

The International WaterCentre (IWC)

*Engaging and communicating with stakeholders for river
health and environmental flow assessment:
Case studies from Australia and China*

INTERNATIONAL
WATERCENTRE

MEMBERS:





A joint venture of four leading Australian universities with national and international knowledge networks, the IWC provides a breadth of expertise and experience rarely found in a single organisation.

Members



Partners



Supporter



Water leadership for the future



What does the I

Education

- Master of Integrated Water Management

Training

- Tailored Australian and Global education projects to build integrated water management capacity

Applied research

- Integrated water resources management

Expert advice

- Scientific and strategic policy and planning advice

Outline

- Opportunities for stakeholders in river basin management
- The importance of effective reporting and communication for river health and environmental flows
- Case studies
 - South East Queensland, Australia
 - Pearl River, Liao River, Yellow River, PR China

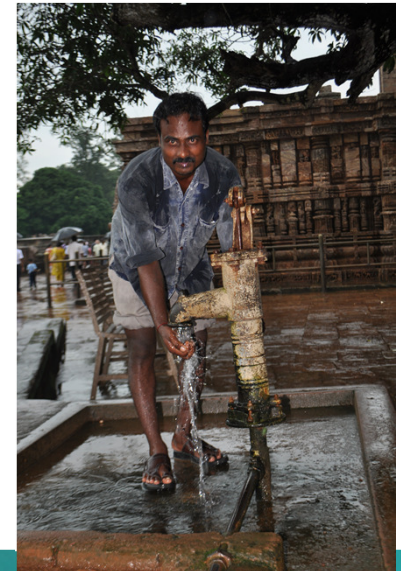
Opportunities for working with stakeholders - Identifying what is important about our rivers and water resources.....

***Healthy Waterways Partnership
South East Queensland, Australia***



Identifying environmental values

- Are qualities of water and rivers that support healthy aquatic ecosystems and human water uses
- Use to set management objectives (numerical) – that will protect the values and assets from the effects of pollution, hydrologic change, extraction,



People in SEQ value their waterways

Environmental Values

- Identified by the local communities in South East Queensland



- ecosystem
- human consumers
- primary recreation (e.g. swimming)
- secondary recreation (e.g. boating)
- visual recreation
- cultural heritage
- industrial use
- aquaculture
- drinking water supply
- irrigation
- stock watering
- farm supply



QWC

Key ecological assets and values: Liao River

- Nature reserves and conservation areas
 - Wetlands
 - Wildlife reserves
 - Drinking water supply catchments
 - protected vegetation communities
- High conservation value species
 - Rare and endangered fish species
- Ecologically important habitats and ecosystems components
 - Fish breeding areas and migration pathways
 - Remnant riparian vegetation communities



