneva has recently been making the first international study of this problem, and by the time that this book is published I hope that the various questions I pose will have been answered as various items of essential evidence are produced.

Despite a gradual clarification of these issues our collective knowledge is still limited, and there are significant gaps in our understanding. For example, we still know little about the precise ways in which local communities function when they tackle their relief or reconstruction. We know little about the usefulness of long-term effects of our aid, whether it be tents or shelters. And there are geographical areas, such as Russia and China, where the approaches to relief or reconstruction are virtually unknown to us.

Overall, this study will reflect the bias of being based largely on documents in English, and also the bias of being written in England, at a safe, perhaps too safe, distance from the vulnerable conditions I have described. It is also limited by the extent of my own first-hand experience, which is of just eight disaster situations, most of which were earthquakes.

Since this is probably the first book to be written specifically on this theme, I have deliberately painted a broad canvas, while recognising that the prime focus is that of shelter needs, immediately after disasters.

I have not restricted myself to 'natural' disasters, but my experience has directed the study away from the 'man-made' disasters such as war or refugee situations, which have certain unique characteristics.

Having established immediate shelter as my central concern, I have deliberately brought into the picture the pre-disaster context. Within Part I, I have attempted to show that the situation prior to the catastrophe is a crucial factor and may be the actual cause of the disaster. In Part II, I have set out in diagrammatic form the widespread myths which exist about disaster shelter, together with the facts which, I hope, will dispel these false beliefs. Then, in Part III, I have commented on the diverse strategies that are likely to be pursued in the immediate aftermath. Once again, I have avoided being 'boxed in' to a time phase called the 'relief period'. Any study of these topics rapidly shows that relief, rehabilitation and reconstruction, though definite phases, constantly overlap, and the immediate decisions made within days of a disaster have a habit of influencing long-term events.

Finally (and perhaps pervertsly) I have left the historical section to Part IV at the end of the book. In this way I have been able to look back and reflect whether the patterns of events I have attempted to define are purely mid-twentieth-century responses, or are more deeply rooted.

I will value the patience of readers in this first venture into print. I hope that this book will produce corroborative evidence, and where an ignorant dogmatism has crept into my ideas I will be grateful to hear counter-arguments. Both are necessary for the development of our knowledge.
PART 1

a vicious spiral

This is the excellent foppery of the world... we make guilty of our disasters the sun, the
moon, and the stars: as if we were villains by necessity; fools by heavenly compulsion; knaves,
thieves, and treachery by spherical predominance; drunkards, liars, and adulterers by an
enforced obedience of planetary influence.

Shakespeare: King Lear

Housing and vulnerability

From man's earliest days, his very survival has been dependent on the great elemental
powers, water, wind, sun, fire and earth. Each is vital for his existence and each can in
turn threaten his puny hold on the planet's surface.

When the drizzle becomes a cascade, or
the breeze a hurricane, man is involved in his
dastic struggle with the elements, and he has
viewed the process in various ways: as an act
of judgement, an omen, or 'an act of God', to
quote the Lloyds underwriter.

For someone living within the
comparative security of northern Europe
(where the label disaster is more likely to
refer to the collapse of steeing than to
bricks and mortar!) it is extremely
difficult to appreciate the extent of the risks
which many communities face. To understand this I will discuss a vulnerable
situation in England, and the way it is being
treated.

Few realise that within central London
there is a very serious risk of flooding. This
has been known for generations, and now a
sum of £211 million is being spent on the
Thames barrage and flood protection
measures. Tony Aldous has observed that all
that is needed is a combination of three
factors: high tide levels, a high freshwater
flow down the river and a surge of water up
the Thames caused by meteorological
conditions in the North Sea. If these
conditions were to come together before the
Thames barrage is completed in 1980 then
London could face a major disaster, which in
monetary terms alone has been estimated at
£2,000 million in damage to property.

It is also significant that this risk has been
steadily worsening because of three factors.
First, the fact that London is sinking on its
clay bed, as a result of a slight tilt of the
south-eastern region. Secondly, tides are
rising in height, and third, building has
progressively engulfed the traditional 'flood
absorption' areas, such as the Kent and Essex
marshes. In technical language, the hazard,
or state of vulnerability, as in so many parts
of the world, is increasing.

London is vulnerable to this one natural
References listed alphabetically.
Thames estuary are an example of a preventative action which will remove the risk at present hanging over London. The measures are a direct result of the disaster in 1953, where 300 people died in the Cheyne Island flooding. This is a characteristic pattern—a disaster occurs and public opinion forces apathetic officials to recognise a risk and spend money to remove it. An earlier example of this process was the introduction of building bye-laws to prevent wooden houses being built on over-narrow streets following the 1666 Great Fire of London (28, 52, 74).

Essentially these are preventative or mitigation measures. Apart from isolated exceptions man has had little success in either predicting or preventing the vast natural forces that produce an earthquake or a flood, and his attention has therefore been...
rightly directed to the other side of the interface—the 'dangerous conditions'.

Since floods, earthquakes and hurricanes recur in some places with relentless frequency, we may wonder why they don't result in changes. When a tidal wave demolishes a village, or an earthquake reduces a town to a dusty heap of rubble, it is logical to consider a new location, or a safer mode of construction. But man is a complex, irrational being and logic will probably always be the victim of expediency. To move the village above the flood plain means the loss of fishing rights—or the sacrifice of fertile farm lands. And these factors, which are everyday necessities, weigh heavily against a flood hazard with a return period of every 5-10 years.

Then, to rebuild a house in a safer manner may demand skills and materials unavailable in the locality. It is easy for visiting teams of expert consultants to shake their heads and write of widespread failures in domestic construction resulting from the lack of lightweight roofs and 'tensile members' (wooden beams). From the point of view of the villager, however, standing amid his ruined house, these words are almost meaningless, since he would have to spend more money than he possesses to frame his house or support a light roof.

When we consider local housing which is vulnerable to earthquakes, and set the 'pros and cons' of safety alongside tradition, then the winner is all too predictable. On the side of safety, there is a house with a lightweight roof, probably built in an unfamiliar manner; the roof will need insulation if the house is to avoid becoming an oven in summer or a refrigerator in winter. This house will be safe against a massive earthquake. Now, set against this there is a traditional house, possibly with thick stone or earthen walls capped with a solid roof of earth piled on rough timber rafters. This house provides the everyday comforts—cool...
temperatures in summer and winter warmth. And when these are set against the security of knowing that the house will survive an event that only one's grandmother can recall, the result is obvious.

From these examples we can learn some important lessons:

First, people build their homes in response to their everyday needs - their occupations, their wealth, their traditional construction techniques and their cultural patterns.

Secondly, the return period of most forms of disaster is so infrequent that it has no influence whatsoever on local construction techniques or the siting of settlements. But having made such a dogmatic assertion, I must immediately qualify it with possible isolated exceptions.

One such exception may be the situation in Guatemala. We know from illustrations of Mayan remains that the traditional houses were built in bajanique - a form of simple timber-framed house with corn stalks as walling. But the Spanish entered the country and brought with them adobe and tiled roofs - a mixture that was lethal in an environment with earthquakes occurring every twenty-five years. This isn't the only place where the introduction of alien building styles has made poor people's traditional housing unsafe.

Another exception is the form of house that is built on stilts to withstand flooding.

8 Traditional heavy stone wall housing in Lice, Turkey

9 Han River slums in Seoul, Korea. The slum residents were forced from their shanties during the 1965 Han River flood

10 Housing in Trinidad, Bolivia, with raised plinths to protect buildings from flooding. In this instance the flooding was so intensive that its level rose above the elevated floor level.
11 The Palace of Minos, Knossos, Crete. Note the wooden ring beam on the wall behind the columns

But here the hazard is probably an annual (or bi-annual) event, that coincides with a monsoon season and as such becomes a predictable ‘everyday’ occurrence within everyone’s memory; and therefore it is a design factor considered when each house goes up.

The final exception is the modification of building techniques following constructional failures in disasters. Historical evidence of this emerged when Sir Arthur Evans excavated the Palace of Knossos in Crete, uncovering a structure built about 1650 B.C. The palace was probably built shortly after some catastrophe, perhaps a volcanic eruption or an earthquake. This may be the reason for the existence of the timber ring beams that occur throughout the palace: a form of lateral bracing to hold the structure together, in the event of earthquake forces.

Professor Nicholas Ambraseys of Imperial College, London, has written:

After destructive earthquakes, towns were often rebuilt on an extensive plan with marked changes in building techniques such as unusual types of foundations, consisting of a grid of wooden beams on which the structures are built, the introduction of timber-bracing of houses and the abandonment of ordinary unreinforced brickwork. It is often assumed that these changes are due to techniques brought into a region by new settlers, or by invaders. This is not always the case (7).

Ambraseys proceeds to show that timber-bracing techniques have been adopted in areas without local timber supplies in order to produce safe structures. These areas include Anatolia, Crete and Northern Pakistan, and archaeological evidence going back over 2,000 years proves this point.

The traditional Japanese house has often been cited as an example of earthquake-proof construction. Evidence on this issue is slight, but it is conceivable that the lightweight wooden frame structure of the traditional Japanese house has evolved to withstand the forces within an earthquake. Further, there are highly ingenious ‘rocking foundation bearings’ in some of these structures, which may have originated as a precautionary measure.

It is important to note a further factor which may prevent communities from taking preventative action against disasters. This was shown to me very vividly whilst I was in Lice, a town that was totally wiped out in an earthquake in Turkey in September 1975. While I was walking around the stark ruins of this ghost town, an old Kurdish man came up to me. Despite my language difficulty, his sentiment was very obvious: “It is the will of Allah”, he declared, with a sorrowful look in the vague direction of Mecca.

In point of fact the buildings of Lice were built on the side of a mountain, and some of the houses were demolished when there were rockfalls, whilst others collapsed like dominoes, one falling on another. In addition many homes collapsed because of bad construction. These events probably account for the fact that 2,383 people were killed within Lice, and 1,800 houses were destroyed: a ratio of 132 deaths per 100 houses. Within the whole of Turkey the normal ratio of deaths to houses destroyed

12 Kurdish man standing in the ruins of Lice, Turkey, declaring that the earthquake was the ‘will of Allah’

13 The Katsura Imperial Villa in Kyoto, Japan. Its lightweight construction has survived earthquakes since it was built in 1640
The exact population of Lice prior to the earthquake is very uncertain, but it is likely to be reasonably close to the census figure of 8,200. Therefore 1 in 6.8 died. This is an extremely high ratio, as is the ratio of deaths to houses destroyed, and it indicates the extreme vulnerability of the population in this region.

But the number of deaths also results from a cultural factor. The disaster occurred at 12 noon on 6 September. This is the eve of the Modern feast of Ramadan, and each house was full of women and children preparing the traditional feast. Thus the casualties were almost exclusively female, since the men were in the fields or in the mosques (23, 24).

It is clear that there are many cultural and economic obstacles that prevent the adoption of sensible preventative and mitigation measures. And in recognising that the target social group is the extremely poor, it is necessary to reflect that it may cost 15% more to construct a safe house (60).

To summarise, the obstacles that stand in the way of house builders responding to these risks are: the long return period of many forms of disaster; the resistance that communities have to moving away to less vulnerable locations; a natural resistance to unfamiliarity; and probably more important building techniques; and the difficulty of education when disaster victims may view these events as the will of Allah, with the reaction 'who are we to prevent such a judgment of omens'?

But as we have seen, societies after a disaster have often taken action, such as the wooden ring beam in the Palace of Knossos, by-laws after the Great Fire of London and the Thames barrage now under construction. All of these activities are responses to known hazards and previous disasters. Clearly, these are positive steps forward, but if it is tragic that the mechanism that stimulates action is nearly always the manifest failure of previous methods of construction. For this we can hope that changes will take place before the event.

Disaster, poverty and urbanisation

If an identical natural phenomenon affected three different geographical locations, it is conceivable that there would be three different results.

Taking, for example, an earthquake, we can observe that if it occurs in an unpopulated area it is clearly not a disaster but is better described as a natural phenomenon. It may result in physical damage — landslides and possible damage to woodlands or agriculture.

Earthquake
1. No population
2. Well-constructed city
3. Badly constructed, ill-sited city

Diagram 3. Geographical variables

If the earthquake occurs in a western-style city, where buildings have been well designed with earthquake-resistant construction, there will again be some damage but it will not be classified as a disaster.

Finally, there is the familiar pattern of an earthquake in a rapidly expanding city of the developing world. There the result is extensive damage and many casualties. A suitable definition would be a disaster, possibly a catastrophe.

Here we return again to Diagram 1 and see the relationship of hazard to vulnerability. The condition of vulnerability may relate to badly constructed buildings or it may relate to the siting of settlements — or most likely to both.

For example, housing in Guatemala City was vulnerable on two counts. First, it was made in adobe, a form of dried mud, and this material, when used in unreinforced walls, is lethal in earthquake zones. Secondly, many urban squatters died on the exposed steep slopes or ravines. Inevitably thousands died as landslides took their houses down the slopes (40). This is a characteristic pattern — the urban poor possessing the worst land in the densest and most dangerous parts of a city (100).

In fact, the study of disasters is almost by definition a study of poverty within the developing world, since this is where most
population. This population is increasingly vulnerable to environmental variation as the process continues (69).

As we now watch the rapid process of urbanisation within the metropolitan cities of the third world, we can see a stage set being assembled for future disasters, with casualties and damage that are likely to occur on an unprecedented scale.

Gradually public awareness of this relationship between urbanisation, vulnerability and poverty is increasing. One of the themes of the 1976 United Nations Habitat conference was introduced by Juan Terra:

In some Latin American cities three quarters of the population are living in makeshift accommodation... in cities like Guatemala city, hundreds of thousands of homes spread up hillsides where it is impossible to establish infrastructures. They destroy the vegetation cover, and cause erosion which in rainy climates threatens the very stability of the land surface (83).

Terra wrote this introductory paper in May 1975. Within nine months, an earthquake had destroyed 40% of Guatemala city's housing stock, a total of 59,000 houses, and almost without exception these houses were occupied by the urban poor.

As we listened to the various speakers at the Habitat conference it became increasingly apparent that this issue is primarily political, and that safe land will have to be released for the influx of migrants into the bulging cities of the third world. But for such a policy to take place, public opinion will have to be mobilised to exert pressures and speak for the squatters perched on dangerous ravines or living in flood plains.

The Bradford team have observed:

They often live in the most dangerous and unhealthy places. It is an accident that San Juan (Puerto Rico) slums are frequently inundated by high tide; that

---

15 Ravine housing in Guatemala city

disasters take place. In a recent series of studies conducted by the staff of the Disaster Research Unit of Bradford University, direct relationships are established between disasters and poverty (69, 100).

This team has produced statistics that clearly show a significant increase in disaster occurrence during the past fifty years. They point out that there is no evidence of significant change in geological or climatological factors; and therefore reasons for the increase must be sought elsewhere:

If the probability is constant then logically the explanation of disasters must be sought in an explanation of the growing vulnerability of the population to extreme physical events... it is known that the frequency of natural disasters is increasing especially in underdeveloped countries. Indeed the increased vulnerability of people... extreme physical events can be seen as intimately connected with the continuing process of underdevelopment.

16 Houses in Tecpan, Guatemala: an example of thick adobe walls

recorded throughout the world. As population continues to expand and as resources continue to be controlled by a minority, the real standard of living drops for much of the world's

17 Two-storey squatter houses in the suburbs of Ankara, Turkey
Rio's infamous *favelas* climb slopes of alpine difficulty; that the poorest urban squatters in much of Asia live on hazardous floodplains. The poor are often clearly aware of their own vulnerability. Why else would the devastated slum dwellers of Guatemala City refer to the earthquake [of

February 1976] as a 'class-quake'? (190).

The United Nations have obtained verification for this state of affairs. They find that 95% of all deaths directly attributable to disasters occur within developing countries. The remaining 5% of deaths occur within the well-publicised disasters of the developed world (70). There are significant differences in the way developed and developing countries approach disasters. These relate both to pre-disaster control measures and to their approach to relief and reconstruction. In very broad terms the distinction can be summarised by saying that in the developed world we seek for *material solutions*, while in the developing world the solutions are primarily *social mechanisms*. Fred Cuny (a world authority in post-disaster housing and shelter needs) observed to me that in the technological world we attempt to control *the phenomena* themselves. We build dams to control floods: we 'seed' hurricanes with chemical bombs dropped out of aircraft to try to dissipate their fury; and we pump water into earthquake fault lines to lubricate them and prevent tremors. In contrast, the people of the developing world must take individual actions to mitigate the *results of the phenomena*. These may include building stronger houses or moving to live in a safe location.

