

Stormwater drainage responsibility in Sydney

by Des Lambley

The Sydney Water Corporation is one of the largest corporatised water utilities in the world and it figures prominently in the lives of every citizen and visitor to Sydney. Sydney Water is responsible for a vast range of functions, from interception, storage, the delivery of safe drinking water, waste water disposal, to the management and maintenance of stormwater drainage. Operating licences have been granted to a number of monopoly water utilities in Australia in recent years, and this helps separate the operation functions from regulation. In the case of Sydney Water the charging regimes are regulated by the Independent Pricing and Regulatory Tribunal. From time-to-time the Tribunal publishes a Discussion Paper and invites submissions on specific issues prior to conducting an inquiry, and makes a determination on a new pricing structure (which is normally upward).

It can be seen from the following submission to the Tribunal that people need to be vigilant to ensure that 'history is not rewritten' purposely to the disadvantage of consumers, rate-payers, and in this instance occupiers of land subject to flooding from a sometimes inadequate stormwater drainage system in the Sydney metropolitan area.

The moral of the story is that one must stand back to observe the whole, otherwise the incremental uncoordinated focus on discrete public policies can cumulatively impact unfavourably on hazard mitigation planning and management. While these consequences are not necessarily the original intention, it behoves those of us who have the time, opportunity and inclination to maintain a watching brief over public policy in the interests of the community, and the fine work carried out by our front-line emergency service staff.

The following letter was recently forwarded to the Independent Pricing and Regulatory Tribunal. While substantial sums of money are being collected by way of a stormwater drainage levy, flood mitigation work has been limited, leaving many property owners near storm drains continuing to be at risk from flooding.

QUOTE:

Dear Independent Pricing and Regulatory Tribunal

Re: Review of Sydney Water Corporation's Stormwater Charges and Expenditures: Call for Public Submissions, Sydney Morning Herald 19 December 1997

The following comments are submitted for consideration as part of this review. I wish to place on record my concern about a number of misleading assertions produced in the Information Paper, and assist IPaRT in being truly independent in its Determination.

Introduction

Background detail is provided to place the subsequent critique in its proper context. It is shown that stormwater has been a responsibility of Sydney Water for a very long time. Concern is expressed about the failure to address the primary function of a stormwater drain, and of the low priority accorded to this responsibility by Sydney Water. Misplaced emphasis in this Review and in a subsequent Determination will only encourage Sydney Water to continue to suppress this responsibility. IPaRT should not be seen as condoning or endorsing this action. There is evidence of misinformation, disinformation and poor data being published in a number of Sydney Water's statutory documents. Customers need to know how widespread this practice is. The customer needs to be assured that IPaRT's Review will not be misled with false data and advice. The customer needs to believe that such a Review is incisive and robust, driving greater transparency within this monopoly utility.

Concern is expressed about the poor representation in IPaRT's Information Paper about Sydney Water's focus on stormwater responsibilities. Operating Licence compliance audits are wrongly quoted to project the image that Sydney Water gets a 'thumbs up'. If the auditors words are compared with those quoted in the Information Paper, it can be seen that Sydney Water is not the 'good corporate citizen' that might otherwise be implied.

The situation is shown to be even more convoluted, and made obscure rather than transparent, by virtue of the mechanisms

applying to the Operating Licence and Environmental Plan, and their annual audit. Close reading of the annual compliance audits, the Licence Regulator's covering submissions, and the Minister's Tabling notes illustrates that the interpretation of these documents has been cause for concern since Sydney Water was corporatised on 1 January 1995.

It is argued that the issue of cross-subsidies for stormwater drainage funding has a precedent that now seems to bind both Sydney Water and IPaRT.

