

Development and Application of Environmental Risk Assessment Methods for Planning and Delivery of City and Suburban Development

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Short Lead

The use of risk assessment methods (a) in the 2000 Olympic Games and (b) in community partnerships in local planning, provide a basis for precautionary planning and ESD.

Introduction

The value of a risk assessment approach to understanding and communicating desirable limits to societal activities is illustrated in the wide number of professional programs which currently undertake some form of risk assessment. This includes the health, finance and insurance industries.

In view of the importance of identifying undesirable effects of given planning options, a consideration of the environmental risks associated with developments is a valuable part of the planning process. An understanding of potential risks offers increased confidence for government in recommending particular development options to the public. It also provides a firmer foundation for public understanding and endorsement of planning options.

Risk assessment in the environmental context has developed over several decades. Early work established a dose-response relationship between radiation exposure in the Second World War and human health outcomes. This work has been extended over time resulting in the development of several formalised methodologies for non-radiation human health risk assessment and, more recently, ecological risk assessment.

The incorporation of methods such as risk assessment into the planning process is an example of the increasing relevance and value of including biological principles, notably ecologically sustainable development, in planning.

With respect to city and regional planning, the most important contribution of a risk assessment step early in the planning process is minimisation of uncertainty in the planning strategy and communication of uncertainties to the public. This attribute makes risk assessment a useful method as part of major pulsar planning and in local area planning.

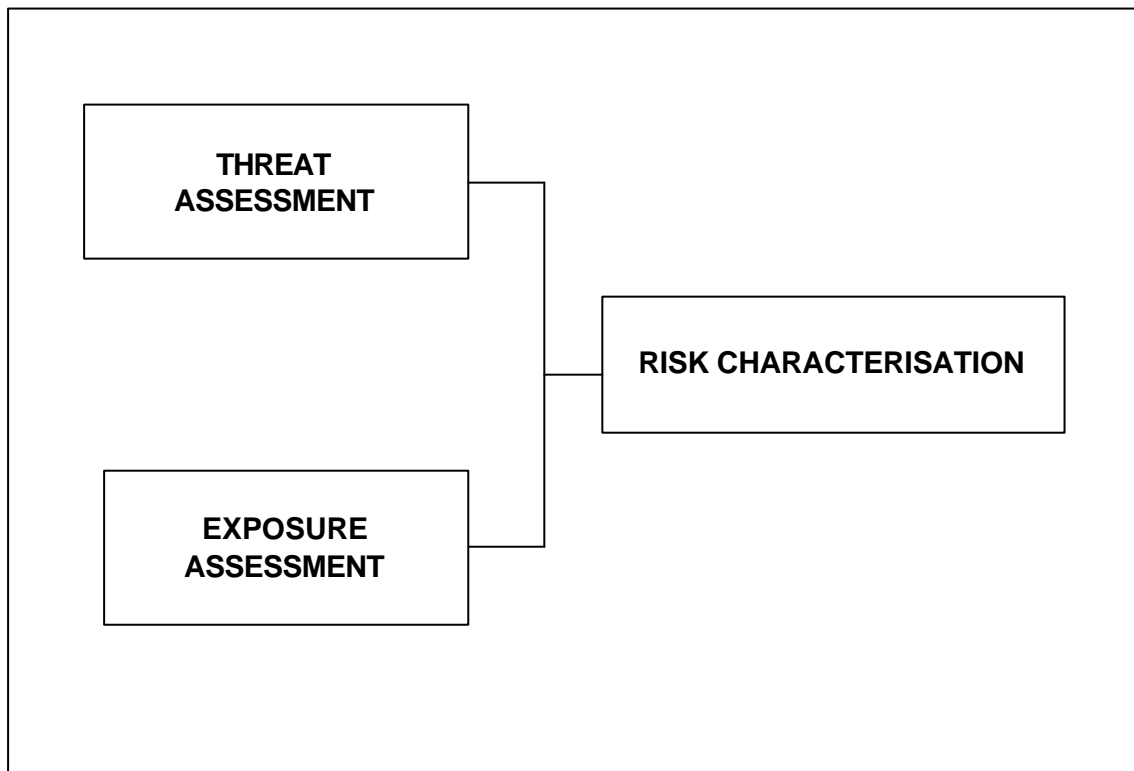
We shall see that application of risk assessment to planning in both large scale development and local area planning also enhances understanding of complex development proposals and increases "ownership" of the planning process by government and the public.

