



Swan Region Strategy for Natural Resource Management

INVESTMENT PLAN TECHNICAL REPORT No 2

Assessment of the Relative Triple Bottom Line Returns from Investment Across Assets and Threats

March 2005

CONTENTS

1. Background	5
2. Methodology	5
2.1 Developing the Investment Framework	5
2.2 Workshop design	5
2.3 Workshop format	6
3. Perceived returns to investment in natural resource management	6
3.1 Overall returns	6
3.2 Urban land	7
3.3 Agricultural Land	10
3.4 Forests and woodlands	10
3.5 Biodiversity	12
3.6 Swan-Canning Estuary and Coastal Plain streams	13
3.7 Freshwater lakes	16
3.8 Groundwater	17
3.9 Darling Range streams	19
3.10 Coastal and Marine	19
3.11 Air	21
3.12 Cultural Heritage	22
4. Regional Capacity to address NRM issues	23
4.1 Approach	23
4.2 Regional capacity as a target for investment	23
4.3 Participants' views on factors influencing regional capacity	24
5. Investment strategy	26
5.1 Analysis of workshop results	26
6. Next steps	30

TABLES

Table 1: Returns to NRM investment, by asset category: Workshop “A” responses (%).....	7
Table 2: Key areas of NRM investment for averting threats to urban land values.....	8
Table 3: Comments on threats to agricultural land values in the Swan Region	9
Table 4: Key areas of NRM investment for averting threats to agricultural land values	10
Table 5: Key areas of NRM investment for averting threats to forest and woodland values	11
Table 6: Comments on threats to forest and woodlands in the Swan Region.....	11
Table 7: Key areas of NRM investment for maintaining or enhancing biodiversity values.....	12
Table 8: Comments on threats to biodiversity in the Swan Region.....	13
Table 9: Key areas of NRM investment for maintaining or enhancing the values of the Swan- Canning Estuary and Coastal Plain Streams	14
Table 10: Comments on threats to the Swan-Canning estuary and coastal plain streams	15
Table 11: Key areas of NRM investment for maintaining or enhancing the values of freshwater lakes	16
Table 12: Comments on threats to freshwater lakes/wetlands.....	17
Table 13: Key areas of NRM investment for maintaining or enhancing the values of groundwater	18
Table 14: Comments on threats to groundwater	18
Table 15: Key areas of NRM investment for maintaining or enhancing the values of Darling Range Streams.....	19
Table 16: Key areas of NRM investment for maintaining or enhancing coastal and marine values.	20
Table 17: Comments on threats to coastal and marine assets.....	20
Table 18: : Key areas of NRM investment for maintaining or enhancing air quality.....	21
Table 19: Comment on air quality	21
Table 20: Key areas of NRM investment for maintaining or enhancing indigenous heritage values	22
Table 21: Comments on threats to heritage values	22
Table 22: Key areas of NRM investment for maintaining or enhancing regional capacity for natural resource management.....	23
Table 23: Comments on building regional capacity	24
Table 24: Rating of regional capacity against different factors	25
Table 25: Participants’ rating of regional capacity against particular threats.....	25
Table 26: Participants’ scores of return to investment by asset class and type of threat.....	27
Table 27: The top 48 threats to asset values, and regional capacity for dealing with the threat.....	29

Assessment of the Relative Triple Bottom Line Returns from Investment Across Assets and Threats

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 program 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

This report deals with the first session.

2.3 Workshop format

Three separate workshops were held to discuss and score the level of threat to asset values and the capacity of the region to address the threat. Each followed the same format, and was attended by twenty to thirty participants.

Careful attention was given to the way in which the discussion would be planned.

The workshop began with introductory statements by the Swan Catchment Council representative, Resource Economics Unit, and the Facilitator.

The first task for participants was to re-cap on the contents of the Swan Region Strategy for Natural Resource Management. Participants discussed and described 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).

For the second task participants discussed factors affecting the region's capacity to address NRM issues. They separately considered (i) current technical know-how, knowledge, capacity to innovate (ii) human resources (iii) degree of stakeholder involvement, (iv) funding levels, (v) the time factor, (vi) organisation and coordination, and (vii) the adequacy of governance, legal and institutional arrangements, and capacity to change policies. This would help to build up to an overall estimate of capacity to address problems within each Asset and Threat Category.

Participants were next presented with a large wall-mounted matrix of assets and threats, measuring approximately 3.5m x 1.5m, and asked to allocate 25 dots to the cells where, in their individual opinion, the greatest return to NRM investment could be achieved. A maximum of three dots per cell was allowed, to reflect especially high returns to investment. Participants were also asked to select three cells and write down their reasons for scoring return to investment and capacity the way they had. This was done in order to provide qualitative as well as quantitative outcomes from the workshop.

Finally a selection of resulting "plots" of return x capacity obtained from the previous exercise, were presented and discussed, by placing labelled cards on a large space indicating four quadrants (HH, HL, LL, LH).

Appendix A gives the results of the Workshop Evaluation forms returned by participants.

3. Perceived returns to investment in natural resource management

3.1 Overall returns

Participants were asked to "indicate with a dot (max 3 dots/cell) where you think the highest returns to natural resource management investment lie within the region". Their overall response, totalled across the three sessions for Workshop A, is given in Table 1.

Table 1: Returns to NRM investment, by asset category: Workshop “A” responses (%).

	Asset Category	%
1	Urban Land Uses	6.4
2	Agricultural Land Uses	4.6
3	Forest & Woodlands	7.3
4	Terrestrial Biodiversity	20.3
5	Swan-Canning Estuary and Coastal Plain Streams	12.7
6	Freshwater Lakes	11.0
7	Groundwater	7.8
8	Darling Range Streams	3.0
9	Coast & Marine	9.7
10	Air	2.1
11	Indigenous Heritage	6.0
12	Other Heritage	0.3
13	Regional Capacity	8.3
14	Other	0.5
	TOTAL	100.0

Terrestrial Biodiversity scored the highest with 20.3% of the rating for total returns to investment. This was followed by *Swan-Canning Estuary and Coastal Plain Streams* (12.7%) and *Freshwater Lakes* (11%), while *Groundwater* accounted for a further 7.8%. Coast and Marine accounted for 9.7% of the total. The three land use categories scored a combined total of 18.3%, across *Urban Land* (6.4%), *Agricultural Land* (4.6%) and *Forests and Woodland* (7.3%), while *Indigenous Heritage* constituted 6.0% of the total return. Investment in building *Regional Capacity* for natural resources management was seen as having a high return (8.3%). The only categories with notably low ratings were *Air* and *Other Heritage*.

