

Lessons from how flood risk is considered in international land use planning practices

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Despite the differences in the nature, frequency and impact from flooding it is clear that in general most developed countries face the same challenges in relation to the management of flood risk.

These include adapting to new understandings of risk that takes into account long term changes to flood behaviour and bridging gaps between land-use decisions and flood risk management considerations. As well as effectively communicating risk to the general public in a way that promotes individual as well as societal responsibility, and aligning planning and actions to identify and meet the most critical risks within a framework that is socially, environmentally, economically, and politically acceptable (IWR, 2011).

There is also not one set of rules on how flood risk and land use planning practices interact that can be followed internationally. Flood risk management needs to be specific to the characteristics and governance framework of each country. However, examining international practice can provide valuable lessons for continual improvement.

As an example, flood events in recent years in Europe have led to the renewed impetus to the development of improved policies and techniques for flood risk management. Clear legal direction from the European Flood Directive (Directive 2007/60/EC) ensures that flood risk is considered in a timely manner within the political agenda and provides a framework to guide regional and local involvement. The consideration of flood risk at each stage of the planning process provides a clear sequential, risk-based approach to the location of development and the development conditions that assist in managing residual risk.

Experiences are drawn within this paper from an international base and from within Australia. The paper looks at where lessons can be learnt from both positive and negative experiences from land use planning practices and draws conclusions on where future improvements may be made.

Introduction

Flooding is the most frequent natural hazard globally affecting approximately 520 million people every year. Floods claim the lives of approximately 25,000 people worldwide and cause global economic losses of between \$50 and \$60 billion annually (IWR, 2011). Within Australia it is estimated that the direct economic exposure of communities to flooding could be in the order of \$80 to 100 billion per annum (extrapolated from McLuckie et al, 2010, Bureau of Transport Economics, 2001). Due to the differences worldwide in the sources and probability of flooding, the density of development/population and existing mitigation strategies there is not one set of best practice measures that are applicable in every country. Management of flood risk needs to be specific to the characteristics and cultural context and the governance framework of each country. Lessons for Australia may be learnt from the international

context and existing practices may be reviewed and improved where opportunities arise.

The aim of flood risk management is to reduce the likelihood and/or the impact of floods. The Australian National Flood Risk Advisory Group in 2008 established a vision for flood risk management in Australia stating “*Floodplains are strategically managed for the sustainable long-term benefit of the community and the environment, and to improve community resilience to floods*”

Recent flood events have had a high profile in both national and international news. With the recent floods in February/March 2012 in Queensland/Northern NSW and the high exposure to floods in Queensland and Victoria in January/February 2011 the impacts of flooding have once again been brought to the forefront of Australian minds. Internationally the picture is similar with floods in the United Kingdom in November 2012 affecting more than 800 households and taking 3 lives.

Reviews have been completed of the recent floods in Australia, including the Queensland Flood Commission of Enquiry (March 2012), the Victoria Review into Flood Infrastructure (August 2012), the Report of the 2012 North East Victoria Flood Review (October 2012) and the Natural Disaster Insurance Review (November 2011). Benefits can be gained at both the State and Commonwealth level by considering and refreshing existing policy based on the lessons learnt from these events. Recommendations from the Queensland review include the:

- completion of up to date flood studies for all urban areas;
- production of flood hazard maps for urban areas to help identify possible appropriate new development areas;
- application of limited development constraints for high flood risk areas;
- inclusion of standard conditions to address flood issues in planning consents.

These practices already exist within the current framework in some States but not all.

The impacts of these reviews (in addition to the National Strategy for Disaster Resilience adopted by the Commonwealth of Australian Governments on 13 February 2011 and the Natural Disaster Insurance Review) have been considered within the update of Managing the Floodplain (AEM 19) 1998-99, and Floodplain Management in Australia: Best Practice Principles and Guidelines (SCARM Report No 73, 2000). The National Flood Risk Advisory Group (NFRAG) are currently finalising the update of *Managing the Floodplain Australian Emergency Management Series (AEM) 19*, and it is expected to be released later in 2013. This handbook is intended to provide broad advice on all important aspects of flood risk management in Australia. It is designed, to be used in association with administrative and technical guides, where desired, by individual States or Territories to provide a best practice framework for managing flood risk.