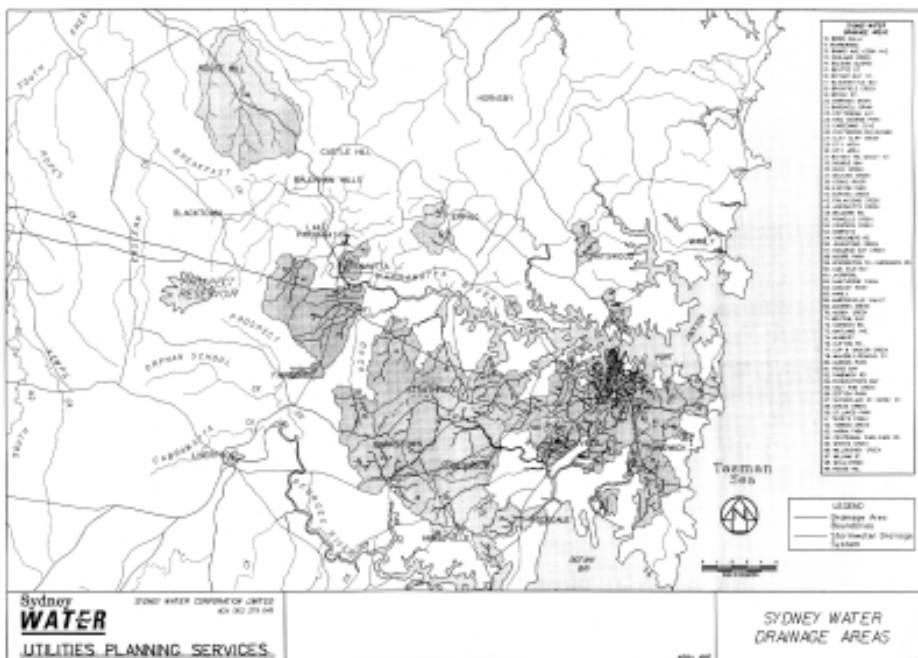
Customers have cause to be suspicious of Sydney Water's motives and honesty when it is shown that the close nexus with Australian Water Technologies (AWT) results in a subsidisation funded in part by Stormwater Drainage levies.

The comparison of various quotations from published material suggests that AWT is little more than a feint operation used to obscure the real structure and overheads of the parent company. IPaRT must truly be seen by Sydney Water's customers as their advocate in rooting out such deception.

Background

The Metropolitan Water and Sewerage Act (10 June 1890) established an authority in Sydney empowered to control, regulate, operate, harvest water, distribute, treat and dispose of waste including stormwater. Specifically, Part I, clause 2 said that a sewer was, "any sewer or drain of what kind so ever whereby any liquid refuse or any water shall be carried of". Clause 5 (13) provided for the drainage from roads and streets into sewers. The legislation enabled the Water Board to construct common drainage to the ocean. It also specified that waste waters carried in these drains were to be freed from all excrement and other foul or noxious matter that would pollute the receiving waters. While this was progressive legislation, and more honoured in the breach than in the observance over the intervening 100 years, the recent corporatisation of Sydney Water has not changed these responsibilities.

In introducing the Corporatisation Bill into Parliament in 1994, the Hon. RJ Webster, the Minister then responsible for the Sydney Water Board, said the environmental groups had welcomed the



Sydney Water drainage areas: it is not understood why drainage areas 1 to 9 are omitted from this statutory document.

legislation as a 'world precedent for water management' and that Sydney Water would be required to give *equal weight* to commercial, environmental, social and public health aspects of its operation. Transparency of operations, effectiveness and efficiency, along with a customer focus were other important objectives. These principles remain.

As a consequence of those legislative changes, the Water Board (Corporatisation) Act 1994, makes Sydney Water Corporation responsible for the trunk drainage part of the stormwater infrastructure in the older parts of the metropolitan area and at Rouse Hill. Sydney Water is audited each year for compliance with the requirements enunciated in the legislation, its Operating Licence and other subordinate documents. Sydney Water is obliged by clause 3.2 of the Operating Licence to 'provide, operate, manage and maintain the stormwater drainage system transferred to Sydney Water under Part 3 of the Act ...'

Clause 1.2(c) of the Operating Licence and clause 2.4 of Sydney Water's Customer Contract acknowledges a responsibility for providing a trunk stormwater drainage service for the transportation of stormwater in the systems under its control in accordance with the relevant terms set out in the Contract, the Operating Licence and the Act. Sydney Water charges property owners for these services (*vide* Operating Licence clause 6.2) where the land is within a declared stormwater drainage area as defined in Sydney Water Corporation's *Drainage Areas Map, April 1997* (Schedule 2 of the Operating Licence 1994).

