At 2.46 p.m. local time on Friday 11 March 2011, the largest tsunami recorded in historical times rolled across the coast of Iwate, Miyagi and Fukushima Prefectures in north-eastern Japan. The waves reached a maximum height of 40.5 metres and in many places crossed the shore more than 10 metres high. As a result, more than 430 square kilometres of coastal land were devastated, 18,500 people were dead or missing and 6,150 were injured, and 400,000 buildings were severely damaged or destroyed. The response by the Japanese authorities was rapid and efficient, yet so many things had been destroyed that it still took more than two years of hard work merely to collect and recycle the debris. The rebuilding of towns and cities effectively razed to the ground by the tsunami posed a remarkable series of challenges in planning, development, architecture, urban design, infrastructure protection, engineering and economics.

On 8 November 2013, Typhoon Haiyan made landfall in the Philippines, where it was given the local name Yolanda. According to some estimates, it was the strongest hurricane to have made landfall over the period for which scientific records are available. The dead and missing amounted to 7,329, and 28,689 people were injured. In Eastern Visayas Province, about 90 per cent of the city of Tacloban (population 220,000) was severely damaged and many people had their homes swept away by a storm surge that, at its maximum, was higher than 5 metres. In addition to encountering many of the same problems as those that resulted from the Japanese tsunami, the Philippines faced the challenge of alleviating extreme poverty among the survivors.

Kesennuma is a city of 73,400 inhabitants in the north-eastern Japanese prefecture of Miyagi. Here, the dead and missing in the tsunami exceeded 2,000 people, and large parts of the urban fabric were destroyed by the waves and pools of burning fuel. To stand in what had been the centre of town two years after the tsunami, when debris clearance was more or less complete, was to
experience the rare sensation of disaster as *tabula rasa*, the ‘scrubbed table’, in which there is much to replace and almost nothing to restore. Standing on the shore of Tacloban months after the typhoon provoked a different feeling. Buildings had been swept away much as they had in Kesennuma. Indeed, in both places it was common to find only the concrete base plates of houses as all superstructure had been swept away by the waves. But while the survivors of the Japanese town had been moved to small but orderly prefabricated homes, many of the Philippine survivors had built shelters amid the rubble of their former homes, such that the shore was populated with a dense ‘informal settlement’ of small wooden buildings.

In Kesennuma, a large trawler, the *Kyotoku Maru No. 18*, was washed up and deposited well inland amid the ruins of the urban area. Five ships of similar size were beached together in Tacloban. But while the Japanese ship stood alone amid the sites of the razed houses until it was dismantled, a village of ‘informal’ houses grew up on the seaward side of the Philippine ships. In a sense, both situations drew attention to the impermanence of human settlement, but the contrast in vulnerabilities and resources available for recovery was notable.

The Japanese earthquake and tsunami of 2011 and the Southeast Asian typhoon of 2013 are examples of unusually large events of natural origin, but there is every indication that they will be followed by more such events in future years and decades, especially if extreme meteorological phenomena are further intensified by climate change. Massive destruction and loss of life on a grand scale are at the upper end of a scale that stretches down to events that merely disrupt and damage, not destroy and annihilate. However, in all cases, the process of recovery is likely to be complex and demanding, for that is how modern life sets the parameters.

In recent decades, there has been a gradual accumulation of information on the processes and experiences of recovering from disaster and rebuilding human settlements, communities and environments. Like the processes themselves, much of the information is fragmentary. There have been relatively few attempts to review and summarise it, or to take stock of knowledge about how best to recover from disaster. Even shelter, one of the basic components of recovery, has not been summarised adequately since Ian Davis did so in his 1978 book *Shelter after Disaster*. The basic conclusion of that work, that shelter is a process more than an end product, is as valid now as it was then, but unfortunately many of the mistakes identified in 1978 are still being made today. When it occurs, disaster usually opens a ‘window of opportunity’ for positive change; but is this being utilised sufficiently? Is the need to recover from disaster being taken as an invitation to recover while simultaneously reducing vulnerability, increasing resilience and creating more functional communities? Or are the same mistakes perpetuated each time such that vulnerabilities are maintained?

We believe that recovery from disaster needs to be taught, organised and practised in ways that are effective, efficient and fair. More notice needs to be taken of good practice, but failures and inefficiencies also need to be understood
so that they are not perpetuated. The verification of ‘lessons learned’ is that there be measurable positive change as a direct result of the experience gained. In our attempt here to summarise and interpret the catalogue of experience and to enrich its theoretical basis, we hope that this book will contribute to the learning of lessons and to changes for the better.

On average around the world, two disasters occur per day, amounting to about 700 per year. Major events such as those described above are thankfully relatively rare, but full recovery from their impacts can take up to a quarter of a century. In some of the poorest and most polarised societies, there are instances in which recovery has simply never been completed. In all societies, disaster represents a setback for most survivors but an opportunity for some. It should be an occasion for seizing the opportunity and ensuring that it is utilised equitably in ways that minimise the setback.

Over several decades, we have observed recovery processes in a wide variety of settings – in rich and poor countries as well as those that fall between the extremes of wealth and poverty. We have sought to identify critical issues and have pondered the solutions to intransigent problems. We have seen recovery and reconstruction from the points of view of the donors, beneficiaries, public administrators and aid agencies and have noted the discrepancies of attitude, approach and expectations.

Advice given to aspiring authors often includes the injunction to ‘write what you know’. This has been our primary motivation and intention. Hence, rather than spending most of our time combing through secondary sources among the extensive disaster recovery literature, we have both reflected on the lessons we have learnt from our lengthy direct and continual exposure to the field of disaster recovery. In the case of Ian Davis, this began in 1972 with the Managua earthquake in Nicaragua, while in the case of David Alexander, it started eight years later in 1980 with the Campania–Basilicata earthquake in Southern Italy. Since then, we have accumulated decades of experience derived from analysing recovery after disaster in the field, through the literature and in the academic institutions of which we are a part.

In 2004, the International Recovery Platform and the United Nations Development Programme asked Ian Davis to write a book on reconstruction (Davis 2007). The task was beset with difficulties and Ian soon acquired a hearty dislike of the approach taken by the sponsoring bodies. Two years after the start of the project, at a review session in Kobe, Japan, Ian was asked to remove from the text all material that was anecdotal as it was deemed inappropriate to an ‘objective’ UN publication. Yet the anecdotes were stories of vital first-hand experience with reconstruction processes. They embodied much wisdom gleaned from the field. One official at the meeting wisely counselled Ian to write a book without UN oversight, in which he could freely include his experiences and opinions. The present work began as a result of this advice. Both of us have enjoyed the freedom of writing without needing to secure the approval of interested parties or paymasters.
Whether they are positive or negative, we have been free to include our experiences of recovery. But to keep us out of the libel law courts or prison cells, we have reluctantly refrained in places from naming individuals or specific agencies or institutions. Where our reflections are sensitive or critical, we have followed a policy of not naming specific UN agencies, using instead the general term ‘UN agencies’. Similarly, we have avoided naming specific NGOs or academic bodies. However, we do refer to specific countries and governments as omitting such precise examples and experiences risks the text becoming meaningless.

We have each undertaken assignments in which we gathered information and the insights of survivors and decision-makers on the progress of recovery: in Indonesia, Malaysia and Sri Lanka following the 2004 tsunami; in Pakistan after the 2005 earthquake; in the Philippines following Typhoon Haiyan in 2013; in settlements recovering from the devastating 2011 Tōhoku earthquake and tsunami in Japan; in New Zealand after the Christchurch earthquakes of 2010–11; in New Orleans after Hurricane Katrina in 2005; in Haiti following the earthquake of 2010; in Sichuan Province in the People's Republic of China following the 2008 earthquake; in Italy following the earthquakes in L'Aquila in 2009 and Emilia in 2012; and so on. We have also looked back at events from the more distant past by revisiting disasters in order to examine the long-term recovery of communities; for example, in India following the Latur earthquake of 1993 and in Italy after the Campania–Basilicata earthquake of 1980.

We have dispersed examples of disaster recovery throughout the book and have located them where they seemed to fit chapter themes. Some examples turned into detailed case studies, while others are brief descriptions. The most detailed examples are as follows:

- Chapter 1: Earthquake recovery in Malkondji, India; Belice, Sicily.
- Chapters 2 and 9: Typhoon recovery in Haiyan, Philippines.
- Chapter 3: Earthquake recovery in Wenchuan, China.
- Chapter 4: Flood recovery in the UK, the Netherlands and Mozambique; Earthquake recovery in Gujarat, India.
- Chapter 6: Earthquake recovery in Christchurch, New Zealand.
- Chapter 7: Earthquake recovery in Skopje, Yugoslavia.
- Chapter 9: Flood impact to a Frank Lloyd Wright masterpiece dwelling; WWII bombing and evacuation in the UK; Earthquake recovery in Managua, Nicaragua; Guatemala; Southern Italy; Kobe and Tōhoku, Japan; and Bam, Iran; Hurricane recovery after Katrina, USA.
- Chapter 10: Earthquake and tsunami recovery in Chile and Japan.
- Chapter 12: Cyclone recovery in Andhra Pradesh, India; Tsunami recovery in Indonesia; Earthquake recovery in Pakistan and L'Aquila, Italy.
We have written this book together as we have been close friends and academic colleagues for over 25 years and brought complimentary backgrounds and experiences to the writing enterprise. Ian comes from an architectural background while David was trained as a geographer and geomorphologist. Both of us have worked with research institutes, universities, governments, NGOs, private sector companies, mass media representatives and locally-based community organisations. Our paths crossed at Cranfield University, where we became Professors of Disaster Management.

We believe our separate approaches balance each other – David has written extensively about emergency planning and contingency management while Ian has focused on disaster risk reduction, adaptation to climate change, shelter and the reconstruction of housing. We have both worked extensively on the vulnerability of people to natural disasters and more generally on disaster risk reduction. Moreover, we are interested in disaster recovery in both developing and industrialised countries as we see increasing parallels in disaster impact and recovery patterns regardless of whether countries have severely limited resources or are fortunate enough to be able to draw upon massive capabilities.

As in all our past writing, this book is intended to be of interest to a wide audience of concerned lay persons, researchers, media personnel, academics, professionals, students and recovery management officials. We have made a number of assumptions that underpin our writing. Specifically, we believe the following:

- Disaster survivors need to be closely involved in decisions that affect them. Moreover, the maintenance and recovery of their dignity should be a paramount concern, and efforts should be made by all parties to avoid creating unrealistic expectations and long-term dependencies. In Chapter 13, we conclude our book with a series of principles and a final model (no. 21), linked to principle no. 13, shows in graphic form the strength and weakness of community participation in recovery in the major case studies of recovery cited in the book.

- In most cases, recovery should be a multi-sectoral process that involves closely linked psychosocial, environmental, economic, physical, political and administrative elements. This is represented in Chapter 3 in a hexagonal diagram that forms model 2 – the ‘recovery sectors’ model.