Environmental Risk Assessment Method

Risk assessment involves the following steps (Figure 1):

- a) Description of a threat which, for example, may be an industrial impact for human health or natural environment loss for biodiversity risk.
- b) Identification of the potential for exposure to the threat, which may be estimated modelling approaches or by direct measurement of an existing situation.
- c) Estimation of a risk resulting from a combined threat and exposure situation.
- d) Consideration and discussion of uncertainties which may be inherent in arriving at the risk estimate.

Figure 1
BASIC STEPS IN RISK ASSESSMENT



*Source: Screening Environmental and Human Health Risk Assessment Study for Oyster Bay – An Agenda 21 Pilot Report June 2001
Environmental Science and Policy Unit, Sutherland Shire Council*

These steps are described below for the Olympics 2000 project and for local area planning.

A risk assessment early in the planning process has the additional benefit of formally identifying and describing key threats, exposures and uncertainties of the proposal and their impacts for the proponents of the development.

A. Land Remediation for a Major Development Project: Olympic Games 2000

Major development proposals are accompanied by potential financial, environmental and community constraints, with inherent uncertainties in the scale of these impacts. Planning for major developments, particularly pulsar events, benefits greatly from a consideration of the effects of the scale of the proposal, its timing, and the potential uncertainties arising from unexpected aspects of the development.

Application of risk assessment to a development proposal potentially enhances the understanding of impacts and uncertainties in the proposal and enhances communication with decision makers and with the public affected by disruption to their local environment or social amenity.

An example of planning of a complex pulsar event which benefited greatly from risk assessment method, was the land remediation and management of the Olympics 2000 site in Sydney, Australia. The government decided to apply a risk assessment approach to protection of the health of remediation workers, near neighbours, and to future uses of the site in order to secure confidence in the project. The application of the method and the subsequent management of risk resulted in site remediation being completed on time and under budget, thereby providing an important foundation for successful construction and staging of the Olympic Games.

The understanding of risk and a demonstration of the benefits to the environment and amenity of Sydney were important features in winning the bid for the Olympic Games. Protection of the health of workers and the public associated with the site, and protection of the natural resources including bushland and threatened animal and plant species, were important parts of a unified and inclusive proposal for urban renewal and staging of the international event. The contribution of risk assessment to the planning process also contributed to the quality of the final urban renewal and to the legacy passed on to the public of Sydney.

(i) Sydney Olympic Park

Sydney Olympic Park sits within Homebush Bay at the heart of Greater Homebush, a subregion of Sydney. It is located 14 kilometres west of Sydney Central Business District. Homebush Bay has experienced considerable urban change over the past 100 years, and major change in the past decade, culminating with the 2000 Olympics.

FIGURE 2
LAND USES AT HOMEBUSH BAY



Source: Olympic Co-ordination Authority (OCA) Ecology Programs March 2000

Homebush Bay's past industrial uses – abattoir, munitions storage depot, brick works and waste disposal dominated the use of the area for much of the past 100 years. These industrial uses, when combined with the limited physical integration and public access into the area.

**FIGURE 3
CONTAMINANTS AT HOMEBUSH BAY**



Source: Olympic Co-ordination Authority (OCA) Ecology Programs July 2000

Regeneration plans for Homebush Bay as an international sporting venue were first proposed in the early 1970's. Renewal of the site began during the 1980's with the development of the Australia Centre, Bicentennial Park and the State Sports Centre. The preparation of Homebush Bay as the main venue for the Sydney 2000 Olympics

and 2000 Paralympics underpinned the regeneration and development processes in the area. The Olympics brought with it high levels of public exposure and interaction with the Homebush area. The Olympic experience and other sporting, entertainment and cultural events have dramatically changed the perception of Sydney Olympic Park and Homebush Bay.