It may be concluded that workshop participants see positive returns to investment across a wide range of natural resource management issues in the region, and notably in biodiversity preservation, surface water resources and estuaries of the Swan Coastal Plain and the marine and coastal environment. This result is entirely to be expected. However, it does show that participants as a whole were not inclined to emphasise any one category to the exclusion of others.

The following sections give comments on each of the individual asset classes.

3.2 Urban land

The greatest returns to NRM investment affecting the urban areas were seen in restoring and protecting biodiversity assets. Averting biodiversity decline, ecosystem fragmentation, habitat loss and the loss of key areas of native vegetation accounted for 44.2% of perceived returns to NRM investment.

Water or air-borne pollutants are another key area for investment totalling 18.8%. These items include Urban or Industrial Discharges (7.3%), Drainage modification (4.2%) Nutrient export & enrichment (4.2%), Chemical contamination (3.1%) and Erosion and sedimentation (2.1%)

Table 2: Key areas of NRM investment for averting threats to urban land values

	Investment Target	%
1	Biodiversity decline	14.6
2	Native vegetation clearing or loss	14.6
3	Ecosystem fragmentation	9.4
4	Urban or Industrial Discharges	7.3
5	Infrastructure development	7.3
6	Political will (lack of)	7.3
7	Habitat loss	5.2
8	Climate Change	4.2
9	Nutrient export & enrichment	4.2
10	Drainage modification	4.2
11	Chemical Contamination	3.1
12	Ignorance, negligence, intolerance	3.1
13	Non-acceptance of NRM principles	3.1
14	Erosion & sedimentation	2.1
15	Inadequate coordination of government & community activity	2.1
16	Inadequate involvement of community or industry	2.1
17	Acidification	1.0
18	Diseases -plants	1.0
19	Exotic Plants	1.0
20	Process disruption	1.0
21	Abstraction of water	1.0
22	Fossil fuels consumption	1.0
	Total	100.0

Table 3: Comments on threats to agricultural land values in the Swan Region

Threat Category	Comment on Threat	Comment on Capacity
Abstraction of water	Need sustainable water allocation and management for agricultural land use.	Need to invest in knowledge gaps in water availability for sustainable uses, and allocation to the environment, eg. Prepare comprehensive water management plans for groundwater and surface water systems and develop EWR's and EWP's.
Erosion and sedimentation	These have wide ranging impacts and they are dependent on each other.	
Exotic plants	Exotic plants affect the value attached to agricultural land use. Weed species are a threat to farmers and costly to control.	
Infrastructure development	Need to protect priority agricultural land for long term agricultural uses and production	
Nutrient enrichment	Nutrient enrichment of land and groundwater due to agricultural land use (particularly Ellen Brockman) requires significantly more investment in: improved land management practices; replacing land uses with less polluting activities (eg. Tree farms, carbon sinks).	
Nutrient export and enrichment	Rated 3, specifically with regard to areas such as the Ellen Brook where phosphorus input is highest in the upper reaches of the Brook where agricultural land uses dominate. The Ellen Brook contributes the majority of phosphors into the Swan River.	
Political will (lack of)	All answers to questions (knowledge of repair) are available – political will to do anything about it is lacking.	
Salinity	Asset loss of production; in the Upper Swan Avon investment against salinity has multiple benefits	Capacity to effect change arises from community. Government processes (tied as they must) to strict guidelines are never able to move swiftly enough to prevent and effect environmental change. So therefore, capacity building must focus on the community level.
Salinity	Use of shallow rooted crops, excessive clearing for agricultural uses interferes with water table. Construction of dams for agriculture – express of ground water which may be saline leads to seepage of salt into landscapes	Difference between technical know-how, innovation and knowledge (within the general community) probably needs highlighting.

3.3 Agricultural Land

Participants identified a wide range of NRM investments for addressing threats to agricultural land values, notably salinity (20.6%), exotic plants (8.8%), erosion and sedimentation (2.9%), exotic animals (2.9%), and plant and animal diseases (3.0%). It appears that some participants may have been as much concerned about off-site effects as on-site effects with agricultural management practices (13.2%), nutrient export and enrichment (10.3%) and native vegetation clearing or loss (1.5%) all being mentioned.

Table 4: Key areas of NRM investment for averting threats to agricultural land values

	Investment Target	%
1	Salinity	20.6
2	Agricultural Management Practices	13.2
3	Nutrient export & enrichment	10.3
4	Exotic Plants	8.8
5	Habitat loss	7.4
6	Political will (lack of)	7.4
7	Non-acceptance of NRM principles	4.4
8	Erosion & sedimentation	2.9
9	Exotic (feral) animals	2.9
10	Abstraction of water	2.9
11	Urban or Industrial Discharges	2.9
12	Drainage modification	2.9
13	Acidification	1.5
14	Biodiversity decline	1.5
15	Chemical Contamination	1.5
16	Diseases -plants	1.5
17	Diseases -animals	1.5
18	Ecosystem fragmentation	1.5
19	Native vegetation clearing or loss	1.5
20	Ignorance, negligence, intolerance	1.5
21	Inadequate coordination of government & community activity	1.5
	Total	100.0

3.4 Forests and woodlands

Participants produced a considerable list of areas for NRM investment to maintain or enhance the values of forest, woodlands and heath lands in the region. These cluster around native vegetation clearing or loss (17.4%), and biodiversity decline (14.7%), and include exotic plants (9.2%); ecosystem fragmentation (8.3%); habitat loss (8.3%); plant diseases including dieback (5.5%); fire management regime (2.8%); and recreational access (2.8%).

Table 5: Key areas of NRM investment for averting threats to forest and woodland values

	Investment Target	%
1	Native vegetation clearing or loss	17.4
2	Biodiversity decline	14.7
3	Exotic Plants	9.2
4	Ecosystem fragmentation	8.3
5	Habitat loss	8.3
6	Political will (lack of)	7.3
7	Diseases -plants	5.5
8	Ignorance, negligence, intolerance	4.6
9	Infrastructure development	3.7
10	Inadequate involvement of community or industry	3.7
11	Process disruption	2.8
12	Fire management regime	2.8
13	Recreation & access	2.8
14	Inadequate coordination of government & community activity	2.8
15	Erosion & sedimentation	1.8
16	Chemical Contamination	0.9
17	Diseases -animals	0.9
18	Exotic (feral) animals	0.9
19	Abstraction of water	0.9
20	Non-acceptance of NRM principles	0.9
	Total	100.0

Clearly, an integrated approach is required for project design in this asset category.