Wrong emphasis: equal weight

IPaRT's Information Paper places a great emphasis on the pollution element of stormwater, hence a number of references to the Environment Protection Authority, even though people (as just another organism) must be regarded as part of the greater 'environment'. Conversely, nothing is said about how the State Emergency Service Act underpins the responsibilities of the State Emergency Service in respect of flood matters, including the binding of the Crown (s.6) and the protection of people and property from flooding. Section 10 of the State Emergency and Rescue Management Act 1989 requires the portfolio Minister to ensure 'that adequate measures are taken by government agencies to prevent, prepare for, respond to and assist recovery from emergencies'. The State Emergency Service Act designates the State Emergency Service as the lead combat agency (read primary regulator) for flooding in New South Wales.

The primary function of a stormwater drain is to transport stormwater so that it does not pose a threat to life and property. It is only as a consequence of this primary role that it becomes the transporter of pollutants. It is therefore proper to try and ensure that water so carried 'be freed of material that would pollute the receiving waters'.

I considered it important for IPaRT not to perpetuate the myth that stormwater drainage has no flood mitigation function or that this function is unimportant. The Foreword to the Information Paper makes no mention of a 'flood' context and the document itself provides a biased emphasis on the pollution element by this omission.

This is probably unintentional on the part of IPaRT.

Sydney Water's *Drainage Areas Map* identifies one dry detention basin (presumably with a flood function) in Marrickville and a total of 7 wet/dry basins (presumably with a multi-purpose flood function, including 4 GPTs) at Rouse Hill.

Misinformation, disinformation or poor data?

Sydney Water's *Annual Report* (1995) says it is responsible for **345** kilometres of stormwater drains, but Sydney Water's *Annual Environment Report* (1996) says the length is **440** kilometres, and the *Annual Report* (1996) says it is **510** kilometres. This is a variation of 165 kilometres or a massive 33% inaccuracy—in Statutory Reporting Documents! The 1995 licence regulation audit report indicated the distance is **354** kilometres. To make this even more hilarious, IPaRT's *Information Paper* (p.35) now says there are **506** kilometres of stormwater drainage under Sydney Water's control.

There seems to be many different stories told by many different people within Sydney Water who are either careless with detail or ignorant about the extent of the stormwater drainage asset. There would be concern if drainage levies were not expended on the same length of stormwater drainage serving customers from whom drainage levies are extracted. Such inaccuracy can only erode public confidence in other data published by Sydney Water. It contributes to an untrustworthiness. This is even more important for IPaRT as it has to carry-out a review and hand-down a determination that may be based on selective or doubtful data presented to it by the Sydney Water Corporation.

Transparency

Details about income from the Drainage Levies and the expenditure on stormwater drainage construction and maintenance cannot be identified in any meaningful way from any of Sydney Water's public documents. To its credit IPaRT's Information Paper now discloses these facts. In the interests of transparency and full disclosure, there should be an obligation for this kind of data to be published on an annual basis.

Operational audits

IPaRT Paper, A2.3 Operational Licence Audits (Page 16)

Use of the Licence Regulator's general covering statement for one independent audit (1996) to the Minister is misleading. The citation should be compared to the detailed comments made by each of the two inde-

pendent auditors about Sydney Water's Operating Licence compliance with their stormwater responsibilities. These reports paint quite a different picture to that referred to in IPaRT's Information Paper. May I draw to your attention that specific commentary.

1995 Operational Audit

'Sydney Water also operates some stormwater drainage systems within its area of operations, constituting 354 km of stormwater drainage channels. The Operating Licence and Environment Plan both include requirements with respect to these stormwater systems (p.54) ... During 1995 there were no EPA licences for stormwater transport or discharge. Sydney Water therefore interprets its requirements with respect to stormwater systems as being to meet the specific targets listed under Objective 16.9 in the Environment Plan. These targets are to participate in the EPA Stormwater Task Force, the State Stormwater Coordinating Committee, which has now superseded the Task Force and appropriate Catchment Management Committees (p.55) ... Sydney Water has participated in the EPA Stormwater Task Force since 1993. The Task Force reported in November 1994 and recommended that a State Stormwater Coordinating Committee be established. Sydney Water has continued its representation on this committee.