A 1995 Master Plan for Homebush Bay was the basis for the majority of the development at Sydney Olympic Park. Subsequent to the 1995 Master Plan, a Public Domain Master Concept Design clarified the objectives of the 1995 Master Plan and developed a coherent design vision for the public spaces of the Olympic site.

The 1995 Master Plan concentrated on major planning and urban design issues for the Homebush Bay area over four major project areas. It also outlined transport and infrastructure frameworks and proposed a broad range of commercial, residential, leisure and recreational developments.

The Master Plan set the vision, planning and urban design framework for Sydney Olympic Park for the next 10-15 years. The proposed development of a diverse range of new uses is set to maintain the level of urban change in the area.

Since the success of the Sydney Olympic Bid in 1993, the planning of Sydney Olympic Park at Homebush Bay concentrated on the provision of facilities for the 2000 Olympic and Paralympic Games and the infrastructure to support these facilities.

Some studies used as a basis for the preparation of the Master Plan were:-

- Environmental Guidelines for the Summer Olympic Games (September 1993)
- Homebush Bay Development Guidelines:
 - Volume 1 Environmental Strategy (1995)
 - Volume 3 Master Plan report (1995)
 - Volume 4 Transport Strategy (1995)
 - Volume 5 Landscape Strategy (1995)
- Homebush Bay Public Domain Master Concept Design: Design Report (March 1997)

(ii) Human Health and Environment Protection at Homebush Bay during the Olympics 2000 Remediation Project

In the late 1980's the NSW government resolved to undertake remediation of the former domestic and industrial waste disposal site at Homebush Bay. The planned remediation would reclaim a large area at Homebush Bay reclaimed a large area of formerly unused land for public recreation, located in the geographic centre of Sydney. The reclamation was also an important part of the successful bid for the Year 2000 Olympic Games.

The Government recognised that the quality of the remediation project was important to the profile of the "Green Games", the ability to deliver on construction deadlines, and the need for public acceptance of the new recreation and residential area. In that light, the highest standards of health and environment protection in NSW for protection of workers, the most vulnerable group in the project, adjacent land occupiers, and the public who would eventually use the site, were adopted and have been rigorously maintained.

The Homebush Bay site was a complex mixture of differing prior land uses and was subject to mixed waste disposal over several decades. In recognition of the complexity of the site and of the materials disposed there, a comprehensive geophysical and hydrological survey was undertaken of the site. Based on this survey a multi-layered approach to health and environment protection was established for the remediation. This approach, documented in the numerous original reports and subsequent management meeting records for the site, is summarised below.

(iii) The Approach to Health and Environment Protection

Three levels of preventive health and environment protection were established at Homebush Bay:

- a) An initial Human Health and Ecosystem Risk Assessment (QHRA)
- b) Working Party Oversight
- c) Site Monitoring and Community Briefings

At Homebush Bay the QHRA was used to understand all potential current and future risks to workers, adjacent land occupiers and the public, and to put in place preventive measures to protect health and the environment at the outset of the project.

Based upon the QHRA results, each area of the Homebush Bay remediation was the subject of Health and Safety plans developed by the major contractors for that area and screened by a Working Party and a risk assessment advisor. Procedures adopted in these plans provided for individual project design methods, use of protective equipment and air, water and soil monitoring, as appropriate, for worker and public protection.

A programme of continuous air quality monitoring was undertaken on the project, testing for key hazardous materials identified in the QHRA. Based on a site-agreed approach with worker groups, the measurement levels for these hazardous compounds were set very strictly. As a result, public health for adjacent land users was equally well protected.

The monitoring programme confirmed that exposure of the workers and adjacent land occupiers to materials from the site is negligible. Monitoring results were recorded and made available for scrutiny, and discussed at local community workshops and briefing sessions.

(iv) Nuisance and Annoyance

Despite the documented protection of health and environment on this project, the potential for nuisance from remediation-associated odours existed. The odour impact was separate from health risk, as shown by the site monitoring results.