Table 6: Comments on threats to forest and woodlands in the Swan Region

Threat Category	Comment on Threat	Comment on Capacity
Political will (lack of)	Legislation available through Local Government and State Government to prevent clearing – political will not available.	
Ecosystem fragmentation	Not enough corridor links. ‘Pocket Parks’ are not biodiversity sustainable. We need larger areas of conservation areas, not fragmented and isolated ones, especially in urban development.	
Infrastructure development / land use planning and clearing	Any additional forests and woodlands to be protected (not just retained) over and above Bush Forever and Forest Management Plan will be protected through: Local Biodiversity Planning leading to Local Planning Strategy leading to Town Planning Scheme.	Support good Local and State Government issues rather than creating a fourth tier of government.

3.5 Biodiversity

With minor differences, the returns to investment in biodiversity maintenance or rehabilitation replicate those for forests and woodlands.

Table 7: Key areas of NRM investment for maintaining or enhancing biodiversity values

	Investment Target	%
1	Native vegetation clearing or loss	13.2
2	Biodiversity decline	12.6
3	Ecosystem fragmentation	12.3
4	Exotic Plants	8.3
5	Habitat loss	7.6
6	Ignorance, negligence, intolerance	7.0
7	Political will (lack of)	6.0
8	Inadequate coordination of government & community activity	4.3
9	Exotic (feral) animals	4.0
10	Climate Change	3.6
11	Fire management regime	3.3
12	Process disruption	2.6
13	Diseases -plants	2.0
14	Abstraction of water	2.0
15	Infrastructure development	2.0
16	Inadequate involvement of community or industry	2.0
17	Salinity	1.7
18	Non-acceptance of NRM principles	1.3
19	Agricultural Management Practices	1.0
20	Recreation & Access	1.0
21	Erosion & sedimentation	0.7
22	Drainage modification	0.7
23	Chemical Contamination	0.3
24	Hydrological change	0.3
25	Fossil fuels consumption	0.3
	Total	100.0

Table 8: Comments on threats to biodiversity in the Swan Region

Threat Category	Comment on Threat	Comment on Capacity
Biodiversity decline	Biodiversity decline is a major threat to terrestrial above). Clearing, in particular, is the major biodiversity on the SCP.	
Biodiversity decline	For conservation of biodiversity, it is a combination of immediate threats and historical prevention and treatment. Looked at it as an umbrella approach: stop clearing = reduction in habitat loss and fragmentation. Need to look and address bigger processes of biodiversity decline: understanding of population dynamics. Focused on biodiversity as I believe it underpins many processes and other assets.	
Biodiversity decline	Fundamental change is required to status quo development if we are to retain adequate representation of biodiversity. Politically bold action is required to reverse dangerous trends. Its important to take action to keep the common, common!	
Biodiversity decline	High level of endemism in area under maximum pressure. High level of human and financial resources centred in this region. A hallmark arena!	
Climate change	The impacts of climate change over coming decades will be major ones – but won't really know what and how much.	We need to be very clear in doing this, particularly to 'capture hearts and minds', coupled with ongoing education.
Diseases – plants	Loss of biodiversity due to <i>Phytophthora cinnam</i> . (Once it is infested it will always be infested at this state, with current knowledge of treatments and control measures.	
Ecosystem fragmentation	Will impact on sustainable / viable populations of flora, fauna, fungi	Lack of cross government process and responsibility for coastal and marine.
Ecosystem fragmentation	Fragmentation and loss of significant area to sustain species means loss of ecobalance / symbiosis. Domino effect.	Ecosystem fragmentation
Ecosystem fragmentation	Ecosystem fragmentation of terrestrial biodiversity due to urban planning and development, focusing away from territorial biodiversity	
Exotic plants	Exotic plants are a major threat to biodiversity in the Swan Region. Weeds replace native species, alter the structure of ecosystems, increase the risk, etc. etc.	

3.6 Swan-Canning Estuary and Coastal Plain streams

The key targets for investment in the Swan-Canning Estuary and Swan Coastal Plain streams cluster around pollutants, most notably nutrients, and include: nutrient export and enrichment (14.8%); urban and industrial discharges (12.7%); drainage modification (6.3%); and erosion and sedimentation (5.3%). Smaller, but still important, investment targets relate to agricultural land management practices (4.2%); abstraction of water (3.7%); hydrological change (2.6%); and chemical contamination (2.1%).

Table 9: Key areas of NRM investment for maintaining or enhancing the values of the Swan-Canning Estuary and Coastal Plain Streams

Investment Target	%
1 Nutrient export & enrichment	14.8
2 Urban or Industrial Discharges	12.7
3 Inadequate involvement of community or industry	6.9
4 Drainage modification	6.3
5 Erosion & sedimentation	5.3
6 Habitat loss	5.3
7 Ignorance, negligence, intolerance	5.3
8 Political will (lack of)	4.8
9 Agricultural Management Practices	4.2
10 Biodiversity decline	3.7
11 Ecosystem fragmentation	3.7
12 Exotic Plants	3.7
13 Abstraction of water	3.7
14 Hydrological change	2.6
15 Process disruption	2.6
16 Salinity	2.6
17 Recreation & Access	2.6
18 Inadequate coordination of government & community activity	2.6
19 Chemical Contamination	2.1
20 Non-acceptance of NRM principles	1.6
21 Acidification	0.5
22 Climate Change	0.5
23 Diseases -plants	0.5
24 Exotic (feral) animals	0.5
25 Infrastructure development	0.5
Total	100.0

There is also a cluster of biodiversity-related threats including biodiversity decline (8.5%); ecosystem fragmentation (7.9%); native vegetation clearing or loss (6.7%) and exotic plants (4.3%).

Table 10: Comments on threats to the Swan-Canning estuary and coastal plain streams

