Swan Region Strategy
for
Natural Resource Management

INVESTMENT PLAN TECHNICAL REPORT No 3

Assessment of Overall Priorities for Investment Across Themes

March 2005

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Assessment of Overall Priorities for Investment Across Themes

1. Background

The Swan Catchment Council is developing a Strategy for Natural Resource Management (the Strategy). Under a Bilateral Agreement with the Commonwealth the Council is required to develop an Investment Framework and Plan for effective and efficient implementation of the Strategy.

This requires a consistent framework for assessing action priorities within and across Asset Categories, based on a form of "triple bottom line" assessment. The Strategy identifies six broad "Asset Categories": respectively land, water, biodiversity, coastal/marine, air and cultural heritage.

The Consultancy Brief indicates that selection of assets for investment should be based on the:

- Value of and target for the asset
- Impact of threats on the asset
- Capacity of the wider regional community to take effective action

2. Methodology

2.1 Developing the Investment Framework

Key steps in the methodology for developing the Investment Framework and Plan are as follows:

- Contacts with the Council's team to establish progress made in identifying and valuing assets under threat, proposed targets, management options, indicators of performance and monitoring and evaluation system;
- Desk research into all asset categories and financial cost estimates;
- Determine current State and Commonwealth governments' latest thinking about their requirements/preferences for the format of investment frameworks and plans, leading to a decision about the appropriate format for the Swan Catchment Investment Framework and Plan;
- A short but intensive program of workshops designed to elicit stakeholder views on an appropriate Investment Framework including targets and management practices; and
- Development of an Excel-based forward Investment Plan linking targets with required investments and cost shares.

2.2 Workshop design

There are two levels at which prioritisation of NRM investments needs to be done: namely at the levels of (i) asset values, threats and capacity to deal with the issue, and (ii) management actions.

The workshops were therefore divided into two sessions, namely:

- Selecting assets for investment, and
- Getting the best mix of management actions, viz overall priorities for investment within and across Themes.

Investment Plan Technical Report No 2 *Assessment of the Relative Returns from Investment Across Assets and Threats* gives results for the first workshop series.

This report deals with the workshop series. Three separate workshops were held to discuss and rate all the management actions given in the Swan Catchment Strategy for Natural Resources Management. Each workshop followed the same format, and was attended by fourteen to twenty six participants.

Each workshop began with introductory statements by the Swan Catchment Council representative, Resource Economics Unit, and the Facilitator. There then followed three workshop tasks, which are described in the next Section. Appendix A gives the results of the Workshop Evaluation forms returned by participants.

2.3 Workshop tasks

The discussion was designed in three segments:

- Task 1: a brief review of outputs from Workshop Series A
- Task 2: consider proposed management actions within each asset category (the bulk of the workshop time was spent on this topic)
- Task 3: consider resource allocation across Themes

2.3.1 Task 1: Review

Task 1 was to review the results of Workshop A (see REU Report). Participants had received a copy of the REU report prior to the workshop. The focus was on the rating of threats to assets key asset values, and then rated the degree to which asset values could be changed by NRM investment (either to avert a future decline in value or to enhance a currently degraded value). Resource Economics Unit had analysed the results and presented tables showing threats to assets ranked in terms of the perceived returns to investment and the capacity of the region to address the threats (HH to LL).

2.3.2 Task 2: Prioritize Management Actions within Themes

For the second task, participants were presented with 11 tables containing a list of all the management actions that have been included in the Swan Region Strategy for Natural Resource Management, asset by asset. The asset category "Air" was excluded, as there had been no participant representing this topic at Workshop A.

The asset classes considered, and indicative total cost of management actions proposed for each asset class are shown in Table 1. Indicative costs for each action, estimated by Resource Economics Unit, were shown in the working sheets used by participants.

Because of the large number of management actions for the asset class "Swan-Canning Estuary and Coastal Plain Streams" it was divided into three groups of management actions, namely those dealing with (i) aquatic ecosystems, (ii) nutrients and (iii) sediments and turbidity. These groups also correspond to the three Matters for Target for this asset.

In order to limit the total number of decisions that participants had to make, many of the management actions listed in the Strategy were combined into a single "larger" action. This was done particularly where components of a particular action had been listed separately in the Strategy (e.g. "undertake a review…and….implement recommendations"), or where actions were of a similar type (e.g. training actions). Participants were invited to break any action into components if they felt they wanted to deal with them individually (e.g. if they wanted to give a higher priority to one part of the action).

At the head of each table were listed the highest ranking returns to NRM investment, obtained from Workshop A. Participants could therefore compare the set of listed management actions with the areas of highest return to NRM investment identified in Workshop A.

The task given to participants was to decide how they would budget for a reduced total funding of management actions for the particular asset. A 75% cut in overall funding was used in each asset class, compared with the indicative total cost estimate. The figure of 75% was considered to be a plausible funding reduction, while forcing participants to make quite significant changes.