Odour impact was minimised by work procedures and planning, and by masking agents, but is impossible to eliminate. Procedures were established and continually revised for odour minimisation.

(v) Public Documentation and Accountability

An important part of the current project design was public documentation of the project procedures and monitoring results with respect to health protection.

The risk assessment and remediation results and documents were made available, and meetings with interested parties and concerned groups were encouraged in order to answer any questions about the project, and to describe the approach to health and environment protection.

(vi) The Olympics 2000 Site

Based upon extensive site monitoring and tender selection of risk assessment consultants, the human and ecosystem health risk assessments were progressively undertaken for the different Olympics site areas. Further details on these may be obtained from the Olympic Coordination Authority web site www.oca.nsw.gov.au and in associated documentation. A best practice approach to occupational health and safety and to ecosystem protection followed from the risk assessment work.

The risk assessment work underpinned the site approach, which attempted to maintain the estimated site occupational health risks below the internationally agreed levels.

During the remediation procedures considerable attention was given to effective risk management, notably by convening a hazardous risk assessment working party to oversee risk management procedures.

The specific applications of risk assessment methodology to the Olympics 2000 project included:

- Remediation of some 160 hectares of the 760 hectare Homebush Bay Olympics 2000 site
- Consideration of the Sydney International Shooting Centre site at Cecil Park for an indication of environment protection requirements in target shooting activities
- Analysis of the risk implications of transient chemical waste emissions from industry adjacent the Olympics site
- Assessment of construction worker health risks from off-site generated pollution incidents around the Homebush Bay area
- Provision of information on risk to adjacent site users, such as Silverwater Correctional Centre, a prison, and communities around Homebush Bay.

(vii) Risk Assessment Outcomes

The outcome of these approaches was an effective and well-organised remediation project for this large-scale contaminated area. The record of site monitoring results provided a useful point of reference verifying the minimal risk approach to workers, adjacent user and public health, and protection of the environment. The risk and work management approaches delivered the remediation on time and under budget.

Interest has recently been shown by some leading industrial remediation companies to incorporate the successful approach developed at Homebush Bay into ongoing private commercial projects.

The Olympics 2000 project involved initial strategic planning, development of a remediation proposal for a large contaminated site, delivery of the remediation to high quality environmental criteria, protection and management of workers involved in the remediation project, and involvement of the community in supporting the methods and outcomes. Thus, the contribution of risk assessment to the Olympics project went well beyond the simple practical remediation steps. It delivered the transformation of a degraded former industrial site and landfill to open parkland with high quality natural environment components and new residential amenity.

**FIGURE 4
RESIDENCES CONSTRUCTED POST REMEDIATION**



Source: The Games Show Australia 2000 – Peter & Jennifer Hyatt publishers

Natural resource protection outcomes at the Olympics site included decontamination of wetland areas, preservation of unique woodlands and wetland habitats, and management of water design and landscaping for the new parkland and urban precincts.

In the lead up to, and delivery of, the Sydney 2000 Olympic and Paralympic Games, the Olympic Co-ordination Authority (OCA) worked to integrate the principles of ESD into the venues and facilities at Sydney Olympic Park.

The environmental initiatives at Sydney Olympic Park won several national and international environment awards. This international recognition of Sydney 2000's commitment to ecologically sustainable development set benchmarks in the areas of energy, water conservation, waste minimisation, pollution avoidance and protection of the natural environment.

At 450 hectares, Millennium Parklands is now Australia's largest metropolitan park and provides an enduring environmental legacy for the people of Australia. Millennium Parklands includes the natural landscape surrounding the urban core of Sydney Olympic Park including Newington wetlands and woodlands and Bicentennial Park. The Parklands contain a network of approximately 40km of pedestrian and cycle trails and has a varied landscape that includes ponds, water features and drainage systems.