- National governments need to coordinate recovery actions within their respective countries. They need to harmonise procedures adopted at lower levels of government and ensure that there is strong, positive leadership at the top. See Chapter 4, model 20 for contrasting frameworks of governmental leadership of recovery.

- Whether they are national or international, assisting groups have key roles to play in recovery, but they must avoid duplicating the actions that disaster survivors can take themselves. We believe that aid should empower, not weaken, efforts by beneficiaries to recover and take back control of their
own lives. In Chapter 9, we consider model 17 which reviews multiple options and identifies the providers of shelter and housing. We discuss the roles of external groups as well as spontaneous actions by survivors to provide their own shelter and build their own houses.

- A key factor in all recovery actions should be to improve safety in the light of future disasters. In Chapter 4, through models 9 to 13, we discuss the critical issue of safety during recovery.

- Finally, we have a shared belief that the world of disaster risk reduction and disaster recovery management is rather overpopulated with self-serving publications, produced by UN agencies, NGOs and international financial institutions. The positive side of this plethora of literature has been the wide coverage of topics and issues, but too many of the publications define these to meet their own interests in gaining publicity, securing resources or building agency profiles. Therefore, we have sought to use our independence to write freely. In the over-politicised world of disaster risk reduction, we believe that the critical spirit badly needs to be revived. While not wishing to take his injunction too literally, we remember Bernard Shaw’s advice to writers: ‘Decide what you want to say and then say it as offensively as possible.’

Having stated the intentions of this book, we need to specify what it is not. For example, it is not a set of technical guidelines – these are already common and examples are listed in our bibliography and in Appendix 3. We have offered practical advice, but it has not been our intention to write a ‘cookbook’; rather, we aim to delve into the principles and theory of recovery management in the manner of a ‘nutrition guide’. We should also note the professional bias of the book. Neither of us are economists, health professionals, specialists in the recovery of the natural environment, etc. While we have noted the importance of these and other sectors in our second model in Chapter 3, we have concentrated our energies in the sectors where we have most experience, such as shelter, housing, planning, risk management and policy concerns.

We have devoted two chapters (3 and 4) to 20 models that relate to recovery planning and management. Many of these have grown from our teaching in various universities and in leading management training workshops, where we have found that students and practitioners value simple conceptualisations to help explain complex ideas. Throughout the text, we return to these models where they fit given topics (see Appendix 1 for a summary of models).

In order to constrain this book to manageable proportions, we have had to adopt a somewhat restrictive definition of ‘disaster’. We do not include conflict, warfare, economic disasters, nutritional emergencies or epidemics and pandemics. Some of our conclusions may apply to such situations, but we recognise that the survivors of disease, spontaneous loss of wealth, wars and displacement may have different predicaments and needs to those that we describe in our focus on natural and anthropogenic disasters, sensu stricto. Where appropriate, we have
noted the overlapping concerns, but we feel that limiting our scope allows us to ensure a more focused, concentrated coverage of our subject matter. Similarly, we have tended to exclude business continuity management and many examples of recovery from technological disasters as these are less germane to the issues of greatest importance to us, such as shelter management. Finally, we have not considered how humanity might recover from apocalyptic disasters, such as asteroid impact or the collapse of the food chain. Such eventualities are outside our experience and will no doubt be taken up by other authors.

During the course of writing the book, we decided to check whether our convictions concerning the priorities of recovery were widely shared by experts working in the field – 51 generously responded to our survey, in which we asked each to state concisely the essence of effective recovery. Their answers were revealing and we devote Chapter 11 to them, accompanied by our observations. Their responses are recorded in full in Appendix 2. We were tempted to quote from their answers within the book but (with one exception) resisted this impulse as it would have been invidious to quote from one author and not another.

At the end of the book in Chapter 13, we present some general principles of recovery from disaster, which we back up with the models noted above that explain how to apply them; and we cite examples of cases in which they were applied or of situations that inspired us to formulate them. In an ideal world – one that is considerably more prudent than that in which we live – much more effort would be devoted to reducing the risks and impacts of disaster. As it is, such efforts are vastly overshadowed by expenditure on responding to disaster when it occurs. Early relief and intervention dominate the field, in part because the imperative of early response to disaster cannot be ignored and in part because it seems to be much easier to respond than to reduce the reasons why such response is needed by making society less vulnerable. The disaster ‘crunch’ model (no. 10 in Chapter 4) seeks to identify possible drivers of vulnerability. In any case, the medium- and long-term phases of impact have been studied much less by disaster scholars than have hazards, risks, predictions, warnings and early phases of impact.

The world’s news media tend to lose interest in disasters long before they cease to be the main issue in the areas that are affected. Like the international relief community, the global news media move on to the next major catastrophe somewhere else, which can lead the inhabitants of disaster areas to feel that the world has lost interest and is neglecting them. A remarkable example of this was investigated by the sociologist Kai T. Erikson, whose book *Everything in its Path: Destruction of Community in the Buffalo Creek Flood* (1976) chronicled the isolation of a poor, isolated community affected by a devastating flood. Anthony Oliver-Smith’s classic work of social anthropology, *The Martyred City: Death and Rebirth in the Andes* (1986), similarly records isolation and neglect in a Peruvian community devastated by a rock avalanche. In Appendix 3, we offer a list of key writings and websites that deal with recovery.
In the present book, we are interested in the long haul, the painstaking process of restoring damaged communities and settlements, activities and environments to a state of functional productivity and hopefully also to a state of resilience against future disasters. In many cases, recovery is a slow process and one that must necessarily proceed on many different planes: social, economic, cultural, psychological, institutional, environmental and physical. The multifaceted nature of the process easily leads to fragmentation. The extension of recovery through various time periods puts it into a dynamic context that forces constant changes upon the guiding parameters. Small wonder that it is a complex and variable process. Nevertheless, we have sought in this book to unravel it and explain the objectives, opportunities, constraints and pressures involved. We hope that this may make a small contribution to enlightening the process of recovery from disaster and suggesting ways in which it can be pursued more vigorously and effectively.

Ian Davis and David Alexander
Oxford, UK, 1 February 2015

Note

1 A further model (no. 21) is introduced in Chapter 3 and described in Chapter 13.
Management models are designed to resolve common problems and challenges. At best they will provide a new way of seeing a situation that will result in positive change. The models may be applied strategically, tactically or operationally; some are problem-solving tools, designed to improve efficiency and effectiveness; most are designed to solve specific problems arising out of a specific situation.

(Van Essen et al. 2003: x)

Introducing models

Having laid down a foundation for the book in the first chapter with positive and negative examples of full and limited recovery, and having established the context for the book in Chapter 2, we now turn to a description of the models that we use throughout the book as visual references or representations for the varied themes and ideas that fill our remaining chapters. We have grouped the models into four categories:

• development and recovery;
• phases of recovery;
• safe recovery;
• organisation of recovery.

By definition, a model is a simplification of reality; and a good model simplifies the complexity of real situations elegantly. Busy readers may wish to focus their attention on this chapter, in which we have selected those models that we regard as the best at simplifying complexity down to its essential elements, helping explain it and showing the most important connections between related factors.
Some of these models have helped us as we have struggled over many years to make sense of the complexities of recovery, and we trust that this will also be the experience of readers.

According to Krogerus and Tschäppeler (2011), to be effective, models of decision-making must fulfil some or all of the following criteria:

- simplify a given situation or issue to its essential components;
- provide new ways of viewing common situations;
- expand our perceptions and understanding;
- contain strong visual images that clearly express ideas which are not easy to convey in words;
- express complex interrelationships and processes;
- provide simple ways to communicate;
- act as aids to memory, or tools to analyse situations and explore a range of solutions.

We echo the quotation from Van Essen et al. (2003) that heads this chapter: ‘At best they [management models] will provide a new way of seeing’. That is the purpose of this chapter and the reason why we use models in our work. But we have a rather more jaundiced view of management models than that of Krogerus and Tschäppeler. Many models seem highly artificial and some are downright misleading when applied to disaster situations. Our concern in using or applying any model is that there is an inherent risk of oversimplifying or distorting a situation. Representations of the complexities of reality are inevitably rather crude two-dimensional, static images that seek to convey multidimensional dynamic processes. In describing various models in this chapter, we note some of their inherent problems and limitations. However, we sincerely hope that Til Schuermann’s comment does not apply in the following two chapters: ‘when models turn on, brains turn off’ (cited in Strachnyi 2012: 6).

Moreover, users should not endow models with excessive authority: they are always approximations of reality. As we describe, some models have serious defects, and problems have arisen when they have been used repeatedly with unquestioning acceptance rather than being discarded or revised. Therefore, in this chapter, we have tried to avoid models that have accumulated too many weaknesses. Model formulation is a dynamic process for, as new insights occur, each model needs to be adapted. In addition, all the models presented in this chapter need to be modified by their users to suit specific situations.

Dr Gustavo Wilches-Chaux, a highly experienced Colombian expert with extensive experience in managing disasters in his country, commented as follows on the difficulties of using models:

The idea of developing ‘models’ that can be copy pasted with equal results in every disaster situation is a big mistake that should be avoided. One strategy that has had successful results in a given historical moment and/
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or in a given environmental, social or cultural context could be a total
failure in a different context. And the opposite: one strategy that fails in
one situation could be successful in a different context. The most that one
can expect is to have a toolbox, with concepts, principles and strategies that
should be tested and adapted (or discarded) in front of each unique
challenge.¹

We offer a total of 21 models, classified according to the four categories listed
above. Each category is introduced with a summary chart that describes the
models, their application and their source, as well as indicating the main places
where they are referred to in the book. See Appendix 1 for a summary of models
introduced in Chapters 3 and 4.

Development and recovery models

<table>
<thead>
<tr>
<th>Model</th>
<th>Graphic representation</th>
<th>Application</th>
<th>Source</th>
<th>Location in book</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image1" alt="Progress with recovery" /></td>
<td>Describes four strands of effective recovery with the characteristics of four recovery scenarios; can be used as a monitoring device</td>
<td>New model developed for this book by the authors; tested in Davis (2012)</td>
<td>Chapter 1: case studies of Malkondji, India and Belice, Italy; Chapter 3: case study of Wenchuan, China</td>
</tr>
<tr>
<td>2</td>
<td><img src="image2" alt="Recovery sectors" /></td>
<td>The twin of model 1; here, the recovery scenarios are applied to five recovery sectors; can also be used as a monitoring device</td>
<td>New model developed for this book by the authors; tested in Davis (2012)</td>
<td>Chapter 1: case studies of Malkondji, India and Belice, Italy; Chapter 3: case study of Wenchuan, China</td>
</tr>
<tr>
<td>3</td>
<td><img src="image3" alt="Development recovery and elapsed time" /></td>
<td>This ‘timeline’ model shows the relationship between development quality and elapsed recovery time</td>
<td>This model appears in various publications; original source is unknown</td>
<td>Chapter 10: example of effective recovery following the Chile earthquake</td>
</tr>
</tbody>
</table>
**Model 1: progress with recovery**

The value of this model (Figure 3.1) is in its description of the stages or scenarios of recovery.