Threat Category	Comment on Threat	Comment on Capacity
Urban or industrial discharge	Deterioration of water quality impacts on a large range of values.	
Abstraction of water	Rated 3, impacts from excessive abstraction can impact on water flows, increased salinity.	
Agricultural management practices	Despite effort, nutrient loss from rural areas is a key problem on the Swan Coastal Plain. Continued support of NRM groups and provision of property planning support to landowners is needed.	
Drainage modification	This category encompasses many of the human failings to NRM	Planning and Development - Infrastructure
Drainage modification	Capacity is high but uncertainty about performance objectives and Best Management Practices persist.	
Habitat loss	The impacts of industrial uses, recreational access, urban development; wetland habitat and estuary ecosystems are being hammered!	Need to utilise all avenues. Universities have a wide ranging knowledge and ability to provide knowledge. Capacity should endeavour to remain in the region ie. CSIRO may not always remain in Western Australia and continue to build.
Inadequate involvement of community or industry	There is a lack of industry involvement in environmental protection, especially industry discharge and drainage of smaller industries and businesses. Greater demand should come from the community for businesses to be environmentally responsible and / or invest in regional NRM	
Nutrient export and enrichment	Nutrient export and enrichment affects the value attached to Swan Canning Estuary and Coastal Plain Streams, also freshwater lakes. Algal blooms may develop, causing threats to public health, loss of recreational use and fish kills (loss of biodiversity).	Actions to mitigate threats will depend largely on financial resources. All levels of government, including local government and catchment groups must be financially resourced to cover costs.
Nutrient export and enrichment	Still is major issue of the Swan-Canning even though inputs have decreased.	
Urban or industrial discharge	While perhaps not the greatest threat to Swan-Canning, small industry has been the most difficult to engage. Swan-Canning Industry Survey found most industry does not know how it disposes of its wastes. Significant effort (increase) is needed to work directly with industry and Industry Associations to change behaviours as passive approaches have not worked. A framework for dealing with all industries is required.	
Human failings	I ranked human failings high eg., need for increased overall education of wider community. I believe that once we increase widely education and therefore awareness of those issues then the political support and will, will therefore increase across all levels of Government.	
Nutrient export and enrichment	Linked to previous. River being used as a drain – fringing and aquatic vegetation being killed, algal blooms and fish kills.	
Urban and industrial discharge	Pollution discharge, drainage, loss of coastal ecosystems and impacts on groundwater and streamlines. Is there a correlation of rich people to low environmental appreciation and poor people to high environmental interest?	

3.7 Freshwater lakes

The Swan Coastal Plain has a large number of freshwater lakes generally formed by a groundwater table at inter-dunal depressions. The Strategy gives those listed as Ramsar wetlands. Returns to investment are indicated in most of the NRM target areas cited for the Swan-Canning Estuary and Coastal Plain streams

Table 11: Key areas of NRM investment for maintaining or enhancing the values of freshwater lakes

	Investment Target	%
1	Nutrient export & enrichment	11.6
2	Biodiversity decline	8.5
3	Ecosystem fragmentation	7.9
4	Native vegetation clearing or loss	6.7
5	Urban or Industrial Discharges	6.1
6	Infrastructure development	6.1
7	Inadequate involvement of community or industry	6.1
8	Habitat loss	5.5
9	Hydrological change	5.5
10	Ignorance, negligence, intolerance	5.5
11	Drainage modification	4.9
12	Erosion & sedimentation	4.3
13	Exotic Plants	4.3
14	Abstraction of water	4.3
15	Political will (lack of)	3.7
16	Chemical Contamination	2.4
17	Inadequate coordination of government & community activity	1.8
18	Climate Change	1.2
19	Agricultural Management Practices	1.2
20	Exotic (feral) animals	0.6
21	Process disruption	0.6
22	Recreation & Access	0.6
23	Non-acceptance of NRM principles	0.6
	Total	100.0

Table 12: Comments on threats to freshwater lakes/wetlands

Threat Category	Comment on Threat	Comment on Capacity
Ecosystem fragmentation	Urban developments resulting in loss of freshwater ecosystems (linked to previous)	
Hydrological change	Major issue for water quality decline, habitat loss and impacts from acid sulphate soils.	
Native vegetation clearing or loss	I think this category should be called Freshwater Wetlands. This is a broader category; lakes are one type of wetland, many of the Swan Region's important wetlands are not lakes just damplands, palus plains, sumplands, etc. Wetland destruction and loss is one of the key threats to biodiversity in the Swan Region. The rate of wetland loss is still substantial (and catastrophic). Current planning, regulatory and institutional arrangements are demonstrably inadequate (latest estimate from two years ago (from Water and Rivers Commission) was 13% of Conservation Category Wetlands are being destroyed per year). Resource Enhancement and Multiple Use Wetlands are also being lost at a rapid rate.	
Political will (lack of)	The legislation controlling the clearing, filling and loss of wetlands is inadequate and has been for years. It does not deter developers from illegally clearing them for development. Greater political will and legislation is required to protect wetlands.	
Abstraction of water	Significant issue due to extraction of bore water for garden use is resulting in low lake levels and disruption to natural systems.	
Inadequate involvement of community or industry	There needs to be a significant increase in resources directed towards protection of natural water bodies from light industrial contaminants.	
Human activities and ignorance	We have the know-how. We have the legislation but wetlands are continuously lost or degraded unnecessarily through poor planned urban/rural development. So what do we need to do to properly protect and value wetlands: tougher, better resourced legislation (political will); better planning focus; better community education.	

3.8 Groundwater

Areas of investment to maintain our very important groundwater values include targeting the abstraction of water (21.6%); hydrological change (6%); and drainage modification (5.2%) There is also a cluster of initiatives addressing groundwater contamination, including nutrient export & enrichment (10.3%); chemical contamination (9.5%), urban or industrial discharges (8.6%); and agricultural land management practices (3.4%).

Table 13: Key areas of NRM investment for maintaining or enhancing the values of groundwater

	Investment Target	%
1	Abstraction of water	21.6
2	Nutrient export & enrichment	10.3
3	Chemical Contamination	9.5
4	Urban or Industrial Discharges	8.6
5	Climate Change	7.8
6	Hydrological change	6.0
7	Drainage modification	5.2
8	Ignorance, negligence, intolerance	5.2
9	Inadequate involvement of community or industry	5.2
10	Political will (lack of)	4.3
11	Agricultural Management Practices	3.4
12	Inadequate coordination of government & community activity	2.6
13	Biodiversity decline	1.7
14	Infrastructure development	1.7
15	Acidification	0.9
16	Ecosystem fragmentation	0.9
17	Habitat loss	0.9
18	Process disruption	0.9
19	Salinity	0.9
20	Native vegetation clearing or loss	0.9
21	Recreation & Access	0.9
22	Non-acceptance of NRM principles	0.9
	Total	100.0

Table 14: Comments on threats to groundwater

Threat Category	Comment on Threat	Comment on Capacity
Abstraction of water	Abstraction impacts on ecosystem function and human water supply.	Groundwater – lack of knowledge (ie. not using precautionary principle).
Climate change	Diminishing run-off and precipitation – all life is dependent on water. Loss of habitat or change (rapid) – migration of species. Impacts?	Groundwater should be used to water our gardens. It is an unsustainable resource. Start giving water a true monetary value and make us value it as a resource and protect it.
Inadequate coordination of government and community activity	Whilst groundwater abstractions from institutional and rural bores are licensed, little if anything is being done to regulate private bores in the urban sphere.	
Nutrient export and enrichment	This process is one of the major nutrient sources on the coast, particularly in Cockburn Sound.	
Urban or industrial discharge – chemical contamination	More emphasis / resources required to deal with point source of contamination – long term cheaper.	
	Education is ongoing	

3.9 Darling Range streams

In addressing asset values in the streams of the Darling Range relatively greater importance is given to hydrological change (15.9%), drainage modification (13.6%) and abstraction of water (4.5%) than is found in the investment requirements for the surface waters of the coastal plain.