International Flood Risk Management

A number of international forums have been set up to bring together knowledge and experience from around the world of the strategies being adopted to manage flood risk. This shows the growing desire and the value, within the international community, of learning from international experience to manage flood risk. These forums include;

- FLOODsite, a European Integrated Project supporting the European Directive on the assessment and management of flood risks which ran from 2004-2009.
- International Flood Initiative (IFI) focuses on research, information networking, education and training, empowering communities and providing technical assistance and guidance¹.

- International Flood Network (IFNet) - created on the Flood Days of the 3rd World Water Forum in March 2003. This group was set up to promote internal cooperation in the field of flood risk management.
- International Collaboration as part of International Partnerships National Flood Risk Management Program – presented at the 5th International Conference on Flood Management (ICFM5).
- The United Nations International Strategy for Disaster Reduction has developed the Hyogo Framework for Action - this explains, describes and details the work that is required from all different sectors and stakeholders to reduce disaster losses.

International Best Practice in Flood Risk Management

There are a number of discrete land use planning practices that have an impact on international flood risk management. This paper considers a number of these practices, in particular flood policy, planning policy, communication, flood mapping, asset management and funding.

Flood Policy

Within Australia there is no federal legislation that requires flood risk to be considered. Constitutional powers rest with the States and Territories who use varied administrative arrangements to manage flood risk within their jurisdictions. Each state has different legislation. Within NSW for example, the primary legislation for planning and mitigation of flooding is the Environmental, Planning and Assessment Act 1979. This is supported by the NSW Cabinet endorsed Flood Prone Land Policy and the 2005 Floodplain Development Manual. The latter is gazetted under section 733 of the Local Government Act (1993), to provide protection to governments within NSW for information provided and decisions made when managing flood risk in a manner consistent with the manual.

Working groups of Australian Governments, involving Commonwealth, State and Territory and Local Government representatives have partnered in developing the AEM series of guidelines (NFRAG). These guidelines are available at www.em.gov.au/Publications/Australianemergencymanualseries/Pages/default.aspx.

Relevant AEM series guides for managing flood risk include:

- AEM 7, *Planning safer communities: land use planning for natural hazards*
- AEM 19, *Managing the Floodplain*
- AEM 20, *Flood preparedness*
- AEM 21, *Flood warning*
- AEM 22, *Flood response*
- AEM 23, *Emergency management planning for floods affected by dams*
- AEM 43, *Emergency planning*
- AEM 45, *Guidelines for the development of community education, awareness and engagement programs*
- *Community recovery. The Community recovery handbook 2: building a disaster resilient Australia.*

As detailed above, AEM 19: Managing the Floodplain is currently being updated.

A recent report prepared by the World Bank (2012), “A guide to Integrated Urban Flood Risk Management for the 21st Century” stated that effective flood risk management needs to be embedded at a policy level requiring responsible agencies, departments and institutions to establish policy positions setting out a vision or strategic direction (GFDRR, 2012). Flood events in recent years in Europe have led to renewed impetus in the development of improved policies and techniques for flood risk management.

There is a growing recognition that flood risk can be mitigated by making space for water through sustainable management, such as the policies in the UK “Making Space for Water” (2005) and in the Netherlands “Room for Rivers” (2006-2015).

All European Countries are required to meet the requirements of the European Flood Directive (Directive 2007/60/EC) which sets out requirements to manage flood risk from all sources in order to reduce the consequences of flooding on human health, economic activity and on the environment. The Regulations embed a risk-based approach by requiring, within specific timescales, the identification of Flood Risk Areas (where there is a significant risk of flooding) Flood Hazard Maps, Flood Risk Maps, and Flood Risk Management Plans (IWR, 2011). This is being introduced into each EU country. Within the UK this is enacted by the mechanism of the Flood Risk Regulations 2009. This policy provides a clear legal direction, ensuring that flood risk is considered in a timely manner within the political agenda and offers a framework to guide regional and local involvement.

Both the UK (Flood and Water Management Act 2010 and the National Flood and Coastal Erosion Risk Management Strategy for England, 2011) and Germany (2005 Water Act) have clear national policies that define the roles, responsibilities and accountabilities of national and local government and other organisations in relation to flood risk management. This provides a sound legal framework and ensures that flood risk is considered appropriately at all levels of government. Flood risk is considered by employing a multi-layered approach using data from national, regional, catchment, strategy and local levels. Such a comprehensive, stratified approach promotes appropriate consideration of the existing flood risk, informs future funding requirements and allows prioritisation of resources. This structured approach is also seen in New Zealand with the introduction of a series of principles for flood risk decision making as part of the Flood Risk Standard (2011). These standards set out a clear, outcome focussed approach to the implementation of flood risk reduction measures.