Need to balance activities in the catchment with uses/values



farming



urbanisation



aquaculture industry



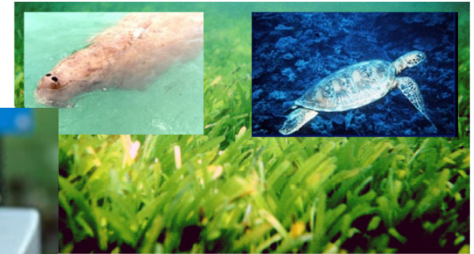
grazing



fishing



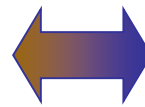
boating



ecosystem



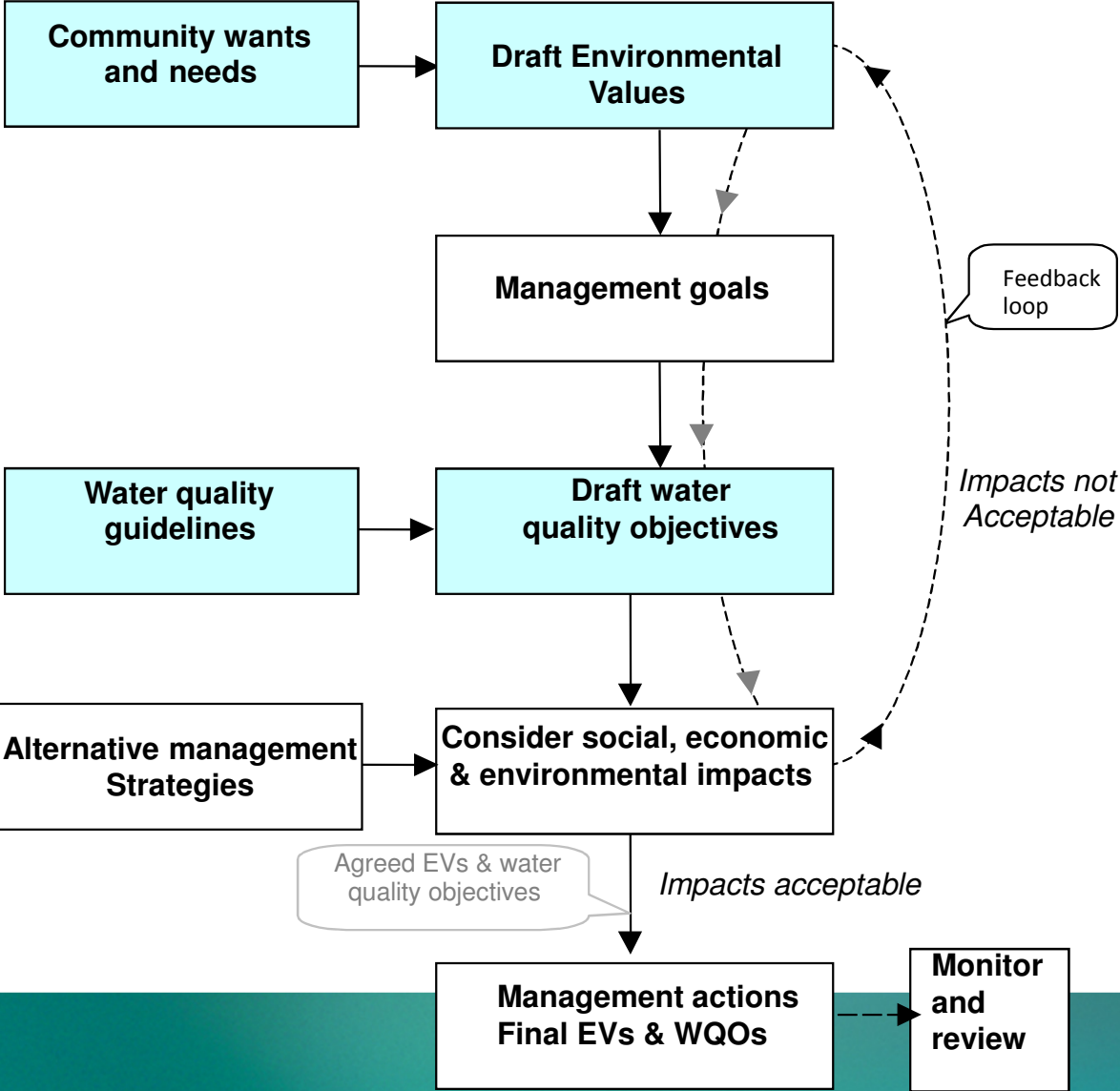
drinking water



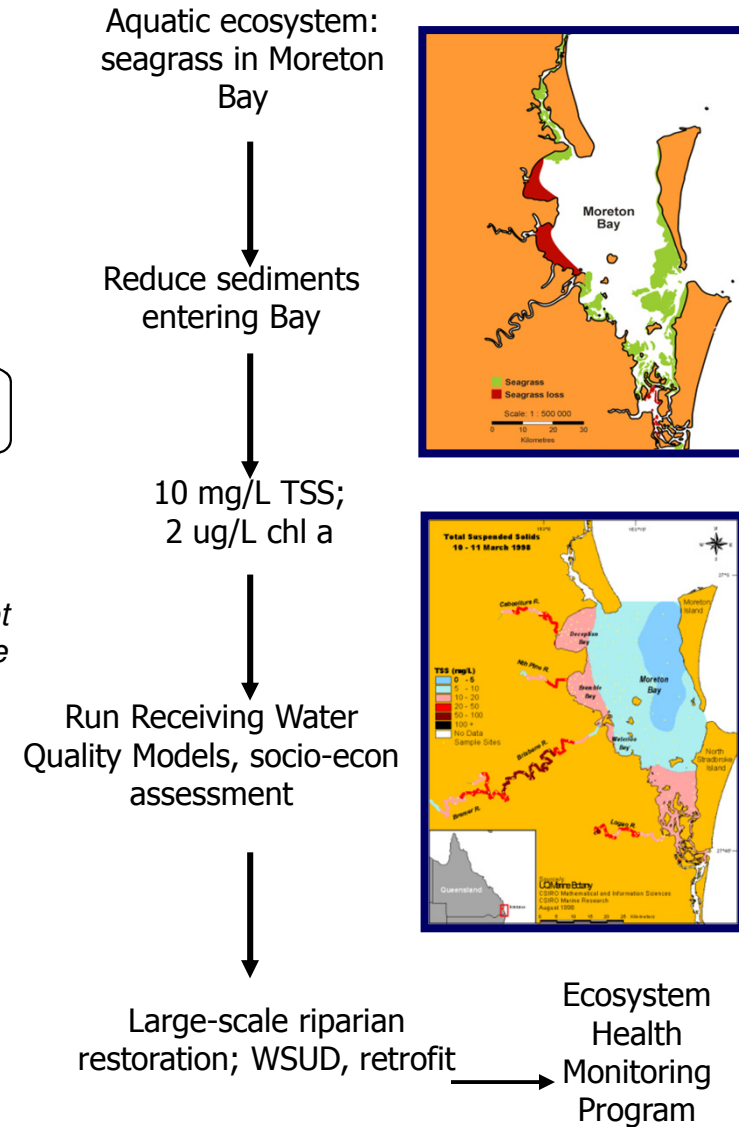
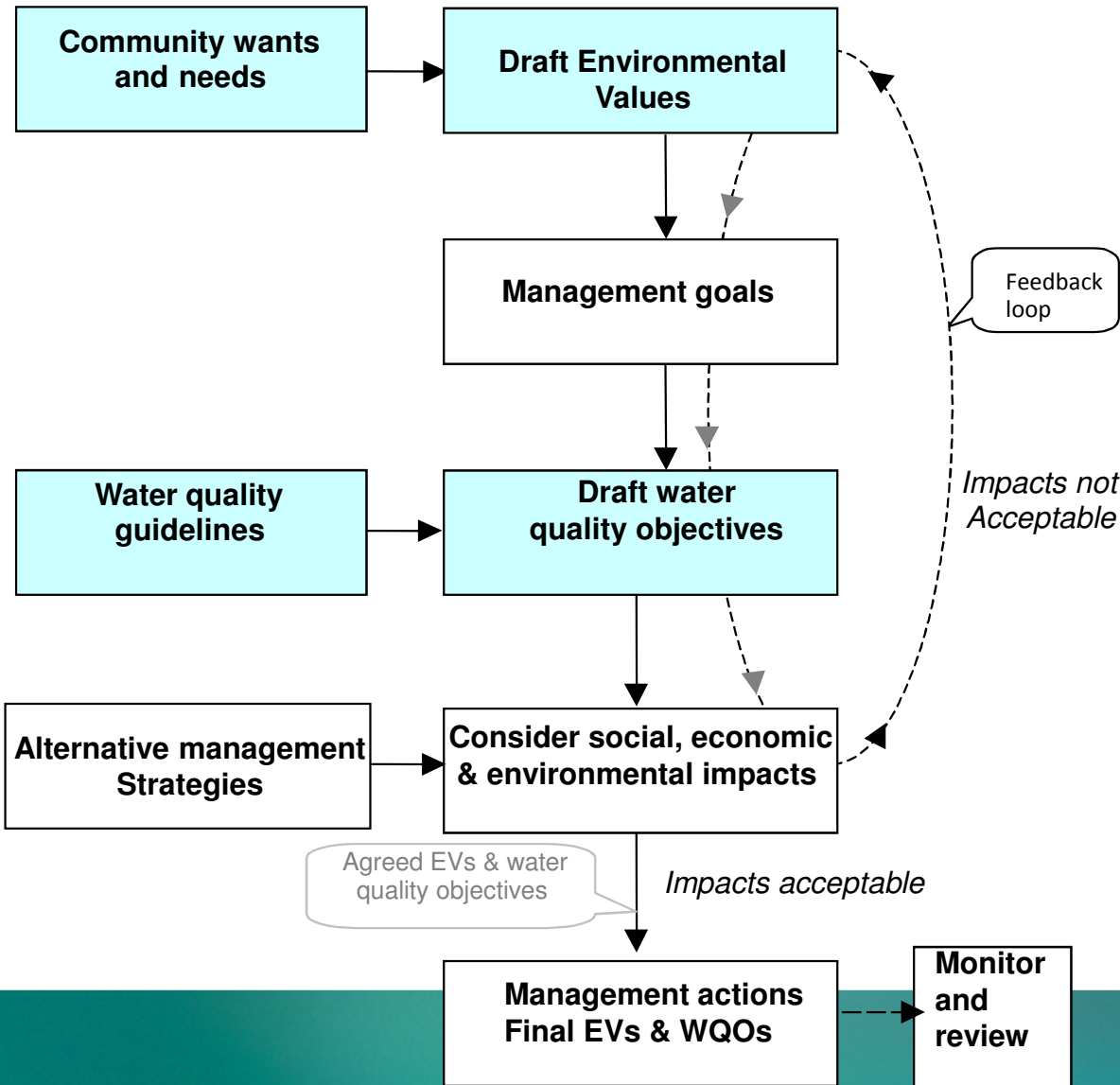
The importance of effective reporting and communication of river health and water resource science ...