### Cultural values

21 The village of La Nueva Futona, Honduras, built after Hurricane Fif, September 1974, showing contrasting forms of new housing — concrete block provided by CARE and traditional thatched homes
Any study of housing or shelter provision must begin with an analysis of what goes to make up 'normal housing' in a given community; housing that relates to local cultural patterns. This has to be the starting point of any investigations and it should not be viewed, as has so often happened, as a 'low-priority concern'.

Amos Rapoport has written:

It is clear that we need to understand the underlying structure of a culture and its relation to the physical forms before we can design. This knowledge must be specific rather than general, both for design and implementation, and openness may be an important consideration. We must study the vernacular forms since they show most clearly the relations between life styles, values and physical form, the relation of social structure to dwellings, dwellings to the larger environment and so on. The traditional housing and settlement forms, and their associated social and cultural patterns, should be seen as the point of departure rather than being ignored.

Several questions must be asked on this issue. If housing is vulnerable to disaster risk, what then? Can changes be made in house forms that avoid disturbing the subtle relationships described by Rapoport? Further, how far do these cultural values apply in the aftermath of a disaster? Are they necessities that can be disregarded in the race for survival? And who are the most suitable people to implement policies? If outside agencies or personnel are involved, how can they avoid transplanting whole sets of cultural values into an alien situation?

I shall be constantly returning to this key issue throughout this book. We shall see three basic forms of response.

First, there are forms of housing or shelter which either ignore this entire issue or deliberately attempt to modify the cultural habits of the occupants. An example of this process is when officials have attempted to rehouse reluctant disaster victims in western-style prefabricated houses totally alien to traditional patterns.

Secondly, there have been attempts to produce 'universal' solutions. These have
ignored the cultural issue altogether, or else assumed that people's living patterns are more or less identical throughout the world. One such product has been used in the mountains of Peru and Turkey and in the tropical plains of Nicaragua (11, 29, 41).

Thirdly, there have been attempts at shelter that fully recognise these cultural issues and yet try to modify housing techniques where traditional patterns have produced unsafe homes. Examples of this process are currently in progress in Guatemala and Bangladesh (20, 33, 41).

Casualties and damage

It is a rather cruel twist of fate that people are so often drawn, as by a magnet, to the very area where their lives will be cut short, or where they will see their homes demolished.

Earthquake fault lines often produce gushing springs of water, and in an arid climate people will naturally gravitate to those locations. A good example of this is Llo, the Kurdish town set on the lower slopes of the Taurus mountains, which was devastated by an earthquake in September 1975 (24). I have already referred to the factors which draw people to flood plains, and also to the economic factors which leave families with little option other than very dangerous locations for their homes.

Paradoxically, and tragically, the major force that creates the 'magnetism' of vulnerable situations is the basic human need of survival. This may operate in the search for water for flocks of sheep, or there may be an abundance of fish in the river that is apt to flood. The most lethal magnet is probably the city. In the process of urbanisation people have to leave the land (as mechanisation of agriculture devours their jobs) only to live on the dangerous slopes of a Rio or Guatemalan city.

So, when we look at the statistics of death and damage, we are left with one conclusion: they are all increasing, and this is in direct response to urbanisation. To put it another way, disaster mitigation measures have totally failed to keep pace with the speed of urban growth.

In recent years studies have been made of two major cities (both of which suffered disasters during this century) to see what scale of casualties and damage would result if earthquakes of identical intensity were to recur in the near future.
Diagram 4 indicates the projection made for San Francisco by Professor Robert Kates of Clark University, Worcester, Mass. (55).

The Japanese earthquake prediction centre has made a similar extrapolation for Tokyo. These results are far more serious, since the population has grown by thirty times since 1923.

<table>
<thead>
<tr>
<th>Earthquake of 1906</th>
<th>Estimated consequences of earthquake in near future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale of Earthquake</td>
<td>8.3 (Richter)</td>
</tr>
<tr>
<td>Population</td>
<td>400,000</td>
</tr>
<tr>
<td>Deaths</td>
<td>500</td>
</tr>
<tr>
<td>Homeless</td>
<td>220,000</td>
</tr>
<tr>
<td>Damage</td>
<td>Entire commercial and industrial centre destroyed. 100,000 homes unusable 52% of all housing units destroyed.</td>
</tr>
</tbody>
</table>

Diagram 5. Casualty and damage projection: Tokyo

<table>
<thead>
<tr>
<th>Earthquake and Fire of 1923</th>
<th>Estimated consequences of earthquake in near future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale of earthquake</td>
<td>8.3 (Richter)</td>
</tr>
<tr>
<td>Population</td>
<td>400,000</td>
</tr>
<tr>
<td>Deaths</td>
<td>140,000</td>
</tr>
<tr>
<td>Damage</td>
<td>40% of all Tokyo's buildings destroyed, burning out 7 sq. miles of the downtown area. Approx. $3 billion US. If the epicentre is under Tokyo, estimates suggest total destruction in 1.2 mile radius of epicentre, 50% destruction in 3.1 mile radius. Both figures assume no fire.</td>
</tr>
</tbody>
</table>

The factors that caused San Francisco and Tokyo to grow are many, but they may include the immediate surge of population that appears to follow disasters. Skopje, Managua, and more recently, Guatemala City have grown as a result of the sudden influx following their earthquakes. The reasons are obvious: reconstruction work and wages that are well in excess of those in rural areas. Currently, the rural peasants of Guatemala who earn no more than $2-$2.50 per day are moving in vast numbers to Guatemala City, where they can earn up to $8 a day. All the evidence would suggest that they will never return to the rural areas.

It is difficult to calculate the full extent of the havoc caused by disasters. The US Department of State estimated that between 1 July 1970 and 30 June 1971 over 51 disasters took place (none of which was man-made). These disasters affected 68,000,000 people and caused 500,000 deaths (68).

If disasters alone are considered, Professor Ambrasos estimated in 1971 that over 400,000 people had died since 1900, an average of about 14,000 per annum (5). If we take just one year, 1973, there were 20 major disasters, which killed 110,000 people, disrupted the lives of 225 million people and cost more than $500 million. Accurate statistics for disasters are extremely difficult to obtain, but we are now certainly witnessing a rapid escalation of casualties.

Then if we take one major disaster like the Guatemalan earthquake of February 1976, about 59,000 dwelling units were destroyed in Guatemala City (40% of the city's housing stock). In addition, 165,000 units were destroyed in rural areas (35% of the total number of houses in these areas).

In human terms, between 22,778 (the official figure) and 30,000 were killed in Guatemala, and 74,000-77,000 were injured. It has been estimated that 1,666,000 people were made homeless. This figure accounts for one-sixth of the total population of the country. In financial terms the World Bank has estimated the total reconstruction cost to be about $500 million. I have estimated this sum to account for about one-eighth of the current gross national product of the country (102). (In comparison, the Managua earthquake of 1972 caused damage assessed at one half the GNP (71).)

Perhaps the only way we can comprehend the scale of the Guatemalan tragedy is to make a comparison of what the damage percentage would imply if a comparable disaster had happened in Britain. Without changing the scale, the area of Guatemala affected by this earthquake is roughly a triangle, which would enclose Oxford to the west, Northampton to the north and London to the east. If one-sixth of Britain's population were homeless, this would amount to a higher total than the entire population of Greater London, approximately 3.3 million people.

In Guatemala one in every 232 people was killed. If this ratio of loss to total population was sustained in Britain, 241,000 would have been killed. Finally, in crude

29 The central area of Skopje, Yugoslavia, in 1975 — thirteen years after the earthquake
30 Centre of Managua three years after its earthquake

financial terms, a disaster on the Guatemalan scale in Britain would cause damage equivalent to £1,939 million (one-eighth of our GNP).

Since it is difficult to relate figures of this magnitude to anything tangible, it is worth saying that, at 1975 prices, the total projected cost for building Britain’s new city, Milton Keynes (for 250,000 people) was £1,000 million. Therefore, if a disaster affected Britain in the same ratio as that of Guatemala it would cause damage (in material terms) equivalent to the cost of building twelve cities — or developing Concorde twelve times over.

This is a rather long-drawn-out way of saying that the poorest countries are least able to afford their heavy losses, which in relative terms are enormous.

At present there are fifty to sixty developing countries which are characterised as very disaster prone. I have attempted to show this on Map 2 in Appendix B. Within these countries the annual damage from disasters far exceeds in absolute terms the external aid that they receive.

Precise statistics must wait for the world survey of disaster damage at present being undertaken by UNDRO. Already, however, we have some revealing statistics. As I have already said, it is significant that 95% of all disaster-related deaths occur in the developing countries. This percentage has to be seen against the fact that 66% of the world’s population are living in the developing world. It is apparent that disasters and the damage they cause are a greatly neglected factor which inhibits the economic growth of vulnerable countries (70).

One further aspect of the damage caused by disasters needs to be examined. This is disruption and the time needed for full recovery. On my visits to eight places that had been devastated by disasters, my overriding impression was that the recovery lags far behind the optimistic speeches that the politicians are wont to make, in which they promise a new city in five years (or whatever period will elapse before the next election). For example, Skopje was largely destroyed in 1963, and it received aid on a massive international scale, and also from within Yugoslavia. Yet despite this help Skopje is still unfinished. By the time completion comes there will be children fifteen years old, born after the earthquake of 1963 (38, 91). The reasons for such delays are not technological: they are legal, political and economic.

I recently returned to Managua, where three years earlier the centre of the city had been destroyed. Within these years massive progress has been made in the city, but it is still without a heart; the centre is a total ghost town (71). Such facts are unknown to the layman, whose newspaper carries a “disaster” story for only a few days.

We have seen in this section that vulnerability may be the result of harsh exploitation of the poor by the affluent, and study of these issues shows the extent to which man’s greed is a direct cause of death and injury. The exploitation relates particularly to land. A landowning family will resist all demands to release safe land for the houses of low-income families. The only solution here is land-reform and this is unlikely to happen without a revolutionary struggle (25, 42).

Within the relief and reconstruction phases we can detect similar abuses of power: corruption that may divert relief funds and impede reconstruction.

Sadly, these abuses occur in high and low places. As a contribution to the relief of Managua, the government of Colombia donated 100 houses and 12 school rooms. After a careful survey of the occupants of each house we found that every single unit was occupied by families or friends of the President and his wife or high-ranking army officers. Not a single unit had been given to a disaster victim. It was also significant that this housing was the monstrosity of all disaster aid housing and it was the only “normal” system that was allowed to be built within the city boundaries (37, 83).

I have attempted to look at the larger dimensions of disasters. First, casualties are increasing because of population growth and rapid urbanisation. Disasters cause massive damage when considered as a ratio of a country’s total population or wealth. The protracted time taken for recovery can cause local disruption, which could easily extend to twenty years after a major urban disaster. Finally, the picture is incomplete without reference to exploitation and corruption, inevitable bedfellows of so many disasters.

This all contributes to a vicious spiral of poverty, vulnerability and underdevelopment, an intertwining of high exploitation, high population and high casualties.
PART 2
from myth to reality

He bade me observe it, and I should always find, that the calamities of life were shared among the upper and lower part of mankind; but that the middle station had the fewest disasters.

Daniel Defoe: Robinson Crusoe

We have seen that the prime target of disasters is not the 'average' man; it is likely to be a poor family living in vulnerable conditions. The public image of disaster as a great leveller, striking families irrespective of social position, is just one of many myths. Poor media coverage has perpetuated a whole series of myths, and it is necessary at this point to look at the full range of misapprehensions and set them alongside the real situation.

Several important studies of these 'myths' have been made in the USA (77, 98, 99) and my observations confirm that they are also prevalent in Britain. This is understandable since we are subjected to similar pressures from the media. If the public hold incorrect views of these situations, it follows naturally that their attitudes will be coloured by them. This in turn may be the explanation for the decisions made in donor countries, which appear to be based on myths rather than reality.

At the time of writing this book, the province of Van in eastern Turkey has been devastated in the sixteenth major earthquake of 1976. In listening to various newscasts and scanning the press coverage, I have found abundant examples of these myths. One example will suffice. A BBC radio correspondent on 30 November (the seventh day after the disaster) reported as follows:

'A serious obstacle to relief efforts has been the presence of newly erected tents set amongst the ruins; this has prevented the entry of army bulldozers in their clearing operations.'

In reality the situation is probably the precise reverse of the commentator's view of the facts. The obstacle to rapid recovery is likely to be the bulldozer, not the tent (see myth No. D2), and the tent, sited within the ruined walls of the owner's house, is the first poignant step to recovery and ultimate reconstruction (see myth No. B4).

It is, therefore, of prime importance to provide facts in place of myths, and then to disseminate this information to as wide a public as possible. To support the claim to 'reality' in the following charts, I have cited published works as evidence: all numbers refer to the References listed alphabetically. I have discussed some of these points in Part I, and I shall return to others in Parts III and IV.
MYTH  

ASSUMED SITUATION  

(A) VULNERABILITY  

1. Disasters are caused by natural phenomena: earthquakes, floods, hurricanes etc.  

2. Disasters strike all social groups, and affect rich and poor countries alike (they are not resisters of persons).  

3. Vernacular housing is a response to local needs and is built to withstand hazards.  

4. Protection or disaster mitigation measures are too expensive for poor countries.  

(B) SOCIAL ATTITUDES  

1. The public will show signs of panic or will be dazed into a state of inactivity.  

2. Local organisations are likely to be ineffective and inadequate.  

3. Morale is likely to be low, with looting and other forms of deviant behaviour; a situation that rapidly deteriorates into chaos.  

4. People in a dazed condition will be passive, awaiting aid and assistance.  

5. Following the disaster, there will be acute shortages of food, blankets and medical supplies.  

REALITY  

ACTUAL SITUATION  

Disasters are caused by natural phenomena, when they strike a dangerous condition.  

On the contrary, they affect the rich and poor, in the poorest countries.  

It is built to withstand hazards only:  
1) when a disaster is frequent, and it is built to withstand hazards.  
2) when societies modify their techniques after a disaster has exposed the vulnerability of their housing.  

Some measures may be very costly (e.g. the Thames barrier), but correct siting and simple constructional measures may add to the overall cost of settlements.  

No evidence to support this belief.  

The evidence indicates the reverse.  

Again the reverse is likely to be true, except in droughts, famines and refugee camps.  

The reverse: the normal reaction being a highly motivated self-preservation instinct, enabling people to find solutions to their own problems.  

A variable situation, but in most contexts goods will be locally available (exceptions may include widespread droughts and extensive famines).  

EVIDENCE  

(See References)  

25, 40, 42, 66, 69, 80, 100.  

21, 22, 25, 39, 40, 41, 42, 69, 76, 77, 100.  

7, 8, 13, 33, 35, 39, 66, 72, 79, 80, 92.  

1, 2, 20, 32, 33, 35, 59, 66, 72, 80, 96.  

8, 19, 22, 24, 39, 41, 44, 51, 58, 60, 76, 77, 89, 90, 98, 99.  

22, 39, 41, 60, 65, 76, 77, 98, 99.  

39, 41, 76, 98, 99.  


37.  

33 A village near Trasaghis in Friuli, Italy, crushed by falling rock in the earthquake of May 1976.  

34 A family sorting through the rubble of their home in the San Martin Jilotepeque, Guatemala.  

35 Drawing by W. Russell Flint of panicking crowds attempting to escape from San Francisco in 1906.
### Myth vs. Reality for Shelters

<table>
<thead>
<tr>
<th>Assumed Situation</th>
<th>Actual Situation</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. After a disaster, people will eat unfamiliar food, from a desire to survive</td>
<td>The reverse: all nutritional evidence suggests that people behave more conservatively than usual.</td>
<td>19, 21, 60.</td>
</tr>
<tr>
<td>7. There are serious risks of epidemics, from bodies lying in the ruins.</td>
<td>No evidence of this risk; therefore no need to adopt measures such as ignition of ruins, which disrupt reconstruction processes by destroying building materials.</td>
<td>44, 60, 65.</td>
</tr>
</tbody>
</table>

#### Shelter Needs

1. There is a need for officials to provide large volumes of emergency accommodation for homeless families.

   - The reverse: most families appear to go to official shelters only when all other alternatives have failed.
   - Evidence: 19, 21, 23, 24, 25, 26, 37, 38, 40, 42, 65, 89, 98, 99.

2. There are no clear patterns of behaviour relative to shelter provision.

   - People have clear preferences, which normally follow this order:
     1) The homes of relatives or friends
     2) improvised shelters
     3) converted buildings — schools etc.
     4) official provision.
   - Evidence: 19, 21, 23, 24, 25, 26, 37, 38, 40, 42, 65, 89, 98, 99.

3. Compulsory evacuation is an effective policy.

   - The reverse. All evidence from World War II onwards indicates the failure of such policies.

4. Tents are a very effective form of provision.

   - They can be most useful, but evidence suggests under-use, and that they often arrive too late to serve their function of emergency shelter.
   - Evidence: 21, 24, 25, 26, 34, 36, 38, 39, 40, 41, 42, 90.