Table 15: Key areas of NRM investment for maintaining or enhancing the values of Darling Range Streams

	Investment Target	%
1	Hydrological change	15.9
2	Drainage modification	13.6
3	Nutrient export & enrichment	11.4
4	Biodiversity decline	9.1
5	Erosion & sedimentation	9.1
6	Ecosystem fragmentation	6.8
7	Exotic Plants	6.8
8	Habitat loss	4.5
9	Abstraction of water	4.5
10	Urban or Industrial Discharges	4.5
11	Native vegetation clearing or loss	4.5
12	Political will (lack of)	4.5
13	Salinity	2.3
14	Non-acceptance of NRM principles	2.3
	Total	100.0

Also, investment for this asset category should significantly target biodiversity values (9.1%), ecosystem fragmentation (6.8%), habitat loss (4.5%) and native vegetation clearing or loss (4.5%). Otherwise, the pattern of investment is similar to that for the surface waters of the coastal plain, including nutrient export and enrichment (11.4%); urban or industrial discharges (4.5%); and salinity (2.3%). Generally, the catchments of Darling Range streams are protected from salinity by clearing controls, but notable exceptions occur through the Avon, Brockman, Ellen Brook and Helena River catchments. One workshop participant chose to comment on this asset.

3.10 Coast and Marine

Symptoms of degradation of the region's coastal and marine environment, which creates a need for new NRM investment, are biodiversity decline (13.1%); exotic marine species (5.5%); ecosystem fragmentation (4.1%); exotic plants (4.1%); and habitat loss (3.4%).

Prominent causes are recreational activities (7.6%), urban or industrial discharges (6.2%); erosion and sedimentation (4.8%); nutrient export and enrichment (4.8%); process disruption (2.1%); infrastructure development (3.4%); and chemical contamination (2.8%).

Investment is needed to change community attitudes to use of the coast and marine environment, particularly with regard to recreational boating (7.6%), and to increase community involvement (9.1%) and awareness (9.0%).

Table 16: Key areas of NRM investment for maintaining or enhancing coastal and marine values

	Investment Target	%
1	Biodiversity decline	13.1
2	Inadequate involvement of community or industry	9.7
3	Ignorance, negligence, intolerance	9.0
4	Recreation & Access	7.6
5	Inadequate coordination of government & community activity	6.9
6	Urban or Industrial Discharges	6.2
7	Exotic (feral) animals	5.5
8	Political will (lack of)	5.5
9	Erosion & sedimentation	4.8
10	Nutrient export & enrichment	4.8
11	Climate Change	4.1
12	Ecosystem fragmentation	4.1
13	Exotic Plants	4.1
14	Habitat loss	3.4
15	Infrastructure development	3.4
16	Chemical Contamination	2.8
17	Non-acceptance of NRM principles	2.8
18	Process disruption	2.1
	Total	100.0

Table 17: Comments on threats to coastal and marine assets

Threat Category	Comment on Threat	Comment on Capacity
Biodiversity decline	The decline of coastline and marine biodiversity due to the lack of existing knowledge of the biodiversity and ecosystem function in this area.	
Climate change	Can we effectively influence it?	
Cockburn Sound / Owen Anchorage	Important point – should sort out boundary ambiguity for Cockburn, Kwinana and Rockingham. Shared catchment ok, but needs to be decided.	
Ignorance; inadequate coordination; inadequate involvement; Non-acceptance; political will (lack of)	Inadequate recognition of long term effect of usage and development on the coastal strip.	
Infrastructure development	Need to protect coastline and marine areas from planning and development (eg. Marinas, ports, development).	
Infrastructure development	There appears to be no consistent approach to infrastructure development along the Perth Metro coast. Planning is currently more reactive than proactive. We have ‘no vision’ for the future of our coast. What do we want in the future?	
Nutrient export and enrichment	Nutrients are a major cause of seagrass death or loss and can create ‘monocultures’ of plants elsewhere.	
Recreation and access	Beach access is an ongoing issue. Recreation (and commercial) fisheries are a constant threat. The fact that we know very little about the total recreational fishing catch is a really big issue, to fisheries management and target species sustainability.	

Threat Category	Comment on Threat	Comment on Capacity
Recreation and access (for recreational fishing)	Zillions of people doing it but we know so little about the real catch amounts – it is currently unmanaged.	
Exotic (feral) animals	Introduction of marine pests is a substantial and important issue which lacks adequate funding, coordination and knowledge.	
Exotic animals	Introduced marine pests are a real threat to marine and estuary biodiversity and fishing industries (commercial and recreational)	The future of Swan is its people and the will to change our impacts on our environment. The first step for this is awareness raising and education. We need to radically improve this and ensure wide spread application.
Recreation and access	With the move towards marine planning on a State level and Commonwealth level, access to and resource allocation will become an issue.	Until the day comes when traditional data is aligned with scientific data, there will never be integrated management options and outcomes sought for multiple benefit outcomes.

3.11 Air

The principle issues for targeting investment relate to the consumption of fossil fuels (34.4%); urban or industrial discharges (9.4%); and chemical contamination (3.1%). Infrastructure development (12.5%), biodiversity loss (3.1%), habitat loss (3.1%), and loss of native vegetation (3.1%) are all seen as being implicated as threats to air quality.

Table 18: : Key areas of NRM investment for maintaining or enhancing air quality

Investment Target	%
1 Fossil fuels consumption	34.4
2 Climate Change	12.5
3 Infrastructure development	12.5
4 Urban or Industrial Discharges	9.4
5 Political will (lack of)	6.3
6 Biodiversity decline	3.1
7 Chemical Contamination	3.1
8 Habitat loss	3.1
9 Native vegetation clearing or loss	3.1
10 Recreation & Access	3.1
11 Ignorance, negligence, intolerance	3.1
12 Inadequate coordination of government & community activity	3.1
13 Non-acceptance of NRM principles	3.1
Total	100.0

Burning of wood, for domestic heating and for forest fire management is seen as the biggest threat to air quality in the region. There was just one participant comment, which sums up the issue.

Table 19: Comment on air quality

Threat Category	Comment on Threat
Fossil fuels consumption	Focus on consumption (reducing it) to improve air quality.