Using environmental values and assets to establish measurable, scientifically relevant management objectives

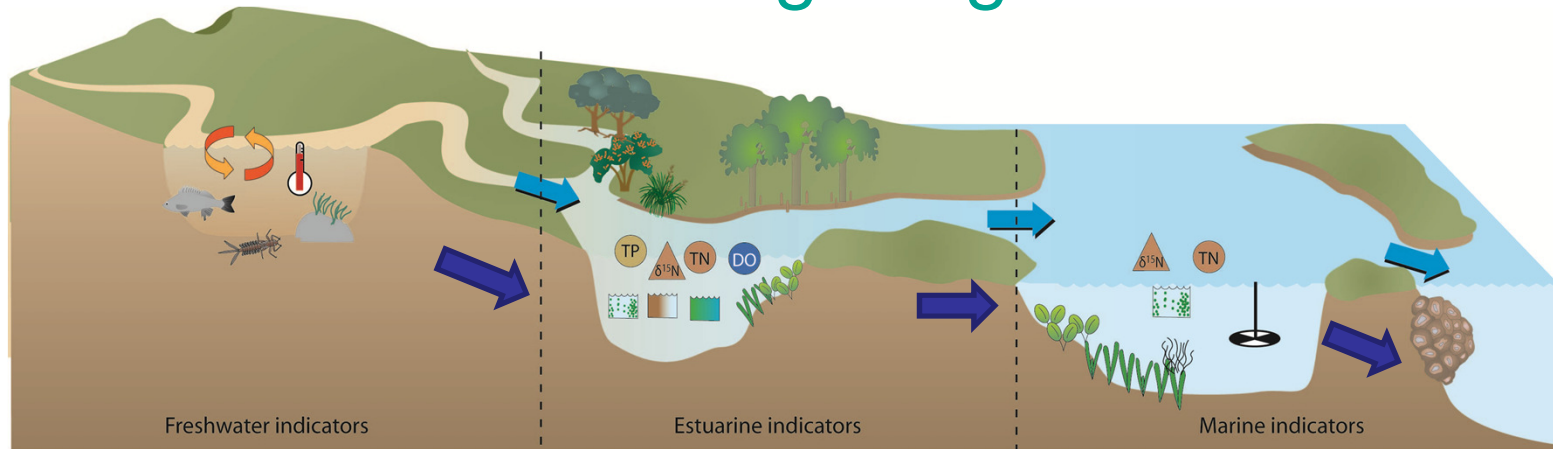
Relevant and achievable management objectives, reflecting the environmental values



Relevant and achievable management objectives, reflecting the environmental values