This model owes part of its origin to the work of Kates and Pijawka (1977), who distinguished between recovery designed to replace what was lost and that which goes beyond mere replacement and is intended to show that the area affected has overcome the problems and setbacks caused by the disaster (see models 6 and 7). In many respects, this diagram is the key to the entire book, as it conveys the message that effective recovery management has to develop well beyond the vulnerable status quo that gives rise to any disaster.

*A challenge from the floor in a disaster management workshop in 1983:* Ian Davis was leading an international workshop on disaster management in Oxford in 1983 when a revealing exchange took place between a speaker and a participant. A speaker from the International Federation of Red Cross and Red Crescent Societies (IFRC) was making a presentation on disaster recovery. He projected a diagram that stated that the aim of disaster recovery is to restore normality. This resulted in an outburst from the back row, where a senior nurse from Jamaica with extensive disaster experience was sitting:

May I protest; please do not use that slide ever again! You are stating that the aim of disaster recovery is to return to the status quo, but that must be fundamentally wrong! In the city where I live, Kingston, Jamaica, we have people living in cardboard boxes; so are you seriously suggesting that after a future hurricane or earthquake in Kingston, we need to rehouse them back in these boxes? No Sir! Any recovery must move forward to a better and safer future since ‘normality’ equals vulnerability.
FIGURE 3.1  Model 1: progress with recovery.
The speaker was reduced to stunned silence by the force of her interruption, but it is not known whether these passionate words had any effect on his subsequent lectures.

This model has a double message. The first concerns an expanding vista that grows from a point that indicates the start of disaster recovery into four strands, each of which is necessary to its success. Without ‘vision and leadership’, recovery is likely to drift into gross inefficiency or stagnation. In a frequently quoted saying from the Book of Proverbs, the wise King Solomon declared: ‘Where there is no vision, the people ...’ – evidently the next word is inaccurately translated from the original Hebrew as ‘perish’, but a more correct rendering would be: ‘the people run wild’ or ‘the people act without restraint’ (Proverbs, Chapter 29, Verse 18). We are aware of situations after disaster in which Solomon’s words would accurately describe some exceedingly unwise mismanagement that lacked vision and failed to promote recovery. Some of these cautionary tales are described in this book.

Without political, financial, material or human ‘resources’, nothing substantial can be created. Without ‘participation’, affected residents and stakeholders will certainly have no sense of ‘ownership’ of the reconstructed environment. Finally, without ‘organisation’, recovery will be erratic, piecemeal and wasteful.

In synthesis, this means that in most cases, recovery from disaster opens a ‘window of opportunity’ for the improvement of safety, the reduction of vulnerability and the creation of environments that are more efficient at satisfying their users’ needs. It represents a situation in which change is inevitable and it is imperative to ensure that this is positive. A ‘negative window of opportunity’ would give free reign to criminal elements, corruption and vested interests and is, of course, to be prevented. Transparency and a participatory approach are the means by which recovery can be kept on a positive track.

Throughout the book, we provide a series of positive and negative examples that substantiate our conviction that these four strands are essential. The entire history of disaster recovery is a procession of frequent failures and rare success stories.

In relation to the second message derived from this model, we relate the unfolding recovery process to four scenarios, the first of which is the worst solution and the last of which is clearly the best target.

- **In Scenario 1, there is no recovery**: Typically, for years after the disaster, ruined buildings abound, infrastructure is damaged and inefficient, half-finished projects are littered about the landscape and there is clear evidence of failure to deliver on promises made early in the recovery process (e.g. Managua, Nicaragua after the 1972 earthquake).

- **In Scenario 2, recovery is insufficient or erratic**: Some buildings have been reconstructed, but there is widespread unemployment, the economy is limping along, society remains fragmented and the environment remains degraded – for example, trees have not been replanted (e.g. Port-au-Prince, Haiti following the 2010 earthquake).
In Scenario 3, **replacement recovery restores the status quo ante**: Significant attempts have been made to recover the pre-disaster situation, but alas, this so-called ‘normal’ situation is characterised by high levels of the same vulnerability that gave rise to the disaster. (For centuries, this was the case in Europe and the Middle East when floods or earthquakes occurred – only recently has there been any attempt to reduce vulnerability during rebuilding).

In Scenario 4, **developmental recovery occurs**: There are rare examples of recovery in which positive development has taken place to produce a better and safer environment. In Figure 3.1, four key elements are listed: build back better and safer, complete all sectors, make use of an inspired vision, and ensure that leadership is strong, inspired and wise. (The example of the reconstruction of the Indian village of Malkondji described in Chapter 1 is a fitting example of recovery that fulfilled this scenario.)

This model can be used as a monitoring device to enable government and donor officials to check on progress as they strive to reach the final scenario.

Having proposed this model, we can immediately see some of its limitations. For example, the four radiating strands simplify reality to its barest essentials, but they contain words that raise problems. While the word ‘vision’ is certainly uplifting, and few would deny its importance, the questions remain as to whose vision should be represented and vision of what? The vision for recovery of the chief executive or shareholders of a firm of building contractors will inevitably differ from that of the leader of an NGO concerned to make recovery sustainable for the most vulnerable citizens. For example, Ian Davis gave advice to the manufacturing association of prefabricated housing following the 1980 Campania–Basilicata earthquake in Italy. An exhibition organised in order to present what was on offer had a banner in letters about two metres high, that stretched across the entire exhibition hall with the slogan: ‘One man’s disaster is another man’s marketing opportunity.’ This could be rephrased as ‘one man’s tragedy leads to another man’s commercial gain, or vision’. Morally speaking, leadership vision should not be confused with exploitation. The issue of ‘provided shelter and housing’ is discussed in Chapter 9, options 5b (‘provided shelter’) and 7b (‘contractor-build permanent dwellings’).

Another problematic word is ‘participation’. It describes an essential process and has become the mantra of every fundraising application or project evaluation. However, the first reality is that in most countries, and almost certainly in countries with authoritarian regimes, the very notion of participation is alien. Moreover, participation is often used in conjunction with the word ‘community’. There is a prevalent feeling that communities are the solution to all problems of disaster vulnerability, risk and recovery (Berkes and Ross 2013). We would like to point out that, useful and fundamental as they are, some communities are heterogeneous, at odds with themselves, dominated by vested interests (including the process of so-called ‘elite capture’ – see Platteau 2004) or lacking a sense of direction or purpose. Moreover, there is no inherent
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geographical scale at which community exists: it can vary from a single street to a global phenomenon.

Nevertheless, it may be perilous, or at least unfair, to ignore the community. An example occurred in the late 1990s when one of Ian’s close friends, David Oakley, an architect and planner, conducted an evaluation of a UN-sponsored project that involved disaster risk reduction activities in rural Pakistan. Oakley concluded his evaluation report with the criticism that there had been no consultation whatsoever with the residents of settlements in the floodplain before measures had been put in place that significantly affected their houses and livelihoods. He proposed that in future, participation should be built into all projects. He completed the study and it was duly sent to the relevant ministries of the Government of Pakistan. Just before leaving to return to the UK, Oakley received an unexpected invitation to meet one of the ministers in Islamabad to discuss the evaluation report. He arrived and was met by the minister who had been a military general before his political career. This man’s explanation of why he had sent for him ‘spoke volumes’ in Oakley’s words:

Mr Oakley, I have read your report from cover to cover and I have invited you here to ask you just one question. You say that there should have been full participation of the local communities before the flood risk reduction project was undertaken. Well, I want to ask you this, since we do not consult these local communities on any other issues, why should we single out flood protection for consultation?

David Oakley told Ian that for the first time in his life he was reduced to total silence by this extraordinary question.

The second reality to recognise is that the price of the extensive participation of those involved will almost inevitably be long delays. It is also possible that conflicts between rival approaches to recovery will be intensified through the participatory process. ‘Participation’ is often used in conjunction with the word ‘community’, and much faith is put in the ability of communities to be the source and location of reconstruction (Duyne Barenstein and Leemann 2012). However, communities are not necessarily homogeneous, receptive to good practice or capable of working in harmony (Davidson et al. 2007). Moreover, in any society, rich or poor, community agendas can be subject to ‘elite capture’ by the most powerful members (Kundu 2011). Hence, ‘community’ and ‘participation’ are words that should be used with caution. The strong links between ‘participation’ and ‘accountability’ are discussed in Chapter 6 (‘Accountability’).

Perhaps the main reason why recovery from the Sichuan earthquake in China was completed in an astonishing four years (2008–12) may be due to authoritarian leadership and minimal participation of the surviving population in decision-making (Bernal and Procee 2012). The same could be said of the exceedingly rapid rebuilding of the areas of north-eastern Japan affected by the earthquake and tsunami of March 2011, in which many key decisions were made remotely by national leaders in Tokyo, regardless of local concerns.
Model 21 (Chapter 13) compares the strength of participation with the strength of government.

Recovery from the Wenchuan earthquake, Sichuan Province, People’s Republic of China, 12 May 2008

The recovery following the 2008 earthquake in Wenchuan is discussed here as it relates to model 1, ‘progress with recovery’, and model 2, ‘recovery sectors’.

According to Han et al. (2014), the Sichuan disaster was the most destructive earthquake with the largest devastated area and the most difficult emergency relief challenges to have occurred in China since the founding of the People’s Republic. This magnitude 7.9 seismic event occurred at 2.30 p.m. local time. It struck an area of about 130,000 square kilometres (roughly the size of South Korea) in which 46.3 million people lived (more than the population of Canada), 43 per cent of whom (19.9 million) were directly affected by the tremors. In all, 69,227 people were killed, but almost 18,000 others were unaccounted for and so the final death toll may have been as high as 87,150. Some 4.3 million people were injured. An estimated 20 million houses were destroyed or damaged in rural and urban districts, which left 15 million people homeless. Temporary housing had to be provided for 12 million people (comprising about 4 million families), and livelihood support was given to almost 9 million. More than 11,000 medical centres, 7,444 schools and 47,000 kilometres of roads were damaged. Floods, rockfalls and landslides damaged 60 per cent of farmland in the affected area. Damage was valued at US$116 billion, of which US$31.3 billion (27 per cent) represented the cost of damaged housing.

Like the earthquakes and tsunamis in the Indian Ocean in 2004 and the Tōhoku area of Japan in 2011, the Wenchuan earthquake remains one of the most complex and challenging disasters of modern times. The scale and nature of the disaster and its unique characteristics make it an essential case to be taken into consideration in any study of recovery. When observing the effects of a disaster, emotions tend to swing back and forth from the negative to the positive, from anger to awe. One may experience acute sadness at the appalling waste of human lives, particularly the loss of children, which is so often an effect of human weakness in the form of corruption or official negligence; but this can change into admiration at the rich ability of diverse societies, at all levels, to cope with their respective trials and tribulations, or even triumph over them.