The *National strategy for disaster resilience*, adopted by the Council of Australian Governments on 13 February 2011 (COAG 2011) recognised that a national coordinated and cooperative effort is required to enhance Australia’s capacity to withstand and recover from emergencies and disasters. A disaster resilient community is one that works together to understand and manage the risks that it confronts. Disaster resilience is the collective responsibility of all sectors of society, including all levels of government, business, the non-government sector and individuals. If all these sectors work together with a united focus and a shared sense of responsibility to improve disaster resilience, they will be far more effective than the individual efforts of any one sector.

Planning Policy

Historical experience shows that flood risk must be considered at each stage of the planning process to ensure that inappropriate development does not occur. Such development could result in flood risk to people and property requiring flood risk mitigation that may be both costly and, in some instances, ineffective. Effective land use planning reduces the need for flood risk mitigation and where required ensures that this is allowed for within a development design and not required to be considered as an afterthought.

International experience, such as from the UK, demonstrates the importance of appropriate planning guidance. This structured guidance began in July 2001 with the introduction of Planning Policy Guidance 25: Development and Flood Risk. The guidance has now been updated by Planning Policy Statement 25 (last updated March 2010) which provides a clear and sequential, risk-based approach to guide the location

of development. This approach is designed to ensure that each category of development is located appropriately with due regard to flood risk.

Consideration of flood risk as early as possible in the planning process is key to ensuring that development is appropriately sited and development constraints reduce risk effectively. Lack of consideration to appropriate zoning of land can lead to poor location of development that is incompatible with the flood function of the floodplain and the flood hazard. This can result in developments which may adversely impact upon flood behaviour affecting either existing development or located in areas where the hazards they face cannot be effectively managed by reasonable development controls. The update of AEM 19 *Managing the Floodplain* encourages the consideration of flood risk in all parts of the planning cycle from strategic planning through to site specific development controls.

Communication – Inter Agency Working/Cross Boundary Working

International experience demonstrates that communication must be a key priority in effectively managing flood risk. A variety of communication channels are needed to reach every sector of an at risk population (Jha, 2011). Throughout the world lessons can be learnt in relation to communication of flood risk across the board, from the government to the general public. As government priorities change, flood risk may rise or fall within the political agenda. This can be affected by dry periods when flooding may cease to be a priority and essential funding may be diverted to other works. This scenario is seen in the Netherlands where the high standard of protection offered by defences has lowered flooding in the priority list for funding amongst administrators and politicians (IWR, 2009).

Training exercises can assist with communication between the many different organisations involved in flood risk management. Examples have been seen in both the UK with exercise “Watermark” and in the Netherlands with exercise “Waterproof”. In these cases national flood risk exercises have been undertaken to increase preparedness by normalising response actions, raising awareness, testing emergency plans, training personnel and monitoring actions. The lessons learnt from both of these exercises are being embedded into the UK and Dutch national policy retrospectively.

Rivers generally do not follow administrative boundaries and communication is needed between administrative areas at all levels of government to ensure that rivers are managed on a catchment wide basis. This is seen across Europe, particularly in France, where watersheds are managed within catchment boundaries rather than administrative boundaries. This approach is now adopted within the USA with the creation of an Interagency Regional Flood Risk Management Team (RFRMT) looking at the management of a large regional watershed that extends over five Midwestern states. In Victoria, Catchment Management Authorities (CMAs) have a key role in co-ordinating the assessment and management of flood risk, the CMA works with the NSW Office of Environment and Heritage on managing flooding on the Murray River.

The risk from flooding cannot be completely removed as it may not be practical, feasible or cost effective to do so within a resource constrained environment. Flood mitigation measures can generally only reduce the risk and it is likely that a residual risk will remain. The recognition that living in the floodplain has an inherent risk, and a residual risk is a key principle considered in updating AEM 19 *Managing the Floodplain*. The level of residual risk will vary depending on how exposed areas of the floodplain are to flooding, the development controls that were in place when the area was developed, and the measures implemented to manage flood risk.