Sydney Water is also represented on sixteen catchment management committees and actively contributes information on the performance, operation and maintenance of a number of prototype pollution control devices on stormwater channels. Sydney Water communicates relevant studies on stormwater monitoring to government agencies involved in stormwater monitoring ... it is not the role of this audit to determine whether Sydney Water has complied with the requirements of its pollution control licences (that rests with the primary regulator, the Environment Protection Authority) ... however the auditors must assess compliance with the Operating Licence requirements... Comments by the EPA on Sydney Water's performance have assisted the auditors in developing their view in this section (p.57) ... Sydney Water has fully complied with its requirements with respect to stormwater drainage systems as set out in the Environment Plan (p.60).' (1995 Audit Report)

As can be seen, the 1995 audit report simply reiterates Sydney Water's emphasis on the pollution problem in stormwater discharges and it overlooks entirely those problems of increased water volumes, discharge efficiency, stormwater infrastruc-

ture asset maintenance and flood mitigation works.

1996 Operational Audit

'Sydney Water operates and maintains 510 km of stormwater drainage channels and is preparing stormwater management plans for 48 catchments. Long term solutions to stormwater quality and flooding issues are being addressed through involvement with the State Storm Water Coordinating Committee and Catchment Management Committees. In short, the impacts of under capacity in the drainage systems and the consequent risk of flooding have not been considered in management plans, and the current flooding risk to customer properties has not been addressed.

*Sydney Water has achieved only **partial compliance** with the requirements for stormwater management because requirements to minimise the consequences of flooding are not fully addressed. It is recommended that in the short term, in cooperation with local councils, Sydney Water should ensure that current areas of high risk are identified and customers in these areas are made aware of mitigation measures they can apply to minimise the consequences of flooding'. (1996 Audit Report p.3.22)*

This statement by the 1996 auditor speaks for itself. Quite specifically, Sydney Water has adopted a minimalist responsibility for flood damage from inadequate stormwater systems that are their responsibility. It could be inferred from the auditor's criticism that income from Drainage Levies might for many years have been squirrelled away as general revenue and used for other purposes.

There is an onus upon Sydney Water to identify how all of those moneys collected since 1992–93, have been disbursed. Expenditure on various committee 'gabfests' can hardly be seen as 'works'.

Environment plans

Sydney Water's 1996 Annual Environment Report focuses on protecting rivers and oceans (3 sections), and conserving water supply and other resources (2 sections). It makes no mention of protecting people (a resource as one of the three factors of production) from stormwater flooding. Equal weighting for social, health and safety is an obligation clearly specified in the Water Board (Corporatisation) Act 1994, Section 21. The Environment Report discusses the improvement of stormwater management, but focuses on pollution issues in the inner urban areas, and only admits involvement in flood minimisation works at Rouse Hill (see page 43).

Although the Operating Licence is issued under the authority of executive government, I understand that approximately half the scope of the Licence Regulator's annual compliance audit is defined in Sydney Water's Environment Plan and the Demand Management Strategy. These ancillary documents were published by Sydney Water after the Operating Licence was granted. The Operating Licence requires annual audits to be undertaken of the Corporation's progress in the implementation of its environmental objectives against the targets published in the Environment Plan. However, the Operating Licence does not require an evaluation of the targets themselves. Significantly, the first Environment Plan (undated) included nearly ninety targets, approximately half of which restated statutory or Operating Licence requirements. There was but one tenuous linkage to 'flooding', viz *'participate in the EPA Stormwater Task Force and Catchment Management Committees'*.

The second Environment Plan (published in 1996 by Sydney Water) is a heavily truncated version of the 1995 Plan that includes only nine targets, seven of which are restatements of statutory or Operating Licence requirements. There is but one flood related mention, viz *'manage stormwater systems ... to minimise ... the consequences of flooding'*. More importantly, it should be noted that neither edition was submitted for Government approval, nor exhibited for public comment, and the current version can be changed by Sydney Water at any time. It is understood that Sydney Water has produced a 1997 Environment Plan—the third in 3 years!