Table 1: Preliminary Costings of Management Actions Contained in the Swan Regional Strategy

Source: Resource Economics Unit 19/7/04: PRELIMINARY

Asset Category	$000s	%
Land	3,267	19%
Terrestrial Biodiversity	1,186	7%
Swan-Canning Estuary & Coastal Plain Streams:		
Ecosystems	1,835	11%
Nutrients	1,770	10%
Sediments & turbidity	1,590	9%
Freshwater Lakes & Wetlands	800	5%
Groundwater	390	2%
Darling Range Streams	1,690	10%
Coast & Marine	2,652	15%
Heritage	559	3%
Regional Capacity	1,630	9%
Total Investment Plan	17,369	100%

Participants were asked whether they would adjust to the reduced funding by doing one of the following with each listed management action:

- Keeping
- Spreading
- Trimming
- Deferring, or
- Cutting completely.

They were then asked to show a new indicative expenditure and new number of years over which the management action would be undertaken.

Participants were allowed to increase funding for an action, but only within the overall 75% budget constraint.

At the end of this exercise the results were collectively reviewed by participants by recording the number of times A (add) K (keep), S (spread), T (trim), D (defer) or C (cut) had been made against each management action.

Having rated all the possible actions within an Asset Category, the cumulative amount of money required as successively more actions are “approved” is noted. Then, If there is a budget constraint, it is possible to “draw the line” under the actions that can be afforded. The tighter the budget constraint the fewer is the number of actions that can be undertaken, and the longer the time needed to achieve resource condition targets. This is illustrated in Figure 1.

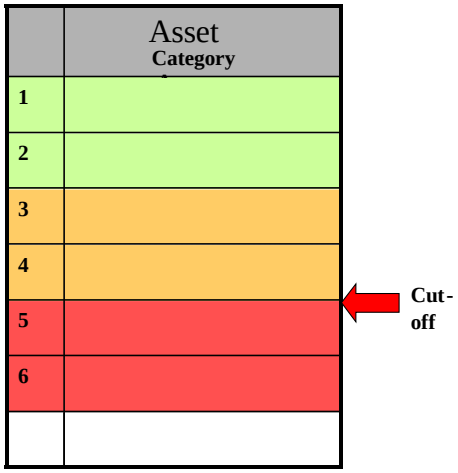


Figure 1: Priority ranking within an asset category

Actions 1 and 2, shaded in green, are deemed "essential" (having been rated as "Add" or "Keep"); Actions 3 and 4 (Spread, Defer or Trim) shown in brown are "marginal" and Actions 5 and 6 shown in red (Cut) are "not do-able" given the budget constraint, though they remain as probably still worthwhile actions for some future date.

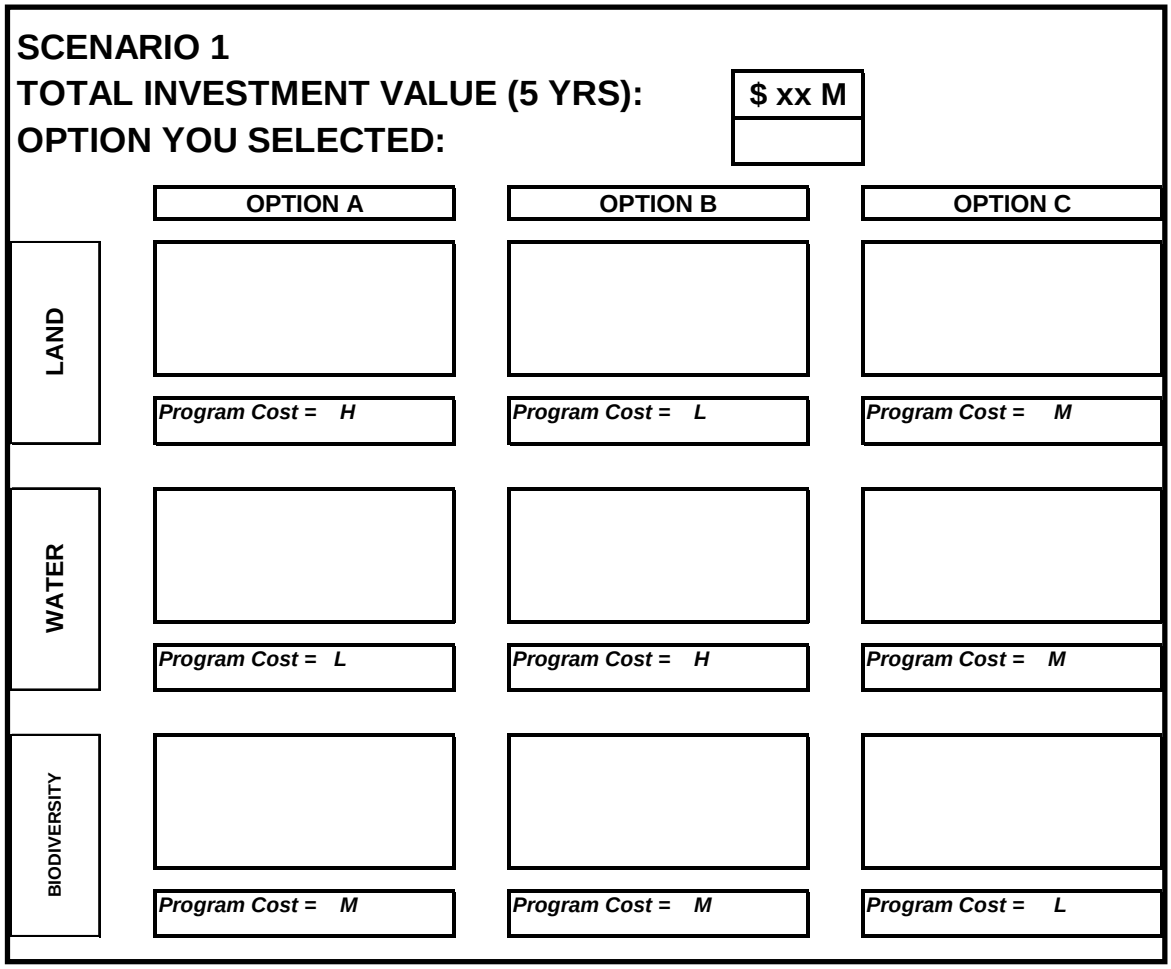
2.3.3 Task 3: Choose Management Actions Across Themes