5. In areas of high exposure risk, shelter needs become matters of life and death.

   - Obviously this is a critical need, but there is no evidence of deaths or illness directly related to exposure-risks. The social mechanisms which exist in all societies to cope with everyday hazards still function after disasters.

6. Following a disaster people will be prepared to live in unfamiliar forms of housing.

   - Societies are adaptable, but a form of cultural rejection has occurred in many instances when unfamiliar shelters have been provided.

7. During the emergency period, people will be prepared to live in communal shelters.

   - The reverse: people tend to clutch to the family unit, and when facilities have been provided they have not been popular.
<table>
<thead>
<tr>
<th>MYTH</th>
<th>REALITY</th>
<th>EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) RECONSTRUCTION</td>
<td>1. Some form of temporary housing is needed prior to reconstruction.</td>
<td>Reconstruction, in the third world, usually starts immediately, and takes place irrespective of government plans for relocation etc.</td>
</tr>
<tr>
<td></td>
<td>2. Clearing rubble is a first priority once people are rescued.</td>
<td>Apart from clearing streets to provide access routes, the rubble is best left for recycling into new homes.</td>
</tr>
<tr>
<td></td>
<td>3. Crash reconstruction programmes by agencies and governments are a highly effective way of solving housing needs.</td>
<td>The reverse is true. An indigenous response will always be the most rapid and effective form of provision, particularly of temporarily unemployed people to build their own homes.</td>
</tr>
<tr>
<td></td>
<td>4. The ideal situation (in an area of high risk) is to relocate the community in a safe area.</td>
<td>In the few instances where communities have been relocated, the results have been unsatisfactory, particularly from social and economic standpoints.</td>
</tr>
<tr>
<td>(5) THE PROVISION OF AID</td>
<td>1. Aid is given in response to the needs of disaster victims.</td>
<td>This may be the case; or it may be given in response to perceived needs of the victims. Or it may be given to satisfy the needs of a relief agency or donor government.</td>
</tr>
<tr>
<td></td>
<td>2. A rapid recovery is dependent upon a rapid influx of aid.</td>
<td>Often the precise reverse: A large influx of aid may inhibit the recovery mechanisms, the worst example being the development of ‘dependency relationships’ where local initiative is swamped.</td>
</tr>
<tr>
<td></td>
<td>3. The major proportion of post-disaster housing is likely to come from donor sources.</td>
<td>No evidence. Normally donor provision from outside the country is unlikely to amount to more than 20% of the total.</td>
</tr>
</tbody>
</table>
PART 3

filling the gap

Food, drugs and first aid are naturally the first items needed by the stricken homeless, but surely architects are in the enviable position of being able to authoritatively advise and prod UNO or WHO or UNRRA (if it still exists) into providing instant housing capable of being parachuted into disaster areas at short notice . . .

Right here in the U.K. we have one of the most powerful and respected architectural institutions in the world, and we have some of the world's more public-spirited architects.

As members of RIBA it is the duty of British architects to demand of their institution that it should, in its century and a half of sleep, inaction perform just one so-easily-achieved shining deed by acting positively to encourage whatever acronymically-named international body with material advice to prepare NOW for future man-made or natural disasters by having to hand a supply of instant housing and the wherewithal for transporting it to the afflicted site.

Perhaps the RIBA might temporarily adopt the Donne-ish motto: Never send to know for whom the earth quakes; it quakes for thee.

The architect: editorial, March 1976

Three strategies

Having established the context of disasters and the realities of the various responses to them, I can now pursue the subject of shelter and housing needs.

It is important to emphasise at the outset that shelter must be considered as a process, not an object. A specific product may form a part of the process, but as the preference scale on myth no. C2 indicates, donor shelters are low in priority. It is also worth emphasising that the Western world is not to view solutions in material terms, while
1 Normal housing  Construction continues

Disaster

2 Normal housing  Gap filled with temporary shelter and temporary housing

Resumption of normal housing

Normal housing is interrupted by the disaster. Thus a gap is formed in normal housing construction, and a gap of living accommodation caused by the destruction. The gap is filled by the provision of temporary shelter and possibly temporary housing.

3 Normal housing  Gap filled with accelerated reconstruction

Resumption of normal housing

Normal housing is interrupted by the disaster. In this instance, however, the gap is filled by starting the reconstruction very early – thus preventing the need for temporary accommodation.

Diagram 6. Three strategies for shelter and housing following disasters

In the developing world they are sought in social terms. Dr. Fred Krieger, an architect working on hazard research at Massachusetts Institute of Technology, has suggested that there are three basic approaches to shelter following a disaster. These are shown in Diagram 6.

While one of these strategies may be followed alone, it is more likely that all three will be operating simultaneously.

Strategy 1 — Housing survival

We have already considered some of the issues relating to the first of these strategies: the provision of housing that withstands the hazard. This must become the clear objective for national governments, international bodies and relief agencies. But, always, there is a price to be paid for such security and that price is often political dynamite. In simple terms it implies land reform, to provide, within the price range of the poorest families, a safe, serviced plot of land, with security of tenure, in a location within reach of employment (not a three-hour walk from the urban centre). It also implies a variety of methods to modify traditional building techniques, where they are clearly vulnerable. It is instructive to watch present work in both Turkey and Guatemala, where this issue of retraining in building techniques is being taken very seriously.

A special ministry has been established in Turkey, the Ministry of Reconstruction and Resettlement, with the purpose of instigating preventative measures, as well as handling all relief activities. This measure is a response to the fact that Turkey is highly vulnerable to various forms of hazard – earthquakes, tsunamis (seismic waves, often called tidal waves), rock-falls, floods etc. However, the major threat is that of earthquakes and statistics obtained in 1965 show that 91.4% of the total surface area, and 95% of the entire population, are in earthquake zones.

The ministry has divided the entire country into zones with different degrees of risk (Diagram 7). This map was based on an analysis of past earthquakes, which showed that in Turkey an average of 1,223 people are killed and 7,526 buildings are destroyed annually (92).

As part of the policy of lessening risk, an analysis was carried out to ascertain the types of vernacular building that exist within the country, their distribution, and their vulnerability as to sitting and constructive form. Diagram 8 indicates the rough distribution of the various building types. In crude terms this diagram indicates the spread of those housing types within the major seismic zones of the country.

Of the five types of building indicated on Diagram 8, the frame structures B and W (built in areas with good supplies of timber) will probably be safe structures. However, categories A and S, adobe or stone masonry construction, will be vulnerable. If a comparison of Diagrams 7 and 8 is made, it becomes all too clear that when category A or B housing is found in the 1st and 2nd degree earthquake zone, the next likely disaster areas are indicated.

The ministry carefully surveys the country to determine these vulnerable settlements, and instigate mitigation measures. These may take the form of relocating vulnerable communities, or of
strengthening existing structures (9, 52). Clearly, either action presents tremendous social and economic obstacles, when it comes to dealing with existing vulnerable settlements or house types. It is far easier and cheaper to include safety measures in new settlements than to introduce them into existing ones. Methods of disseminating information on safe house construction include radio and TV programmes and comic books, which are also being used in Guatemala (32) (see Diagram 9).

One of the most disappointing aspects of the massive reconstruction effort in Guatemala has been the fact that virtually all the relief agencies (including the government reconstruction housing programmes) have placed their emphasis on building large numbers of houses. Twenty-two out of the twenty-four housing programmes appear to have ignored the opportunity the disaster presented to institute retraining procedures in safe construction (88).

Taking the example of the clever advertising copy of Christian Aid, ‘Buy a man a fish and you feed him for a day – train him how to fish and you feed him for life’, we can suggest: ‘Give a man a safe home and you have housed his family – but train him how to build his own safe house and you have housed his family, and very probably his children’s families, and his relatives and friends’.

Fred Cuny is directing a retraining programme in Guatemala, which has been instigated by Oxfam and World Neighbours (32, 72, 88).

It is unique in that its central purpose is not directly to build houses. It is to support local organisations, particularly co-operatives, and promote earthquake-proof construction techniques that use traditional materials and existing (though developed) construction skills. The result is that the traditional character of the houses is retained while the structure is made safe. The programme consists of the following activities:

- Salvage materials from destroyed or damaged homes.
- Mount an extensive educational programme. This has resulted in cloth wall charts and a series of simple ‘how-to-do-it’ manuals in a comic book format, which define safe construction techniques (see Diagram 9).
- Build a model house, using techniques (such as the introduction of timber and barbed wire bracing) that will ensure safety next time. When this model house has been built in a given village, it often forms the focus of further educational activity.
- The roofing, of corrugated zinc (locally called ‘amina’), is subsidised and is
distributed through local co-ops.
It is interesting that these Turkish and Guatemalan strategies are both putting reliance on a grassroots educational programme, in contrast to the often repeated injunctions for vulnerable countries to adopt planning controls, or instigate bye-laws to stop unsafe building in dangerous locations. Those who make lofty injunctions are often unaware of the almost total absence of planning controls in most countries of the third world, and the by-law concept is often unrealistic, particularly in rural areas with high levels of illiteracy. These countries usually lack the money and manpower to enforce such regulations (70).

Therefore, in aiming for the ideal strategy - housing that will survive the next hazard - the following points require emphasis:

1. Programmes can be instigated by capitalising on the visual impact of widespread damage, as in Guatemala.
2. Considerable emphasis should be placed on a grassroots form of response. Key individuals should be isolated within a vulnerable community - such as local builders, who can be taught safe techniques which they can then pass down the line.
3. It is necessary to question the philosophy being followed in Turkey of relocating vulnerable communities (92). Naturally, the objectives are praiseworthy, but it must be recognised that the immense social and economic disruption caused by such upheaval may constitute a minor disaster in itself. It is better to spell out the facts to a local community, provide an alternative site, and allow them to make the decision whether or not to move. If they decide to remain, then place reliance on the strengthening of houses.

Following the earthquake in eastern Turkey on 24 November 1976, a total of 8,267 families, almost 50,000 people, were made homeless. The Turkish government made an announcement six days after the disaster that money was being made available for people to move to the warmer climate of the Turkish Aegean coast. The families would then be able to purchase new plots of land and other necessities and build new homes. By day 9, the BBC reported that 4,000 out of the total 50,000 had accepted the offer; the remainder doggedly refused to move. On past evidence, the likelihood of even these 4,000 moving is very slender.

4. It is most encouraging that the international community has now come to realise that it is the small dwelling, not built by contractors, not built in accordance with any earthquake-resistant codes, that is killing people. Therefore major studies have been undertaken to see how small buildings can be designed to withstand the various hazards, and this problem must increasingly become one of the major concerns of engineers, seismologists and architects. The studies that have been undertaken on vulnerability and the small dwelling have been selectively listed in the References listed according to subject.

For some this chapter is in the realms of fantasy. Cynical readers will be pessimistic about disaster mitigation measures and historically they are correct when they say that human nature being what it is, it is most unlikely that people will bolt the stable doors prior to the horse bolting. I have said that this is the 'ideal' strategy and clearly it is the one to aim for, and in aiming for it, it is necessary to maintain a 'grape shoot' mentality. That is to say, by all means try to persuade governments to introduce planning controls, or by-law codes; this is one part of the grape shoot (70).

But probably far more important is the larger educational thrust which must take place at a grass roots level, simultaneously with the broad questions of national planning policies.

The issue presents a tremendous challenge to international agencies and their consultants, to relief agencies and their workers and to national governments and their officials. All these individuals are probably within one elevated social group. Can they understand the problems of a rural family whose house is vulnerable, a family who need answers to two simple questions - how and where can they build a safe home?

Sadly, if past experience is anything to go by, there has been neither the interest nor the will to make this needed effort to understand. And when it has been made by local co-ops or relief groups they have rarely had the answers available to these two pertinent questions.

Strategy 2 — Filling the gap

On Thursday 5 February 1976, I woke up and turned on the bedside radio. 'News is coming in,' the commentator said, 'of a major earthquake in Guatemala city!' By lunchtime satellite TV pictures were already appearing on our screens and the press had it on their front pages.

Two days later I was on a plane for Guatemala. The plane was full of pressmen, doctors, relief officials and volunteers. The
entire first-class section of the 747 Jumbo Jet had its seats taken out to make way for emergency supplies of medical goods and food. On our arrival in Guatemala, the airport was a scene of continuous activity: large jet transports unloading their relief supplies, reception tents for this or that agency, military command posts, and so on. One of my initial memories is of the wide variety of languages being spoken, and of the international diversity of the relief planes on the tarmac.

These events serve to underline certain basic propositions. First, we already live in McLuhan's 'Global Village', in an age of internationalism, with all the benefits and problems which this brings. Secondly, ours is an age of social awareness, and many of the officials and volunteers on the tarmac of Guatemala city airport were certainly there because of a genuine altruistic concern.

Thirdly, we have a unique capacity for fast action, and this has happened to us almost unawares, so that we take for granted our capacity to send a jet cargo 6,000 miles in half a day.

After a few hours in Guatemala I visited the US Agency for International Development (AID) director to try to obtain some reliable data on casualties and the extent of the damage. I was handed some sheets which were the helicopter pilot's completed reports on the rural areas (40). I asked if there were any aerial photographs yet and a few minutes later I was able to see some of the completed air survey material.

This intelligence had already been professionally analysed, and very accurate data were given on damage and casualties, and all this information was completed within about sixty hours of the disaster. This is clearly a technological achievement, and it suggests that we may already be far ahead of ourselves in a technological sense.

The problem here was what to do with the data: how to translate the flow of statistics into a tangible, logical response, in effect bringing these facts down to a human level. A galaxy of agencies are operating often in competition with each other, few having much idea where to focus their energy and resources. In Guatemala it was not until twenty-one days after the disaster that the first meeting of agencies was held to attempt to co-ordinate their shelter and housing programme; a sign that matters may be out of step (40). Our technological capacities may be highly sophisticated, the amount of money available may be enormous, and both may be available as a result of a massive social concern in 'donor' countries. But what is lacking is the knowledge of what is happening to the homeless families. We very rarely know their precise reactions and so we oversimplify their needs. Then there is confusion over the 'needs', of which there are actually three. First, the real needs of the homeless families, which may be very different from their wants. Secondly, there are the needs as we may perceive them — and these will certainly be coloured by our own prejudices. Thirdly, there are the needs of the donor government or agency. It is foolishness to pretend that these don't exist and don't exert their own subtle influence on the aid response.

Diagram 10 indicates the range of options that will probably exist during the early weeks following a major disaster. We have seen in myth No. 02 that there is a clear order of preference in the way the members of the affected population use the available shelter.

The eight categories a-h can be sub-divided in two ways:

First, into social and physical solutions. Items a and c (extended families and evacuation) are social solutions, while the remainder are forms of physical provision.

Secondly, the categories can be split into local ad-hoc response (for example squatter or improvised shelter) and donor provision, where help comes from external sources. These may be within the national government, or outside the country.

What unites these forces is that they are all concerned with filling the 'gap', even if they don't view the process as such.

Local ad-hoc response

The major force in relief and reconstruction is that of the families themselves. Because our primary source of data in these matters is the material put out by agencies, we may obtain a false impression that the agencies are the major force at work after a disaster. I have suggested (in myth No. E5) that the involvement of external agencies is unlikely
Diagram 10. Modes of shelter and housing provision

- Extended families (duration approx. 6-8 weeks)
- Utilisation of existing buildings (duration approx. 3-4 weeks)
- Government evacuation policy (duration approx. 6 months)
- Tents
- Emergency housing (duration indefinite)
- Squatter housing
- Permanent housing
- Move settlement to less vulnerable location

- Indigenous solutions
- Imported solutions
- Local skills, local materials
- Local skills, local materials, Western designs

- Individual units
- Multiple family units
- Used individually on own land
- Large refugee camps
- Laid out on regimented military lines
- Family clusters, informal layout

- New subdivision of existing villages and cities
- Refugee settlement centres

A 'night-time home' in Guatemala being taken down so that the mud can be used for day-time activities.
to amount to more than 20% of the total relief and reconstruction, the balance being
an ad-hoc local response together with the
response of the national government or local
authority. Toni Hagan has noted that in the
post-war situation in Bangladesh, out of a
total housing need of 1.5 million units, the
combined relief agencies managed to build a
total of 450,387 housing units between
1972 and 1973. He then goes on to note that
one million houses were probably rebuilt by
owner/builders during the same period
without any external assistance (51).

One of the overriding impressions of
Guatemala city during the first week after
the earthquake was of the thousands of
improvised shelters, throughout the affected
zones, and huddled in the city parks. It is
estimated that 50,000 of these simple
make-shift shelters were produced within the
first twenty-four hours (40).