FIGURE 5
THE OLYMPICS NEIGHBOURHOOD (Foreground) & STADIUM (Background)



Source: The Games Show Australia 2000 – Peter and Jennifer Hyatt publishers

The remediation of the formerly highly degraded environment in areas of Sydney Olympic Park represents an environmental legacy for the people of New South Wales and all visitors to the site to enjoy. As part of the remediation strategy, Sydney Olympic Park Authority (SOPA) is continuing the final stage of the on-site treatment of scheduled chemical waste.

SOPA has expressed a commitment to ensuring an ongoing and informative interface with the community. A number of significant education and environmental communication processes were established as part of OCA's Enhanced Remediation Strategy.

The successful use of risk assessment in the Olympics 2000 project provided support for application of the method in local area planning, described below.

B. Government-Citizen Partnerships in Local Planning

There is a well-recognised need for planning to move beyond community consultation into community partnering. One popular dictionary describes a partner as

“a person associated with others in business of which he shares risks and profits”

An ideal situation in plan development is agreement and commitment between a community and its local government authority for a development plan. The complexity of ecologically sustainable development at the biological and land use levels, and the need to integrate environmental, economic, and social planning components, makes genuine community partnering vital to ecologically sustainable development. Despite this, genuine partnering is only rarely achieved today, and consultation is a poor working alternative.

In developed nations only an appreciation of the personal impact of our lifestyle will galvanise public opinion to the point where citizen choices and political decisions will reflect the true urgency of environmental change.

We have developed a method for applying risk assessment in regional and local planning. The method was used in a pilot project on the Oyster Bay area, a community of some 10,000 people on the Georges River in Sydney's south.

(i) What do Citizens want as Partners in Planning?

In 1999 we undertook at Sutherland Shire Council a citizens panelling exercise to assess citizen perspectives on plan alternatives for a large local government area of 200,000 residents in southern Sydney Business District. The exercise was facilitated by an independent community consultation consultant and was overseen and evaluated by students of a university-accredited post-graduate course. The citizens were presented with detailed biological and other scientific information and presented with alternative plan approaches aimed at minimising environmental risks to their local areas.

Key outcomes of the panelling process included:

- a) The presentation of information describing and documenting local environmental risks was readily accepted by the citizens' panel.
- b) The citizens demanded even more information than was presented in a few hours.
- c) Citizens exhibited scepticism over the independence of government information and the resolve of government to implement effective planning.

A clear message from this panelling process was that citizens are prepared to undertake genuine partnering, including personal involvement in understanding information related to constraints on plan options and limits to growth and lifestyle. However such willingness is subject to being provided with adequate information and with a genuine government commitment to take action.

On the basis of these results, the present paper describes an environmental risk assessment procedure which has been adapted to local planning to inform citizens about local risks and which documents government commitment to openness and factually based plan-making.

(ii) Environmental Risk Assessment in Community Partnering and Planning

At Sutherland Shire Council we developed a procedure for adapting traditional risk assessment methodologies to a local environmental risk assessment at both a regional and local level. The local risk assessment was undertaken as a pilot project on the Oyster Bay area, a community of some 10,000 people on the Georges River in Sydney's south.

**FIGURE 5
AERIAL VIEW OF OYSTER BAY**



Source: Oyster Bay Pilot Risk Assessment – Sutherland Shire Council June 2001

Human and ecosystem threats for Oyster Bay were identified from first principles by assessing air, biodiversity, land and water threats. For simplification, representative indicators of human or ecosystem health were selected for analysis. For example, vertebrates were chosen as the indicator species for biodiversity, and impervious surfaces chosen as the indicator for land use. The key biodiversity threat was loss of habitat, particularly by clearing residential land for development. In order to include social, economic and environmental considerations in the risk assessment, threats such as traffic safety and congestion were also considered.