The final task was to derive an allocation of resources for natural resource management across Asset Categories (Themes) that is *approximately proportional to relative social preference*, and which defines a cut-off point for selection of management actions (see below).

A suitable environmental economics technique for assessing appropriate resource allocation across Asset Categories is *Choice Modelling*. This technique has been used in household surveys used to elicit willingness to pay for generalised outcomes across broad environmental categories (see for example NLWRA 2002).

> The timeline and budget for this consultancy did not allow for a household survey, so a workshop approach was used. Instead of expressing their "willingness to pay" the workshop participants were assumed to be seeking the maximum environmental, social and economic returns obtainable from alternative mixes of management actions. They expressed their preference by choosing from a number of pre-set mixes of actions across asset categories. This is illustrated in Figure 2.

Figure 2: Format of the Choice Sets offered to participants (example)



The mixes of management actions corresponding to the “High”, “Medium” and ”Low” funding for a particular asset category were developed as follows:

- “High” implied full implementation of all proposed management actions;
- “Medium” implied an intermediate set between “High” and “Low”, and
- “Low” implied a set of management actions corresponding to 75% funding.

The task required from participants was to select Option A, Option B or Option C out of the three shown on a single sheet, termed a “Scenario”. Each Option represented a complete investment plan for the Region, specifying a “high”, medium” or “low” bundle of management actions for each of the 11 asset categories. For the purpose of the exercise the management actions were summarised as statements of the outcomes that could be expected following successful completion of the particular set of management options specified.

This exercise was completed four times, each with a different combination of high, medium or low numbers of management actions in each asset category. In two of these Scenarios the management actions for water were held constant across Options. In the other two scenarios management actions for terrestrial biodiversity and land were held constant. This was done in order to force advocates of investment in one area (e.g. water) to consider alternatives across other areas (e.g. terrestrial biodiversity, coast and marine, or regional capacity building) independently from their “pet” area.

Finally, participants were asked to nominate which of the twelve Options they had considered across the four Scenarios came closest to their ideal investment plan for the region. They were also

asked to write down and return their reasons for their best choice on a card. This was done only for Days 2 and 3 of the workshop series.

The outcome of the workshop was therefore a direct statement of the way in which individual participants would allocate investment resources across Asset Categories. Aggregating over all participants gives an "informed judgement" of a preferred investment pattern for the region.

3. Management Actions Rated within Themes

The following tables show the results of an exercise undertaken by 64 participants in Investment Plan Workshop B. Participants were asked to consider indicative costs for each action, then to indicate how they would cope, in a financial sense, with an enforced overall budget cut. A notional figure of a 25% overall cut to the Strategy's five-year budget was used. This 25% figure was varied slightly across asset categories, in order to present participants with a total budget for each asset class rounded to the nearest $100,000 in aggregate. Thus, each management action listed in the Strategy is presumed to be worthwhile, but difficult choices are needed if funds are short.

Participants were asked to first decide whether, faced with an overall shortage of funds, they would do one of the following to the budget for a particular management action:

- Keep the action
- Spread the budget over time
- Defer the action
- Trim the budget
- Cut the Action Out Altogether

They were then asked to supply a new cost level for each management action, including any desired increases in allocation to "kept" actions, provided the participant stayed within the new 75% budget overall for the asset class. Calculators were provided to all participants.

Management Actions were taken from the *Swan Region Natural Resource Management Strategy Draft for Public Comment*, (April 2004), with some modifications by the Strategy Team, following from a consideration of comments received. Also, some management actions that were either similar to each other, or belonged to a specific project sequence were amalgamated. This was done in order to keep the total number of choices required of participants to within a feasible number.