Over recent years within Europe there has been a drive for communities to take some responsibility for flood protection themselves. This is increasingly being required by

legislation in various European Countries (FLOODsite, 2009). In the UK a change has occurred in how flood information is provided to the public to enable them to help themselves and there is a drive for relevant organisations to be more transparent with information. Historically this has been seen as an area of controversy with government agencies being accused of withholding information. Increased transparency involves making flood warning statements and river level information available on the internet and the use of social media such as twitter, facebook and smartphone applications to assist in the dissemination of flood warnings. In Japan, flood hazards are actively promoted to the community. In the USA the CWMS system promotes the same open approach.

In Australia, this is reflected in the practice of some States. Victoria has a publically available database of flood information. NSW requires new studies to be available on the council's internet site when government funding subsidies are provided. In addition, the Australian Government's response to the Natural Disaster Insurance Review included the National Flood Risk Information Project (NFRIP) which aims to improve access of the community and insurers to strategic flood risk information in a consistent manner across Australia. This project is currently underway.

Flood Mapping

National flood risk assessments can help put into perspective the relative risks faced in various parts of the country and can help prioritise measures on a national scale, particularly when available funding is limited (IWR, 2011). Flood risk mapping is an essential component of understanding the spread of flood risk countrywide. This is essential to allow effective land use planning to be completed ensuring that flood risk is included as one of the key factors in the consideration of a new development. Flood risk mapping can be undertaken at a number of different levels and there are examples of countries starting with basic mapping and, as time moves on, expanding the extent and quality of their flood map information. Preliminary broad scale mapping has recently been completed for Queensland following the flooding in 2011.

In the USA the Federal Emergency Management Agency's (FEMA) flood insurance rate maps show the 1% annual chance flood and this data has been available for a number of years. These information is now being updated through the Risk Mapping, Assessment, and Planning (Risk MAP) (IWR, 2011) project. This is also the case in Japan where a flood hazard map is available for the whole country, managed as part of the Flood Fighting Act. England and Wales have a composite flood map showing areas that could be affected by flooding from rivers or the sea. In the UK this plan is built upon by the National Flood Risk Assessment to produce an assessment of the likelihood of flooding at a national scale (Environment Agency, 2006).

The National Flood Risk Information Project (NFRIP), being implemented by the Commonwealth Government as one of the recommendations from the Natural Disaster Insurance Review (NDIR), and other databases in Australia are generally spatially based. To be of most use these databases need to:

- provide information on a range of different flood events to identify the relative frequency of flooding.
- identify the varying flood function (flow conveyance and storage) of the floodplain and the relative degree of hazard at the location due to flooding.

This additional information is important to understanding the different issues that need to be considered in managing risk as they vary across the floodplain.

Asset Management

The construction of flood mitigation works is a costly process and their reliability during an event will depend on the maintenance of the asset.

Internationally the importance of asset management has long been recognised. In the Netherlands the required standard of protection for each defence is defined and a 5 yearly framework for monitoring each of these systems is set out (Alphen, 2010). The Environment Agency asset inspection programme in England and Wales defines an inspection frequency for each asset based on the asset type, the risk of failure and local conditions. This information is tied into a database/GIS (Geographical Information System) management system which records, for each flood defence asset, the target condition, the current condition, the cost to replace the defence (if required), modelled studies and historic flood levels. An asset management system is now being introduced in Japan where efforts have been made to introduce structured maintenance practices based on active monitoring. Components addressed in the management of rivers and lakes include regular patrols, embankment inspection and repair, weeding, dredging of channels and tree cutting.

In NSW, where state funding has been provided to build or upgrade a flood risk management asset, conditions of financial assistance require the owner to maintain the asset. In addition the NSW Local Government Charter (section 8(1)) of the Local Government Act 1993 provides obligations that pertain to asset management as follows:

- to bear in mind that it is the custodian and trustee of public assets and to effectively plan for, account for and manage the assets for which it is responsible
- to have regard to the long term and cumulative effects of its decisions.

Funding

The number of reported flood events worldwide is on the increase (World Bank, 2012). It is recognised that a long-term approach to flood and coastal risk management is required to address the impacts of climate change and to achieve greater efficiency in the delivery of effective flood alleviation. In England and Wales the Environment Agency has a long term investment plan which gives direction on resources and investment required, including an assessment of the costs and benefits of flood risk management over the next 25 years (Environment Agency, 2009).

It is clear that in all countries there is competition for funding for flood defences from government funds. Some countries are looking for alternative sources of finance to supplement government funding such as contributions from private developers or community financial support.