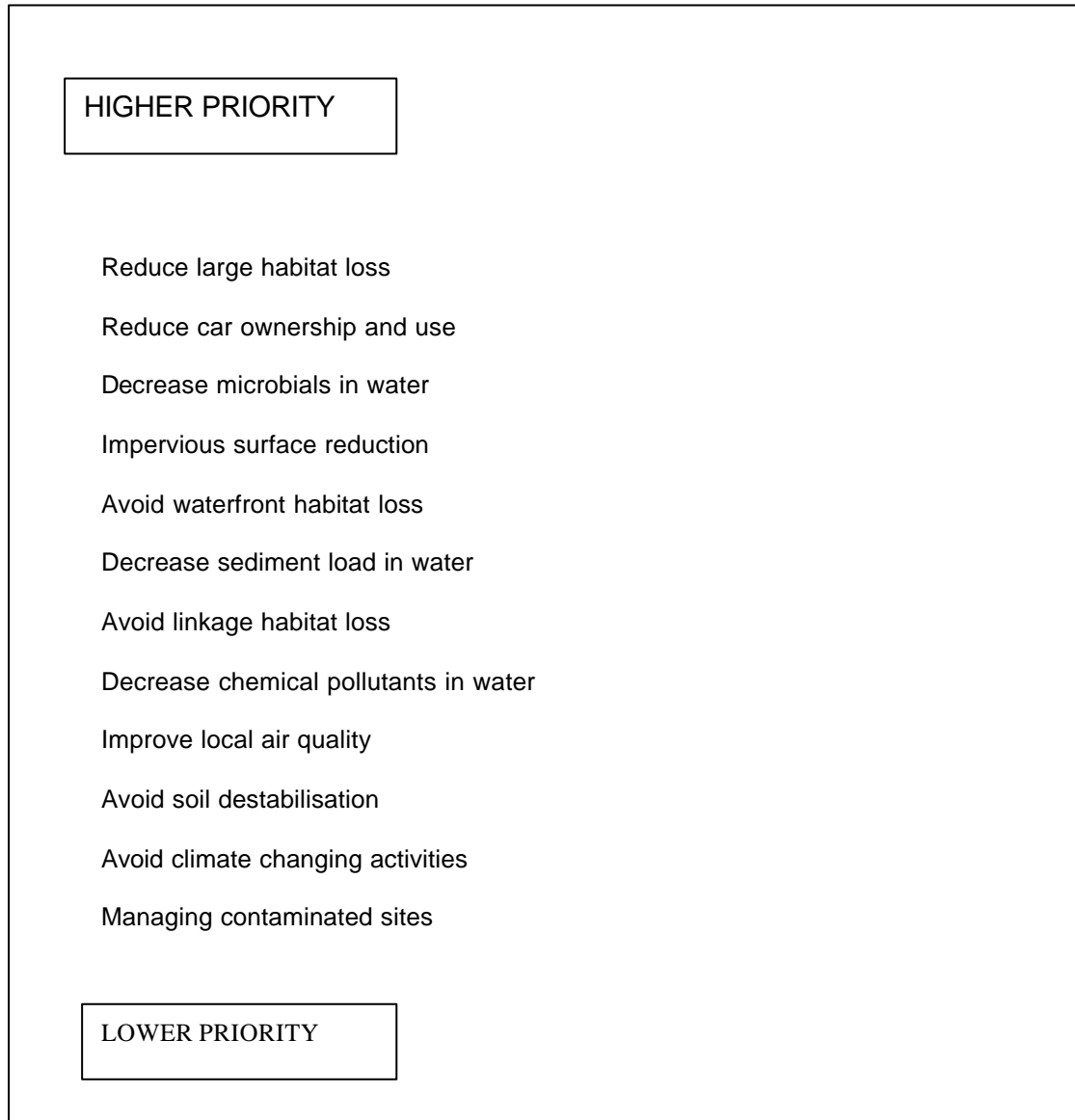
Following the consideration of threat, consideration was also given under each environment category to the potential exposure of humans or the ecosystem to the threats.

A risk assessment, categorised as high, moderate or low, was assigned to each threat/exposure outcome.

Finally, uncertainty was assessed for each risk assessment.

Figure 6 shows the risk assessment results (The Risk Action Ranking) for the Oyster Bay planning area.