In June 2014, Ian visited Sichuan to observe progress in reconstruction six years after the earthquake. The following are some of his observations on the situation.

Human rights and the vulnerability of schools

While this book is about disaster recovery, not disaster vulnerability, we still need to consider how the failure of buildings gives rise to disaster since vulnerability
and risk can be perpetuated by reconstructing buildings that are as shoddy and unsafe as those they replace (see the ‘crunch’ model – no. 10 in Chapter 4). As data are not available on the vulnerability of rural and urban dwellings, the following discussion concentrates on school buildings in Wenchuan. In total, 7,444 schools were damaged in the earthquake, and this led to a disproportionate number of deaths among children. It is worth making a comparison here with the losses of schools and pupils in the 2005 Kashmir earthquake in Pakistan, which were deemed to be very large (Table 3.2).

It is probable that the much higher ratio of deaths of children to total deaths in Pakistan relates to the much larger number of children in the average Pakistani family, where they constitute a higher percentage of the population compared to that of Sichuan Province where the ‘one child per family’ policy prevails.

Sophie Richardson, Advocacy Director of the Asia Division of Human Rights Watch, wrote the following about government actions in China:

Rather than conduct impartial investigations into allegations of shoddy construction, or provide a full accounting of those who died in the schools, national and local officials opted instead to persecute those who were asking the questions. Grieving parents were told not to try to take cases to court, or bought off in order to drop their complaints.

(Richardson 2010)

Richardson observed that within hours of the Sichuan earthquake, the Government’s Central Publicity Department (which had previously been identified in English as the Propaganda Department) began to dictate to the Chinese press precisely how the disaster was to be covered. The coverage would ‘uphold unity and encourage stability’ and stress ‘positive propaganda’. By the end of the month in which the earthquake occurred, Chinese journalists had been instructed to minimise coverage of the school collapses.

Throughout the region, grieving parents mounted protests against the authorities over the collapse of the school buildings and the lack of information they were receiving. The deaths of children were particularly tragic in China on

<table>
<thead>
<tr>
<th></th>
<th>Kashmir, Pakistan 2005</th>
<th>Sichuan, P.R. China 2008</th>
</tr>
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<tbody>
<tr>
<td>Deaths</td>
<td>74,676</td>
<td>69,227</td>
</tr>
<tr>
<td></td>
<td>17,923 missing</td>
<td>(totalling 87,150)</td>
</tr>
<tr>
<td>No. of children killed</td>
<td>18,091</td>
<td>5,333</td>
</tr>
<tr>
<td>(24% of total)</td>
<td></td>
<td>(6% of total)</td>
</tr>
<tr>
<td>No. of teachers killed</td>
<td>853</td>
<td>Unknown</td>
</tr>
<tr>
<td>No. of schools destroyed</td>
<td>3,424</td>
<td>7,444</td>
</tr>
</tbody>
</table>
account of the ‘one child per family’ law, and this factor added to the suffering of the parents. As a response to the protests, the government offered each family that had lost a child in a school collapse a lump sum, equivalent to around US$8,800, and a guarantee of a pension in return for silence (The New York Times 2009).

Three Chinese activists – campaigning journalist Huang Qi, literary editor and environmental activist Tan Zuoren and the artist Ai Weiwei – took up the parents’ cause by seeking to find out the names of all the children who died, in which schools their deaths occurred, and exactly how shoddy construction had led to the school collapses. The Chinese authorities persecuted the three men violently for taking this initiative. In 2009, Huang Qi and Tan Zuoren were imprisoned for ‘revealing state secrets’ and ‘subversion’. In reality, what they had done was criticise the Chinese authorities (US Government 2009). Tan was released in March 2014 after five years of confinement in prison, while Huang spent three years in prison. On Huang’s release, he continued to suffer from violent headaches as a result of the beatings he had received from the police in Chengdu.

Ai Weiwei became internationally famous when his concept of the ‘bird’s nest’ inspired the design of the Olympic Stadium in Beijing. He played a key role in helping the parents who lost their children to find out how the tragedy happened. With the help of 50 volunteers, he attempted to collect data about the deaths in schools; he then placed the information on his blog and used it in art exhibitions in Germany in 2009 and Washington in 2013. His intention was to draw international attention to the denial of human rights in Sichuan (Elegant 2009). His museum exhibits included the display of school satchels, which symbolised the missing children who died in the earthquake. In the 2009 exhibition, the satchels covered the entire façade of the Haus der Kunst art gallery in Munich. A series of Chinese characters formed by the backpacks spelt out the words of a parent whose daughter had died in the disaster: ‘She lived happily for seven years in this world.’ Ai explained that his idea to use the backpacks:

came from my visit to Sichuan after the earthquake in May 2008. During the earthquake many schools collapsed. Thousands of young students lost their lives, and you could see bags and study material everywhere. Then you realize individual life, media, and the lives of the students are serving very different purposes. The lives of the students disappeared within the state propaganda, and very soon everybody will forget everything.

(Ai Weiwei, cited in McMahon 2009)

A poignant exhibit was included in the exhibition in the Hirshorn Museum in Washington in October 2013, which spoke volumes about the reluctance of the authorities in China to provide information to disaster survivors. Ai Weiwei included a scan of his head to show the cerebral haemorrhage he sustained on 12 August 2009, two weeks before he attempted to give evidence at the trial of Tan Zuoren, when he was beaten by the Sichuan Police. The circumstances that
led up to his beating by the police as well as the MRI brain scans showing his cerebral haemorrhage have been fully documented (Mason 2014).

The persistence of these brave activists in gathering statistics eventually compelled the Chinese Government to reveal that 5,333 children died in the earthquake. The activists may also have pushed the authorities to develop China’s first national human rights action plan, issued on 13 April 2009 (Government of China 2010). Ai Weiwei continued to receive information from survivors about deaths in their families, and he estimates that the official figure of child deaths represents 80 per cent of the actual total. Significantly, he suggests that 3,500 of these deaths occurred in only 18 of the 14,000 schools that were damaged or destroyed (Grube 2009).

It is important to note that the imprisonment and beatings of the activists violate Chinese citizens’ rights to freedom of expression and information, as guaranteed under both international law and China’s constitution. Such action against critics also contravenes the aforementioned human rights action plan, which contains clauses of direct relevance to the Wenchuan earthquake; for example, by committing the government to ‘respect earthquake victims (and) register the names of people who died or disappeared in the earthquake and make them known to the public’ (Government of China 2010).

When interviewed by The Economist in 2009, Ai Weiwei suggests a reason why the schools had been so shoddy and unsafe. He believes that these structures:

were erected across China because of the government’s drive to provide enough classrooms for all children to undergo nine years of compulsory education. Building costs were supposed to be shared by central and local authorities, but the latter often failed to chip in. This led to quality problems.

(The Economist 2009)

In February 2009, a government report noted that many school buildings were poorly constructed, with the disturbing information that 20 per cent of the primary schools in one south-western province ‘may be unsafe’ (The New York Times 2009). Further confirmation that catastrophic failures among schools and other buildings may have been strongly related to corruption and criminal negligence came from another direction: although there has never been official confirmation, Ian has been reliably informed from an internal source that 15 officials in charge of enforcing the quality of building work, who approved substandard, unsafe school buildings and thus failed in their inspectorate roles, were executed by the Chinese authorities.

**Shelter provision**

The government had stockpiles of 300,000 tents, but within a month, this was expanded to 900,000 due to the demand. In addition, 300,000 quilts were allocated.
Some 677,131 wooden-plank, so-called ‘makeshift’, cabins or houses and some larger prefabricated school units were stockpiled in eight localities distributed around China, including Chengdu, Sichuan. The temporary house units (Figures 3.2 and 3.3) were 5.4 metres long and 3.6 metres wide, making a total of 19.4 square metres. These units were occupied by displaced families for up to three years from around July 2008 until permanent dwellings were available; the latter began to reach completion in the summer of 2010 (Jing 2014; Han et al. 2014).

In June 2008, it was reported that media had been instructed not to refer to miscarriages that were reported to have occurred among women living in temporary houses due to the presence of formaldehyde, a material that had been used in the construction (The New York Times 2009). This building material also caused a problem following Hurricane Katrina, when toxic air quality was found inside post-disaster shelters (Hagerman and Doherty 2009).

**Permanent reconstruction**

After the earthquake, it was estimated that about ten million dwelling units were required. They were provided with astonishing speed as required by the National Emergency Relief Plan on Natural Disaster Reconstruction, which states that houses need to be reconstructed within one year of a disaster. This may be
a reasonable goal when the massive resources of the Chinese state are pitted against the effects of a small disaster, but it is hardly realistic when dealing with something the size of the Wenchuan earthquake. Initially, the government stated that two years would be required, but this was later changed to three years. Reconstruction of dwellings began in October 2008, five months after the

FIGURE 3.3  Lifelike display of a family of waxwork models occupying a temporary cabin. They are wearing overcoats since there was no heating in the shelters (photograph by Ian Davis, taken in Wenchuan Earthquake Museum).
earthquake, and was completed by December 2012, 55 months after the disaster, representing a total construction period of four years and three months.

Given the vast area affected by the disaster, varied approaches to reconstruction were adopted. In the rural area of Mianzhu County, Sichuan, a cash distribution approach was adopted to support 63,000 families in the reconstruction of homes, this money being placed directly into each individual’s bank account. These dwellings ranged in size from 50 to 150 square metres. The cost of materials for the dwellings was US$9,000–US$18,000, and the construction cost per dwelling unit was US$440–US$1,500. Precise selection criteria were adopted in the allocation of rural housing to families who:

- had lost a family member in the earthquake;
- had a family member who sustained a permanent disability from the earthquake;
- lived with an elderly family member, over 60 years old;
- lived with an elderly family member who was seriously ill prior to the earthquake;
- lived in one particularly vulnerable township where total relocation was necessary (Ashmore 2010).

Government relocation of communities and settlements

In the immediate aftermath of the earthquake, Chinese scientists advised the government to move many communities away from unsafe sites, subject to landslides resulting from earthquake aftershocks. On 17 June 2008, 110,000 residents of Aba Prefecture were moved, and further relocations occurred in Maoxian, Lixian, Heishui and Jinzhai. A total of 25 townships were relocated. Ian has been reliably advised that these were ‘forced relocations’ in which families were given no choice to remain in their original settlements and accept the risks in so doing.

A decision was made to relocate the surviving residents of Wenchuan to new towns at Beichuan (Figures 3.4 and 3.5) and Yinxu. These settlements were built extremely rapidly and completed by 2013, just five years after the earthquake. Special consideration was given to the rebuilding of minority communities in a traditional architectural style. However, it is possible that some of the new residents of Beichuan were not offered the choice of whether to remain in their original settlements or be relocated.

In the past, relocation of settlements after disasters has been a source of persistent failure. Reasons include social objections from relocated communities who wish to remain in their existing site for cultural motives, the fact that the abandoned settlement often continues to exist in parallel to the new relocated settlement, the massive costs involved, and the pressing issues of families not securing a house or plot comparable to their abandoned home. However, from what Ian could gather when visiting the area in June 2014, there appeared to be
FIGURE 3.4  Entrance to the relocated town of Beichuan (photograph by Ian Davis).