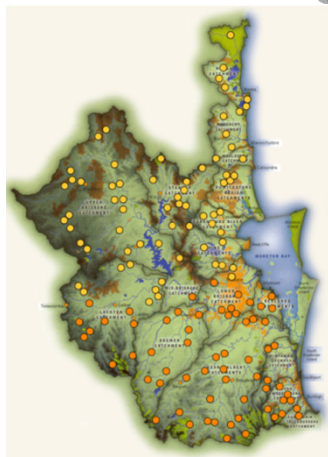
Tracking the achievement of targets: Ecosystem Health Monitoring Program



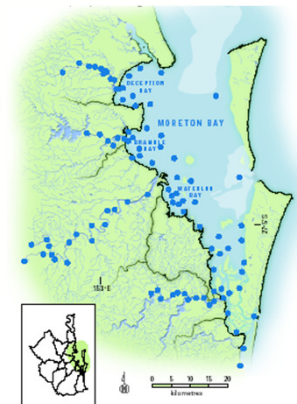
- Macroinvertebrates
- Ecosystem processes
- Nutrients
- Fish
- Physical and chemical

- Ecosystem Health Index (EHI)**
- Total nitrogen
 - Chlorophyll a
 - Turbidity
 - Total phosphorus
 - Dissolved Oxygen
- Biological Health Rating (BHR)**
- Seagrass depth range
 - Nutrient plots
 - Riparian assessment
 - δ¹⁵N mapping

- Ecosystem Health Index (EHI)**
- Total nitrogen
 - Chlorophyll a
 - Secchi depth
 - δ¹⁵N mapping
 - Lyngbya
- Biological Health Rating (BHR)**
- Seagrass depth range
 - Seagrass distribution
 - Coral cover