The Managua disaster of December 1972
confirms this local ability to cope and resolve
shelter problems. In this city it would appear
that 250,000 people were homeless, and
owing to government policies of expelling
people at gun point from the ruins of their
homes they had no option other than to
leave the city. A census taken a month after
the earthquake indicated that no less than
90% had been absorbed by families and
friends. The census figures for just four of
the outlying towns indicated that no less
than 130,000 had moved in with friends or
relations in these towns. Seven weeks after
the earthquake a further census revealed
that 80,000 were still in their adopted
homes (36, 37, 67). The graph (Diagram 11)
contrasts the refugees in extended families
with those in a camp site in the same town,
Masaya, which is fifteen miles to the south
of Managua.

We cannot deduce from these examples
that a similar response will take place in other
situations. For example, the extended
family 'sponge' cannot function in the long-
term disasters such as the Sahel drought, for
the obvious reason that everyone is affected.

50 Existing buildings form a very valuable resource for housing for homeless families: a
converted convent in Trinidad, Bolivia.
Another context where it won't function is the refugee camps of Bangladesh or Bengal, where people have been uprooted from their environment. Perhaps, even in rural situations like the major Turkish earthquakes of 1975 and 1976, where there are self-sufficient villages with little outside contact, we would be wise not to expect such a local response to meet people's needs; and initial studies confirm this (24).

However, in urban areas, particularly where urbanisation has been rapid (and this applies to most cities in the developing world), there will exist strong rural links for most, if not all, families, and this is of great benefit after a disaster.

Donor provision: Rationale
To understand this fully, we have to recognise that relief agencies obtain massive press coverage in any major disaster and this is the only time they get free publicity. The first question on the interviewer's lips is: "What is Oxfam or CARE, or Save the Children doing?" Or at a governmental level, what is the British or the American government doing? The public expects, and often receives, a visible response from the relief agency, and we are all familiar with newsreel clips of large jets being loaded in the dead of night at some remote military airfield. News at Ten switches to another topic, and the public is satisfied that this or that agency is doing its job, and inevitably the donations flow in at a massive rate.

If we ask the question, "Is it necessary to send goods halfway round the world?" the answer has to be in two parts. In terms of shelter provision the answer is almost certainly, "No, it isn't" — at least as far as the needs of the homeless families are concerned. But the needs of the relief agency or government may result in an opposite response.

In addition to the problem of vested interests there is the problem, faced by all donor agencies, of the 'culture gap'; all too often they have entered a post-disaster situation with a blythe self-confidence which may be wholly misplaced. Dr. Schumacher has written about this process:

Astonishingly, the aid-givers simply assume that they have the appropriate knowledge to help the poor: they think they know and therefore rush straight into 'projects'. But what makes them think that they know how to bring help to destitute villages, when they have no such villages in their own countries? What makes them think that they can teach poor people how to use their labour power with virtually no capital, when the entire experience and education of these experts derives from societies where labour is secure and capital plentiful? (82).

The whole phenomenon of 'donor' provision of shelter is comparatively recent and I have found no evidence of emergency housing (other than tents) being given by
one country to another prior to World War II. Therefore, the provision of shelter can be seen as coinciding with the development of aid, rapid transportation, and the growing spirit of internationalism mentioned earlier, and also the continual losses in disaster casualties (39, 41).

**Donor provision: Western solutions**

In this situation there has been no shortage of ideas: having visited various relief agencies in Geneva and Washington I found that a familiar pattern was for the officials to say 'Emergency Housing', and walk over to a filing cabinet which virtually overturned as it was opened. The drawers were bulging with '57 varieties' of shelter types. The vast majority of these concepts mercifully have never left the drawing board or filing cabinet, but this seems no deterrent to the ingenuity and persistence of designers (11, 12, 32, 39, 41). The reason for this is perhaps that architects and industrial designers have seen this problem (wrongly) as relatively simple and well defined. And it uniquely combines many of the preoccupations of students and designers: social awareness; advanced technology; mobility and impermanence (54).

Some of the proposals have been bizarre in the extreme. Perhaps the crowning example is that of the Moss Air-drop Shelter, a project devised on the principle that a unit is 'jettisoned from an aircraft' and 'through the differing accelerations of the air-resistant membrane and the fast descent payload, is opened to its stable position in the air, landing upright and ready for immediate use' (32).

A measure of the public interest in such ideas can be gauged from the statement about Moss in *Time* magazine:

But Moss the tentmaker will not be fully satisfied until someone buys his favourite idea—a ready-tested shelter that can be rushed to earthquake, or other disaster-stricken areas. Carried over the site by helicopter and released in mid-air it opens like a parachute and drops softly to earth, ready for immediate occupancy (86).

Perhaps one issue that Mr. Moss has still to consider is how to give his helicopter pilots a crash course in town planning! Michael Mánzies comments on this...

... prepossessing western technologists have with devising 'cunning technological packages' labelled 'post-disaster emergency housing' which, far from being installed in any disaster situation, reach their zenith within the pages of the ubiquitous 'glossy' monthly magazines (63).
UNESCO and the International Union of Architects chose Emergency Shelter as the subject of their student competition timed to coincide with their Twelfth Congress held in Madrid in July 1975. In the absence of any guidance to competitors on sensible and realistic criteria, this inevitably produced a vast array of clever but (for reasons to emerge later) largely irrelevant ideas (54).

Some fairly short-lived attempts have been made to provide 'universal' donor systems of emergency shelter. Perhaps the two that come immediately to mind are the West German Red Cross/Bayer polyurethane igloos (over 1,400 have been produced for use in Peru, Nicaragua and Turkey) (11, 12) and the Oxfam polyurethane hexagonal igloos, first used in Lice, Turkey, where a total of 453 units were used.

I have gone into some detail elsewhere on both the origin and performance of these systems (36, 37, 39, 41). In addition, Jon Cavanagh made a detailed study of the use of the Oxfam units in Lice (24), Paul and Charlotte Thompson recently examined those in Peru (90), and a team from the School of Architecture in Stockholm has made a study of the domes in Gediz, Turkey (84).

There have been many criticisms of these and similar products, and this may be the reason that both systems have now been abandoned (29). These criticisms include: Cultural unacceptability of alien forms of housing (see Myths Nos. 96 and 98). It must be said, however, that some of the igloos in Peru, Nicaragua, Turkey and Lice are still being lived in very happily, a fact that tells us something of the adaptability of societies.

Timing: This is often wrong, since the shelters have tended to arrive too late to fulfill their role of filling a gap. For example, in Peru the first units were occupied 60 days after the disaster (39), while in Managua the delay went up to 148 days (36). The Oxfam units took a total of 60 days to reach Turkey in 1975 (24).

Fire risk. Adrian Greeman has questioned
whether a relief agency has any business to subject disaster victims to high fire risk in the igloos. He writes:

The foam ignites easily, burns quickly and gives off lethal cyanide fumes. Residents are being warned not to have open fires near the huts...advanced technology brings advanced problems: should charities suspend the safety standards of the advanced countries?

(49)

Cost. When transport costs and development costs are added, it becomes apparent that these igloos cost as much a square metre as fully serviced permanent housing. (And in Lice, permanent housing was in position prior to these 'emergency' houses (24.)

Work. The shelters generated little or no local employment — a vital need in any post-disaster situation (8).

Donor provision. Low-technology solutions

I have written at length on these high-

technology solutions. However, there have been donor systems which have not relied on advanced technology — and in general these have been more effective. The reasons for this are that housing using low technology is more likely to come within the price range of disaster victims, it is probably better suited to local cultural patterns and climate, and it will probably generate local employment.

One of the most significant developments
in low-technology shelters is the work being undertaken at Carnegie-Mellon University, under the direction of Volker Hartkopf and Charles Goodspeed (20). Working with Fred Cuny, this team has developed a proposal that relies on indigenous materials and indigenous building skills. But the expertise of advanced technology has clearly been necessary to devise their 'A' frame structure, which withstands cyclone force winds. (The term 'A' frame derives from the form of structure, as shown in the photograph.) This method, now being used in Bangladesh, would seem to be a model approach. It clearly results from a careful analysis of an existing situation. The research has included a study of local cultural, economic and climatic factors, as well as a study of the performance of local vernacular housing. However, an ultimate test of any donor system is whether it is adopted (perhaps with local modification) by the families building their own homes. And early reports from Bangladesh would indicate that this system, with all its qualities, has had little impact on new construction approaches (20, 39, 41).

Another donor 'system', if we can call it that, has been the use of 'lamina' or of corrugated iron or zinc sheet. In Guatemala, the bulk purchase of this material has shown itself to be a very effective policy. Oxfam and World Neighbours have broken all records over the amount they have spent on this product. By July 1976, five months after the earthquake, they had spent £854,000 on this metal roofing, the largest financial allocation in Oxfam's history (72).

This lamina has many obvious advantages over total systems of temporary shelter in that it can be used initially for shelter - set over a few sticks or on an 'A' frame house - and then re-used for a more permanent house.

Donor provision: Tents

But the most typical low-technology donor product is clearly the tent, and for thousands of years it has probably been the basic form of emergency shelter. Tents also constitute one of the few types of mass shelter that are stockpiled. AID keep stockpiles in various key parts throughout the world, Europe, Africa, Asia and Latin America. These stockpiles contain up to 10,000 frame tents. The Red Crescent in Turkey and Iran also stockpile bulk supplies of up to 20,000 ready for use. These are manufactured by refugees or one disaster, ready for the next one.

One significant problem is the rapidly rising cost of tents and their weight in transit, and for this reason it is hoped that the plastic, woven polythene tents being developed specifically for post-disaster use by a Japanese firm, Fujimori Kogyo Co. Ltd., will be a success (47). These tents were developed to a specification worked out by Jurg Vittini of the League of Red Cross Societies (95). Thus far they have been used in South East Asia - after floods and earthquakes in the Philippines, as well as Vietnam, Laos and Cambodia. However, as yet no reports have been provided on their performance.

The various reports on the layout of refugee camps by Fred Cuny are of considerable interest since they represent the only attempt, to my knowledge, of town planners applying their particular skills to the problems of camp layouts (30). The layout that Cuny worked out for El Coyotepe camp in Nicaragua produced a humane environment in sharp contrast to the regimented military camps (31). This resulted in far higher occupancy figures. The basic principles were the use of family clusters, localised cooking and sanitation units.

The obvious problems of tents are high winds and extremes of heat and cold. Another problem is that the homeless often bring scraps of furniture with them, which can easily puncture the fabric. It is also very surprising that agencies with the experience of AID stockpile American 'vacation-style' tents - although they have recently started producing a more sturdy model. The punishment from climate, intense use for a
period of three to nine months and furniture damage, makes many tents most unsuitable for post-disaster shelter. This is the reason why agencies like Oxfam use only heavy-duty tents. Perhaps the unique advantages of tents are their 'built-in obsolescence', the fact that they can be erected within hours, and their relative lightness and compactness for bulk transit.

One rather surprising realisation is that tents are grossly undervalued after disasters. In Managua, the US army 'after action' report puts matters with military precision:

December 22 earthquake
December 29 200 tents erected to date
89 tents occupied

January 2 242 tents erected to date
161 tents occupied
32 tents used for administration purposes (93).

Professor Quarantelli of the Disaster Research Centre at Ohio University told me that the great blessing of tents is that there are always plenty of spaces, and that is where the relief officials will be staying!

There would certainly have been plenty of space for a convention of relief officials in the tents of San Martin, in Guatemala. The army set up 3,000 tents that the German government had donated. After two weeks seven of these were occupied, and this was in spite of threats that the army would force
people out of the ruins into the tents at gun-point (25). The reasons for the lack of use are not hard to find. As with so many disasters, the residents of San Martin needed to be near their animals and household belongings and a camp site on the outskirts of town is not suitable for either.

At the time of writing, a massive relief operation is in progress in Turkey following the earthquake of 24 November 1976. Of all the major disasters of the previous five years, this poses some of the most critical shelter problems, in view of winter exposure dangers, with temperatures at night descending to -11°C. Many of the tents were far too flimsy for these conditions, and the authorities requested polar tents with internal heating systems. The US government responded by sending a total of 1,120 of these tents which arrived in the affected area within forty-eight hours. By the tenth day it was estimated that 10,000 winter duty tents had arrived at the airport in the town of Van, although a careful census of tents on 17 December indicated that 6,467 had been delivered.

The question that was in the mind of John James, the Guardian reporter, on Saturday 4 December (day 10) was what became of these tents — he writes:

In a visit to the worst-hit settlements of Muradiye and Calderan — I did not see one such tent being occupied by a homeless family. Plenty of them had been erected, but these were either unoccupied, or under Turkish army guard, or else occupied by the Turkish troops.

James then visited a supply depot:

A destitute crowd was pressing around the entrance to the dump, calling for food and tents. Soldiers were keeping them back, and an officer told them to be patient, that their demands would be met village by village. But at the other side of the dump, screened from the crowd by trucks and piles of supplies, three comparatively well dressed men were helping themselves while the soldiers looked on.

The thieves are recorded for posterity on TV films which were broadcast over British networks. Against mounting international pressure, the Turkish authorities issued statements to contradict such reports, and two men were taken into custody on theft charges on day 13 in the town of Van. On day 14 the Turkish premier had to answer opposition questions in parliament. He rejected suggestions of corruption as "exaggerated rumours".

I have dwelt on this at length to show something of the problem when a highly sought-after, highly expensive relief object (in this case a polar tent costing up to $600) arrives in a disaster situation. It may well be the case that the cash value on the black market of such an object would be far higher than a man's annual wages — and almost certainly far higher than the purchase price of a peasant house built out of local materials.

The situation in eastern Turkey may well yield very vital evidence as to what is needed in conditions of extreme exposure. The technique used by armies all over the world in cold conditions of digging a tent into the ground to get ground warmth and wind protection does not appear to have been adopted, or so the press photographer would indicate. (See Diagram 13.)

There have been many proposals for the use of inflatable structures, or large marquee tents, which can be subdivided internally into small cubicles for individual families. Although there are obvious cost benefits in such proposals, there remains the apparent dislike of families for multi-family units (see myth No. 27). An example of this can be seen in Calderan, eastern Turkey, where forty twenty-person tents had been erected by day 10, and yet they were totally unoccupied.

Donor provision: Summary of external sources
I must summarise. Of all the myths in Part II, probably the most significant is C1, the popular misconception that there is a gap waiting to be filled by external sources. With the possible exception of famine, refugee camps and war, we can confidently state that local initiative is well able to fill this shelter gap. The particular problem of areas of high exposure risk may well be clarified when full evidence emerges from the Turkish
earthquake of November 1976; but it is worth restating that we have not as yet found any evidence of deaths from exposure following a natural disaster.

The fact that a western product is almost certainly not required (and this may even include the supply of tents) is a matter that needs to be communicated to the decision makers of relief agencies and governments. It also has to be stated to designers and to manufacturers who may be tempted to get spin-off publicity.

There are four questions that donor governments or relief agencies should ask of any housing or shelter product that they consider sending to a disaster zone: How quickly will it be occupied? (If it is beyond a week, it will be probably too slow.) How much work will construction generate? (This is a valid question even with an emergency shelter programme.) How 'universal' is it? (Will it be rejected on cultural grounds like some of the donor systems in the refugee camps of Bangladesh?) How does it stand up to rough development and transit costs to materials and labour, and then compare it with what this currency could purchase locally?

If, as we must suspect, donor products of most kinds relate more to the needs of manufacturers and agencies in donor countries than to the local needs in affected zones, then officials should think very hard on those issues. And the money that is used to go on goods for the long flight round the world can be used instead by experienced officials to purchase badly needed materials in nearby towns and neighbouring countries to affected areas. This was how Oxfam purchased tents in Salvador, for Guatemala, and it is a model pattern for donor provision, an excellent 'gap filler' (72).

The problem of shelter will probably continue to fascinate designers and students indefinitely; but for any significant development to be made, they must begin to recognise that this role is one of support or partnership with the people in question. This is impossible to achieve without close contact with the vulnerable population. Such contact would render obsolete the clever ideas worked out in the comfortable drawing offices of London and New York. Fred Cuny has summarised three priorities:

1. Designers must work with, instead of designing for, the people.
2. Any designer trying to introduce change must begin with what the people already have; that means not only the shape, size etc., of the structure itself, but also the indigenous materials, skills and other resources available in the 'normal housing process'.
3. The whole idea of developing housing cannot be divorced from the entire development approach. It makes no difference if the house is earthquake resistant if the person hasn't made the choice himself to participate and accept what he is being presented with.

Any real understanding of donor provision must recognise that both the giver and the receiver needs to be satisfied. And as more evidence comes to light it becomes, very clear that disaster aid is part of the international aid market. Both relief agencies and donor governments have mixed motives. A recent example of this emerged after the earthquake in the Philippines of 16 August 1976, when 8,000 died and an estimated $100 million damage was sustained. The New York Times carried a report that the US Embassy in Manila had made contact with the government of the Philippines to see if a rapid agreement could be reached on American air bases; if so there would be no obstacle to the flow of aid to the 35,000 homeless families.