As the pressure of development continues in Australia investigation into different funding sources may be worthwhile to ensure that adequate funding is available to support the implementation of high priority flood mitigation works to reduce risks to the existing community and land use planning measures to manage flood risk to future development.

Summary

This paper presents a snapshot of current international practices in relation to flood risk management and in particular those practices that affect land use management. Despite the differences in the nature, frequency and impact from flooding it is clear that many countries face the same challenges in relation to flood risk. These include adapting to a new understanding of risk that takes into account the impacts of climate change. The need to bridge the gaps between land-use decisions and flood risk management considerations must be addressed, together with the effective communication of risk to the general public in a way that promotes individual as well as

societal responsibility. The key is to align forward planning and subsequent action to identify and resolve the most critical flood risks within a comprehensive framework that is socially, environmentally, economically, and politically acceptable (IWR, 2011).

This paper shows that the effective implementation of integrated flood risk management depends on the effective application of clear legislation, policy, structures and financial resources at all levels of government (GFDRR, 2012). Evidence shows that policy should be outcome focused, seeking cost effective flood risk reduction. This approach is clearly seen in New Zealand with the introduction of a series of principles for flood risk decision making as part of the Flood Risk Standard (2011) setting out clear, outcome focussed approach to the implementation of flood risk reduction measures.

The consideration of flood risk within land use planning frameworks is essential to ensure an integrated approach. This is evident in England with the implementation of Planning Policy Guidance 25 in 2001 promoting a clear, risk based approach to be considered throughout the planning process.

In general, in terms of floodplain risk management, Australia follows a similar approach to current practice in many other countries around the world. International experience has demonstrated the effectiveness of the pressure that jurisdictional policy can provide in terms of the implementation of flood risk management. It is clearly important that the guidance is focussed and effectively delivers a reduction in flood risk. It is also evident that having a good understanding of the broad scale flood risk across an area (country/state), allows targeted investment to the areas of most significant manageable flood risk. This applies in particular to the portion of the risk that can be effectively managed by a sound understanding of the condition of existing mitigation systems, by long term planning and the design of well-considered mitigation measures. This comprehensive and integrated approach can inform the development of a long term investment plan with comprehensive justification for each item of expenditure where the consequences of not actioning a particular planning outcome are fully understood.

References

Alphen, J. V., (2009). Flood Risk Management in the Netherlands. Organisation, Legislation and Governance. Ministry of Transport, Public Works and Water Management Accessed on 04/02/12 at:

<http://www.nfrmp.us/IFRMA/docs/pre/governance/NetherlandsGovernancePaper.pdf>

Attorney Generals Department (2011). Natural Disaster Resilience Program. Accessed on 18/01/12 at: <http://www.em.gov.au/npa>

Australian Department of Primary Industries (1992). Floodplain management in Australia. Australian Dept. of Primary Industries and Energy and Australian Water Resources Council Water management series (Australian Water Resources Council), Australian Government Publishing Service: Canberra

Australian Emergency Management Committee (2007). National Emergency Risk Assessment Guidelines. Accessed on 04/01/12 at: <http://www.ga.gov.au/hazards/governance/policy/national-emergency-risk-assessment-guidelines.html>

Australian Government. The Treasury (14 November 2011) Government's Response to NDIR Recommendations. Accessed on 15/02/2012 at: <http://www.treasury.gov.au/PublicationsAndMedia/Publications/2011/NDIR-Recommendations>

BTE. (2001). Economic Costs of Natural Disasters in Australia. Bureau of transport Economics Report 103: Canberra.

Commonwealth of Australia (2011). Natural Disaster Insurance Review. Accessed on 15/02/2012 at: <http://www.ndir.gov.au/content/Content.aspx?doc=home.htm>

Crown (2010). Planning Policy 25: Development and Flood Risk. Accessed on 18/01/12 at: <https://www.gov.uk/government/publications/development-and-flood-risk-practice-guide-planning-policy-statement-25>

DECC, 2007, Floodplain Management in NSW: The management of flood liable land.

Department of Infrastructure, Planning and Natural Resources (2005). Floodplain Development Manual: the management of flood liable land. New South Wales Government: Sydney.

Department of Planning (2007). SECTION 117 MINISTERIAL DIRECTIONS Revised direction no. 15 Flood Prone Land (31 January 2007). Accessed on 17/02/12 at: http://www.planning.nsw.gov.au/planning_reforms/p/fpl_s117direction15_31jan07.pdf

Emergency Management Australia (1999). Managing the Floodplain: PART III Emergency Management Practice: Volume 3—Guidelines. Emergency Management Australia: Canberra.