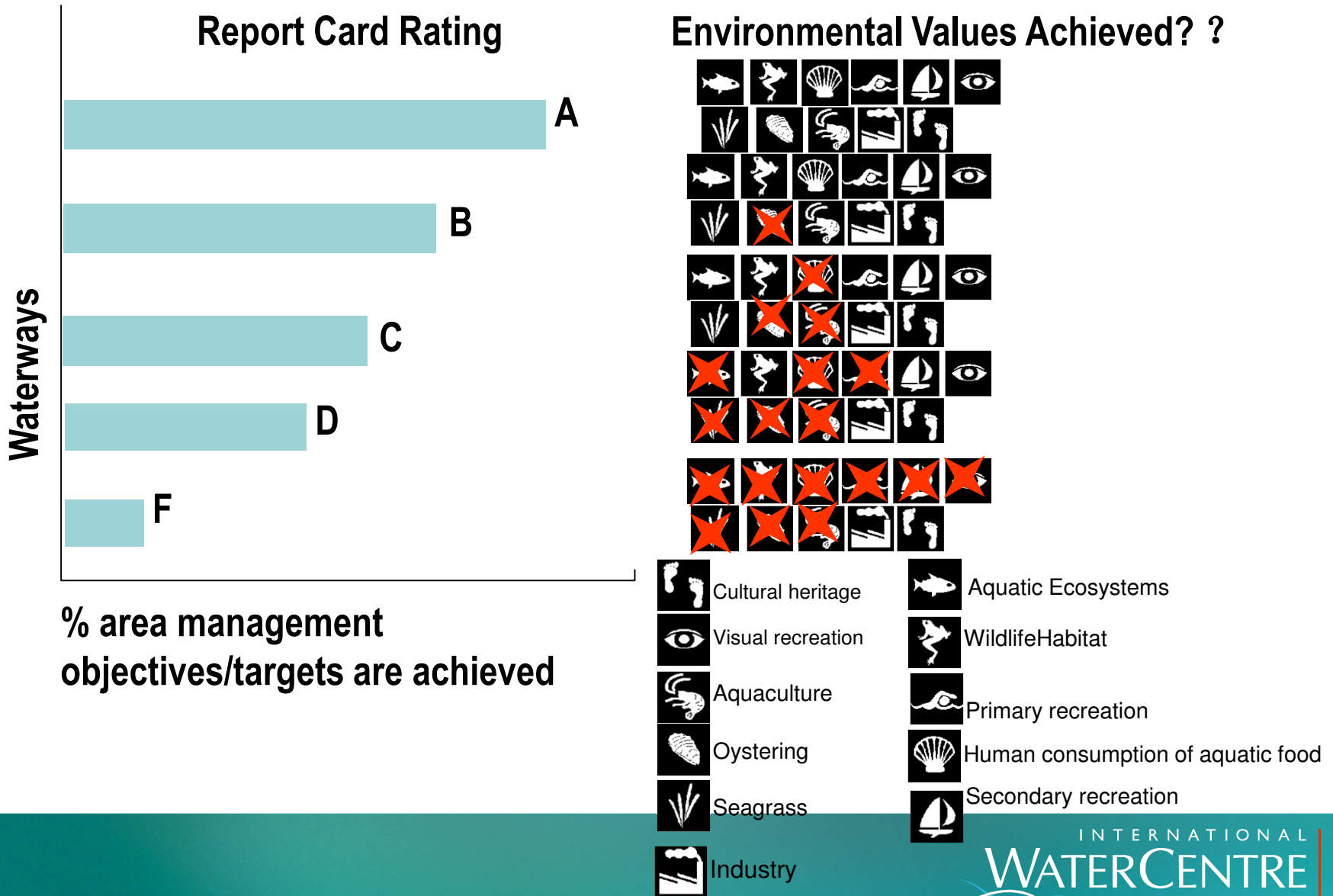


135 freshwater sites
(sampled 2x/yr)



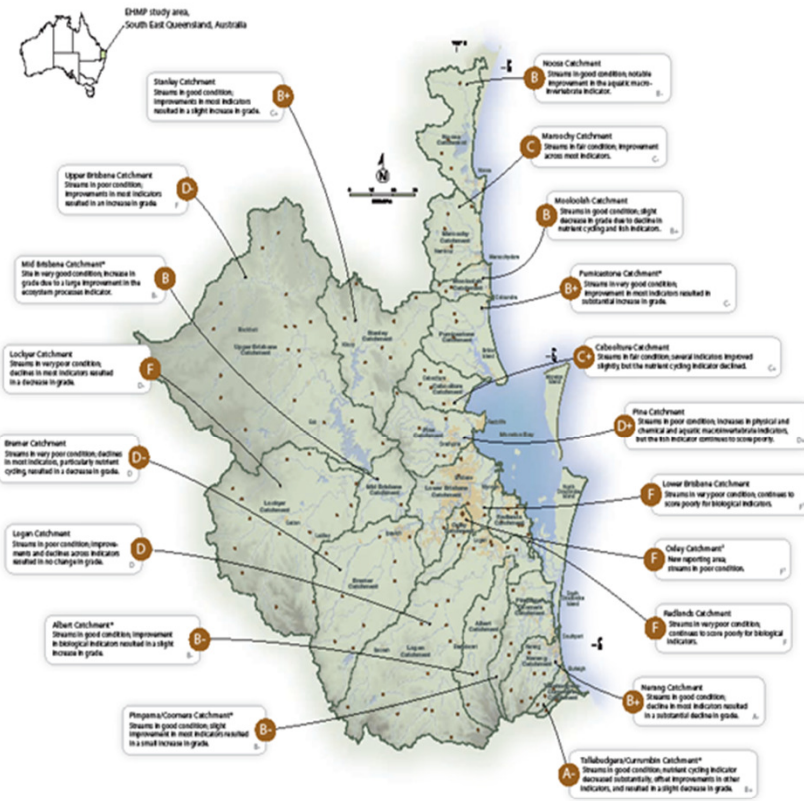
254 estuarine & marine sites
(sampled monthly)

Environmental condition linked to achieving the environmental values



Communicating Science: Score Cards

Freshwater Report Card 2008



Grades—what do they mean?

Ecosystem Health Report Card Grades (A to F) are generated for 19 catchments and 18 estuaries in South East Queensland and Moreton Bay. Parameters for freshwater, estuarine and marine ecosystems are assessed against guidelines resulting in the application of a single grade for each system.

- A** Excellent: Conditions meet all set ecosystem health values, all key processes are functional and all critical habitats are in near pristine condition.
- B** Good: Conditions meet all set ecosystem health values in most of the reporting region, most key processes are functional and most critical habitats are intact.
- C** Fair: Conditions meet some of the set ecosystem health values in most of the reporting region, some key processes are functional and some critical habitats are impacted.
- D** Poor: Conditions are unlikely to meet set ecosystem health values in most of the reporting region, many key processes are not functional and many critical habitats are impacted.
- F** Risk: Conditions do not meet set ecosystem health values, most key processes are not functional and most critical habitats are severely impacted.