Working sheets containing the management actions in each asset category were supplied to each participant. Due to the large number of Matters for Target and management actions proposed for the Swan-Canning Estuary the management actions for this asset were divided into three groups, namely those addressing (i) aquatic ecosystem, (ii) nutrients, and (iii) sediments and turbidity. This gave a total of eleven working sheets. Management actions for air were not rated, as there was no participant from this topic.

The participants worked on tables of four to six people, and freely discussed issues as they worked through the sheets. Participants were allowed to NOT work on a particular sheet if they felt uncomfortable due to a lack of knowledge.

The following tables summarise the results of the workshop as a ranking of the management actions within each asset category, using all participants' responses over the three days that the workshop was held.

3.1 Land

Table 2: Management Actions addressing the Land Asset: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Develop a benchmark for community capacity to address acidification, erosion, acid sulfate soils, and land restoration. LM 2.6
2	Strategic partnerships with the Urban Development Institution of Australia (UDIA) for protection of land assets. LM 2.6
3	On-ground projects of community groups, local government and State Agencies addressing acidification, erosion, acid sulfate soils, and land restoration. LM 2.5
4	Network for the use of market based instruments/incentives. LM 2.6
5	Develop a benchmark for regional community salinity management capacity LM 1.4
6	Land-use and management support programs (e.g. planning decision support tools, EMS, best practice guidelines, workshops, education and training, demonstrations, information system & service, land capability tools, property planning) addressing land salinity and restoration. LM 1.4
7	On-ground salinity projects of community groups, local government and State Agencies. LM 1.3
8	Develop and implement land-use and management support programs (e.g. planning decision support tools, EMS, best practice guidelines, workshops, education and training, demonstrations) addressing acidification, erosion, acid sulfate soils, and land restoration. LM 2.5
9	Review Environmental Protection Policies, Statements of Planning Policy and Regional Planning Schemes and build land salinity risk assessments in planning approval process. LM 1.2
10	Review Environmental Protection Policies, Statements of Planning Policy and Regional Planning Schemes; include ASS risk assessments in planning process. LM 2.3
11	Facilitate salinity risk mapping, and interpretation into management strategies. LM1.1
12	Audit land use compatibility through an assessment of capability and suitability. LM 2.7
13	Mapping and prioritisation of prime agricultural land LM 2.4.
14	Develop models predicting land use change scenarios and impacts. LM 2.7
15	Risk mapping of agricultural land affected by wind and water erosion, waterlogging. Monitoring systems. Identify information needs / gaps in land resource information LM 2.1
16	Implement ONE large scale land salinity remedial actions in priority areas. LM 1.3

3.2 Terrestrial Biodiversity

Table 3: Management Actions addressing Biodiversity : priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Determine of percentage elimination, reduction, containment targets for priority feral/pests and diseases
2	Develop dieback surveying/mapping schedule
3	Expand Skills for Nature Conservation, Urban Nature, Land for Wildlife, Greater Gardens, Grow Us A Home include biodiversity restoration and management training through tertiary institutions and TAFE's
4	Establish collaborative partnerships to ensure the conservation management and recovery planning of threatened species and threatened ecological communities, and to identify research needs.
5	Promote the Local Government Biodiversity Planning Guidelines for Natural area Protection and Management, Local Plants Landscaping Policy and Landscaping with local plants guidelines; support the preparation of local biodiversity strategies and action plans.
6	Provision of training in feral, pest animal and disease identification, mapping and management
7	Develop threat abatement plans and management responses for feral animals and pests linked to National Threat Abatement Strategies
8	Develop recovery plans/interim recovery management and buffering plans
9	Develop and implement local biodiversity action plans
10	Promote wider regional community, land manager and Local Government education and awareness and training programs on feral animal, pest and disease management
11	Regional implementation of State Weed Plan and Environmental Weed Strategy for Western Australia.
12	Review land planning process and design codes for new urban areas. Develop recommendations for local and regional structure planning processes. Identify cleared land suitable for development. Develop mechanisms to preferentially locate new developments on previously cleared land
13	Develop guidelines for rural landscapers
14	Identify significant species populations for monitoring, protection and habitat management
15	Identify priority weed species and determine percentage elimination, reduction and containment targets for priority weed population
16	Review and prioritise existing conservation management actions for natural areas, significant species populations, and threatened ecological communities
17	Review of CAR system. Identify priority areas for addition, and off-reserve areas for protection
18	Review of CAR system. Identify priority areas for addition, and off-reserve areas for protection.