It is this type of report and the vast inappropriateness of perhaps 90% of all donor shelter provision that encourages us to speculate whether in most societies would not do better to follow the example of Mexico, the Philippines and China. These countries have decided that donor provision is likely to create more problems than it solves. Future studies must consider the success or failure of their unaided relief and rehabilitation procedures.

Donor provision: National governments
We have seen from the section on myths that we are prone to exaggerate the importance of the donor role, and in turn to minimise the role of national governments. Clearly they have the potential to fulfil the major role in the immediate relief phase, and also in the reconstruction period. Their aid may be administered by national emergency committees, or national reconstruction committees, as in the case of Skopje and Guatemala. Or administration may take place at a local level, as in Friulli, Italy. In this instance every village has its own resources, and its own emergency administration.

One very effective procedure for governments to follow is to use existing facilities for shelter provision - schools, churches, all public buildings. Naturally, they can be used for only a very short time, but this may be all that is needed to fill the gap, since the gap is likely to be only a few days pending the start of reconstruction activity. The resources of existing buildings is immensely valuable, and for this reason all public buildings in vulnerable situations should be built to high factors of safety.

Another action governments are often tempted to pursue is that of evacuating all people not specifically involved with search, rescue or relief activities. Of all procedures, the results of this can be confidently predicted. Studies of wartime London have shown that at any one time more 'evacuated' children were returning to London than were being dispatched out of the city (after the first great evacuation) (27).

In Skopje 150,000 left the city within the first three weeks. However, families did not being split up and virtually all had returned within four months (38, 211). In more recent times the classic evacuation is that of Darwin, Australia. At the time of Cyclone Tracy, the population of Darwin was 47,000. Within six days of the disaster 36,000 had been evacuated to towns at least 1,700 miles from the city. The remaining 11,000 stayed behind to commence reconstruction work. By 15 March, 10 weeks after the cyclone, the population had risen to 27,500 and by September, 9 months after the cyclone, it was 38,000 (50, 97).

The twin desires - to return to one's home, and to remain with one's family - appear to be so powerful, particularly in periods of stress, that people will tolerate any degree of discomfort to achieve them. Once again, there is a conflict, and the obvious benefit of having all non-essential personnel out of the area has to be set against the socio-economic factors. Enforced evacuation measures will create.

In this section, I have looked at the various responses of Strategy 2. (See Diagram 6.)

The major gap fillers are local people often acting unpaid. I have looked at the role of donors and considered the real or imagined gap which they try to fill. I have only seen the potential for local governmental provision.

Strategy 3 — Accelerated reconstruction

If it is not possible to achieve strategy 1 (the continuation of housing through the disaster)
(see Diagram 6), then by far the next best strategy will be to achieve rapid reconstruction (strategy 3). This will again close the gap, but in a far more effective way than the two-stage approach of strategy 2, which is very wasteful of money, scarce materials and of manpower.

In considering third world housing it is important to note certain images which colour our thinking. The distinction which we draw in the west between, for instance, the semi-detached home and the summer beach hut may too easily spill over into our consideration of permanent and temporary housing in a totally different context. Most housing for the people who are homeless after a disaster will be 'temporary' by our standards. It is not unusual for a simple house in Asia or Latin America to be built in a couple of days at a fraction of the cost that some relief officials consider 'proper' for a permanent home.

The relationship between speed of construction and an economic situation can be seen in Diagram 14. Very approximately this graph shows a vital relationship that national wealth to the construction time of building. Obvious facts emerge — in a poor country house building is very rapid, and can be thought of in terms of days, whilst in the 'developed' world it is a matter of months. The dotted line on the time co-ordinate represents the approximate extent of the 'emergency period'. It follows therefore that if the construction time of a normal low-cost home falls within this line, then clearly permanent reconstruction and emergency shelter are two names for the same house.

Another myth that colours our thinking is to imagine housing as a static, complete entity, when in actual fact it is always evolutionary. I am grateful to Fred Cuny for his comments on this process in the light of his Guatemalan experience:

The houses start off with a very small structure of usually only one room, used as sleeping quarters for the entire family. Over a period of time, usually a long number of years, the house acquires more rooms and eventually becomes a formal home. The implications of this are that when any type of structure is introduced, be it an emergency shelter, a temporary structure or a long-term structure, it must from the very beginning be very strong because people
its ultimate state in the evolutionary process.

One of the overriding impressions of the first six days after the Guatemala earthquake was of feverish reconstruction activity. In any group of houses, there would be groups at work: straightening corrugated iron sheets, rebuilding frames and so on. And it is true to say that unless events occur to prevent it, reconstruction will take place like a reflex.

The factors that can inhibit or prevent the process taking place are: the enforced evacuation of a destroyed city (as in Managua); the burning of rubble (a vital rebuilding resource); or the acute uncertainty engendered when local politicians make early pronouncements about the possibility of moving the settlement to some new and safer location. (A favourite precaution, particularly when politicians own land in the favoured site!)

In Nicaragua, a local development organisation, FUNDE, and also CARITAS built (or donated materials for owners to build) their own houses) a very extensive number of houses long before the 'temporary shelters' were constructed. This was done by the process of infiltration, where units were built in small areas, back gardens or odd scraps of ground, thus obviating the need for a lot of bureaucratic approvals (36).

A more recent example of this rapid house-building process is that of Lidz, where 1,500 prefabricated (permanent) houses were completed by the Lithuanian government in 1987, just eight weeks after the earthquake. This is undoubtedly the fastest building programme of any recent disaster, but the speed was highlighted by the fact that the Oxfam 'temporary' or emergency shelters were being constructed after these units were complete (24).

The obvious conclusion is to concentrate all resources on a rapid housing recovery with permanent housing, while relying on tents, existing buildings and the extended family 'sponge' to hold the population during the reconstruction period. The major concerns of such a rapid housing programme will be: finding suitable future disasters; the use of local materials where available; and the use of labour-intensive rather than capital-intensive systems, thus providing work for the homeless people. George Atkinson, in his study of reconstruction after disaster, comments on the need to mobilise local labour:

To begin with, the organisation of relief falls for special bodies and outside agencies. But soon, very soon if possible, all who are able-bodied should participate, increasingly in their normal employment. Too often it happens, especially in poorer countries, that large numbers of able-bodied men stand idle, living on relief while outsiders do the reconstruction. Not only is such a happening demoralising to the able-bodied, but it wastes much needed resources (8).

It is worth emphasizing that the word 'temporary', when applied to housing, is a myth; that the 'temporary' prefabs of World War I and II are still being lived in in Britain is testimony to this fact (62). A further example was recently recorded by Larry Baldassarre (10). He describes the plight of 45,000 people still living in appalling conditions in 'temporary' barrack-like shelters, Quonset huts, following the 1968 Sicilian earthquake. In this instance there has been an "out of sight, out of mind" attitude, when the temporary shelter has removed all official will properly to house these earthquake victims.

In contrast, the Italian authorities have been more active following the Friulli earthquake in northern Italy in 1976. A decision has been taken to rebuild all the historic towns and villages as they were prior to the disaster. In consequence each house will be rebuilt over a five-year period by the government. Already elaborate steps have been taken to shore up historic façades, number the bricks of arches that will have to be temporarily demolished and so on; although, tragically, many of these shore-up façades collapsed in the further earthquake of September 1976. In order to accommodate the population during this period of reconstruction, the government assigned architects and planners to each community. They then drew up plans for 'temporary housing'. This provision is for
centrally heated, fully serviced prefabricated units. They cost on average between £5,000 and £8,000 per house unit. Naturally, the question which will be asked repeatedly over the next few years is, 'can any government afford this type of two-stage policy?' The officials I talked to in Friuli explained that they realised that the 'temporary' homes would stay for good but they had in mind the tourist development of the neighbourhood, and this would be the major use of the homes once their temporary occupants returned to their original houses.

One very fascinating aspect of the policy being pursued in Friuli is its relationship to the Sicilian situation discussed by Baldassaro (10). Following a very fervent press campaign which highlighted the details of the Sicilian fiasco, the government (with a general election looming) decided to embark on this highly expensive two-stage operation, which may be doomed to failure.

Professor Otto Koenigberger has succinctly summarised the relationship of relief to reconstruction and of indigenous response to official provision.

There are really four principles. 1. Relief is the enemy of reconstruction. Therefore minimise relief. 2. Even the minimal relief operation stretches the public sector executive capacity to the utmost. Therefore avoid paternalism. The public sector must not touch any jobs the people can do themselves. The last thing the public sector should do is the construction of houses, of any kind. 3. Under the immediate impact of a disaster people are ready to change long-standing methods and customs. Therefore act quickly to introduce improved construction methods and bye-laws. 4. Quick action means planned action. It is a good starting making plans after the event. The plans must be ready beforehand, including four vital checklists. (a) Emergency legislation, particularly with regard to the use and occupation of land. (b) New and extended city layouts, that's for re-modelling as well as for growth. (c) New construction systems and bye-laws. (d) Most important, a role casting plan, because the disaster is the curtain raiser to a big drama and the action will not take place unless every role in the subsequent action is filled by an actor (39).
PART 4
historical perspectives

And God saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually... And God said unto Noah... 'Make thee an ark of gopher wood; rooms shalt thou make in the ark, and shalt pitch it within and without with pitch'... In the six hundredth year of Noah's life, in the second month, the seventeenth day of the month, the same day were all the fountains of the great deep broken up, and the windows of heaven were opened. And the rain was upon the earth forty days and forty nights. In the selfsame day entered Noah, and Shem, and Ham, and Japheth, the sons of Noah, and Noah's wife, and the three wives of his sons with him, into the ark... And the waters prevailed, and were increased greatly upon the earth; and the ark went upon the face of the waters.

Genesis vi, vii

When Noah and his family climbed into the Ark, they were entering a disaster shelter of a rather special kind, built as a piece of meticulous pre-disaster planning. This must be one of the earliest recorded examples of shelter provision against disaster, in this case an 'act of God' in a very literal sense.

Within this section I want to look at various disasters in history, drawing wherever possible on primary sources of information or, if these are unavailable, on secondary records of these events. The evidence of shelter provision in history is very fragmentary and slender, as will be seen. In my researches I have found only one reference prior to the Great Fire of London of 1666. This is a very brief reference which states that Amīr Khusrāvī Dihlavī Sas-I Khusrāvī, a poet who lived in Persia between 1253 and 1325, lived in a tent following the collapse of his house in the rainy season.

Although the central theme of this chapter is that of shelter and housing provision, I have deliberately strayed into peripheral areas where there are items of interest. For example, the subjects of aid provision, public morale and reconstruction are closely interrelated, and I have not hesitated to compare previous patterns of human behaviour with current attitudes.
Famine in Judea c.AD 41–54

In addition to the account of the Flood, there is another story of a disaster in the Bible, with an early example of aid or 'donor provision'. This is the account in Acts 11:27 of the sending of aid from the church at Antioch to Jerusalem, where a famine had been prophesied:

Agabus stood up and foretold by the Spirit that there would be a great famine all over the world; and this took place in the days of Claudius. And the disciples determined everyone according to his ability, to send relief to the brethren who lived in Judea; and they did so, sending it to the elders by the hand of Barnabas and Saul.

Eruption of Vesuvius AD 79

In the same era the Roman historian Pliny wrote a meticulous description of this eruption. He describes the relief efforts of his uncle, in a letter he wrote to Cornelius Tacitus:

He gave orders for the warships to be launched and went on board himself with the intention of bringing help to many more people... he hurried to the place where everyone else was hastily leaving, steering his course straight for the danger zone. He was entirely fearless, describing each new movement and phase of the portent to be noted down exactly as he observed them. Ashes were already falling, hotter and thicker as the ships drew near, followed by bits of pumice and blackened stones, charred and cracked by the flames: then suddenly they were in shallow waters, and the shore was blocked by the debris from the mountain (79).

Pliny goes on to describe the situation on the mountain slopes:

My uncle tried to allay the fears of his companions by repeatedly declaring that these were nothing but bonfires left by the peasants in their terror, or else empty houses on fire in the districts they had abandoned (75).

The family within the house were faced with a dilemma whether to remain indoors or to go into the open. But with ashes filling the courtyard they feared they would be trapped within the building — they were almost literally between the devil and the deep blue sea.

Outside, on the other hand, there was a danger from falling pumice-stones, even though these were light and porous; however, after comparing the risks they chose the latter... As a protection against falling objects they put pillows on their heads tied down with cloths.

This is a 2000-year-old example of resourcefulness when a disaster occurs: it is also a very vivid picture of the relief efforts that were made, although the account is tantalizingly brief and we are left in doubt as to the success of the relief mission.

Lincoln earthquake 1185

Holinhsh, the Tudor chronicler, wrote:

In 1185, on the Monday in the week before Easter, a great earthquake through all the parts of the land; such... as... had not been heard of in England since the beginning of the world... Stone houses were overthrown and the great church of Lincoln rent from the top downwards (26).

This is the sum total of knowledge of the earthquake. It took about two hundred years to rebuild the cathedral, which was infinitely more auspicious than its predecessor.

Great Plague of London 1665

Only one aspect of this disaster concerns us here. This is the massive evacuation that took place, on such a scale as to result in a capital city that was virtually deserted (28).

Daniel Defoe was only five years old at the time, but he later used his memory and interviews to set down a contemporary account of the disaster. He records the dilemma of a London shopkeeper.

I now began to consider seriously with myself concerning my own case, and how I should dispose of myself; that is to say, whether I should resolve to stay in London or shut up my house and flee, as many of my neighbours did... I had two important things before me; the one was the carrying on my business and shop... in which was embarked all my effects in the world; and the other was the preservation of my life in so dismal a calamity as I saw apparently was coming upon the whole city (43).
Great Fire of London 1666

We can be grateful that Samuel Pepys and John Evelyn kept diaries when the Great Fire of London took place. Inevitably, they were preoccupied with the dramatic events of the first week in September 1666. However, the diaries give fascinating glimpses of the plight of the homeless families. John Evelyn wrote:

Here we saw the Thames cover'd with goods floating, all the barges and boats laden with what some had time and courage to save, as, on the other, the carts, &c., carrying out to the fields, which for many miles were strew'd with moveables of all sorts, and tents erecting to shelter both people and what goods they could get away (45).

Many thousands now have nowhere to lay their heads and the fields are the only receptacles which they can find for themselves and their goods; most of the late inhabitants of London lie all night in the open air, with no other canopy over them, but that of the Heavens (46).

Evelyn believed that there were over 200,000 refugees dispersed upon the fields of Highgate and Islington, with the majority in Moorfields: 'People of all ranks and degrees dispers'd, and lying along by heapes of what they could save...' (46).

Amazingly only four people were killed, while those made homeless numbered about 100,000 (one in six of London's population at that time). Careful surveys were carried out of the damage, and it was found that 13,200 houses were destroyed in an area of 436 acres. The estimated cost of rebuilding these homes was calculated at £3.9 million. This sum is contained within the total £20.7 million estimated as the cost of rebuilding the destroyed areas, but this estimate included £2 million for rebuilding St. Paul's Cathedral (52, 73, 79).

Our knowledge of what happened to the ruined buildings is much greater than our
understanding of what happened to the refugees. We do have a few facts. King Charles rode out to Moorfields to address the homeless. He promised them £500 worth of bread and he also provided tents for them, and the City of London gave permission for temporary building in the open spaces north of the City walls. Three days after the fire broke out a royal proclamation ordered all the authorities in neighbouring parishes to provide lodgings for the derelicts. The proclamation required that all towns and cities should ‘without any contradiction receive the said distressed persons and permit them the free exercise of their mutual trade’. We know that traders set up work in Ipswich and Oxford as a result of this proclamation (79).

My study is concerned with immediate relief, and not primarily with reconstruction issues. But it is worth blurring the distinction to note in the wake of the Great Fire a whole series of post-disaster characteristics, patterns that reappear in subsequent catastrophes in major urban centres or capital cities (28, 79).

1. A vulnerable condition was the basic cause of the disaster. London was a mass of very narrow streets of tall wooden houses all highly vulnerable to fire, and the flames spread quickly.

2. The refugees living in improvised homes (tents, shacks, etc.) were gradually absorbed by those whose homes had survived. This was encouraged by royal proclamations.

3. Bold, near-Utopian plans were produced. (Wren’s first plan was completed within fourteen days, but Evelyn had beaten him by three days with his proposals!) These plans were for wide streets and long vistas, in sharp contrast to the higgledy-piggledy nature of the old City. But as so often in subsequent centuries, expedience, money and private interests triumphed over the bold dreams of innovators.