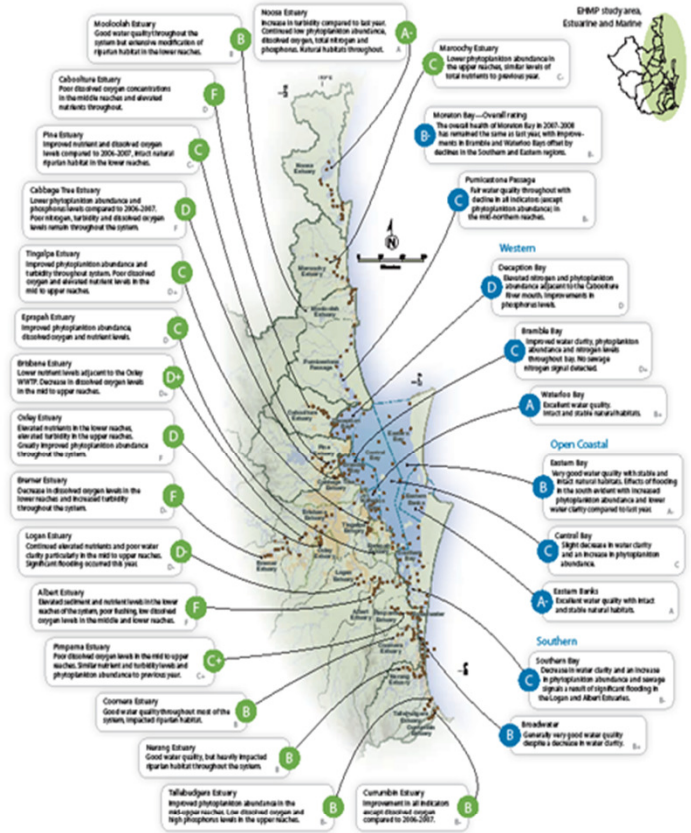
Environmental Goals

- Freshwater**
- Protect freshwater riparian vegetation and habitat
 - Protect fish and macroinvertebrates
 - Minimise nuisance algal blooms and growth of aquatic weeds
 - Minimise sediments and nutrients
- Estuarine**
- Protect estuarine habitats (seagrass, mangroves, softwedge and riparian vegetation)
 - Protect fish and macroinvertebrates
 - Minimise nuisance algal blooms and growth of aquatic weeds
 - Minimise sediments and nutrients
- Marine**
- Protect marine habitats (seagrass, mangroves and softwedge)
 - Protect fish and macroinvertebrates
 - Minimise nuisance algal blooms
 - Minimise sediments and nutrients

Legend

- Catchment border
 - Urban areas
 - Monitoring sites
 - Wayway name
 - Catchment and further east
 - 2008 grade
 - 2007 grade
- * Data from lower than 1 km²
- 1 Combined Grade for Lower Brisbane and Oley Creek Catchments in 2007
 2 In 2007, 2008 the additional freshwater flow was measured in the Oley Creek Catchment, hence it has its own reporting score in 2008

Estuarine and Marine Report Card 2008



Communicating annual monitoring results to the people who make a difference: Report Cards (A-F)

Grades – what do they mean?

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- C** **Fair:** Conditions meet some of the set ecosystem health values in most of the reporting region; some key processes are functional and some critical habitats are impacted.
- D** **Poor:** Conditions are unlikely to meet set ecosystem health values in most of the reporting region; many key processes are not functional and many critical habitats are impacted.
- F** **Fail:** Conditions do not meet set ecosystem health values; most key processes are not functional and most critical habitats are severely impacted.