Sydney Water's continually evolving Environment Plan should fully reflect all statutory objectives, including measurable targets for stormwater (flood) management. The management and financial detail for this responsibility must be fully transparent and auditable.

As the primary financial regulator, it is understood IPaRT in effect 'certifies' that Sydney Water has carried out the work commensurate with the justifications they would have put at previous IPaRT hearings, and to the level of fees and charges subsequently determined by IPaRT on those occasions.

Cross subsidisation

The Hon. Ernie Page MP, Minister for Local Government, when shadow Minister for the Sydney Water Board in 1990, supported the concept that all benefiting householders should be charged for drainage and flood mitigation work rather than being subsidised by the community at large (Local

Government Bulletin, December 1990, p.24). Today, the elimination of cross-subsidies is central to National Competition Policy reform protocols and in accordance with recommendations contained in IPaRT's general determination on water and service charges for monopoly utilities (SPR/94/01).

It would be duplicitous if Sydney Water were to now argue that additional income is necessary to fund its stormwater responsibilities in greenfield sites such as Rouse Hill, or where retrofitting is necessary in the older parts of the metropolitan area by a broad cross-subsidisation. The same principle should apply to stormwater drainage levies as has been determined by IPaRT for sewerage backlog contributions (Determination SRD/97/01), that is, those benefitting should be the ones to pay.

Conversely, if stormwater drainage is ever to be viewed as a community service program, then all of the income derived from drainage levies should be spent on that asset, or otherwise the levy should be reduced.

IPaRT Paper, Table A4 (p. 12)

It would be useful to include another table (or another row) to show the number of employees of Australian Water Technologies Pty Ltd (AWT) over this same period. A comparison could then be made between that commercial arm and Sydney Water as to the extent of customer supported cross-subsidisation. That is, although employee numbers in Sydney Water have fallen, the number of employees in AWT (or other obscure commercial arms) may have proportionally increased. I believe this suspicion is made more relevant by the Auditor-General's recent criticism of Sydney Water's support payment to AWT of \$9.1m in the last financial year.

Moreover, AWT has stated (Annual Report 1997): *'The Company entered into a commercial agreement with its parent which formalised the business rules that apply to trading between the two entities. In accordance with the terms of that commercial agreement, the parent reimbursed the Company \$9,092,993 representing net costs incurred by the Integrated Asset Services business of the Company for the financial year. The purpose of this payment was to ensure the retention of specialist skills within the Company which the parent may need to call upon from time to time to fulfil its role and objectives'* (p.32). It has also admitted providing *'high level of electrical and mechanical maintenance services'* to Sydney Water (p.8). Even more outrageous is the cross-subsidisation admitted by Sydney Water in AWT's Annual

Report that *'... we wish to confirm that Sydney Water Corporation Limited will provide whatever financial support or assistance, if any, to ensure that AWTPL is able to satisfy its existing debts, anticipated loan repayments and the obligations under any existing or future guarantees'* (p.3).

There appears every reason to believe that AWT is used by Sydney Water as a 'shelf' on which to park an essential workforce and to hide the real operating overheads of Sydney Water Corporation. AWT's Report provides evidence for this construction to be drawn. This subsidised entity appears to be a purposeful device to effectively prevent public disclosure by Sydney Water, and to maximise the 'commercial-in-confidence' defence to avoid public scrutiny.

By way of inference this gives further reason to suspect that Sydney Water is breaching its Operating Licence conditions relating to the requirement not to hinder market competition (clause 1.5). Can there be a guarantee that any of the \$9.1 million support payment made by Sydney Water is not used in some way to allow AWT to 'compete' unfairly in the marketplace? Also, will any of the 'support payment' for 1996–97 be repaid to Sydney Water from AWT future profits? If not, then every customer is cross-subsidising annually an obscure, creative, fenced-off enterprise over which they have no control.

It would seem wrong that Sydney Water could argue for an increased price path income from customers in the Drainage Areas and then flagrantly use part of that income to cross-subsidise AWT. Customers of Sydney Water would expect that IPaRT will address the global implications of Drainage Levies and general disbursements on their behalf, as their only economic advocate. (See *Daily Telegraph* 22 January 1998, and the *Auditor-General's Report to Parliament 1997*, Volume Three, pp.577–591).