3.12 Cultural Heritage

A quartet of social factors is targeted to help enhance indigenous heritage values. These include information and educational products (23.3%); initiatives to increase community involvement (13.3%); increased political will (13.3%); and improve coordination (10%). Natural features that add to indigenous heritage values include biodiversity (8.9%), habitat loss (7.8%), ecosystem fragmentation (5.6%), and exotic plants (4.4%). These are threatened by native vegetation clearing or loss (2.2%) and water abstraction (2.2%). Human activities that must be managed better for protection of indigenous heritage values include recreational access (3.3%) and fire management regimes (3.3%)

Table 20: Key areas of NRM investment for maintaining or enhancing indigenous heritage values

	Investment Target	%
1	Ignorance, negligence, intolerance	23.3
2	Inadequate involvement of community or industry	13.3
3	Political will (lack of)	13.3
4	Inadequate coordination of government & community activity	10.0
5	Biodiversity decline	8.9
6	Habitat loss	7.8
7	Ecosystem fragmentation	5.6
8	Exotic Plants	4.4
9	Fire management regime	3.3
10	Recreation & Access	3.3
11	Hydrological change	2.2
12	Native vegetation clearing or loss	2.2
13	Process disruption	1.1
14	Non-acceptance of NRM principles	1.1
	Total	100.0

Table 21: Comments on threats to heritage values

Threat Category	Comment on Threat
Infrastructure development	Lead to healthy, cooperative societies that can address other issues coherently and collaboratively.
Ignorance, negligence, intolerance	Educating our broader community is essential to gaining ecological and Indigenous Heritage understanding, therefore, gaining a passion to protect, restore and respect our environment.
Ignorance, negligence, intolerance	Indigenous heritage can provide many insights for future environmental management but also the NRM Strategy has great potential to provide for Indigenous community development by re-establishing connections to heritage and the country.
Political will (lack of)	Need more than talk, therefore, real legislation to respect, understand and value Indigenous spirit, knowledge and ecological understanding.
	Indigenous involvement is lacking in a number of key areas of NRM.
Ignorance, negligence, intolerance	Indigenous knowledge and land management practice can play a larger part of NRM.

4. Regional Capacity to address NRM issues

4.1 Approach

The Workshop sessions included a period for reflection on what determines the region’s capacity to address NRM issues. Participants were invited to consider a list of factors that contribute to “capacity”. The responses are discussed in Section 4.3. First, we report on how participants viewed the lack of capacity as a threat to asset values requiring corrective investment.

4.2 Regional capacity as a target for investment

Investment could help to improve regional capacity to tackle NRM issues, across a range of social factors namely: education (17.9%); increased community and stakeholder involvement (17.1%); improved coordination of government and community (9.8%); increased awareness of NRM principles (8.1%); and increased political will (4.9%). These were seen as being likely to leads to improvements across a wide range of NRM issues.

Table 22: Key areas of NRM investment for maintaining or enhancing regional capacity for natural resource management

Investment Target	%
1 Ignorance, negligence, intolerance	17.9
2 Inadequate involvement of community or industry	17.1
3 Inadequate coordination of government & community activity	9.8
4 Nutrient export & enrichment	8.1
5 Non-acceptance of NRM principles	8.1
6 Biodiversity decline	6.5
7 Urban or Industrial Discharges	5.7
8 Political will (lack of)	4.9
9 Drainage modification	3.3
10 Native vegetation clearing or loss	3.3
11 Chemical Contamination	2.4
12 Habitat loss	2.4
13 Ecosystem fragmentation	1.6
14 Exotic Plants	1.6
15 Agricultural Management Practices	1.6
16 Erosion & sedimentation	0.8
17 Hydrological change	0.8
18 Process disruption	0.8
19 Salinity	0.8
20 Fire management regime	0.8
21 Infrastructure development	0.8
22 Fossil fuels consumption	0.8

Table 23: Comments on building regional capacity

Threat Category	Comment on Threat
Chemical contamination	Education / capacity building; incentives (MBIs); appropriate infrastructure; appropriate planning processes; regulation; partnerships; coordination.
Habitat loss	Not enough Local Government planning and integration with State Planning on this issue. Too much habitat loss equals loss of local providence and biodiversity for flora and fauna.
Human failings	Education of the whole community is severely under-funded.
Ignorance, intolerance	Education is the foremost.
Ignorance, negligence, intolerance	If people do not know that thee are environmental problems or if they don't know that their actions are causing problems, how can be possibly fix any of the major environmental issues in Perth. Education is the key. We need to tackle the key causes rather than try and fix the symptoms. It comes down to informed people, being inspired to change their behaviour for the benefit of all.
Infrastructure development	Education / public relations process for all who are affecting or causing issue, makes community and industry responsible for their actions and consequences.
Nutrient export and enrichment	One of the major environmental issues in Perth. Needs to be highlighted more to the community so that we don't have a 'dead' river system in 10 years. This will then affect the entire Perth community. If people don't know about the issue they can't to anything to fix it. And if they don't know how to fix the problem, then it will only get worse.

4.3 Participants' views on factors influencing regional capacity

Participants were asked to fill out a table showing a list of factors that contribute to regional capacity, against a list of 29 threats, by putting a tick in any cell where they thought that regional capacity was relatively good, and a cross where they thought that regional capacity was inadequate.

A total of 2017 ticks were provided by participants, who worked either individually or in pairs. Table 24 shows the relative scoring of different factors. There was strong agreement that the region possessed (i) the necessary technical know-how, knowledge and capacity to innovate (1.6 times the average rating); and (ii) the capacity to change policies and legislation if needed (1.3 times the average rating).

All other factors were considered to be less than adequate. These included human resources (0.9), financial resources (0.6), time (0.8) and organisation and coordination (0.7).

Table 24: Rating of regional capacity against different factors

	Total Ticks	Average Ticks per Cell across 29 Threats	Ratio to Overall Average
Technical know-how, knowledge, innovation	455	15.7	1.6
Human resources	254	8.8	0.9
Degree of community involvement	243	8.4	0.8
Financial resources	172	5.9	0.6
Time	225	7.8	0.8
Organisation & coordination	197	6.8	0.7
Ability to change policies & legislation	384	13.2	1.3
Other... Knowledge	74	2.6	0.3
Other....Adaptation	8	0.3	0.0
Other.....Political Will	5	0.2	0.0
Total	2017	9.9	1.0

Table 25 shows how participants rated the region's capacity to address particular threats. Capacity was rated as "relatively high" for many of the traditional NRM issues, though it is notable that capacity to deal with some of the most salient threats to asset values in this region, including nutrient export and enrichment, native vegetation clearing, exotic plants and animals, and hydrological change was rated as only "moderate".

Capacity was rated as inadequate against a number of typical "big city" environmental issues such as urban or industrial discharges and air pollution, , process disruption, habitat loss and ecosystem fragmentation. It was also thought that there is inadequate capacity to deal with a number of societal threats to asset values, including inadequate coordination, acceptance of NRM principles and lack of political will.

Table 25: Participants' rating of regional capacity against particular threats.