3.3 Swan-Canning Estuary and Coastal Plain Streams: Aquatic Ecology

Table 4: Management Actions addressing Aquatic Ecosystems of the Swan-Canning System: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1

Rank	Management Action
1	Strategic partnerships with UDIA and the Stormwater Industry Association (SIA)
2	Community-training programs: TAFE, Universities, SCCP Education program, Ribbons of Blue, Waterwise, Skills for Nature Conservation, Urban Nature and Land for Wildlife. Include stormwater education, water use efficiency and water conservation.
3	Implement prioritized actions from Swan River Trust Foreshore Condition project
4	Support restoration plans to protect major rivers
5	Continue Riverplan; the Swan-Canning Cleanup Program; plus new sub regional and local action plans. WM 1.2
6	Continue large scale implementation of Riverbank and Swan Alcoa Landcare Program foreshore projects
7	Continue Canning River Environmental Water Provision project
8	Integrated regional information system to enhance planning, implementation, monitoring and evaluation of inland aquatic ecosystems
9	Develop MoU between the Swan Catchment Council and Swan River Trust to implement Riverplan.
10	Continue Foreshore Condition project: water quantity & quality baseline data, targets, investigate marine pests & response mechanisms, research water and dependency of ecosystems, prioritise stream condition; “catchment” report card monitoring program. WM 1.1
11	Dept Fisheries 12 month study of fish kills in the Swan River
12	Implement incentive schemes and revolving fund for protection and conservation of major tributaries.
13	New EWP projects for Helena River & Brockman River
14	Undertake a strategic review of Planning Policies WM 1.2
15	Benchmark community capacity to protect major tributaries

3.4 Swan-Canning Estuary and Coastal Plain Streams: Nutrients

Table 5: Management Actions addressing Nutrients in the Swan-Canning System: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Councils to adopt the Local Government NRM Policy Manual.
2	Continue and expand existing community-training programs such as Swan-Canning Cleanup Program education initiatives, Ribbons of Blue, Wetland Watch and Skills for Nature Conservation, through the integrated regional education and training program. Support wetland restoration and management training through tertiary institutions and TAFE's.
3	Industry awareness and accreditation programs for small to medium sized industries (SME's).
4	Review existing training programs for SME's. Include stormwater education, water use efficiency and water conservation into the regional training and education program.
5	Incorporate Water Sensitive Design (WSD) and Total Water Cycle Management principles in new developments, retrofits and drainage network
6	Include stormwater education, water use efficiency and water conservation into the regional training and education program.
7	Implement WaterWise program across all water users including schools, Local Government and industry.
8	Develop and implement nutrient intervention program, with financial assistance package, incentives and strategic partnerships to assist resourcing and implementation.
9	New regulations for urban drainage
10	Water quality monitoring and analysis to support ICM/NRM management plans to address the eutrophication of waterways Algal bloom and fish death assessments. Advice to the community and regional groups
11	Facilitate SCCP priority actions related to water quality resource assessment, research and monitoring and evaluation
12	Historical land use surveys to identify sources of nutrients and contaminants.
13	Review regulations for point source contamination.

3.5 Swan-Canning Estuary and Coastal Plain Streams: Sediments and Turbidity

Table 6: Management Actions addressing Sediments and Turbidity in the Swan-Canning System: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Integrate water quality monitoring programs.
2	Support waterways and wetland restoration and management training through tertiary institutions and TAFE's.
3	Continue and expand existing community-training programs such as River Restoration training, Skills for Nature Conservation, Urban Nature and Land for Wildlife through the integrated regional education and training program
4	Fence off defined waterways
5	Support development, resourcing and implementation of restoration plans to conserve and protect waterways and wetlands
6	Program support for foreshore and riparian restoration on waterways
7	Support sediment sourcing study to identify and assess active erosion areas and their impact on the Swan-Canning River system.
8	Include biological indicators and an index of river condition in the development of monitoring systems.
9	Best management practice for minimising waterways and land erosion
10	Review regulations for minimizing erosion from urban and rural landuses.
11	Establish baseline and trends and set targets for turbidity/ suspended particulate matter.
12	Decision-making tools for land use planners to identify and address turbidity/particulate matter impacts.
13	Develop a benchmark for wider regional community capacity to address impacts of turbidity/particulate matter
14	Develop an integrated regional information system to enhance planning, implementation, monitoring and evaluation.

3.6 Freshwater Lakes & Wetlands

Table 7: Management Actions addressing Freshwater Lakes and Wetlands: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Form strategic partnerships with UDIA and the Stormwater Industry Association (SIA)
2	Include stormwater education, water use efficiency and water conservation training program. Expand Wetland Watch, Skills for Nature Conservation, Urban Nature and Land for Wildlife. Assist the WaterWise program across all water users. Support wetland restoration and management training through tertiary institutions and TAFE's.
3	Further development and implementation of Wetland Watch program.
4	Develop & implement restoration plans to conserve and protect wetlands
5	Implement a framework for incentives schemes and revolving fund for protection and conservation of priority wetlands by 2005
6	Develop a benchmark for regional community capacity to protect priority wetlands
7	Consolidate baseline data and analyse priority wetland condition. Classify and evaluate resource condition.
8	Develop an integrated regional information system to enhance planning, implementation, monitoring and evaluation.