FIGURE 3.5  Beichuan town centre (photograph by Ian Davis).
widespread public support for the decision to relocate. This may in part be on account of the bodies of family and friends that remain buried under earthquake or landslide debris. Thus, Wenchuan was no longer a town; it had become a cemetery as well as a tourist venue.

**Significance of the recovery from the Wenchuan earthquake**

There are several important reasons why the Wenchuan earthquake and its aftermath are particularly significant to a book on recovery from disaster.

*The fundamental role of the ‘risk drivers’ of vulnerability:* Inadequate or non-existent certification of construction played a significant role in the collapse of schools and apartment blocks. As noted above, after these failures, the authorities engaged in a violent crackdown on demands for justice by civil rights protestors and the parents of children who died. This case study records the struggle of activists to gather information on dead children to assist grieving families and to help establish reasons why so many schools collapsed. The gathering of information to inform policy and share with involved parties and the forensic identification of causes of failure to guide future policies and practice are regarded in any progressive society as essential processes and part of an established international procedural convention. All the undoubted successes of the recovery process in Sichuan are diminished by the actions undertaken by national and local governments to stamp out enquiries that are both essential and legitimate (see model 10, Chapter 4).

*Speed of recovery:* The fact that dwellings were reconstructed throughout the region for more than 15 million inhabitants in less than five years is a remarkable achievement by any standard. The work required selection of the site, planning the new settlements, construction of buildings and creation of associated infrastructure. It employed a workforce of 100,000 people, which involved devising opportunities to create livelihoods. It counts as a major feat that in less than five years the town of Beichuan was occupied by 40,000 earthquake survivors (see Chapter 7, ‘Fourth dilemma: speed of reconstruction vs vital requirements in reconstruction planning’).

A similar case is that of Monterusciello, a new town for 67,000 people displaced by volcanic activity from Pozzuoli in Southern Italy, which was built in 1985 by the Italian Government in only six months. However, in the Italian case, that was the sum total of relocation needs whereas the Chinese authorities were dealing with millions of displaced survivors. In Sichuan, the relocation of survivors into two major towns and countless smaller settlements appears to have been a popular decision – a rare example of public acceptance of complete relocation. Such rapid progress depended on the vast human, financial and material resources of the People’s Republic of China, with its centralised political system and government ownership of land.

*Partnerships to assist recovery:* The World Bank report that about 41,130 projects for reconstruction and rehabilitation were undertaken, 99 per cent of which were
completed within a two-year period. This astonishing speed resulted from innovative measures, such as a partnership scheme in which the central government paired up each affected province with an unaffected province that worked in close partnership to provide financial and technical assistance for reconstruction and restoration. It is estimated that US$146 billion were invested for reconstruction (Bernal and Procée 2012). A similar approach has been used in recent Italian earthquakes. For example, transitional accommodation provided in the L’Aquila area of Central Italy after the 2009 earthquake was partly provided by the Province of Trento and the Autonomous Region of Friuli–Venezia Giulia, both of which are located in the Alps where there is a tradition of prefabricating small buildings in wood.

Unlike disasters in such locations as Indonesia, India, Sri Lanka and Pakistan, the Chinese survivors played only a minimal role in creating their own provisional or temporary shelters or in building their own houses. Instead, they relied on government agencies to provide for their varied needs, and on high levels of cooperation with other regions of China. This provides an example of how a centralised communist state manages disaster recovery as an expression of its political ideology. This is similar to the values that underpinned the reconstruction of Skopje in communist Yugoslavia in the years after the 1963 earthquake. For commentary on Skopje by a resident, see Chapter 7, ‘First dilemma: reform vs continuity’.

Disaster tourism or risk education? The decision was taken to conserve the ruins of Wenchuan as a cemetery and memorial of those whose bodies lie under the ruins or under a massive landslide. This appears to have had the approval of the survivors, many of whom had relatives whose bodies were buried by collapsed buildings, particularly the school where 400 children and teachers were buried when the earthquake triggered a debris flow that engulfed the building.

This was not the first such instance of ruins being retained. After the devastating lahar caused by the eruption of Nevado del Ruiz in Colombia in 1985, the town of Armero and 22,000 of its citizens were buried under ten metres of mud and volcanic rock debris. The Colombian Government decided not to rebuild on this site but to conserve the entire area as a memorial to the people who died in the eruption (see Figure 9.4 in Chapter 9). Similar considerations were raised after the destruction of Yungay by the Mount Huascarán earthquake and debris avalanche of 1970 (Oliver-Smith 1986).

When the authorities decided to abandon Wenchuan, they put in place stabilisation measures to prop up damaged structures, which were fenced off to prevent public access. Large hoardings were erected with ‘before and after’ photographs of the town.

In May 2009, the Wenchuan Earthquake Museum was opened. The focus is to show the triumphant way the survivors responded and the vast scale of the relief operation and to set on record the contribution of national and provincial officials as well as the army and international agencies. Unlike the excellently conceived Kobe Earthquake Museum in Japan where there is a clear desire to
explain the nature of the earthquake and inform the public of all ages what they
can do to reduce risks, this museum does not address such matters.

The likely positive intentions of both the ‘living museum’ of the ruined town
and the displays in the Earthquake Museum may involve paying tribute to those
who suffered, remembering a massive event in the history of the region,
celebrating the recovery achievements and raising public awareness of earthquake
risk. However, the captions in various languages that were set next to the ruined
structures missed a golden opportunity to explain why this or that structure
failed and why some appeared to be totally unscathed.

But is there a negative consequence to the decision to retain the ruins with
public access? This is a site where a massive tragedy occurred where thousands
died, many after acute suffering and many who were children denied a future by
the disaster; and this is also a vast cemetery where they are still buried. Thus, to
regard this as a major tourist attraction, with revenue-earning potential, seems
inappropriate and questionable on ethical grounds. The issue of tourist fascination
with disaster reconstruction is also discussed in Chapter 9, ‘Option 7b: contractor-
build permanent dwellings’, in relation to reconstruction of dwellings in New
Orleans following Hurricane Katrina.

Relevance to models

As mentioned at the start of this case study, the Wenchuan example relates to
model 1, ‘progress with recovery’, and model 2, ‘recovery sectors’.

The ‘progress with recovery’ model contains a progressive set of scenarios, or
stages, that lead towards Scenario 4, ‘developmental recovery’. There can be
little doubt that all these stages have been reached in this ambitious recovery
programme. However, the other aspect of this model concerns four strands of
recovery: vision and leadership, resources, participation and ownership, and
organisation.

The shortcoming in the Wenchuan recovery operation relates to the absence
of the third strand, participation. The values expressed in the Sichuan recovery
are different and in some cases virtually the opposite of the philosophy and
components of ‘development recovery’, with its emphasis on the participation of
disaster survivors in decision-making in such a way as to create local ‘ownership’,
self-help, the development of skills, sustainability, the mobilisation of civil society,
transparency and accountability. From a Western perspective, the Sichuan recovery
would be regarded as decidedly ‘paternalistic’; but when seen in the light of
Chinese traditions (or possibly from an Asian viewpoint as similar dynamics seem
also to apply to Japan), a highly active government was expected to deliver, at
great speed, an abundant supply of goods and services to what they perceived to
be a passive population, one generally regarded as composed of ‘victims’ rather
than ‘survivors’ with little ability to help themselves.

In essence, the Government of China regarded itself as ‘provider’ rather than
‘enabler’. Model 21 (Chapter 13) contrasts the strength of government in
recovery operations with the strength of community participation. The Wenchuan recovery is represented as very high in government strength but extremely weak in community participation.

**Model 2: recovery sectors**

The value of this model (Figure 3.6) is in its description of the sectors of recovery linked to the scenarios of recovery set out in model 1.

The scenarios in model 1 are broken down according to the five sectors shown in model 2:

- physical recovery;
- recovery of the economy and livelihoods;
- psychosocial recovery;
- environmental recovery;
- institutional and governmental recovery;

Model 18 (Chapter 4) considers typical strengths, weaknesses, opportunities and threats pertaining to these recovery sectors. These are set out in Table 4.3 ‘The SWOT model applied to recovery sectors’.

As each of these sectors depends in some manner on the others and close integration is therefore needed, people in charge of recovery must aim to move

![Model 2: recovery sectors](image-url)
Models of recovery: development and phases

60

Models of recovery: development and phases

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each sector, in a balanced manner, towards Scenario 4 of model 1, ‘developmental recovery’.

An encouraging example of holistic recovery planning – involving economic, social, natural environment and built environment recovery – is the approach taken by the Government of New Zealand after the four Christchurch earthquakes: 4 September 2010, 22 February 2011, 13 June 2011 and 23 December 2011.

Effective integration can occur in the following manner. After a major disaster, one of the first requirements is for recovery of government. In many disasters, damage or destruction of government buildings, records and equipment, and deaths and injuries to government staff result in the absence or weakening of authority. Yet this is precisely where it is most needed in order to manage the recovery process. Despite this, international donors rarely regard the fundamental need to re-establish effective local government as one of their sectors for intervention or funding, and there are even examples of central governments that have neglected this local need. A restored, functioning and enlightened local government is vital to the integrated management of the sectors in this model.

In Banda Aceh, Indonesia following the 2004 tsunami, an estimated 20 per cent of public officials working for the local government were killed. Thus the functioning of local government at a critical time was severely affected. Yet despite the obvious need to strengthen the weakened local administration, several international NGOs (some being leading players who should have known better) hired some of the remaining government officials at inflated salaries, way above government levels, to work for them as they urgently needed staff with local knowledge and language skills. A UN team, including Ian, met the Program Director of a leading agency who had the nerve to moan about the inadequacies of local government, without recognising that his own agency had further contributed to that weakness by hiring key local government staff to work in its own recovery programme.

By providing contracts to local firms and by providing them with incentives to employ disaster survivors, physical and economic recovery are closely linked. If a ‘user-build’ approach is followed, this will generate vital work for survivors in rebuilding their own homes and the surrounding environment. Moreover, providing work for disaster survivors who may be grieving the loss of family members can be a useful therapy for psychosocial recovery.

The selection of materials for rebuilding can be based in part on considerations of environmental recovery by encouraging the use of building materials that will support environmental regeneration. Another example is to reuse damaged material such as timber and stone in building and to use crushed disaster debris as ballast for roads in order to avoid the need to find capacious landfills.

The integration of all key sectors into a balanced approach requires an agreed policy framework and decisive coordination backed by the ultimate authority of the prime minister or president of the affected country.

Model 2 can be a useful monitoring device to enable government and donor officials to check on relative progress across the five sectors of recovery. Therefore,
the hexagon can be filled in at regular intervals to indicate whether recovery is evenly balanced or confined to a single sector.