	Ratio to Mean	Relative Capacity ¹
Region has relatively high capacity to address:		
Recreation & Access	1.37	H
Fire management regime	1.35	H
Infrastructure development	1.29	H
Salinity	1.24	H
Chemical Contamination	1.21	H
Diseases -plants	1.18	H
Acidification	1.14	H
Agricultural Management Practices	1.14	H
Drainage modification	1.14	H
Abstraction of water	1.11	H
Biodiversity decline	1.08	H
Region has moderate capacity to address:		
Erosion & sedimentation	1.04	M
Diseases -animals	1.02	M
Nutrient export & enrichment	1.02	M
Exotic Plants	0.99	M
Native vegetation clearing or loss	0.99	M
Ignorance, negligence, intolerance	0.99	M
Exotic (feral) animals	0.96	M

	Ratio to Mean	Relative Capacity ¹
Hydrological change	0.95	M
Climate Change	0.93	M
Region has relatively low capacity to address:		
Urban or Industrial Discharges	0.89	L
Fossil fuels consumption	0.83	L
Habitat loss	0.81	L
Involvement of community or industry	0.79	L
Coordination of government & community activity	0.76	L
Non-acceptance of NRM principles	0.75	L
Ecosystem fragmentation	0.73	L
Political will (lack of)	0.69	L
Process disruption	0.62	L

Note 1: (i) If the average score against the particular threat across all asset categories is greater than 110% of the average score for all threats across all assets, then capacity against the particular threat is classed as “relatively high”; (ii) if the average for the particular threat is less than 90% lower then capacity against the particular threat is classed as relatively high; (iii) if the average for the particular threat is within +/- 10% of the overall mean, then capacity to address that threat is classed as “moderate”

5. Investment strategy

5.1 Analysis of workshop results

The outcome of the workshop is a classification of asset categories into a simple (but large) 2 x 2 matrix as follows.

	Capacity to Address the Issue	
Threat to Asset Value	HL	HH
	LL	LH

Asset/threat combinations that are classified as HL will have high levels of threat to asset values and low perceived current capacity to address the problem. These would be high-priority areas for additional expenditure under the Strategy. Conversely any asset-threat combination that was classified as LH would be an area where continued investment should be questioned. LL scores indicate that investment should not occur. A HH score would indicate that current efforts should probably continue, but that additional investment should be carefully evaluated.

The total matrix comprises 13 asset groups by 29 threats identified in the Strategy, a total of 385 cells. Participants were given 25 stickers each, and were asked to place their stickers in the cells that represented in their view the greatest returns to NRM investment. They were limited to a maximum of three stickers in any one cell, but were also encouraged to take account of where other participants were placing their stickers, so as to achieve what, in their view, would be the “best” distribution of investment across all options. In all, a total of 1,490 stickers were placed in the matrix combining the three workshop sessions. The results are shown in Table 26.

Table 26: Participants’ scores of return to investment by asset class and type of threat.

POSSIBLE THREATS TO ENVIRONMENTAL SOCIAL AND ECONOMIC VALUES ➔	BIOPHYSICAL PROCESSES														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Acidification	Biodiversity decline	Climate Change	Chemical Contamination	Diseases - plants	Diseases -animals	Ecosystem fragmentation	Erosion & sedimentation	Exotic (feral) animals	Exotic Plants	Habitat loss	Hydrological change	Nutrient export & enrichment	Process disruption	Salinity
Urban Land Uses	1	14	4	3	1	0	9	2	0	1	5	0	4	1	0
Agricultural Land Uses	1	1	0	1	1	1	1	2	2	6	5	0	7	0	14
Forest & Woodlands	0	16	0	1	6	1	9	2	1	10	9	0	0	3	0
Terrestrial Biodiversity	0	38	11	1	6	0	37	2	12	25	23	1	0	8	5
Swan-Canning Estuary and Coastal Plain Streams	1	7	1	4	1	0	7	10	1	7	10	5	28	5	5
Freshwater Lakes	0	14	2	4	0	0	13	7	1	7	9	9	19	1	0
Groundwater	1	2	9	11	0	0	1	0	0	0	1	7	12	1	1
Darling Range Streams	0	4	0	0	0	0	3	4	0	3	2	7	5	0	1
Coastline & Marine	0	19	6	4	0	0	6	7	8	6	5	0	7	3	0
Air	0	1	4	1	0	0	0	0	0	0	1	0	0	0	0
Indigenous Heritage	0	8	0	0	0	0	5	0	0	4	7	2	0	1	0
Other heritage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regional Capacity	0	8	0	3	0	0	2	1	0	2	3	1	10	1	1
OTHER 2.....	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
OTHER 3.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	132	37	33	15	2	94	37	25	71	81	32	92	24	27
Percentage	0.3%	8.9%	2.5%	2.2%	1.0%	0.1%	6.3%	2.5%	1.7%	4.8%	5.4%	2.1%	6.2%	1.6%	1.8%

Table 26 (Cont)

POSSIBLE THREATS TO ENVIRONMENTAL SOCIAL AND ECONOMIC VALUES (Cont)	HUMAN ACTIVITIES									HUMAN FAILINGS					Total	Percent
	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
➔	Abstraction of water	Agricultural Management Practices	Urban or Industrial Discharges	Drainage modification	Fire management regime	Infrastructure development	Native vegetation clearing or loss	Fossil fuels consumption	Recreation & Access	Ignorance, negligence, intolerance	Inadequate coordination of government & community activity	Inadequate involvement of community or industry	Non-acceptance of NRM principles	Political will (lack of)		
Urban Land Uses	1	0	7	4	0	7	14	1	0	3	2	2	3	7	96	6.4%
Agricultural Land Uses	2	9	2	2	0	0	1	0	0	1	1	0	3	5	68	4.6%
Forest & Woodlands	1	0	0	0	3	4	19	0	3	5	3	4	1	8	109	7.3%
Terrestrial Biodiversity	6	3	0	2	10	6	40	1	3	21	13	6	4	18	302	20.3%
Swan-Canning Estuary and Coastal Plain Streams	7	8	24	12	0	1	0	0	5	10	5	13	3	9	189	12.7%
Freshwater Lakes	7	2	10	8	0	10	11	0	1	9	3	10	1	6	164	11.0%
Groundwater	25	4	10	6	0	2	1	0	1	6	3	6	1	5	116	7.8%
Darling Range Streams	2	0	2	6	0	0	2	0	0	0	0	0	1	2	44	3.0%
Coastline & Marine	0	0	9	0	0	5	0	0	11	13	10	14	4	8	145	9.7%
Air	0	0	3	0	0	4	1	11	1	1	1	0	1	2	32	2.1%
Indigenous Heritage	0	0	0	0	3	0	2	0	3	21	9	12	1	12	90	6.0%
Other heritage	0	0	0	0	0	3	0	0	0	0	0	0	0	1	4	0.3%
Regional Capacity	0	2	7	4	1	1	4	1	0	22	12	21	10	6	123	8.3%
OTHER 2.....	0	0	0	0	0	0	0	0	0	0	0	0	0	6	8	0.5%
OTHER 3.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
TOTAL	51	28	74	44	17	43	95	14	28	112	62	88	33	95	1490	100.0%
Percentage	3.4%	1.9%	5.0%	3.0%	1.1%	2.9%	6.4%	0.9%	1.9%	7.5%	4.2%	5.9%	2.2%	6.4%	100.0%	