3.7 Groundwater

Table 8: Management Actions addressing Groundwater: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Determine priority groundwater-dependent ecosystems. Research into acid sulfate soil risk potential and groundwater contamination plumes. Develop groundwater-modelling programs for priority areas.
2	Review Environmental Protection Policy (Swan Coastal Plain Wetlands). Incorporate sustainable limits and allocations in Water Source Protection Plans and Landuse and Water Management Strategies. Prepare new Groundwater Management Plans
3	Monitor commercial bores and make sustainable allocations.

3.8 Darling Range Streams

Table 9: Management Actions addressing Darling Range Streams: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Strategic large-scale revegetation programs in the Brockman River, Wooroloo Brook and Helena River catchments (see "Land" Sheet).
2	Expand River Restoration training, Ribbons of Blue, Wetland Watch, Skills for Nature Conservation, Urban Nature, Land for Wildlife
3	Adoption by Local Government Authorities of the Local Government NRM Policy Manual.
4	Develop a benchmark for wider regional community capacity to address surface water salinity
5	Support land management, waterways and wetland restoration and management training through tertiary institutions and TAFE's.
6	Evaluate and coordinate available data and establish adequate monitoring systems, including extent of rising water tables, salinisation of currently freshwater bodies, area affected by secondary salinity and the risk of further salinity. Identify, map and develop management plans for all salinity risk areas.
7	Support development, resourcing and implementation of restoration plans to address surface water salinity
8	Strategic large scale surface water management programs in priority areas
9	Review regulations for addressing surface water salinity in the Avon Upper Swan region.
10	Decision-making tools for land use planners to identify and address surface water salinity impacts.
11	Develop an integrated regional information system to enhance planning, implementation, monitoring and evaluation of salinity initiatives.

3.9 Coastal and Marine

Table 10: Management Actions addressing Coastal and Marine Environments: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Promote the Coastal SPP widely to Councils to ensure consideration is given to sea level rise when establishing appropriate setbacks for new developments. MoU with Local Government on stormwater action plans. Implement WESROC's stormwater management plan
2	Support national and international effort into sea level rise modeling and research
3	Consolidate existing information on marine commercial and recreational fishing in the region to better understand the effects on target species, including recreational fishing effort, boat and on-shore line catch, and effects on fish biodiversity.
4	Training and capacity building for Local Government and Coastcare groups on coastal biodiversity/ecology. Continue to support strategic local level rehabilitation and revegetation works.
5	Implement 1-5 year groundwater quality targets outlined in the Cockburn Sound Management Plan
6	All future proposals of land based aquaculture to LGAs to undergo land capability assessment, (ongoing); Land/sea areas zoned for aquaculture use
7	Update the Contaminated Inputs Inventory annually;
8	Development of integrated marine wildlife management and monitoring program.
9	Support the extension of Shoalwater Islands Marine Park.
10	Develop benchmark for regional community capacity to protect marine habitats
11	Support Marine Community Monitoring Program. Develop an ecological monitoring program: ecological reference sites, habitat types and spatial extent, mapping, threat analysis, observation targets for each habitat type
12	Implement and expand the recommended State Marine Parks and Reserves Authority (MPRA) marine reserve system
13	Develop regional information system to enhance planning, management, monitoring and evaluation.
14	Respond to suspected incursions in accordance with the National and State framework for management response to marine pests
15	New monitoring systems for stormwater impacts on nearshore marine habitat
16	Develop training programs in marine habitat management, operational policy, and restoration for Local Government Authorities
17	Include marine fauna restoration and management training through tertiary institutions and TAFE's.
18	Develop and implement Regional Coastal Strategic Plan
19	Estimate current and predicted human usage of estuarine and marine resources, focusing on Rottnest Island, Shoalwater Islands Marine Park and other metropolitan marine parks
20	Partnerships with Agencies and Local Government for implementation of the Beach Watch program
21	Identify 100% regionally representative marine habitat types using CAR approach. Determine priority areas for management/protection; management programs for priority areas
22	Develop five-year protection and restoration target for wind erosion by 2005 (all coastal areas). Develop strategies to meet targets to reduce the coastal dune areas affected by coastal wind erosion.
23	Identify 100% marine habitat areas 'at risk' from introduced marine pests; Identify at-risk areas, and support the preparation of the State framework for management response to marine pests

Rank	Management Action
24	Develop scientific methodology to identify key indicator species; wildlife mapping; Develop project for use as decision-making support tool
25	100% of priority natural coastal areas identified and assessed by 2005·including monitoring systems, biodiversity buffer zones threatened by sea level rise Estimate current and predicted human usage of coastal resources
26	Develop an integrated regional information system to enhance planning, implementation, monitoring and evaluation.
27	Water quality monitoring and evaluation action plan consistent with the Perth Coastal Waters (2000); define natural variability of marine quality; further develop R&D; identify future reference sites