In the case study of the Wenchuan earthquake recovery, discussed above, progress is assessed particularly in relation to the physical recovery of buildings and settlements. While noting the achievements of rapid reconstruction, the absence of participatory involvement is a major criticism of action by the authorities. This omission represents a major lost opportunity that is highlighted by this model of recovery sectors and the need for integrated planning and action. If the traumatised, grieving population had been able to play a significant role in their own recovery, this would have contributed to their *psychosocial* recovery.

While the need for close multi-sectoral integration seems self-evident and essential for the well being of a society that has suffered damage and destruction across all aspects of life, the mutual isolation of government departments is frequently a major obstacle to holistic, integrated actions. Individual departments of government, at both central and local levels, often compete for resources, staff and status with the consequent neglect of one sector at the expense of others. As already noted, this is a blinkered approach in which self-interest prevails at the expense of close working collaborations between related sectors. It has to be dealt with through education, strong direction and close coordination of the kind that can only come from the apex of political power (see model 20, ‘organisational frameworks of government for recovery management’, in Chapter 4).

**Model 3: development recovery and elapsed time**

This model deals with resilience and needs to be considered together with model 11, ‘resilient communities and settlements’ (see Chapter 4). Its value is to depict the trajectory of resilience over time in relation to a theoretical concept of progress in development and safety.

The model (Figure 3.7) has the following elements: the horizontal axis is drawn as a timeline from the pre-disaster context through the disaster event to the period of recovery. The vertical axis relates to the state or quality of development at a given location, which may be a city, a town or a region, and is certainly a place that has suffered the impact of disaster and is attempting to recover. Quality is defined in terms of the functionality, efficiency and safety of the elements of life, including the urban fabric, infrastructure, economy and social services. If a location has a high level of development or quality, the starting point of the bold line would be much nearer the top; however, it would be unlikely to attain the 100 per cent target. Conversely, in a country such as Haiti with a low tenor of development and high levels of vulnerability, the starting point would inevitably be near the base of the diagram, as a sign of low quality. However, despite these reflections, the term ‘quality’ is difficult to define operationally as it involves a relative judgement of what is good and bad. The same is true of the term ‘safety’. As the risk expert Chauncey Starr observed decades ago, ‘a thing is safe if its risks are seen as acceptable by society’ (Starr 1969).
Perception of risk, experience with hazards, and expectations of safety and security mould the public’s expectations of acceptable risk in widely varying ways.

The gradually rising line that traverses the model indicates a trajectory of steadily improving development over a defined span of years. As all societies seek gradual improvements in quality, safety and economic growth over time, even if they often fail to realise their high expectations, the trajectory moves upward. The starting point of the model is roughly at the halfway stage, indicating that the country in question is one of relatively low development – unlike Sweden or Switzerland, for example, where the starting point would be near the top of the quality scale.

The first part of the rising line represents a period of pre-disaster vulnerability during which the aim of resilience should be to prepare society to absorb the disruptive and damaging effects of disaster. Hence, the first quality of a resilience framework should be to create a planned programme of risk reduction measures (see model 12, Chapter 4). The bold line represents the real situation. The disaster causes a sudden drop in quality, which is not vertical as the losses are not felt instantly but include indirect consequences that follow in the period after the disaster.

The resilience framework described in model 11 indicates a second aim, namely to ‘bounce back rapidly’ through the application of detailed recovery plans and efficient measures. However, we noted above that the aim of recovery is not merely to restore pre-existing conditions, and hence it is better to think in terms...
of ‘bounce forward’ conditions (Manyena et al. 2011) in which recovery goes beyond mere restoration.

At the point of the disaster, the rising line of development becomes a dotted line that represents the projected future for the given locality that has been interrupted by the disaster. Following the impact, recovery has to begin, and from this point onwards, the process starts on its rather variable progress. Spurts of growth may be followed by stagnation. In resilience terms, the entire recovery phase is one of adaptation and change as both processes are needed for effective recovery. The graph makes an important point about the aim of recovery. It is not merely a question of reconnecting with the rising trajectory line; there is also a need to overtake it. To reconnect could be to return to the vulnerable status quo ante that gave rise to the disaster; therefore, an adapted and changed recovery has to rise above this to the development recovery stage, as described in Scenario 4 in models 1 and 2.

This model graphically highlights one of the great challenges of disaster recovery: not merely to restore all the recovery sectors but also to improve on what used to exist in order to create a safer and better environment and one that more closely responds to the basic needs of citizens. To accomplish this with limited resources is an immense challenge, and in the rare cases when this happens, it represents a massive achievement (see model 7 in this chapter, which focuses on the cost-effectiveness of recovery).

**Model 4: relationship between disaster and development**

This model (Figure 3.8), developed by Rob Stephenson (1991), endeavours to depict succinctly the relationships that exist between the setback of disaster and the forward process of development.

The four quadrants of this model need little explanation. They describe the linked realms of ‘disaster’ and ‘development’ and indicate the positive and negative possibilities of each. There are numerous instances of how each quadrant may exist in disaster recovery situations. Here are some typical examples.

*Development can increase vulnerability:* In disaster recovery, plans are sometimes implemented in great haste before risks have been assessed, building regulations have been revised and builders have been trained in safe construction techniques. The persistent pressure from the survivors, mass media and political leaders to reconstruct rapidly can result in shortcuts that compromise future safety. After the 1906 San Francisco earthquake, debris was dumped on the shore, thus creating reclaimed land from the sea. Eventually, houses were built on this land, and in the Loma Prieta earthquake of 1989, extensive damage was suffered due to the irregularity of ground motions through unconsolidated terrain.

*Development can reduce vulnerability:* There are many examples in which radical changes in patterns of land use have resulted in safe disaster recovery. In Skopje after the 1963 earthquake, the recovery planners wisely decided to designate a floodplain beside the Vardar River as public parkland in order to prevent new
buildings from being constructed in areas that had been subject to repeated flooding, and also to avoid an area in which alluvial sediments accentuated seismic shaking. Likewise in the Christchurch, New Zealand earthquakes of 2010–11, 65 square kilometres of land suffered liquefaction and much of it was occupied by suburban development. The areas of greatest liquefaction risk will in future be given non-urban uses.

Disasters can set back development: All major disasters result in widespread failures in which the tangible results of development, such as school buildings, roads, bridges and economic investments, are destroyed. In many cases, these assets will be of recent origin, which may indicate faulty construction, corrupt building practice or failure to implement building codes. The cumulative effect of these failures is to seriously set back development. However, loss of life is far more serious than the destruction of the built environment. The death of children, who had all their lives ahead of them, is the greatest tragedy in any community. Unlike a bridge that can be replaced, such losses are irreparable and will have lasting negative impacts on development hopes. See model 3 for a graphic timeline representation of the drop in quality and development caused by a disaster.

Disasters can create development opportunities: This topic is discussed at various points in our book. For example in the Malkondji case study in Chapter 1, we noted how the community were introduced to using toilets that were incorporated into their new dwellings. Another example of an ‘opportunity grasped’ is found in Chapter 12 in the section ‘Yellow hat – optimism’. Here we describe how cash grants were made available to rural families in Pakistan when they secured new

![Model 4: relationship between disaster and development (Stephenson 1991).](image)
dwellings and how this cash was distributed with the dual advantage of cutting out ‘middlemen’ – a frequent source of corruption – and enabling families to enter the formal banking system – a vital prerequisite to future development opportunities. In Chapter 2, we identify pioneers of the subject – all of whom regarded disasters as unique opportunities for development with numerous examples of how ‘form followed failure’. Such opportunities include new building bye-laws, the development of land use planning controls to prevent building in floodplains or on precipitous slopes, safer construction techniques, the adoption of community preparedness plans, and fiscal and insurance incentives designed to encourage prudent building practices.

**Phases of recovery models**

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Model 5: disaster cycle

The value of this model (Figure 3.9) lies in its representation of the pre- and post-impact phases of disaster management and how they relate to each other.

Not all disasters are cyclical and some are not even recurrent. For example, virtually all of the world’s flood disasters involving the catastrophic breaching of reservoir dams have been unrepeatable events. On the other hand, many extreme events in the natural world are recurrent. Meteorological disasters may be seasonal, earthquakes will recur after strain has accumulated on faults, and volcanic eruptions may follow a cycle associated with the build-up and release of magma and gases. Hence there is some utility in using a model based on the idea that disasters are recurrent events.

The ‘disaster cycle’ makes a basic distinction between times of quiescence, in which the emphasis should be placed upon mitigation and risk reduction, and times of emergency, in which the accent is on intervention and recovery. The five phases are:

- risk reduction (during peaceful times without disasters);
- preparation prior to impending events (assuming that forewarning is possible);
- emergency response to impacts;
- recovery of essential services;
- reconstruction.

**FIGURE 3.9** Model 5: disaster cycle.
The advantage of using this model is that it clearly distinguishes the phases in such a way that they can be related easily to a sequence of tasks that needs to be accomplished in order to provide, or restore, safety and security. As it elegantly simplifies the processes of managing hazard and disaster, the model has proved particularly useful in teaching disaster management to practitioners. It also helps order copious amounts of knowledge about the processes of dealing with hazards, risks and emergencies. Moreover, it helps one to draw a functional distinction between tasks on the basis of their duration; for example, emergency intervention is usually a fairly transient process; reconstruction is, in many cases, long-drawn-out; and mitigation should be a constant duty that has no ending.

The origins of the phases of disaster model are obscure and date back to the 1970s (Richardson 2005). In an influential social science book, Drabek (1986) used it as the basis of a taxonomy of sociological research about disasters. Since then, others have drawn attention to the deficiencies of the model. For example, Neal (1997) considers the asynchronous nature of the phases, and Richardson (2005) argues that they are just too simplistic to embrace and classify all the social realities of disaster. Nevertheless, the ‘disaster cycle’ is widely employed to characterise the process of managing major hazards and their impacts. Indeed, in its various forms, it is probably the most popular model of its kind, especially because of its ability to reduce the chaotic complexity of disaster to an elegantly simple sequence.

The shortcomings of the model can be summarised as follows.

• As noted above, not all disasters are cyclical and some are decidedly non-recurrent. Whereas the model will work for events that do not follow a regular cycle, providing they do indeed recur, it will not work for hazards that are extremely irregular. Examples of these may include certain industrial hazards, transportation crashes or acts of terrorism; these may be, in a certain sense recurrent, but they are hardly cyclical.

• The phases of the model are likely to be of widely differing duration. As a result, there may be strong discrepancies in the level of detail and the nature of the sequences of actions and events involved in each phase – i.e. the model may be inconsistent or unbalanced in its treatment of each phase.

• In many disasters, the phases are likely to overlap rather than be sequential. Hence, the idea of a sort of ‘wheel of fortune’, in which emergency response is followed by actions designed to promote recovery and thereafter by reconstruction planning and management, is at variance with reality. In a society that has prepared well for the next disaster, reconstruction planning may be able to take place immediately after the impact and run concurrently with emergency intervention and restoration of services (see quotation from Quarantelli, 1982, in the introduction to Chapter 9). Moreover, it is important not to separate mitigation from recovery and reconstruction processes as the latter are a golden occasion to improve the level of mitigation actions.