4. I have already mentioned (see Diagram 2) that bye-laws were introduced after the Fire to prevent the next disaster — while the charred City was still smoking. Since there has not been a similar disaster in the subsequent 300 years, we can congratulate the City fathers on their foresight!

The reconstruction after the Fire is a further example of radical change being triggered off by a catastrophe. It is a reminder that when officials have to contend with public uproar on top of financial loss, conditions are ripe for either reform or repression. Mercifully for London the former resulted.

Lisbon earthquake 1755

At 10 a.m. on 1 November 1755 Lisbon (perhaps the most prosperous European capital of the eighteenth century) was ravaged by a massive earthquake. This created total havoc, widespread loss of life and extensive fires within the city. Just twenty minutes later, seismic sea waves or tsunami engulfed the ruined city, causing further damage and casualties. Perhaps as many as 60,000 people died in the cataclysm, and it became the source of widespread philosophical debate throughout Europe (56).

This event, coupled with the earthquake that had devastated Lima, Peru in 1746, had a profound effect on Voltaire, and three years after the Lisbon tragedy he wrote his very witty comedy Candide, a novel dealing with the problems of evil and human suffering posed by such events as earthquakes.

The earthquake appears to have been a ‘classique’ rather like the Guatemala disaster in that the casualties were almost without exception from the poorer sections of Lisbon society, with just two deaths from the nobility.

The relief operation was handled largely by local priests and nuns, and it was carefully documented by contemporary historians. Antonio Pereira de Piguemedo described the form of improvised shelter:

The general desire was to get out of buildings into tents or huts, and to sleep in the garden rather than indoors, even if one’s house still stood safe and sound, and for this reason the great camps on the high and open places round the city...

74 Lisbon rebuilt after 1755 earthquake.

78 Eighteenth-century engraving of the destruction of Lisbon.

79 Lisbon earthquake 1755.

T.D. Kendrick, from whose book the above account is taken, comments on the relief operation:

A particularly difficult problem was the control of refugees from the city. They were finding their way all over the country, and among them were thieves, escaped prisoners and rascals of all kinds, in addition to a large number of able-bodied craftsmen and labourers who were needed in Lisbon. A system of passes had to be introduced, and the provincial governors instructed to send back to the capital all those who had escaped to a distance without very good reason (37).

So we can see the authorities trying to reverse the mass migration from the capital into the surrounding rural areas. Then there was the problem of temporary shelters which Kendrick comments on:

Another urgent business was the provision of temporary shelter for the homeless and the collection of material for making huts. Profiteering in wood, of which there was a shortage, was stopped, and...
Irish potato famine 1845–9

Although it did not destroy buildings, this disaster illustrates certain attitudes over the giving or receiving of aid. Cecil Woodham-Smith has written a moving account of the tragedy:

Much of this obtuseness sprang from the fanatical faith of mid-nineteenth century British politicians in the economic doctrine of laissez-faire, no interference by government, no meddling with the operation of natural causes. Adherence to laissez-faire was carried to such a length that in the midst of one of the major famines of history, the government was perpetually nervous of being too good to Ireland and of corrupting the Irish people by kindness, and so stifling the virtues of self-reliance and industry (101). John Kenneth Galbraith commented on this attitude in his recent TV series:

Few things in life can be so appalling as the difference between a dry, antiseptic statement of a principle by a well-spoken man in a quiet office, and what happens to people when that principle is put into practice . . . The response of the British Government to the potato blight was according to Ricardo and Malthus. The dry, antiseptic principle was enunciated by Charles Edward Trevelyan, the permanent head of the Treasury: 'Trade', Trevelyan advised, 'would be paralysed'—that was his word—if the government gave away food to the Irish and so interfered with the profits of business enterprises (48).

It is probable that one and a half million Irish people died, many as a result of this economic theory. Their deaths are a further reminder of the two-pronged nature of relief, with donor interests likely to win in any conflict over priorities. In talking to officials in government offices or embassies in Central America I have heard similar views to these of the politicians of the mid-nineteenth century. One seasoned official told me: 'Nature has its own way of dealing with over-population, and it's probably wise not to interfere in the process.'

San Francisco earthquake 1906

This disaster was the first major urban earthquake of this century. Diagram 4 indicates the scale of damage. Set against the $525 million estimated damage, the relief grants were pitifully inadequate. The US government gave $2.5 million and foreign governments contributed a total of $474,211 (which included a gift from Britain of $6,570). In terms of shelter provision, there was widespread contemporary documentation, which included (perhaps for the first time) photographic coverage.

The earthquake destroyed 250,000 homes and resulted in 300,000 people sleeping outdoors during the first days after the disaster. This total, as in all earthquake situations, included both the homeless and those who were too frightened to return to their homes lest there should be a further earthquake. By June the total had dwindled to less than 50,000 and by July to 25,000. In the autumn, (five months after the earthquake) the permanent population of all emergency camps was down to 17,000.

There are many excellent studies of the San Francisco earthquake; in one of these studies, William Bronson has written:

The makeshift shelters of blankets and rags which helped shield two hundred thousand from the rain after the fire didn't last for long. Tents issued by the military replaced them, and the beginnings of the permanent camps which were to dot the City's parks and reservations for more than a year were
established. The problem of housing a
city in which three fifths of the dwellings
had burned was met in many ways. And
in the final analysis, most of the people
solved it for themselves (14).

Following the disaster, the full range of
shelter options was available. Thousands of
women and children were bundled off to
spend the summer with friends and relatives,
while others moved in with the fortunate
citizens whose homes had been spared. The
combined relief committee established a sub-
committee purely concerned with the
refugee camps. Their task was to replace the
canvas shelters with wooden huts or
'cottages' as they liked to call them.

In a dozen locations the committee built
6,000 of these two-room huts. These units
cost $2 per month rent, which was collected
by the camp directors, army officers who
operated as 'benevolent despots', ruling their
camps with a strong hand. Mayor Schmitz
queried whether the conditions of the camps,
particularly in a Golden Gate parkland
setting, were rather too salubrious: 'I'm only
afraid these people will never want to leave
their new homes here.' This attitude is
reminiscent of the authorities' views in
Ireland, and not without its counterpart
today whenever we hear the outrage of press
or politicians at the featherbedding effects
of social welfare provision.

After the cottages had been occupied for
just under a year the exodus began. The
unique event here was that the exodus was of
cottages as well as people. The enterprising
occupants succeeded in jacking the huts off
their foundations and in fitting wheels to
them, and then with suitable horse or mule
power the huts were moved to private lots.
To this day some of these wooden cottages
still remain as garden sheds, but now they
are almost unrecognizable.

The committee spent a further $600,000
on building a further 1,400 houses for people
who had sufficient cash to match the money
spent by the committee. As an incentive the
owners got a financial discount if they sited
these homes in the burned area of the city, a
very unpopular area for reconstruction (15).

80 The spread of the fire which followed the San Francisco earthquake

81 An improvised home in San Francisco

82 A further example of improvisation
83 Improvised huts and refugees' belongings in Golden Gate Park, San Francisco

84 Harbor View emergency camp with Alcatraz in the background. This site was used for several months and housed the toughest and most unmanageable group of refugees

85 Emergency camp in San Francisco

86 The Park Presidio Drive site

87 Lobos Square Camp (now called Funston Playground)
Reggio-Messina earthquake 1908

Unfortunately, we don’t have such detailed knowledge of other disasters in the early part of the century as we possess for San Francisco. Two years after this major disaster, the Sicilian city of Messina and the city of Reggio on the Italian mainland were destroyed. There were massive casualties which may have included 50,000 deaths. We can deduce something of the post-disaster situation (in the era before rapid relief became a characteristic pattern) from the eye-witness account of a Swedish doctor, Axel Munthe, who described the situation in his best-selling autobiography — The Story of San Michele. He writes:

[what I did in Messina was very little compared with what I saw hundreds of unnamed and unrecorded people do at the peril of their lives. I myself was in no peril except that of dying from hunger and from my own stupidity. It is true that I brought a number of half-suffocated people back to life by means of artificial respiration ...]

Following this earthquake the local authorities rebuilt the city of Messina, with every kind of earthquake-proof form of construction. So successful was this approach that although 4,000 tons of Allied bombs were dropped on the city during 1943, very few of the buildings collapsed. The technique was firstly to provide a massive ground slab of reinforced concrete, in place of individual foundations for buildings. Secondly, each building was

88 5,000 huts were built on this emergency site in Park Presidio Drive

89 A temporary house being moved to a permanent site in the summer of 1908 (after about nineteen months on its original site). Note the legs of the small boys pushing the house from the rear

90 Modern Messina, reconstructed after the earthquake of 1908
framed in reinforced concrete (with maximum spans of 5 metres). Thirdly, heights were limited initially to two storeys, but this was relaxed in the 1930s to allow for structures up to four storeys. Finally, the spacing of houses and the new street widths were calculated to provide fire breaks [13].

Mezina was probably the first complete town to be rebuilt with comprehensive earthquake-resistant construction. And the use of reinforced concrete construction in 1908 is a remarkably early use of this material.

Tokyo earthquake and fire 1923

The earthquake covered an area of 1,800 square miles. The casualties were enormous: 140,000 killed, 100,000 injured and massive property damage. In all 280,000 buildings collapsed and a further 700,000 were burnt in the fire that followed the earthquake. The tsunami, or seismic wave, was over 36' high, and it swept across the Sagami Bay to destroy 159 houses and kill a further 60 people.

As a result of the damage a total of 6,000,000 people were made homeless in Tokyo and Yokohama. Many built temporary shacks of wood in the scorched, still-smoking ruins of their old homes. 12,000 refugees were taken by lifeboats and fishing smacks and were placed aboard the Empress of Australia, which was moored in Yokohama harbour. The bewildered city authorities of Tokyo sent cables to the Lord Mayor of London requesting any advice they could offer, as a result of London's reconstruction after the Great Fire 257 years earlier.

I have yet to discover any reliable accounts of temporary housing provision in Tokyo. The photographs indicate the familiar pattern of wooden huts and improvised shacks.

One feature of the Tokyo earthquake that gets into all the architectural history books is the story of the survival of Frank Lloyd Wright's Imperial Hotel, because of its earthquake-proof construction, of which Wright was particularly proud.

I have compared the Tokyo situation with that of San Francisco in Diagrams 4 and 5.
World War II 1939–45

In the two great man-made disasters of this century, the two world wars, we can find examples of shelter provision which dwarf all post-disaster housing provision in their vast scale. Even the great Finnish architect, Aalto, produced detailed designs for emergency wartime shelters [81]. But the wars also yielded very useful information on social behaviour in stress situations [27]. I have already referred to wartime studies of evacuation in writing about Skopje and Darwin in Part III, strategy 3.

In one of the major studies of emergency housing provision during the Second World War, Fred Ink has made a careful analysis of Hamburg. Within a few days in 1943 half of the city's houses were destroyed. Ink writes:

At first, after the raids, the administration and the public expected that a programme for the construction of emergency homes would provide shelter for the homeless. People were even urged to assist the building workers by labouring on their prospective homes on Sundays... However five months later, no more than 1,625 emergency homes had been erected, accommodating less than 2% of Hamburg's homeless [53].

Ink proceeds to quote data from a housing census the German authorities carried out in October 1943. This is to describe the types of accommodation used by the citizens of Hamburg two and a half months after the heavy air raids.

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Berlin in 1946</td>
<td>3.6%</td>
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<tr>
<td>Hiroshima in 1948</td>
<td>4.2%</td>
</tr>
<tr>
<td>Kobe in 1948</td>
<td>7.7%</td>
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<tr>
<td>Yokohoma in 1948</td>
<td>5.9%</td>
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These very small percentages are on a par with findings from 'natural disasters' (see myth no. C1).

There is not sufficient space to comment on the prefabrication of 'temporary' homes.

Diagram 16. Design for World War II emergency shelter by Alvar Aalto

These shelters are designed solely to give temporary emergency shelter. They are so constructed that they may be nested in groups of four and more on a grid plan, forming a pattern of separate central heating units. The shelters are moved by forklift trucks. They are more stable and warm.

94 Emergency housing after the World War II raids on Berlin

95 Temporary homes en route to their destination
CONCLUSION

This has been a fascinating and yet highly tantalizing search. So often the contemporary narrator stops short of any comment on shelter needs. But even with these slender items of evidence, taken from a small set of historical disasters, significant behaviour patterns emerge. And when the uniformity of behaviour, observed in various historical disasters, is considered together with the uniformity of behaviour seen over a wide contemporary geographical distribution of disasters, we can confidently make certain assertions.

Firstly, human improvisation and inventive resourcefulness are general characteristics, which are totally predictable. Diverse examples are the pillow protectors after Vesuvius or the wheels that were fixed under the San Francisco disaster 'cottages'.

Secondly, tents have a very extensive pedigree. From the Great Fire of London to Lisbon.

Thirdly, disasters can become the catalysts for disaster prevention measures.
EPILOGUE

By glancing over the events of history, and by looking closely at contemporary disasters, I have attempted to find patterns.

There will be exceptions to any expected forms of behaviour, such as the looting and atrocities that appear to have followed the Tokyo earthquake of 1923. It is wise, therefore, at this stage of knowledge, to avoid dogmatism and I realise that at times I may have drawn premature conclusions from limited factual evidence.

I hope I have conveyed some of the complexities of the subject. Future studies cannot be carried out in isolation: they will succeed only if the investigator recognises that the architect needs the seismologist, the relief official, the economist and the anthropologist (to name a few of the interdependent professions).

One of the complexities is the variety of attitudes that can be detected or exposed in any analysis of relief provision. Initial, basic assumptions may well be very naive or totally false, and this above all else curbs any optimism that matters are improving. Sadly, the three assumptions that we cannot take for granted are: that societies show any concern to learn from the past; that all officials in international and government offices have a genuine concern for the welfare of the victims; and that aid is always given altruistically.

It is wise to recognise the seedier sides of the problem. I have found, in making detailed investigations of certain products, that their existence as disaster relief is not a response to the needs of the particular disaster. Rather it is the result of an individual’s whim, or sales pressures, or aid quotas from a donor agency. When one questions the logic with local or even international officials the indignant shrug is a good indication of the level of concern for the recipients of misplaced aid. Mercifully this is in contrast to the genuine concern of others who are constantly striving to understand the real needs and provide sensible answers.

In conclusion, I must restate the aim of emergency shelter, since this may have been lost in the issues I have covered. It is to provide protection for a vulnerable family. It may take the form of a product, or it may be a process. It could start as a sheet of corrugated iron which would ultimately become the roof of a house.

In providing this protection, any donor must be aware of the long-term consequences of his actions. The future form of the new settlement and even the long-term economic development of a community is being determined in the early decisions that are made while flood waters are receding, or dust still hangs in the air.
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109. WENGER, DYKES, SEBOK and NEFF. 'It's a matter of myths; an empirical examination of individual insight into disaster response'. *Disasters, emergencies*, vol. 1 (1975), pp. 33-46.


REFERENCES
LISTED ACCORDING TO SUBJECT

This list is confined purely to the references quoted in this book.

Pre-disaster planning
3, 59, 70, 80.

Techniques for building safe houses in vulnerable situations
1, 2, 9, 13, 16, 17, 18, 20, 32, 33, 34, 35, 40, 42, 59, 66, 80, 84, 87, 88, 89, 90, 92.

Emergency shelter — initial 72-hour period
5, 9, 21, 24, 30, 31, 36, 37, 39, 40, 41, 44, 47, 50, 58, 60, 65, 76, 77, 84, 91, 93, 95.

Tents
14, 21, 24, 30, 31, 34, 36, 39, 40, 41, 47, 86, 90, 91, 93, 95.

Donor shelters
11, 12, 20, 23, 24, 29, 32, 36, 37, 38, 39, 41, 49, 54, 59, 63, 72, 84, 87, 88, 89, 90, 91, 93.

Indigenous shelter
1, 2, 8, 16, 20, 24, 29, 32, 33, 35, 36, 39, 40, 41, 42, 58, 80, 87, 88, 89, 90.

The rule of the extended family
19, 27, 36, 65, 76, 77, 97, 98, 99.

Evacuation policies

Prefabrication techniques
8, 9, 10, 23, 24, 32, 36, 59, 63, 87, 88, 89, 90, 91.

Reconstruction of towns and cities
5, 8, 9, 10, 13, 14, 16, 23, 28, 37, 38, 42, 51, 55, 59, 63, 67, 71, 79, 83, 87, 88, 89, 90, 91.

Cultural factors in post-disaster relief and reconstruction
98

8, 10, 14, 19, 21, 23, 25, 32, 36, 37, 38, 39, 40, 41, 42, 44, 50, 60, 65, 68, 77, 78, 83, 84, 87, 88, 89, 90, 97, 98, 100.

Flood conditions
3, 18, 20, 22, 34, 66, 70, 80, 87.