3.10 Air

Not ranked

3.11 Cultural Heritage

Table 11: Management Actions addressing Cultural Heritage: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Develop and implement cultural heritage training programs for the range of stakeholders.
2	Establish partnerships with The National Trust and the Heritage Council of WA for mutually beneficial outcomes for NRM and heritage protection.
3	Research, record, and publish Nyoongar history of the Swan region by 2009.
4	Identify sites of cultural and historical significance in each local area and support the development of management plans for significant sites
5	Work with Local Government and heritage bodies to encourage more proactive management of sites
6	Review opportunities in policy and legislation to include Indigenous cultural heritage by 2009, including management by DIA (Aboriginal Land Trust estate), management plans and arrangements, inclusion of clauses in NRM related policies and legislation at all jurisdictional levels.
7	Funding for training facilitators.
8	Develop or identify existing MOU's with State and local government and SCC/ATSIC/SWLSC/ILC.
9	Facilitate the preparation of management plans (including human impact) for recreational and tourism areas that have high ecological value

3.12 Regional Capacity Building

Table 12: Management Actions addressing Regional Capacity: priority ranking for budget retention with constrained total funding (least percentage cut ranked 1).

Rank	Management Action
1	Develop a sub-regional community support structure with security of tenure by 2005.
2	Provision of training fund to enable volunteer development in local communities
3	NRMO's to rejuvenate local groups or support new groups to form where there is a defined role for group.
4	Council costs for implementing the Strategy, including communications and engagement strategies; an integrated regional education and training program; develop sponsorship and partnership strategy for major corporate bodies;
5	Developed working relationship with Aboriginal reference groups and local Aboriginal organisations.
6	Align NRM plans with local area land use plans and design sacrificial zones for region for recreation and development, and earmark areas for conservation and preservation.
7	Integrated incentive schemes for private investment; local government planning systems; cost recovery schemes, market based incentive programs and regional trading of "costs and benefits" in NRM.
8	Develop appropriate targets, indicators and a monitoring and evaluation framework for regional community's capacity in consultation with the State Monitoring and Evaluation Working Group and the Australian Government.
9	Developed NRM entrepreneurship program which focuses on innovation thinking "out of the box"
10	Develop a map of all key players and define roles and responsibilities and investment partners for strategy implementation (include special interest groups), partnerships with players outside the region (inter-region partnerships and network with opportunities wherever they lie).
11	Develop an integrated regional information system to enhance planning, implementation, monitoring and evaluation. Review local level environmental plans for spatial compatibility and establish linkages to the Strategy by 2008.
12	Audit of all relevant legislation impacting strategy implementation.
13	Viability rural population maintained or increased by facilitating incentives/subsidies to encourage local business / industry development

4. The preferred Investment Plan

4.1 Description of choice sets

The Choice Sets presented to participants may be summarised as follows:

Scenario 1 (Water fixed):

- Option A: maximises the financial allocation to Land at the expense of Coasts and Marine, Cultural Heritage and Regional Capacity Building
- Option B: Emphasises Cultural Heritage and Regional Capacity Building relative to Land and Terrestrial Biodiversity
- Option C: Accepts a reduction in allocation to Land in order to strengthen Terrestrial Biodiversity, Coasts and Marine, Cultural Heritage and Regional Capacity Building

Scenario 2 (Water fixed):

- Option A: Is very similar to Scenario 1, Option C, but with a smaller reduction in the allocation to Land.
- Option B: Is equal to or inferior to Option 2A on all counts
- Option C: Contrasts with Option 2A, and strongly emphasises allocation to Land.

Scenario 3 (Land and Terrestrial Biodiversity fixed):

- Option A: Maximises actions dealing with the water asset rather than with Coasts and Marine or Regional Capacity Building
- Option B: gives a “fair go” to most assets, and gives mainly “Medium” allocations to all asset categories
- Option C: participants choosing this option were willing to give up some Water actions in order to maximise Coasts and Marine, Cultural Heritage and Regional Capacity Building

Scenario 4 (Land and Biodiversity fixed)::

- Option A: This provides strong programs for Water and Coasts and Marine at the expense of Cultural Heritage and Regional Capacity Building
- Option B: In contrast with Option 4A, allocation to Water is trimmed in order to strengthen Cultural Heritage and Regional Capacity Building
- Option C: Maximises allocation to Water without losing emphasis on Cultural Heritage.