Figure 6
ENVIRONMENTAL RISK ACTION RANKING



*Source: Screening Environmental and Human Health Risk Assessment Study for Oyster Bay
– An Agenda 21 Pilot Report June 2001
Environmental Science and Policy Unit, Sutherland Shire Council*

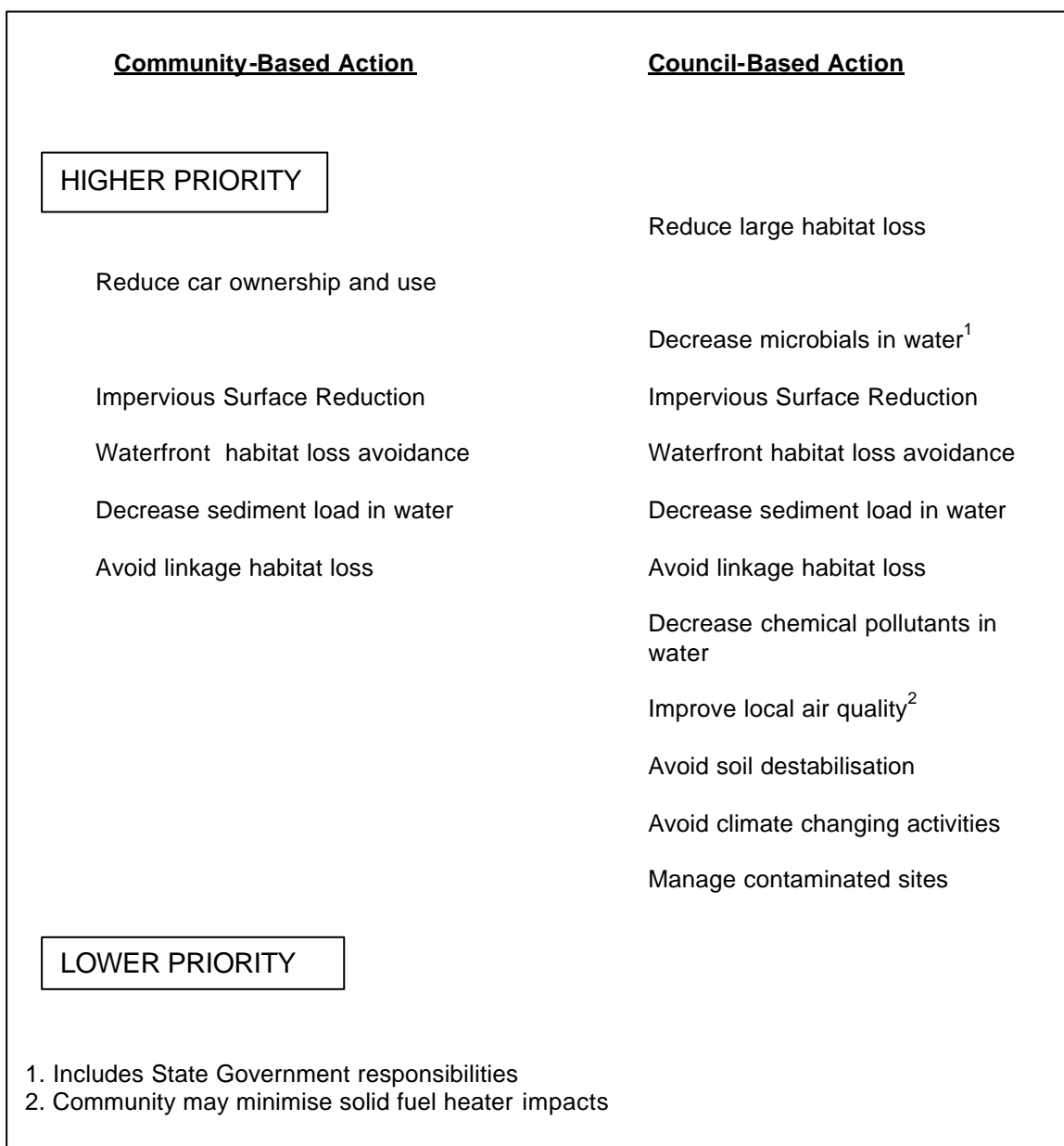
The individual risk reports for the different environmental components were published together with a summary risk assessment. This was done in order to provide full clarity with respect to risk assessment methods and results.