Environment Agency (2009). Investing for the future Flood and coastal risk management in England A long-term investment strategy. Environment Agency: Bristol

Environment Agency (2009). Flooding in England: A National Assessment of Flood Risk. Environment Agency: Bristol

Environment Agency (2011). National flood and coastal erosion risk management strategy for England. Environment Agency: Bristol

European Commission (2007). Flood Risk Management. Accessed on 04/01/12 at: http://ec.europa.eu/environment/water/flood_risk/index.htm

FEMA (1994). A unified national program for floodplain management. Federal Emergency Management Agency: Washington DC

FEMA (2011). FEMA's Risk Mapping, Assessment, and Planning (Risk MAP): Fiscal Year 2011 Report to Congress. Federal Emergency Management Agency: Washington DC

Fleming, G. (2002). Flood Risk Management. Thomas Telford Publishing: London.

Flood and Water Management Act (2010) England. C.29. Accessed on 04/01/12 at: <http://www.legislation.gov.uk/ukpga/2010/29/contents>

Flood Risk Regulations (2009) England. Accessed on 04/01/12 at: <http://www.legislation.gov.uk/uksi/2009/3042/contents/made>

FLOODsite, 2009. *Flood risk assessment and flood risk management. An introduction and guidance based on experiences and findings of FLOODsite (an EU-funded Integrated Project)*. Deltares | Delft Hydraulics, Delft, the Netherlands

Glas, Peter (2010). The Dutch Approach. Accessed on 18/01/12 at: <http://www.slideshare.net/naoiseomuir/dutch-flood-defence-presentation>

Greater Wellington Regional Council (2011). Delivering Flood Protection. Accessed on 16/02/12 at <http://www.gw.govt.nz/Delivering-flood-protection/>

IWR (September 2011) Flood Risk Management Approaches. As being practiced in Japan, Netherlands, United Kingdom and United States. IWR Report No: 2011-R-08

Ministry for the Environment (2008)/ Meeting the Challenges of Future Flooding in New Zealand. Ministry for the Environment: Wellington.

Ministry for the Environment (2011). Managing flood risk. Accessed on 17/02/12 at: <http://www.mfe.govt.nz/publications/climate/preparing-for-future-flooding-guide-for-local-govt/page5.html>

Ministry for the Environment (2008). Flooding – roles and responsibilities. Accessed on 17/02/12 at: <http://www.mfe.govt.nz/issues/land/natural-hazard-mgmt/flooding-roles.html>

NFRAG (2008) Flood Risk Management in Australia. The Australian Journal of Emergency Management. Vol 23, No. 4, November 2008

New South Wales Government (1912). Water Act 1912. Accessed on 18/01/12 at: <http://www.legislation.nsw.gov.au/maintop/view/inforce/act+44+1912+cd+0+N>

New Zealand Standards (2008). NZS 9401:2008. Managing Flood Risk – A Process Standard. Standards Council: Wellington.

NSW Office of Environment and Heritage (2011). Standard Floodplain Risk Management (FRM) documents. Accessed on 04/01/12 at:

<http://www.environment.nsw.gov.au/floodplains/StandardFloodplainRiskManagement.htm>

Ruimtevoorderivier (2007). Room for the River Programme. Accessed on 16/02/12 at:

<http://www.ruimtevoorderivier.nl/meta-navigatie/english/>

SCARM (2000) Floodplain Management in Australia: Best Practice Principles and Guidelines. Agriculture and Resource Management Council of Australia and New Zealand, Standing Committee on Agriculture and Resource Management (SCARM). Report No 73. CSIRO Publishing, 2000

USACE (2010). Flood Protection. Accessed on 04/01/12 at:

<http://www.usace.army.mil/CECW/Pages/home.aspx>

World Bank (2012) Cities and Flooding - A Guide to Integrated Urban Flood Risk Management for the 21st Century. Global Facility for Disaster Reduction And Recovery

ⁱ IFI is a joint initiative in collaboration with such international organizations as UNESCO (IHP) United Nations Educational, Scientific and Cultural Organisations, WMO (World Meteorological Organisation), UN/ISDR (UN International Strategy for Disaster Reduction), UNU (United Nations University), IAHS (International Association of Hydrological Sciences) and IAHR (International Association for Hydro-Environmental Engineering and Research)