• The ‘disaster cycle’ does not make allowance for repeated impacts or those that are complex or cascading (in which one impact leads to another).
Models of recovery: development and phases

For example, in Japan after the 11 March 2011 Tōhoku disaster, recovery from the earthquake and tsunami may have taken place at a different pace to recovery from the Fukushima nuclear radiation emission crisis.

• In difficult situations, there is no guarantee that the cycle will be completed. For example, after the 1973 earthquake in Nicaragua, reconstruction stalled more or less permanently in parts of Managua.

• The model implies the existence of a status quo ante and a requirement of reconstruction to restore it. However, recovery processes should usually be progressive and should ‘bounce forward’ rather than ‘bounce back’ by providing a rebuilt environment that is safer and functions better than the one that existed before the disaster.

• While the model identifies a series of distinct disaster phases, there is no indication that they are under separate management. While emergency services may have responsibility for the immediate disaster aftermath as well as preparedness planning, they are seldom, if ever, responsible for longer-term rehabilitation and recovery or mitigation. This division is inevitable given the diversity of tasks and varied areas of departmental responsibility in government. But it means that emergency services often make decisions that have unforeseen long-term negative consequences, particularly in the shelter sector.

• There is a weakness in the graphical representation of the model in that the cycle of protective measures, such as mitigation and preparedness, appears to lead directly into a disaster when they should do precisely the opposite!

• Finally, dealing with disasters, and the risk of such events, is a pluralistic process in which, to all intents and purposes, there are many ‘disaster cycles’ rather than one alone. Recovery may proceed at a different pace and in different ways between different sectors: economic, medical, infrastructural, social, psychological, and so on.

We have taken the trouble to list many of the criticisms of the ‘disaster cycle’ because it is an important, and nonetheless valuable, model. Rather than invalidating it, the critique suggests that it has limitations, as indeed most models do.

To restore the balance, let us consider an example of the model in action. The magnitude 7.6 earthquake in Western Sumatra on 30 September 2009 seriously affected Padang Pariaman District with the loss of 1,115 lives. The tremors damaged 379,200 buildings, a third of them seriously or catastrophically. The emergency phase involved all relevant organs of the Indonesian Government plus 170 NGOs, two-thirds of which were international. The emergency phase lasted about one month.

During the early recovery phase, about 100,000 people were settled in tent camps while 13,778 temporary dwellings were constructed. Survivors were then dispersed to relatives and alternative accommodation, or they were assigned to the prefabs. The regional Yodarso Hospital of Padang suffered major damage and its functions were evacuated to tents and later to prefabricated buildings. Subsequently, as recovery got underway, deadlines were set for the repair and
reconstruction of infrastructure and public buildings and for the resettlement of homeless survivors. Despite problems of policy and finance, these appear largely to have been respected.

The Padang catastrophe occurred almost five years after another Sumatran disaster, namely the earthquake and Indian Ocean tsunami that primarily affected Aceh Province in December 2004. One consequence of this for Padang is that the interval between the two disasters was used to improve preparedness. This included the beginnings of systems of catastrophe insurance and micro-insurance at the national level as well as the prevalence of disaster drills that undoubtedly saved lives in September 2009. This, then, was a good example of the importance of the mitigation phase between disasters.

Model 6: the Kates and Pijawka recovery model

The value of this model (Figure 3.10) lies in its representation of variables that express the duration of recovery; namely, level of development, availability of resources and degree of organisation.

In 1977, two geographers, Robert Kates and David Pijawka, contributed a chapter to a book on reconstruction. The title of their work was ‘From rubble to monument: the pace of reconstruction’. They chose to look at recovery from earthquakes as these are the archetypical sudden-impact disasters, and in particular they studied the aftermath of three events: San Francisco 1906, Nicaragua 1972
Models of recovery: development and phases

and Alaska 1964. Their thesis was that the level of development, availability of resources and degree of organisation affected the length of time taken to achieve recovery.

The first two stages in Kates and Pijawka’s model were the emergency and restoration periods. The former usually lasts from a few days to about a month and ends when the basic needs of survivors have been met. Attention is focused on pressing and fundamental needs. Major infrastructure is cleared, mass feeding programmes are set up, search and rescue are priority activities, precarious structures are buttressed and basic shelter is provided to survivors. When the majority of these tasks have been accomplished, or they no longer need to be carried out, the phase is over. The restoration period may last from two to nine months. During this time, structures that cannot be repaired are demolished, damaged buildings are rehabilitated (or entry is banned, pending reconstruction) and infrastructure and public utilities are repaired.

When dealing with reconstruction, Kates and Pijawka differentiated between the ‘replacement–reconstruction’ and ‘developmental reconstruction’ phases. They saw the former as lasting from 3 to 20 years. The Rapid City, South Dakota dam-burst floods of June 1972 led to an example of three-year reconstruction in a relatively uncomplicated situation where the scale of damage was not particularly large. In the replacement–reconstruction phase, capital stocks are gradually rebuilt, the local economy recovers to pre-disaster levels (if it can), and social equity, which prevailed in the early stages of the disaster, is replaced by social differentiation. This last observation stems from the fact that people of higher social standing tend to have greater access to capital, credit and insurance than the poor and, hence, have more opportunities to recover and more access to mechanisms that speed up the process. Kates and Pijawka noted that financial institutions are often the first to recover, as these have access to capital and credit. The model has the advantage of placing emphasis on the context of recovery. In the case of Nicaragua, corruption and civil war slowed down the process and made it a differential one in which the middle and upper classes, who had access to credit and insurance, were far more successful than poorer people.

The phase of developmental reconstruction uses monumental building to commemorate the disaster and show that the affected area has overcome the problems associated with it. This phase also marks the process of local or regional regrouping in order to launch economic growth. It usually occupies some years after the end of the replacement–reconstruction phase. According to Kates and Pijawka, the size and opulence of San Francisco’s new City Hall, completed in 1929, were meant to show publicly that the problems created by the 1906 earthquake had been overcome.

The Kates and Pijawka model was qualified by work conducted by Sarah Hogg in Friuli, north-east Italy, after the 1976 earthquake (Hogg 1980). She found that the speed of recovery and reconstruction were related to the degree of geographical and political connectedness of each settlement. In other words, the pace of recovery was not uniform throughout the disaster area. Moreover, in
the Friuli case, a second earthquake occurred six months after the first one, which returned the area to the emergency phase and effectively restarted the sequence of recovery. The same could be said of the 2010 and 2011 Christchurch, New Zealand earthquakes.

The Kates and Pijawka model is simple and elegant, but is it sufficiently accurate to conceptualise recovery processes as they actually are? To begin with, as in other models based on periods, the phases may overlap or they may lack an adequate conclusion. Politics, economics and social factors can influence the recovery processes, perhaps more than Kates and Pijawka suggested. Moreover, the political, economic and social context of recovery is likely to change, perhaps radically, during the process, especially if it is long-drawn-out. Effectiveness, fairness and equity in recovery processes are influenced by various forms of vulnerability, both to disasters and to subsequent processes. For example, the arrival of large amounts of relief and reconstruction money in a disaster area may lead to corruption and expropriation of resources.

A good example of long-term problems is furnished by Nicaragua. The Somoza family controlled Nicaragua from 1927 until 1979. The devastating effect of the December 1972 earthquake, which destroyed 90 per cent of the capital Managua, was one very significant element in the revolution that ended their rule. In 1973, vast amounts of relief money were syphoned off to pay for the luxury homes of the elite while the poor were constrained to live in temporary shelters of the most miserable kind. Opposition was progressively galvanised by the utterly corrupt situation until the Sandinista revolution finally occurred in the summer of 1979. This was followed by the counter-revolution of the Contras and a decade of economic ruin. Nicaragua remains the second poorest country in the Western Hemisphere, and almost half of its population lives below the poverty line. The country still has what is officially classed as a recovering economy, in which the twin depredations of civil war and natural disasters have continuously retarded development. In 1998, Hurricane Mitch killed 3,800 Nicaraguans, severely damaged 70 per cent of the country’s roads, destroyed 92 bridges and caused huge losses in all sectors of agriculture. According to some estimates, this storm set back development by 20 years. The multinational fruit producers were widely criticised for exploiting the devastation to increase profits while doing nothing for laid-off workers who had been made destitute by the storm. In Nicaragua, social, economic, political and military conditions have conspired to retard or halt the process of recovery from disaster.

**Model 7: cost-effectiveness (unit cost)**

The value of this model (Figure 3.11) lies in its representation of the escalating unit costs of the phases of recovery in relation to the passage of time.

One question that has often been debated is the effectiveness of expenditure on mitigation. Does spending money, presumably wisely, before disaster strikes significantly reduce losses afterwards? It is sometimes written that on average for
every one monetary unit spent on disaster mitigation, four units are saved in damage that is prevented. That may be true although it is difficult to verify in any broad, comprehensive manner. However, a very wide range of cost–benefit values have been developed, depending on the hazard, the level of vulnerability, what assets are involved, and other such details. Long ago, cost–benefit figures were compiled by Leighton (1976) for some natural hazards in California, and the figures varied from 1:1.5 for flood to 1:137 for landslides. None of the data would be acceptable as a universal generalisation.

It is sometimes also assumed that cost–benefit ratios are invariable at any stage of the expenditure, something that is not borne out by circumstances. For example, if a construction is threatened by earthquake or windstorm and has no built-in protection measures, initial expenditure on making it safe is likely to achieve substantial, even spectacular, reductions in vulnerability. For example, in wood-framed vernacular housing threatened by windstorms, the use of the ‘hurricane strap’ – a simple metal tie – can stop the roof blowing off, which may in turn stop the entire structure from being demolished. However, once the simple measures have been instituted, mitigation tends to become more and more sophisticated and expensive and to achieve less and less reduction in vulnerability. Fairly soon, the break even point is reached at which the cost of reducing vulnerability is equal to the value of damage avoided. At this point, in technical terms, mitigation should cease as it achieves no further net economic benefit and any further expenditure amounts to a form of economically unjustifiable risk aversion. However, it is rare that society sets its acceptable risk levels on the basis of positive cost–benefit ratios.
These observations may seem to apply only to the mitigation phase in the absence of disaster or in the periods of quiescence between impacts. However, they have a distinct resonance during the reconstruction period. At this point, there is a visible demonstration, in the form of damage, that rebuilding needs to take place to a higher standard than previously. If funds are abundant, this may take the form of risk aversion in which risk is very significantly reduced by heavy expenditure without reference to criteria that might justify the levels of protection sought.