In analysing the data given in Table 26 all 385 cells were separately listed, with their cell address e.g. “*Asset Class Darling Range Streams by Salinity*”, together with the rating of return to investment and the capacity score for the particular threat i.e. in this case Salinity. The data were then sorted with the highest return to investment and lowest current capacity listed first, and the lowest return to investment and highest current capacity listed last. There were 136 cells with no sticker, indicating insignificant return to investment. These were discarded. Of the remaining 249 cells the “top 48” cells were then coded into the four groups HL, HH, LH, LL. The results are shown in Table 27.

Table 27: The top 48 threats to asset values, and regional capacity for dealing with the threat

	Asset Class	Threat	Value Score	Capacity
1	Urban Land Uses	Native vegetation clearing or loss	14	L
1	Urban Land Uses	Biodiversity decline	14	H
2	Agricultural Land	Salinity	14	H
3	Forest & Woodlands	Native vegetation clearing or loss	19	L
3	Forest & Woodlands	Biodiversity decline	16	H
3	Forest & Woodlands	Exotic Plants	10	L
4	Terrestrial Biodiversity	Native vegetation clearing or loss	40	L
4	Terrestrial Biodiversity	Biodiversity decline	38	H
4	Terrestrial Biodiversity	Ecosystem fragmentation	37	L
4	Terrestrial Biodiversity	Exotic Plants	25	L
4	Terrestrial Biodiversity	Habitat loss	23	L
4	Terrestrial Biodiversity	Ignorance, negligence, intolerance	21	L
4	Terrestrial Biodiversity	Political will (lack of)	18	L
4	Terrestrial Biodiversity	Inadequate coordination of government & community activity	13	L
4	Terrestrial Biodiversity	Exotic (feral) animals	12	L
4	Terrestrial Biodiversity	Climate Change	11	L
4	Terrestrial Biodiversity	Fire management regime	10	H
5	Swan-Canning & Coastal Plain Streams	Nutrient export & enrichment	28	H
5	Swan-Canning & Coastal Plain Streams	Urban or Industrial Discharges	24	L
5	Swan-Canning & Coastal Plain Streams	Inadequate involvement of community or industry	13	L
5	Swan-Canning & Coastal Plain Streams	Drainage modification	12	H
5	Swan-Canning & Coastal Plain Streams	Ignorance, negligence, intolerance	10	L
5	Swan-Canning & Coastal Plain Streams	Habitat loss	10	L
5	Swan-Canning & Coastal Plain Streams	Erosion & sedimentation	10	H
6	Freshwater Lakes	Nutrient export & enrichment	19	H
6	Freshwater Lakes	Biodiversity decline	14	H
6	Freshwater Lakes	Ecosystem fragmentation	13	L
6	Freshwater Lakes	Native vegetation clearing or loss	11	L
6	Freshwater Lakes	Inadequate involvement of community or industry	10	L
6	Freshwater Lakes	Urban or Industrial Discharges	10	L
6	Freshwater Lakes	Infrastructure development	10	H
7	Groundwater	Abstraction of water	25	H
7	Groundwater	Nutrient export & enrichment	12	H
7	Groundwater	Chemical Contamination	11	H
7	Groundwater	Urban or Industrial Discharges	10	L
9	Coast & Marine	Biodiversity decline	19	H
9	Coast & Marine	Inadequate involvement of community or industry	14	L
9	Coast & Marine	Ignorance, negligence, intolerance	13	L
9	Coast & Marine	Recreation & Access	11	H

Asset Class	Threat	Value Score	Capacity
9 Coast & Marine	Inadequate coordination of government & community activity	10	L
10 Air	Fossil fuels consumption	11	L
11 Indigenous Heritage	Ignorance, negligence, intolerance	21	L
11 Indigenous Heritage	Inadequate involvement of community or industry	12	L
11 Indigenous Heritage	Political will (lack of)	12	L
12 Regional Capacity	Ignorance, negligence, intolerance	22	L
12 Regional Capacity	Inadequate involvement of community or industry	21	L
12 Regional Capacity	Inadequate coordination of government & community activity	12	L
12 Regional Capacity	Non-acceptance of NRM principles	10	L
12 Regional Capacity	Nutrient export & enrichment	10	H

It is seen that Terrestrial Biodiversity, together with Forests and Woodlands are regarded as a prime target for investment across a wide range of threats. Capacity in this area is still mainly low.

The condition of the Swan-Canning Estuary and Coastal Plain Streams is another prime target for investment. Capacity for addressing this issue is adequate in some respects, but low capacity is identified in regard to urban and industrial discharge control and the level of community involvement. Freshwater Lakes and Wetlands have a wider range of threats, including biodiversity values, and capacity is generally perceived to be low in relation to management of the threats to this asset group. Groundwater is also viewed as offering high returns to investment in NRM, with capacity generally received as adequate, except for controls of urban and industrial discharges.

Coast and marine issues were perceived as important, though overall ranked slightly lower than the issues discussed above. Areas offering significant returns to investment are initiatives to maintain marine biodiversity and it is viewed as critical to engage the community and improve communication in this regard.

Air quality was not viewed as a particularly high priority for investment, though capacity for dealing with fuels consumption was seen as low.

Indigenous heritage is seen as an important area for investment, emphasising social and educational initiatives rather than on-ground works.

Finally, the capacity of the region to deal effectively with NRM issues across the board is viewed as inadequate, with emphasis being needed on education, involvement, coordination and embedding of NRM principles into the way the Swan Region is planned and managed.

6. Next steps

The results achieved in Investment Workshop series “A” provide a first-cut rating of returns to investment across asset classes and threats within the Swan Region. But investment decisions will need further justification than what we have achieved so far. In particular it will be necessary to identify potential projects having a high probability of success, and positive benefit-cost ratios. It will also be necessary to make tradeoffs across the different asset classes.

The next step will be to derive an allocation of resources for natural resource management across Asset Categories that is *approximately proportional to relative social preference*, and which defines a cut-off point for selection of management actions.

This will be the subject of Investment Workshop Series “B”.