Earthquakes
4, 5, 6, 7, 9, 10, 13, 14, 16, 19, 23, 24, 25, 26, 33, 35, 36, 37, 38, 40, 42, 55, 56, 59, 63, 67, 70, 72, 74, 80, 83, 88, 89, 90, 91, 92, 102.

Wind storms
3, 20, 34, 50, 70, 87, 97.

Disasters prior to 1945
4, 6, 7, 13, 14, 26, 27, 28, 43, 48, 52, 53, 56, 64, 73, 74, 75, 79, 81, 94, 101.

World War II
27, 53, 61, 81.

Skopje
38, 91.

Bangladesh
20, 30, 39, 51.

Managua
12, 21, 31, 36, 37, 67, 71, 83, 93.

Hurricane Fifi
22, 34, 39, 87.

Turkish earthquakes
7, 9, 23, 24, 59, 63, 84, 92.

Darwin
59, 97.

Guatemala
19, 25, 33, 40, 42, 72, 85, 88, 102.

APPENDIX A: SUMMARY CHARTS

The table which appears on the following twelve pages summarises the effects of six recent disasters and the kinds of relief work and reconstruction activity that followed them. These disasters have been chosen because I have had direct personal experience of them, either as an observer or as a consultant.
<table>
<thead>
<tr>
<th>DISASTER TYPE</th>
<th>LOCATION</th>
<th>DATE</th>
<th>NO. KILLED</th>
<th>NO. INJURED</th>
<th>NO. OF HOUSES DESTROYED</th>
<th>NO. OF HOUSES REBUILT</th>
<th>VALUE OF EARTHQUAKE DAMAGE</th>
<th>CURRENT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake</td>
<td>Skopje, Yugoslavia</td>
<td>26 July 1963</td>
<td>1,070</td>
<td>3,100</td>
<td>Approx. 35,000</td>
<td>200,000</td>
<td>$800 million</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

**STATISTICS OF SHELTER AND HOUSING PROVISION**

<table>
<thead>
<tr>
<th>NO. OF TENTS PROVIDED</th>
<th>NO. OF TEMPORARY HOUSE UNITS</th>
<th>TYPES OF SHELTER PROVISION USED</th>
<th>NO. OF HOUSE UNITS BUILT SINCE DISASTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. 5,000</td>
<td>1,711</td>
<td>1. Quonset huts (125)</td>
<td>In initial 6 months 14,000 units overall 1953-57 35,000 built units</td>
</tr>
<tr>
<td>% OCCUPANCY</td>
<td>% OCCUPANCY</td>
<td>2. Maisonette huts (200)</td>
<td></td>
</tr>
<tr>
<td>Approx. 66%</td>
<td>Unknown</td>
<td>3. Section framed housing (1,568)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Caravans (79 approx.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Tents</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individual tents approx. 4,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Macedonian 464</td>
<td></td>
</tr>
</tbody>
</table>

**EMERGENCY SHELTER POLICY**

A contingency organisation, STAR, assumed control. Within 24 hours, tents were provided for 25,000 people. An evacuation policy was implemented and 350,000 women and children left the city within 3 weeks. 60,000 men were available for cleaning, repairing and erecting housing. 1,711 temporary houses were built (1,568 by army on Want UK and a team of Royal Engineers). They were intended for eventual agricultural use.

**TIMING OF EMERGENCY PROVISION**

Tents were erected very rapidly and were used for 3-4 months. People moved from them to the 1,711 temporary houses. Some remained in these houses (which still exist); others moved to the prefabricated houses.

**RECONSTRUCTION POLICY**

A decision was made to requisition land to build 14,000 houses to house a total of 70,000 people. Repairs to existing houses were undertaken to provide housing for 50,000. A new, safe plan for the city was devised and implemented. This included an international competition for the design of the city centre.

**TIMING OF RECONSTRUCTION**

Within 4 months, 14,000 houses were built. They are still in use, in modified form. By 1976, when the population of the city had risen to over 420,000 (double that of 1963), a total of 25,000 living-units had been built. In 1977 the city centre was nearing completion.

**SUMMARY OF MAJOR LESSONS FOLLOWING THIS DISASTER**

1. The contingency organisation was highly effective.
2. The tents were not all used.
3. The evacuation policy was partially effective (all returned within 3-4 months).
4. The ability to requisition land contributed to the rapid reconstruction of houses. Another contributory factor was the massive aid received from East European and Western sources ($62 million).
5. Overall there was a balanced, diversified approach to shelter provision, which satisfied the need, in spite of the exposure threat of cold weather, which came 3 months after the disaster.

**KEY SOURCES OF REFERENCE - IN ORDER OF IMPORTANCE (AUTHOR/EVALUATION)**

4. Davis, Ian. 'Skopje rebuilt'. Architectural design, Nov. 1975. (Ref. 36)
<table>
<thead>
<tr>
<th>DISASTER TYPE</th>
<th>LOCATION</th>
<th>DATE</th>
<th>NO. KILLED</th>
<th>NO. INJURED</th>
<th>NO. OF HOUSES DESTROYED</th>
<th>NO. HOMELESS</th>
<th>VALUE OF DAMAGE &amp; CURRENT VALUES</th>
<th>VALUE OF AID</th>
<th>CURRENT VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake</td>
<td>Managua, Nicaragua</td>
<td>23 December 1972</td>
<td>6,000-10,000</td>
<td>20,000</td>
<td>56,000</td>
<td>200-240,000</td>
<td>Estimates vary from 250 million to 380 million</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATISTICS OF SHELTER AND HOUSING PROVISION</th>
<th>NO. OF TENTS</th>
<th>NO. OF HOUSES</th>
<th>TYPES OF SHELTER AND HOUSING PROVISIONED</th>
<th>PRE-Disaster Population</th>
<th>NO. OF BUDGETS</th>
<th>TYPICAL SHELTER USED</th>
<th>NO. OF UNITS BUILT SINCE DISASTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managua</td>
<td>365 in Managua, approx. 1,600 in Managua</td>
<td>11,635</td>
<td>Tents</td>
<td>Wooden huts</td>
<td>430,000</td>
<td>Unknown but approx. 10,000 houses</td>
<td></td>
</tr>
</tbody>
</table>

EMERGENCY SHELTER POLICY
1. A policy of evacuation was implemented using all houses.
2. The government built campsites in Managua but these were very little used, since the extended family "sponge" was the major factor in absorbing up to 50% of refugees.
3. The government with US aid built 11,635 wooden huts.
4. The W.German Red Cross built approx. 900 polycarbonate igloos.
5. Many local agencies built permanent houses in this emergency period.

TIMING OF EMERGENCY PROVISION
(SAYS, WEEKS, MONTHS FROM DISASTER)
In Managua 4 tents in 2 days.
In Managua 4 tents in 3 weeks.
(Followed by the remainder of the total of 1,980 tents.)
The initial group of US aid huts were completed 14 weeks after the disaster.
The igloos were first occupied 5 months after the disaster.
Certain local agencies, like Caritas and FONDE, built simple wooden houses within 3 weeks of the disaster.

RECONSTRUCTION POLICY
1. A policy of reconstructing the city on the same site, this is being implemented with twin policies of deconcentration and decentralization.
2. New construction codes were implemented.
3. A new ministry was formed to control reconstruction.
4. With the freezing of decisions on rebuilding the urban centre, the private sector has developed the perimeter sites of the city, a process that had already started before the earthquake.
5. Reconstruction by the private sector has been rapid, on the periphery of the city.

SUMMARY OF MAJOR LESSONS FOLLOWING THIS DISASTER
1. The decision to order the total evacuation of the city must be seriously questioned. The urban waste land that still exists is a memorial to that decision.
2. The extended family "sponge" was highly effective.
3. The German igloos (which have not been used since Managua), arrived very late, and were under-used despite free distribution.
4. The AID wooden huts were ineffective as emergency provision; they were remotely sited, and insufficient attention being paid to infrastructure.

KEY SOURCES OF REFERENCE - IN ORDER OF IMPORTANCE (AUTHOR'S EVALUATION)
<table>
<thead>
<tr>
<th>DISASTER TYPE</th>
<th>LOCATION</th>
<th>DATE</th>
<th>NO. KILLED</th>
<th>NO. INJURED</th>
<th>NO. OF HOUSES DESTROYED</th>
<th>NO. HOMELESS</th>
<th>VALUE OF DAMAGE</th>
<th>VALUE OF AID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane Fifi</td>
<td>Honduras</td>
<td>10-20 September 1974</td>
<td>5,000</td>
<td>Unknown</td>
<td>3,400 destroyed</td>
<td>12,000</td>
<td>168,000</td>
<td>$449 million</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATISTICS OF SHELTER AND HOUSING PROVISION</th>
<th>NO. OF TIMES PROVISION USED</th>
<th>TYPES OF SHELTER USED</th>
<th>NO. OF HOUSE UNITS BUILT SINCE DISASTER</th>
<th>TYPES OF NEW HOUSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive use of tents on various sites</td>
<td>Nil</td>
<td>Tents</td>
<td>1,212 post-disaster houses - all built by relief groups</td>
<td>1. <em>Tipi</em>-up concrete housing. 2. 6 systems of mud construction. 3. 5 systems of concrete construction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMERGENCY SHELTER POLICY</th>
<th>OCCUPANCY</th>
<th>OCCUPANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Several large refugee camps were established. The largest was built in Choloma to house 318 families (1,821 people) built on very regimented sites. In addition there were improvised homes, but the extended family system does not appear to have functioned very effectively. Existing buildings, i.e. schools, were used as temporary provision.

<table>
<thead>
<tr>
<th>RECONSTRUCTION POLICY</th>
<th>NO. OF HOUSES BUILT</th>
</tr>
</thead>
<tbody>
<tr>
<td>above the flood plain, on the side of the hill, but is still vulnerable in many instances due to poor ‘hat and fill’ techniques.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMERGENCY SHELTER POLICY</th>
<th>OCCUPANCY</th>
<th>OCCUPANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>-</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SUMMARY OF MAJOR LESSONS FOLLOWING THIS DISASTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One of the new housing settlements, 'Colonía Canada' in Choloma, is interesting in that it evolved from a refugee camp of 468 families to a settlement of 181 houses (with 200 planned for later addition).</td>
</tr>
<tr>
<td>2. There was a marked absence of governmental provision of shelter and new housing.</td>
</tr>
<tr>
<td>3. There was also a marked lack of local involvement in the refugee camps and in rehousing programmes, many of which were culturally unsuited to local conditions.</td>
</tr>
<tr>
<td>4. The distribution of aid was concentrated in certain centres such as Choloma. This set in motion a spiral of 'dependency' with adverse long-term consequences.</td>
</tr>
<tr>
<td>5. Many of the housing systems have not been easily modified.</td>
</tr>
<tr>
<td>6. Most of the emergency housing was built very rapidly, and there was an absence of 'donor systems' from external sources.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KEY SOURCES OF REFERENCE - IN ORDER OF IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Thompson, Charlotte E. Paul: Survey of reconstruction housing in Honduras - 15 years after Hurricane Fifi. Organización de American States, 1975. (ref. 87)</td>
</tr>
<tr>
<td>DISASTER TYPE</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Earthquake</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>STATISTICS OF SHELTER AND INVENTORY PROVISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. OF TENTS</td>
</tr>
<tr>
<td>PROVIDED</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPES OF SHELTER PROVISION USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various types of tort: ridge, pole and chalet types. Polyurethane hemagol- lage provided by Ifam. Permanent housing after 2 months.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPES OF NEW HOUSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>The standard Turkish post-disaster prefabricated houses with aerated concrete infill, corrugated iron roof. Various similar designs from France, Finland and Switzerland.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMERGENCY SHELTER POLICY</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Ministry for Reconstruction and Resettlement decided that the town of Lice was in a highly vulnerable site and provided housing for people re-building their ruined homes. A new, safe, flat site was chosen 1 mile from Old Lice, and on this site the prefabs were built. Initially tents were used and Oxfam provided polyurethane igloos. It was opposed to build 800 units but only 603 were actually built.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIMING OF EMERGENCY PROVISION (NAG, WEEKS, MONTHS FROM DISASTER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tents were in use within 2 weeks. The 1,568 new prefabricated houses were completed by day 54. The first Oxfam units were produced by day 60.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RECONSTRUCTION POLICY</th>
</tr>
</thead>
<tbody>
<tr>
<td>As can be seen above, the Turkish government policy is that of rapid new buildings on safe sites. The initial 1,568 homes will be supplemented with a further 4,165. In addition, various foreign governments provided housing. For example the village of Yunciuc is being built by Switzerland, with 50 homes. The West German government is building some houses and schools in Kilp, and the Libyan government is rebuilding Turgak, at a cost of $1 million US.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIMING OF RECONSTRUCTION (MONTHS, YEARS, FROM DISASTER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A total of 5,805 houses is planned. 3,100 were completed by June 1976 (2 months after the disaster). 84% of the planned 2,776 houses being built with foreign assistance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUMMARY OF MAJOR LESSONS FOLLOWING THIS DISASTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Turkish ministry have a very rapid capacity for building and to build this quantity of houses within 2 months is a considerable achievement. 2. However, in doing so they paid little attention to the cultural pattern of the Kurdish people who live in them. The houses are climatically unsuitable for the harsh climate, and they ignore the people's need to be close to their animals.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KEY SOURCES OF REFERENCE - IN ORDER OF IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cavanagh, Jon 'Shelter after natural disasters,' School of Architecture, University of Newcastle upon-Tyne, 1976. (ref.24)</td>
</tr>
<tr>
<td>3. Lice deprim (a record of the rebuilding in 54 days) Report in Turkish by the Ministry of Reconstruction and Resettlement, Ankara, Turkey, 1975.</td>
</tr>
<tr>
<td>DISASTER TYPE</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>Earthquake</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATISTICS OF SHELTER AND HOUSING PROVISION</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. OF TENTS PROVIDED</td>
<td>NO. OF TEMPORARY HOUSE UNITS</td>
<td>TYPES OF SHELTER PROVIDED</td>
<td>NO. OF SHELTER UNITS BUILT SINCE DISASTER</td>
<td>TYPES OF NEW HOUSING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10,000+</td>
<td>Unknown</td>
<td>Tents, improved houses, 2 programmes of temporary housing</td>
<td>Unknown</td>
<td>By May 1976, 4 months after the disaster, 24 differing agencies were implementing reconstruction programmes using: Block housing, frame/roof schemes, concrete/ asbestos panel systems, wooden housing, steel, block, wood combination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>OCCUPANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMERGENCY SHELTER POLICY</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No real policy existed, except for a government programme to build 100,000 temporary houses with military support. This was programmed to take 100 days but was largely ineffective.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RECONSTRUCTION POLICY</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The major focus of the entire reconstruction programme was rapid building. The majority of house-building programmes have taken place in rural areas. It took approximately 4 months for urban projects to commence.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUMMARY OF MAJOR LESSONS FOLLOWING THIS DISASTER</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There was a massive process of improvisation of housing — a very valuable resource in the post-disaster context.</td>
<td>4. 'Ganitas' and corrugated iron sheeting, which was purchased in vast quantities, fulfilled a vital role as temporary shelter, which could then be re-used as roofing for the permanent housing.</td>
<td>5. The question of rehousing the residents of the squatter settlements in Guatemala City is highly political and demands major land reform.</td>
<td>2. In general, tents were under-used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KEY SOURCES OF REFERENCE — IN ORDER OF IMPORTANCE (AUTHORS EVALUATION)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DISASTER TYPE</td>
<td>LOCATION</td>
<td>DATE</td>
<td>NO. KILLED</td>
</tr>
<tr>
<td>---------------</td>
<td>----------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Friuli, Italy</td>
<td>6 May and 10 September 1976</td>
<td>900–1,000 in May; 1,120 in Sept.</td>
</tr>
</tbody>
</table>

**STATISTICS OF SHELTER AND HOUSING PROVISION**

<table>
<thead>
<tr>
<th>NO. OF TENTS PROVIDED</th>
<th>NO. OF TEMPORARY HOUSE UNITS</th>
<th>TYPES OF SHELTER PROVISION USED</th>
<th>NO. OF HOUSE UNITS BUILT SINCE DISASTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>Tents, railway carriages, hotels on the Adriatic coast (during winter season).</td>
<td>N/A</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>Tent cities in all major towns, temporary prefabricated houses.</td>
<td>N/A</td>
</tr>
<tr>
<td>% OCCUPANCY 50% initially, reducing rapidly</td>
<td>% OCCUPANCY 0% finally</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**EMERGENCY SHELTER POLICY**

1. Tent cities built in each town or village, mainly of tents from Italian military sources.
2. Indigenous control of each local situation.
3. Many able-bodied families left immediately for Turin or Milan, leaving elderly in the tents.
4. Hotels were offered and after the end of the high tourist season in the middle of September these were made available on the Adriatic coast; 20,000 people stayed during the winter.
5. Railway coaches made available at Venice.
6. Mobile homes were used as temporary provision throughout the affected region.