An important component of the risk summary was a ranking of the environmental risks based on a prioritisation step which ranked the key risks with respect to the scale of the risk (e.g. wide geographic significant, large population impacts) and quality of the risk (e.g. well-researched databases, corroboration by independent experts). This prioritisation step was

undertaken independent of, and subsequent to the risk assessment so that the two processes would not influence each other. This is consistent with good risk assessment practice.

Perhaps the most useful outcome of the risk assessment was the opportunity to identify those area risks which must be addressed by local government action, by community action or by joint action (Figure 7). Such local risk-based conclusions provide a firm basis for appropriate 'ownership' of the planning options.

**Figure 7
RELATIONSHIP BETWEEN RISK ACTIONS AND COMMUNITY/COUNCIL
ACTIVITIES**



Source: *Screening Environmental and Human Health Risk Assessment Study for Oyster Bay - An Agenda 21 Pilot Report June 2001*
Environmental Science and Policy Unit, Sutherland Shire Council

The summary risk assessment and accompanying risk reports are accessible on the internet at www.suthlib.nsw.gov.au/environmental_science/index.htm.

(iii) Local Community Workshops

The interface between the risk assessment process and the planning process was undertaken in a community workshop with Oyster Bay residents. The risk assessment was posted on the internet for detailed examination by residents and summary documents provided by mail prior to the workshop.

Several community workshops were held to discuss the detailed risk assessment approach and results. The workshops identified and discussed the environmental risks affecting Oyster Bay and sought suggestions on how these risks could be managed. The outcomes would be used in the preparation of controls that contribute to long-term environmental quality and sustainability for Oyster Bay. The Oyster Bay Planning Study, which included an environmental and land use planning study, was commenced in response to resident concerns with changes to Oyster Bay and encouraged community involvement and participation through Local Agenda 21 principles. The ultimate goal was to include a review of residential zonings, including development of a housing strategy involving consideration of neighbourhood character and neighbourhood centres.

(iv) Local Risk Assessment Outcomes

The planning outcomes from the risk assessment-based workshops included:-

- The citizen-identified risks for Oyster Bay showed a good correlation with the Council-identified risks.
- The citizen priorities on risk were slightly different from the Council prioritisation. This was identified as due to:
- A general citizen concern with the scale of development (notably traffic congestion and bushland loss)
- A high citizen priority on acute risks such as bushfire.
- A significant proportion of citizens expressed a willingness to consider lifestyle changes which could be reflected in local plans, consistent with the risks identified by Council and the community.

Council planners reported the risk assessment approach as very useful with respect to Council and community understanding of environmental issues and any implications of planning choices.

The professional local government planning staff were asked for their response to the availability and use of a risk assessment method in the local planning process. Their responses highlighted:-

- The important contribution of the risk assessment approach to identifying and prioritising risks early in the planning process.
- The value of the assessment in developing planning controls and masterplans.
- The enhancement of an understanding of ESD in planning of the development.
- Enhanced communication and agreement of the risks of particular planning options with the public.
- The perceived independence and objectivity of the risk assessment step in justifying the planning outcomes.

- Attention to specific environmental issues in planning, e.g. the cumulative effect of hard surfaces on the environment.

These results are important in the light of the need for plans to be based upon good information and the willingness of citizens to participate in plan making and implementation.

In previous international work on risk assessment and risk perceptions, the US EPA identified significant differences between human and ecosystem risks identified on a scientific basis versus those identified by communities and the media. In the case voiced today, it is clear that the publication of the risk assessment and its exposition in a workshop format led to significant agreement on risk issues and priorities for the local authority and the community.

(v) Opportunities provided by Risk Assessment Approach to Local Area Planning

The local opportunities identified by the pilot exercise process and the workshop outcomes include:

- Enhanced equity for the community in the planning process.
- Better understanding of planning options and pathways in light of risk information.
- Enhanced trust between the local authority and citizens based upon clear discussion of risk and planning issues.
- Enhanced capacity for committed partnering between community and the local authority with respect to planning options.

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