During a long period of recovery from disaster, conditions are unlikely to remain static. Inflation will affect costs and expenditures, political priorities will change, mass media attention will fall and only sporadically be revived, and social and demographic conditions will vary. On top of this, the relative costs will be different for each phase of the recovery process. As a result of this, it is difficult to predict the outcome of recovery in advance, or what resources it will need. The vagaries of economic management mean that, in most cases, the supply of resources for recovery will vary over time. Commonly, initial costings will underestimate the expense of recovery. With inflation and the need to satisfy ever more stringent safety requirements, costs can soar. At the same time, the political will to complete the process of recovery may lapse as other problems impinge on the consciousness of decision-makers. A good example of stagnation is provided by the aftermath of the L’Aquila earthquake in Central Italy. For a brief period, L’Aquila had a pivotal role in national voting patterns and was the centre of attention. Thereafter, it returned to being a political and economic backwater. Hence, after two years, there had hardly even been clearance of rubble, and reconstruction processes continued to stagnate.

**Model 8: disaster timeline**

The value of this model (Figure 3.12) lies in its representation of the ebb and flow of the strands of management processes before, during and after a disaster.

The relatively high frequency of earthquakes in some parts of the world may justify the use of a cyclical model even though the cycles are not necessarily regular ones. Another way of characterising disasters using phases is to treat them individually and consider the time dimension in a linear manner. The first problem with this approach is to be able to define the conditions under which the impact of an extreme event can be classified as a disaster. Limitation of space precludes a detailed discussion of this thorny issue, but it has already been the subject of two books entitled *What is a Disaster?* (Quarantelli 1998a; Perry and Quarantelli 2005). In synthesis, quantitative definitions of the threshold for disaster (e.g. based on number of deaths or size of economic losses) tend to fail because they ignore systemic factors that betoken a qualitative change between incidents and disasters. ‘Disaster’ implies a need to suspend routine activities in order to cope with an entirely unusual set of circumstances involving high levels of disruption, damage and destruction. The geographical extent of the
phenomenon, the number of people affected and the size of resources involved are all variable quantities that are more or less impossible to characterise in terms of minimum thresholds.

Nonetheless, the transformation wrought by disaster to society, its assets and its activities is invariably profound, whatever the scale at which it occurs. The inception of such change may occur along a continuum that extends from ‘sudden impact’ to ‘slow onset’ disasters. Earthquakes are the archetypical sudden-impact disasters that occur without warning. Drought and accelerated erosion are examples of naturally generated events that grow, perhaps imperceptibly, to disaster proportions.

In a generalised manner, there is usually a correlation between the existence of a premonitory phase and the ability to prepare for the impact of disaster. However, it is not necessarily true that a longer lead time involves greater preparedness. Instead, there may be an optimum period in which the imminence of the impact is balanced against the availability of time to prepare and general sense of urgency.

In sudden disasters, the impact phase may begin with a period of isolation before organised assistance arrives. In fact, commonly, the first aid to be supplied is given by people who are simply at the scene when the impact occurs and have survived in such a way that they can provide help. Hence, the first rescuers are commonly people who have no training and equipment, except in the tiny minority of cases in which citizens’ groups have been specially prepared for prompt disaster response. Such people commonly rescue others from under rubble, or from rising floodwaters, or from burning buildings, and so on. They may
provide first aid or transport to hospital. However, unorganised assistance from spontaneous volunteers and passers-by is inefficient and can lead the rescuer into danger. Indeed, it was estimated that in the 1985 Mexico earthquake, one rescuer died for every four or five people saved (Olson and Olson 1987: 646); though bear in mind that these were spontaneous, untrained rescuers who entered precarious damaged buildings without adequate care and personal protection.

It requires a very high degree of local organisation for organised assistance to arrive at the scene of a sudden-impact disaster in a timely manner. Where building collapse has trapped and injured people, there is an imperative to rescue them within a period of less than eight hours, which represents average survival time under the rubble. Earthquakes, in particular, may cause thousands of buildings to collapse, including some that may have a high density of occupancy. Fallen beams and masonry can cause crush syndrome, which necessitates prompt rescue and dialysis in order to stop the patient dying of kidney failure. Blood loss, cranial injuries, ingestion of dust and multiple traumas all point to the need for rapid, professional urban search and rescue (USAR) and on-site medical assistance.

Commonly in major disasters, the international community mobilises its search and rescue resources over a period extending from 12 to 72 hours after the disaster. Between about 1,200 and 2,300 foreign rescuers may descend on the disaster area during this period, usually in the second and third days after the impact. For example, 1,600 arrived in Bam, Iran after the 2003 earthquake there. They may then be coordinated by UN Disaster Assistance Response Teams working under the auspices of the UN Office for the Coordination of Humanitarian Affairs. Usually, their arrival is manifestly too late to have much impact on the scale of casualties. For instance, in the Haiti earthquake of January 2010, the first country to mobilise its USAR forces was Iceland, which is more than 6,000 kilometres from Haiti. In all, foreign teams rescued only 130 people, even though the death toll may have been well over 200,000. After the fifth day, only nine people were rescued. In cases like this, it is estimated that the cost per life saved may exceed US$1 million, money that could more usefully have been spent on improving local USAR capabilities in places where entrapment and injury in disasters is likely in the future.

The duration of an emergency phase can be highly variable. It has been suggested that it is correlated with the degree of economic development (Kates and Pijawka 1977). In early 1858, travelling on mule-back, the intrepid Irish engineer Robert Mallet managed to reach Montemurro in the Basilicata Region, Southern Italy one month after the December 1857 earthquake (magnitude 7.0). In this highly isolated area, in which most of the local population had been killed by the earthquake, Mallet found the survivors to be in a state of early emergency fully one month after the tremors (Mallet 1862). On the other hand, in cases where resources are abundant, communications are robust, and there is a high degree of organisation, the emergency phase may be over in less than a week.

Emergencies can be prolonged if the impact is cascading (or compound) or repetitive. Since the magnitude 9 Tōhoku earthquake in Japan, there has been
renewed worldwide interest in cascading disasters. In this case, a major earthquake caused a tsunami that led to radiation releases from some of the Fukushima nuclear reactors. This represents both a cascading disaster and a ‘natech’ event, composed of interacting natural and technological components (Young et al. 2004). The levels of uncertainty and complexity tend to increase with the number of elements in the cascade and the number of connections between them.

The emergency phase of disaster is characterised by search and rescue, medical assistance and the provision of the most basic needs, such as shelter and food. Social actions are dominated by a welfare ethos in which the normal market functions of society are temporarily suspended. The next phase is dominated by the recovery of basic services, such as utilities (electricity, water supply, etc.) and other aspects of critical infrastructure. Again, the time taken to achieve this can be highly variable according to the level of damage, the size of the area affected (i.e. the extensiveness of the damage), the complexity of the infrastructure and the availability of funds and technical resources to effect repairs.

After a major disaster that has affected a substantial area, perhaps hundreds of square kilometres, the time taken to complete the recovery process, including full reconstruction, may exceed ten years and possibly be as many as 25. Time is socially necessary in the reconstruction process. Hasty or overly rapid reconstruction runs the risk of being undemocratic, reducing the opportunities to plan the process, failing to allow adequate participation from stakeholders and postponing consideration of risks and hazards until it is effectively too late to do anything about them.

Major reconstruction should involve detailed planning based on careful consideration of the main issues. Some of these are: how to avoid replicating vulnerability, how to reduce the future impact of local hazards, how to promote community spirit, and how to preserve the cultural identity of the area in question. It goes without saying that reconstruction needs to preserve the functionality of the local area and its ability to provide employment and generate wealth. Surveys of local geological and geotechnical conditions, and of hazards, take time and so does public consultation once plans have been drawn up. Hazard avoidance and vulnerability reduction schemes also extend the time required to arrive at reconstruction.

Recovery and reconstruction are not necessarily characterised by harmony. An example is the case in which 144 people were killed, including 116 children between 7 and 9 years old, when a coal spoil heap collapsed upon schools and the urban area of Aberfan, South Wales in 1966. After the disaster, the loss of so many young, innocent lives led to a massive outpouring of solidarity; and this tight knit mining community was inundated with gifts and money while its members remained severely traumatised. There were bitter disputes about how to use the money, which proved more of a divisive than a unifying influence (Miller 1974).

In synthesis, during reconstruction, ‘quick’ does not necessarily mean ‘efficient’ as time is needed to accomplish technical and social processes such as risk
assessment, measurement, planning and consultation. On the other hand, if nothing goes on for long periods of time, this could be considered inefficient. Hence, time is a linear backbone to events – an inevitable meter of progress (or its lack) – but time alone will not sort out the problems of recovery and reconstruction.

**Reconstruction planning needs clearly established objectives**

In terms of time, planning is a means of looking forward and marshalling resources for the future. One reason why reconstruction may be slow is the need for much preparatory work. In this context, a strong parallel is to be drawn between urban and regional planning on the one hand and emergency planning on the other. They both require considerable research and the acquisition of detailed local knowledge. Both are intimately concerned with land use and its control. Urban planning will regulate land use to ensure that incompatible functions do not interfere with one another by being too closely located. It will endeavour to improve the efficiency of the urban and regional system. Emergency planning is concerned to ensure that urgently required resources are in the right place at the right time, including manpower, equipment, fuel supplies, vehicles, specialist assistance, communications and supplies.

One would suppose that the function and utility of emergency planning ends with the emergency phase of a disaster. This is not quite true. To begin with, each disaster and its aftermath yield vital information on how to improve plans for future events since disasters reveal the extent and nature of both hazard and vulnerability. Thus, bottlenecks in the transportation system can be revealed by delays in the supply of relief. Furthermore, magnitude–frequency relationships are qualified by new information derived from impacts when they occur. Thus, probabilistic seismic hazard analysis (PSHA) is based on knowledge of part of the sequence of events and their magnitude–frequency relationships, which can, however, never be perfectly known. In seismic areas, PSHA may form the basis of building codes for the reduction of earthquake damage.

**Summary**

The eight models described in this chapter have covered a central focus of our book – the need for recovery to become a development opportunity. So we can do no better than to repeat that objector’s outburst in Ian’s disaster course, noted at the outset of this chapter: ‘any recovery must move forward to a better and safer future since “normality” equals vulnerability’.

Closely linked to development requirements, the phasing of recovery – as demonstrated in models 5 to 8 – is an interconnected and extended process. Model 7 describes unit cost relationships in relation to time. This shows that the reconstruction will always be the most costly phase in any disaster continuum; yet political imperatives, especially when elections are looming, may well require the allocation of relief funds in abundance with scant regard that such initial
generosity may jeopardise the future where a famine of resources can cause extensive delays or easily bring the recovery process to a juddering halt.

This possibility that the funding, as well as the activities, taken in one disaster recovery phase can have negative implications for a later one was succinctly stated by Otto Koenigsberger almost 40 years ago: ‘Remember that relief is the enemy of recovery, with the consequent need to minimize relief in order to maximize recovery’ (cited in Davis 1978: 66; see also Chapter 2, Evolution of recovery studies, and Chapter 4, Model 18, the SWOT model).

Notes

1 Communication between Ian Davis and Dr Gustavo Wilches-Chaux, 2006.
2 Communication between Ian Davis and David Oakley, 1997.