The suspicion that moneys are obtained and appropriated in ways that are not made transparent is given further substance by IPaRT's Table B1 (p.36) which shows that only one third of the income derived from drainage levies is spent on the stormwater drainage asset. When viewed across the five reporting years in Table B2, and by simple arithmetic calculation, it seems that 376,677 of Sydney Water's customers (those paying drainage levies) have cross-subsidised other un-named Sydney Water activities to the value of \$70m, or \$14m per year for the last 5 years! I am concerned about this. There is every reason for customers to suspect that Sydney Water is abusing its monopoly position.

IPaRT Paper, A3.3 referring to Sydney Water's Water Plan 21 (pages 19–20)

The summary detailed here makes no mention of upgrading stormwater drainage assets to deliver efficient and effective stormwater drainage, or to the mitigation of the effects of flooding. This is a serious omission. It is further evidence of the low priority promoted by Sydney Water to this responsibility.

Summary

Fortunately, excess stormwater in metropolitan Sydney is not a routine seasonal problem that generates much community awareness or outrage. However, outrage will occur when the community begins to believe their stormwater charges are being misappropriated. Overall, it seems many of the messages being propagated by Sydney Water are misleading, and IPaRT needs to be cautious not to endorse that.

I, and the rest of Sydney Water's customers I suspect, would be buoyed by your independent and robust review of stormwater charges and expenditure issues, including those matters referred to above.

References

- Auditor-General 1997, *Report to Parliament*, Volume Three, pp.577–591.
- Australian Water Technologies 1997, *Annual Report*.
- Daily Telegraph* 22 January 1998, '136 trips—that's the waste business'.
- Independent Pricing and Regulatory Tribunal 1994, *General determination on water and service charges for monopoly utilities*, SPR/94/01.
- Independent Pricing and Regulatory Tribunal 1997, *Pricing of backlog sewerage services*, Determination No 4, SRD/97/01.
- Independent Pricing and Regulatory Tribunal 1998, *Review of 1996 medium term price path determinations for Sydney Water Corporation and Hunter Water Corporation: review of Sydney Water Corporation's stormwater charges and expenditures*, Discussion Paper DP–24.
- Local Government Bulletin*, December 1990, 'Stormwater Drain Funding', letter by the Hon. Ernie Page MP.
- State Emergency Service Act 1989*.
- State Emergency and Rescue Management Act 1989*.
- Sydney Water Corporation Operating Licence 1994*.
- Sydney Water Corporation 1995, *Annual Report*.
- Sydney Water Corporation 1996, *Annual Report*.
- Sydney Water Corporation (undated), *Environment Plan*.

Sydney Water Corporation 1996, *Environment Plan*.

Sydney Water Corporation Licence Regulator 1996, *Report to the Minister on the 1995 Operational Audit of the Sydney Water Corporation*.

Sydney Water Corporation Licence Regulator 1997, *1996 Operational Audit of the Sydney Water Corporation*.

Sydney Water Corporation 1996, *Annual Environment Report*.

The Metropolitan Water and Sewerage Act

10 June 1890.

Water Board (Corporatisation) Act 1994.

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New publications

Rain of iron and ice: the very real threat of comet and asteroid bombardment

Lewis, John S.

Addison-Wesley, Sydney, 1997

Introduction—Stones that fall from the sky—Target: Earth—stealth weapons from space—Brighter than a thousand suns—The space age: the cratered planets—Near-Earth objects—The bashful face of Mars—Ends of geological ages—Earth's twin—You found what on Mercury?—Comet and asteroid families—Craters in the ocean don't last—Effects on human populations—The fiery rain: simulations by computer—What can we do about it? (240 pages).

The crisis manager: facing risk and responsibility

Lerbinger, Otto

Mahwah, N.J.: Lawrence Erlbaum, 1997

Communicating in an era of crises—An era of crises—Contingency planning—Communicating during and after a crisis—Managing seven types of crises—Natural crises—Technological crises—Confrontation crises—Crises of malevolence—Crises of skewed management values—Crises of deception—Crises of management misconduct—Improving management performance—Risk management and communication—Ethics: a moral code for executives—Issues management and stakeholder relationships—Conclusions—The crises manager (384 pages).