**TIMING OF EMERGENCY PROVISION (DAYS, WEEKS, MONTHS FROM DISASTER)**

Tent cities built within 1 week.

**RECONSTRUCTION POLICY**

The policy is:

1. To finance all government finance through local reconstruction units in each town.
2. To rebuild the historic town as they were estimated to be 5-6 years.
3. Means to build prefabs instead of 60-80,000 each which will be provided for each family. These will then be used after completion of historic houses, as tourist provision.

**TIMING OF RECONSTRUCTION (MONTHS, YEARS, FROM DISASTER)**

Initial prefabs were built in the first few months, followed by reconstruction of historic houses.

**SUGGESTIONS OF MAJOR LESSONS FOLLOWING THIS DISASTER**

1. The decision to delegate relief and reconstruction policy to each town/village is an interesting one, which is unlike normal pyramid structures.
2. The relief operation was undertaken in the context of such pressure from the media, who had reacted against the corrupt practices of the 1958 Bolognese earthquake.
3. The two-stage policy — (1) temporary housing (very expensive) then (2) rebuilt houses — is highly expensive and unlikely to be fully implemented.
4. 5 months after the disaster the Italian government was still bogged down with bureaucracy, and houses were still not begun.
5. The hotels on the Adriatic coast provided emergency accommodation for 20,000 during the winter months.
6. Many able-bodied people left Friuli very rapidly to find work and may not return.

**KEY SOURCES OF REFERENCE IN ORDER OF IMPORTANCE (AUTHOR'S EVALUATION)**

1. Dalles were alle baryche Special Issue on the village of Osoppo 11 July 1976
2. The survivors take charge of their future Economist 15 May 1976
4. 'All for the quake victims: too little, too late' Guardian, 21 Sept. 1976.
APPENDIX B: MAPS

The incidence of disaster and the world's earthquake belts 1920-76
<table>
<thead>
<tr>
<th>Date</th>
<th>Town</th>
<th>Country</th>
<th>Disaster</th>
<th>Homeless</th>
<th>Killed</th>
<th>No.</th>
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</thead>
<tbody>
<tr>
<td>1923</td>
<td>Tokyo &amp; Yokohama</td>
<td>Japan</td>
<td>Earthquake &amp; Fire</td>
<td>200,000-1</td>
<td>250,000</td>
<td>1</td>
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<th>Killed</th>
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<td>Chile</td>
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<td>1953</td>
<td>Holland</td>
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<td></td>
<td></td>
<td>1,800</td>
</tr>
<tr>
<td>Date</td>
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<td>Country</td>
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<td>Homeless</td>
<td>Killed</td>
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</table>
Map to show vulnerability to disasters
INDEX

*A* frame housing, 52, 53, 54
Aalto, Alvar, 86
ad hoc response, see indigenous response
adobe construction, 6, 11, 12, 35, 57, 64
Agency for International Development (AID), 21, 40, 55
aid, see donor countries, relief agencies
air-raid, 86
Aldous, Tony, I
Ambraseys, Nicholas, 8, 21, 71
Anatolia, archaeological evidence in, 8, 71
Ankara, Turkey, 13
architects, 49, 65, 91
Atkinson, George, 65, 89

*Bagarre* construction, 6
Baldassaro, Lorry, 65, 66
Bangladesh, ii, 18, 19, 44, 49, 52, 53, 54, 60, 90
Baye domes, 18, 50, 51, 52
behaviour after disaster, 26, 27, 28, 40, 44
58, 69, 70, 75, 76, 88-9, 91
Bengal refugee camps, 44-5
Berlin, 86
Bolivia, 7, 44
brickwork, unskilled, 8
Bronson, William, 77-8
building techniques, 4, 6, 7-8, 9, 11, 12, 19,
35, 37, 52, 53-4, 60, 64-6, 71, 74, 76, 83-4,
91; see also safety in building
bulldozers, use in clearing operations, 25
by-law, 5, 4, 10, 38, 39, 66, 74
Cambodia, 55
Camp sites, 44, 55, 56, 57
in history, 74-5, 77, 80-2, 88
*Candela*, Voltaire, 74
Canvey Island floods (1953), 3
CARE, 15, 46
CARITAS, 65
Carnegie-Mellon University, 52-4
casualties, xiii, 9, 13, 19-24, 34-5, 40, 49, 60,
72, 74, 83, 84, 99-111
Cavanagh, Jon, 51
Chimbote earthquake (Peru) (1970), 19, 51,
92
China, xii
historical records, 71
prediction of earthquakes, 71
self-sufficiency, 60
Tangshan earthquake (1976), xv, 71
Christian Aid, 36
Clark University, Mass., 20
Colombia, 23
contingency planning, 55, 66
conversion of existing buildings, 28, 44
cooperatives, 36, 40
corrugated iron sheeting, for roofing, 54, 60,
64, 65, 76
corrugated zinc, 37, 54
corruption, 23, 58, 65, 89
costs
of disasters, 1, 10, 21-2, 52, 55, 60, 72,
76, 88
of disaster mitigation, 10, 26
Crete, archaeological evidence, 8, 10, 71
Crusoe, Robinson, 25
cultural rejection, 28, 51, 60
culture
gap, 46-7, 63
patterns of, 6, 16, 17, 19, 28, 53
values of, 15-19
Cuny, Fred, 15, 36, 55, 60, 63
cyclones, 54, 61
damage, 19-24, 74, 99-111
assessment of, 40
in Great Fire of London, 72
in San Francisco earthquake (1906), 77
in Tokyo earthquake (1923), 84
Darwin, Australia, 61, 86
death/house ratio, 9
Defoe, Daniel, 25, 71
designers, 49, 60
developed world, 11, 15, 33
disasters, xv, 22
housing in, 21-2
definition of, 2-3, 10-11
incidence of, 113-17
in history, 69-88
needs of victims, 26, 40
prevention of, see mitigation measures, planning
proneness to, see vulnerability
see also under specific disasters
Disaster Research Centre (Ohio University), 57
Disaster Research Unit (Bradford University), 2, 7, 12-15
disease risk, see epidemics
donor countries, provision of aid by, 23, 30, 33, 40, 46-61, 65, 70, 79, 91
droughts, 26, 44
earthquakes, xii, 8-10, 11, 13, 15, 20, 22, 25, 26, 34, 35, 99-111, 113-17
in history, 70-1
see also under specific earthquakes
economic factors, 4, 10, 19, 21, 36, 38, 47, 52, 53, 58, 60, 62-63, 65, 77, 79, 91
EFICOR, 18
emergency shelter, xv, 28, 29, 31, 34, 39-63, 77, 81, 82, 86, 91, and put up
employment
location of, 34
due to disasters, 20, 30, 52, 53, 60, 65
epidemics, 28
evasion, 13
evacuation after disasters, 28, 44, 61, 65, 71, 75, 78
Evans, Sir Arthur, 8
Evelyn, John, 72
exploitation of the poor, 12, 22-3; see also economic factors
exposure, risks from, xii, 28, 58, 60
extended families, 16, 28, 40, 44-5, 46, 65
family cohesion, 28
see also extended families
famines, 26, 70, 77
fatalism, 1, 9-10
federal aid, 14
fires, 74, 77, 78
to clear rubble, 28, 65
risk of, 51-2
Great Fire of London, 3, 10, 69, 72-4, 84, 88
Flint, W. Russell, 27, 34
floods, 7, 26, 55, 69, 70
control of, 2-3, 4, 7-8, 15
risk of, 11-2
food, needs after disasters, 26, 28
foundations, 8, 9, 71, 83
Friuli earthquake (1976), 14, 27, 55, 57, 61, 65-7, 110-11
Fujimori Kogyo Co. Ltd., 54
FUNDE, 68
Gabor, John Kenneth, 77
Gediz earthquake (1970), 51
Gemeni, Italy, 64, 67
Goodspeed, Charles, 56
growth response, see indigenous response
Great Fire of London (1666), 3, 10, 69, 72-4, 84, 88
Great Plague of London (1665), 71
Greece, earthquake (1965), 29
Greenman, Adrian, 51-2
Guatemala, 27, 39, 55, 57, 61, 63-4, 76
teaching of safe building techniques, 34, 36-8
vulnerability of housing, 6, 11-15, 19
subsequent population growth, 20-1
comparison of damage with British equivalent, 21-2
Habitat conference (1976), 17
Hagen, Toni, 44
Hamburg, 86
Hun River floods, 7
Hartkopf, Volker, 54
Holness, 71
Honduras, Hurricane Fifi (1974), 15, 104-5
'O Hope Structures', 47
housing, 1-10, 16-19, 21-2, 33, 34-9, 40, 42, 49, 51, 52, 60, 64-6, 77, 86, 88 and put up
Latin American cities, 13
Laos, 55
League of Red Cross Societies, 55
less developed countries, see underdeveloped countries
Lico earthquake (1975), 5, 6, 9-10, 16, 17, 19, 31, 46, 51, 54, 65, 106-7
lightweight roofing, 4, 37
Lima, Peru, earthquake (1746), 74
Lincoln earthquake (1183), 71
Lincoln Cathedral, 71, 89
local resources and activities, see indigenous resources and response
Lisbon earthquake (1755), 73, 74-8, 88
London, 21
flood risk, 1-3
Great Fire (1666), 3, 4, 69, 72-4, 84, 88
Great Plague (1665), 71
looting, 91
low technology housing, 18, 52-4
Malthus, Rev. Thomas, 77
Managua earthquake (1972), xvi, 21, 23, 29, 44, 57, 65, 76, 102-3
use of Bayer domes, 18, 51
subsequent population growth, 20
reconstruction work after, 22, 65
Manila, Philippines, 2, 60
Massaya, Nicaragua, 18, 44, 45, 50, 55-6
Massachusetts Institute of Technology, 34
Mayan traditional architecture, 6
Mcluhan, Marshall, 40
Mediterranean, historical earthquakes, 71
Menézès, Michael, 49
Messina earthquake (1908), 83-4, 89
Mexico, 60
mitigation measures, 3, 7, 9, 10, 15, 19, 26, 35-6, 38-9, 83-4; see also prevention
Moss air-drop shelter, 48, 49
multifamily units, 28, 58
Munthe, Axel, 83
myth and reality, 25-32, 33, 40, 51, 58, 63, 65, 86
national governments, 34, 36, 39, 40, 44, 60-1, 65-6, 77
Nicaragua, xvi, 18, 19, 20, 21, 22, 23, 50, 51, 52, 53, 55, 57, 65, 86, 102-3
North Sea floods (1953), 3
O'Keefe, Phillip, 2
Oxfam, 31, 36, 46, 50, 51, 54, 56, 60, 65
Pakistan, 8, 50, 71
parachute-dropped shelters, 33, 49
Pepys, Samuel, 72
Pereira de Figuiredo, Antonio, 74-5
Peru, Chimbote earthquake (1970), 19, 51, 92
Philippines, 55
Manila, 2, 60
earthquake (1976), 60
planning
controls, 38, 39
post-disaster, 4, 10, 34, 66, 74, 76, 83-4, 89
pre-disaster, 69, 88
Plymouth, 70
politics, 22, 34, 60, 65
polythene, in tents, 55
polyurethane, 18, 50, 51-2
Pompa, Marques de, 96
population growth, 12-13, 20, 23
poverty, 10-15, 22, 23, 25, 34, 40, 62
prediction of disasters, 3, 20
prefabrication, 17, 65-6, 70-1, 86-8
prevention measures, 2-4, 9, 10, 15, 26, 34, 75, 88-9
see also mitigation measures, planning
press coverage, 22, 25, 46, 56, 60, 78
public relations, 60
Puerto Rico, 13
Quarantelli, E.L., 57
Quonset huts, 65
Rapaport, Amos, 16
rapid recovery, see reconstruction
reconstruction, 20, 21, 22, 25, 30, 31, 40, 61-7, 69, 83-4, 89
after Great Fire of London, 72-4
of historic towns, 65
after Lisbon earthquake, 75-6
rapid reconstruction, 25, 28, 29, 30, 36, 40, 62
after San Francisco earthquake, 78
see also 99-111
recycling, 30, 37
recurrence of disasters, 4, 6, 10, 26
Red Crescent, 54-5
Red Cross, 18, 22, 50-1
refugees, 72, 75, 84
refugee camps, 26, 44-5, 53, 55, 57, 60, 70, 80-2
Reggio-Emilia earthquake (1908), 83-4, 89
rehabilitation, see reconstruction
reinforced concrete, 83-4
relief, 66, 70, 71, 72, 74, 78, 83, 91
relief agencies, 17, 18, 30, 34, 36, 39, 40, 46, 49, 51, 54, 60, 67
relocation of communities, 15, 16, 30, 38-9, 65
Ricardo, David, 77
Rio de Janeiro, vulnerability, 14, 19
rockfalls, 9; see also landslides
roofing, 6, 37, 54
rubble removal, 25, 28, 30, 65
rural education programmes, 36-8
Russia, xv
safety in building, 8, 11, 19, 26, 34, 36, 37, 39, 54, 66, 71, 83-4, 89
cost of, 4, 10
resist fires, 3, 84
resist floods, 4, 7-8
教学 of, 32, 34-8
Sahel desert, 44
Salvador, 60
San Francisco earthquake (1906), 20, 27, 77-82, 88, 89
San Juan, 13
San Martin, Guatemala, 27, 57, 58
Save the Children Fund, 46
St. Paul's Cathedral, 72, 89
Sohumaches, E., 46
Sears High Wall Chute tents, 56
seismic waves, see tsunamis
Seoul, Korea, 5, 7
Shakespeare, William, 1
Sicily earthquake (1968), 65, 66
sitting of buildings, 6, 11, 15, 35, 65
Sikoske earthquake (1963), 16, 20, 21, 22, 61, 76, 86, 100-1
social attitudes, 26, 28, 61
social structure, see culture
South East Asia, 55
squatters, 11, 13, 14, 23, 75, 90
statistics, see separate place and subject entries
Stockholm School of Architecture, 51
stone construction, 4, 6, 7, 35, 71
Syria, historical earthquakes, 71
Tacitus, 70
Tangshan (China) earthquake (1976), xv, 71
Tadil earthquake (AD 25), 71, 89
temporary shelter, 14, 43, 54, 63, 65-6, 74, 75, 76, 82, 84, 86, 88, and farm
huts, see after disasters, 14, 24, 25, 28, 54-8, 65, 88
in history, 69, 72, 74, 77
under use of, 28, 56-8
Terra, Juan, 13
Thames, river, 72
barrage, 1-3, 10, 26
third world, see underdeveloped countries
Thompson, Charlotte and Paul, 51
tidal waves, see tsunamis
timber, see wood
tokyo earthquake and fire (1923), 20, 84-5, 91
Tracassini, Italy, 14, 27
Trevelyan, Charles Edward, 77
Trinidad, Bolivia, 7, 44
tsunamis, 34, 74, 84
Turin, Professor Duccio, xiii
Turkey, 13, 37, 54, 65
degrees of earthquake risk, 34-5
Gediz earthquake (1970), 51
government of, 34, 65
Liso earthquake (1975), 5, 6, 9-10, 16, 17, 19, 31, 46, 51, 54, 106-7
teaching of safe building techniques, 32, 34, 36, 38
Van earthquake (1976), xiii, 24, 25, 38-9, 46, 58
typhoons, 54
underdeveloped countries, 12, 13, 15, 22, 23, 26, 34, 38, 46, 65; see also poverty
United Nations, 13, 15, 33
UNIDO, xv, 22
UNESCO, 49, 51
United States, 21, 29, 58, 60, 77
universal shelters, 17, 49, 51, 60
University of Bradford, 2, 7, 12-15
urbanisation, 10-15, 19, 20, 21, 23, 46
Utopian ideas, 74, 76
Van earthquake, Turkey (1976), xiii, 24, 25, 38-9, 46, 58
Vesuvius eruption, (AD 79), 70, 88
Vietnam, 55
Vittani, Jurig, 55
volcanoes, 8, 70
Voltaire, 74
vulnerability, 1-16, 25, 26, 34-5, 37, 72
mapping of, 35, 112-15
wood, as building material, 4, 6, 8, 35, 37, 64, 74, 76
Woodham-Smith, Cecil, 77
World Bank, 21
World Health Organisation (WHO), 33
World Neighbours, 36, 54
World War I, 65, 86, 88
World War II, 28, 47, 61, 65, 83, 86, 88
Wren, Christopher, 73, 74, 76
Yokohama (Tokyo), earthquake, (1923), 84-5, 91
Yugoslavia, 16, 20, 21, 22, 61, 76, 86, 100-1