4.2 Results for each scenario

Table 13: Percent of participants selecting Options A, B, or C in each of four choice sets: participants on Day 1

Scenario	OPTION A	OPTION B	OPTION C	Total
1	14	57	29	100
2	78	18	4	100
3	36	32	32	100
4	50	36	14	100

Total participants = 28

Table 14: Percent of participants selecting Options A, B, or C in each of four choice sets: participants on Day 2

Scenario	OPTION A	OPTION B	OPTION C	
1	0	50	50	100
2	90	10	0	100
3	58	27	15	100
4	62	12	27	100

Total participants = 26

Table 15: Percent of participants selecting Options A, B, or C in each of four choice sets: participants on Day 3

Scenario	OPTION A	OPTION B	OPTION C	
1	0	50	50	100
2	86	14	0	100
3	50	29	21	100
4	64	14	21	100

Total participants = 14

Table 16: Percent of participants selecting Options A, B, or C in each of four choice sets: all participants

Scenario	OPTION A	OPTION B	OPTION C	
1	6	53	41	100
2	84	15	1	100
3	47	29	24	100
4	57	22	21	100

4.3 Overall preference

On days 2 and 3, as a final task, participants were asked to nominate which of the twelve Options contained in the four Scenarios was "closest" to their ideal investment plan. Results are shown in Table 17 to Table 19. It is seen from Table 19 that Scenario 2 Option A was the preferred overall investment strategy for 48% of participants. This Option contains a "Medium", but still considerable allocation of investment to Water and Land, while also giving strong support to Biodiversity, Coasts and Marine, Cultural Heritage and Regional Capacity. The nearest "rival" to Scenario 2 Option A was Scenario 1 Option B. This emphasises Coasts and Marine slightly less than does Scenario 2 Option A, but is in other respects similar. It is notable that the pattern of selections was very similar across the three workshop days, as can be seen by comparing Table 17, and Table 18.

It may be concluded that participants generally rejected Options that would significantly reduce investment in Coasts and Marine, Cultural Heritage and Regional Capacity Building. An investment plan that promotes the mix of management options suggested by Scenario 2 Option A is likely to gain approval from a wide range of stakeholders.

Table 17: Percentage of participants nominating an Option as "Best Overall": Day 2 participants

Scenario	OPTION A	OPTION B	OPTION C
1	0%	19%	15%
2	46%	0%	0%
3	8%	0$	4%
4	8%	0%	0%

Total participants = 26

Table 18: Percentage of participants nominating an Option as "Best Overall": Day 3 participants

Scenario	OPTION A	OPTION B	OPTION C
1	0%	7%	0%
2	50%	0%	0%
3	7%	14%	7%
4	14%	0%	0%

Total participants = 14

Table 19: Percentage of participants nominating an Option as "Best Overall": Day 2 and Day 3 participants combined

Scenario	OPTION A	OPTION B	OPTION C
1	0%	15%	10%
2	48%	0%	0%
3	8%	5%	5%
4	10%	0%	0%

Total participants = 40

4.4 Marginal utilities of additional dollars spent

Results of the choice exercise can be used to indicate the relative preferences of participants with respect to marginal changes in financial allocations to alternative asset classes. This is done through a model that "explains" the expected proportion of participants who choose a particular Option in terms of the amount of money allocated across asset categories. Formally,

$$P = f(L, W, B, C\&M, CH, RCB),$$

Where

P is the percentage of participants selecting an Option, and

L, W, B, C&M, CH and RCB are the respective dollar allocations to Land, Water, Biodiversity, Coasts and Marine, Cultural Heritage, and Regional Capacity Building involved in each of the twelve Options.

Ordinary Least Squares Multiple Regression is used to estimate coefficients on L, W, B, C&M, CH and RCB.

This model was estimated using the data for each of the three workshop days individually, and for the aggregated results over all three days.

The results are shown in Table 20. The meaning of the results is that a $1million *increase* in the allocation to any asset category would change the percentage of participants selecting the Option containing that increase by the following amounts:

+ 0.7%	for Land
- 4.1%	for Water
+45.8%	for Biodiversity
- 2.5%	for Coasts & Marine
-18.9%	for Cultural Heritage
- 2.6%	for Regional Capacity Building

This is a striking result. It shows that, for the group of participants present at the workshops, any increase in $ allocation to Biodiversity would produce a large change in the proportion selecting that Option. Conversely, increased allocation to one or more of Water, Coast & Marine, Cultural Heritage or Regional Capacity Building would slightly reduce the proportion selecting that Option. It is also notable that the Options containing increased allocations to Cultural Heritage were associated with reduced percentage support, because these increases were generally associated with reduced allocations to Biodiversity.

The value of r^2 indicates that the model does not provide a particularly good fit, which is understandable with only 12 observations, and the standard error of the estimated percentage of participants choosing any Option are fairly wide. Nevertheless, it can be seen that the results obtained were very consistent over the three days, even though the composition of participants varied.

Table 20: Choice model regression results

	Day 1	Day 2	Day3	All Days
r^2 (Intercept constrained to 0,0)	0.46	0.43	0.48	0.44
Coefficients on:				
Land	1.97	-0.17	-0.37	0.67
Water	-4.63	-3.62	-3.72	-4.06
Biodiversity	43.73	47.61	46.75	45.83
Coasts & Marine	-2.73	-2.43	-1.92	-2.45
Cultural Heritage	-19.62	-17.50	-20.18	-18.92
Regional Capacity Building	0.04	-5.04	-3.16	-2.56