Critical incident stress management CISM: a new era and standard of care in crisis intervention.

Everly, George and Mitchell, Jeffrey T.

Ellicott City, Md.: Chevron Pub., 1997

Provides educators, trainers, and lecturers a survey of key definitions and concepts pertinent to the field of critical incident stress management (slide set).

The river dragon has come!: the Three Gorges Dam and the fate of China's Yangtze River and its people

Quing D., Thibodeau J. and Williams P.

M.E. Sharpe, Armonk, NY, 1997

The three gorges project: a symbol of uncontrolled development in the late

twentieth century—A profile of dams in China—The world's most catastrophic dam failures: the August 1975 collapse of the Banqiao and Shimantan Dam—Discussing population resettlement with Li Boning—General plan for population resettlement—Is development resettlement possible?—The environmental impacts of resettlement in the three gorges project—What are the three gorges resettlers thinking?—A survey of resettlement in Badong County, Hubei Province—Resettlement in the Xin'an River power station project—The danger to historical relics and cultural antiquities in and around the three gorges area: interviews with the director of the National History Museum of China, Yu Weichao—A lamentation for the Yellow River: the three gate gorge dam—Water pollution in the three gorges reservoir—Military perspectives on the three gorges project (240 pages).

Research on social work and disasters

Streeter, Calvin and Murty, Susan (eds.)

Haworth Press, New York, 1996

Introduction—Disaster research in social work—A primer for social work research on disaster—Predictors of rural community survival after natural disaster: implications for social work practice—Research as social action in the aftermath of Hurricane Andrew—Community responses to chronic technological disaster: the case of the Pigeon River—Social vulnerability to toxic risk—Inter-agency collaboration and hazards education in American communities (160 pages).

Economic consequences of earthquakes: preparing for the unexpected

Jones, Barclay G. (ed.)

National Center for Earthquake Engineering Research, State University of New York at Buffalo, Buffalo NY, 1997

New strategies for dealing with the earthquake hazard—What happened in Kobe and what if it happened here?—Some problems in the assessment of earthquake hazard in the Eastern United States—Scenario earthquakes for urban areas along the Atlantic seaboard of the United States—A tale of two cities—Mitigating risks to lifeline systems through natural hazard

reduction and design—Seismic performance of ports: lessons from Kobe—Prioritising New York City bridges according to earthquake hazard criteria—Built value and earthquake risk—Adopting a seismic code to protect the buildings of New York City—The natural disaster boom theory: or window breaking our way to prosperity—Impacts of recent disasters on businesses: the 1993 midwest floods and the 1994 Northridge earthquake—Forecasting the economic impact of a midwest earthquake—Impact of catastrophic losses on the insurance industry—Preparing for the unexpected—Recommendations for future action (273 pages).

Dealing with disaster

Great Britain, Home Office

Brodie Publishing, Liverpool, UK, 1997

Third edition

Introduction and civil protection arrangements—The combined response—Command and control and co-ordination—The care and treatment of disaster victims—Information and the media—The voluntary sector—Central government and lead departments—The combined approach to planning, training and exercising (57 pages).

The Texas City Disaster 1947

Stephens, Hugh W

University of Texas Press, Austin, 1997

First edition

On April 16, 1947, a small fire broke out among bags of ammonium nitrate fertiliser in the hold of the ship *Grandcamp* as it lay docked at Texas City, Texas. Despite immediate attempts to extinguish the fire, it rapidly intensified until the *Grandcamp* exploded in a blast that caused massive loss of life and property. In the ensuing chaos, no one gave much thought to the ship in the next slip, the *High Flyer*. It also exploded sixteen hours later.

This is the story of the Texas City explosions, America's worst industrial disaster in terms of casualties. In this book, Hugh W. Stephens draws on official reports, newspaper and magazine articles, personal letters, and interviews with several dozen survivors to provide the first full account of the disaster at Texas City (141 pages).