Eastern Banks

A Excellent water quality, improved water clarity and reduced phytoplankton abundance, however greater extent of Lyngbya A-

Bramble Bay

F Declines in all indicators, decreases in salinity at sites near the Brisbane River mouth related to increased flows from the Brisbane River. C

Other example of Report card

About the riverine system

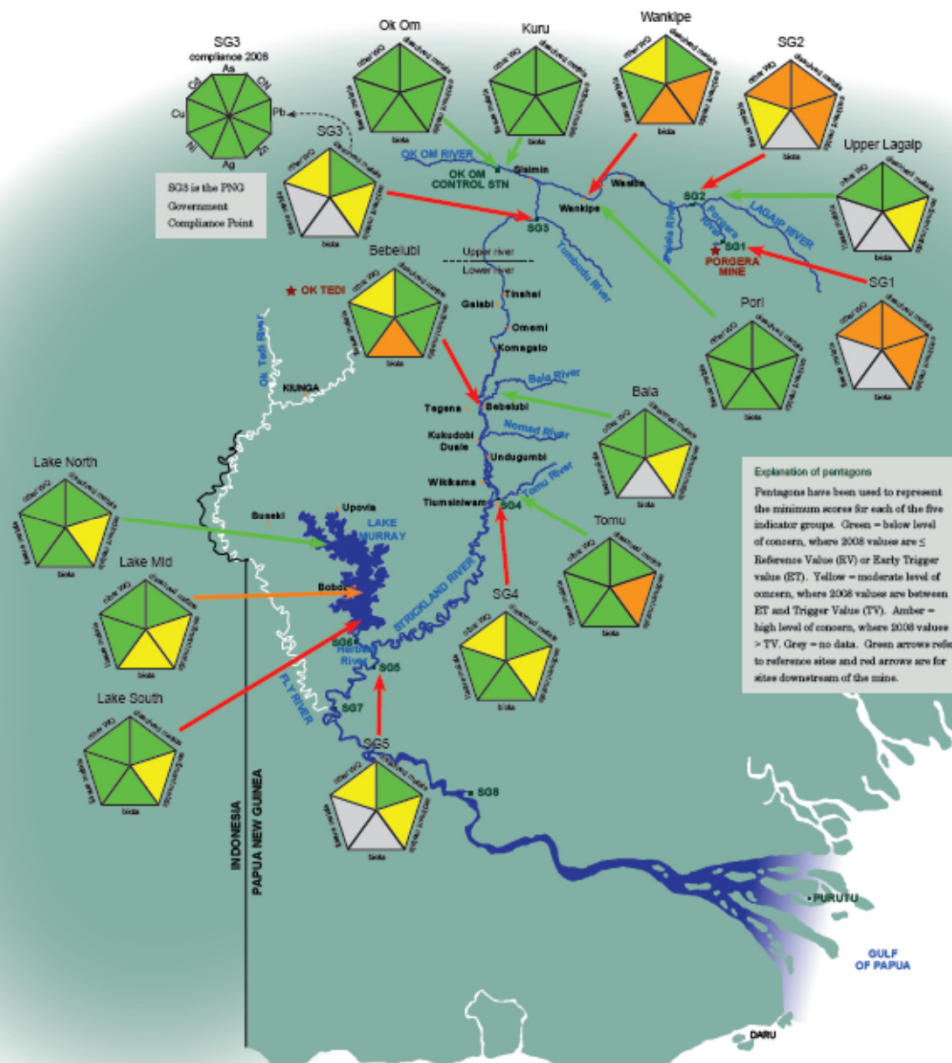
The Report Card covers the riverine system from just downstream of the Poregera mine (Poregera River) to Lake Murray on the Strickland River floodplain.

Poregera Joint Venture (PJV) discharged approximately 6.05 million tonnes of tailings in 2008 to the downstream riverine system (Poregera, Lagapi and Strickland Rivers). Additionally, an estimated 12.5 million tonnes of suspended sediment entered the riverine system from the erodible waste dumps (Anawae and Anjolek).

The Poregera River joins the Upper Lagapi and then flows west to join the Ok Om and then south down the Strickland River. There is significant dilution of the mine inputs along the way. The river flow at SG2 (Stream Gauging Station No.2) on the Lagapi contributes only about one third of the flow at the compliance monitoring site at SG3 and the remainder comes from Ok Om and other tributaries (e.g. Pori and Tumbudu Rivers). It is estimated that about 50% of the sediment at SG3 is mine-derived. Only about one quarter of the river flow at SG4 is from the catchment upstream of SG3.

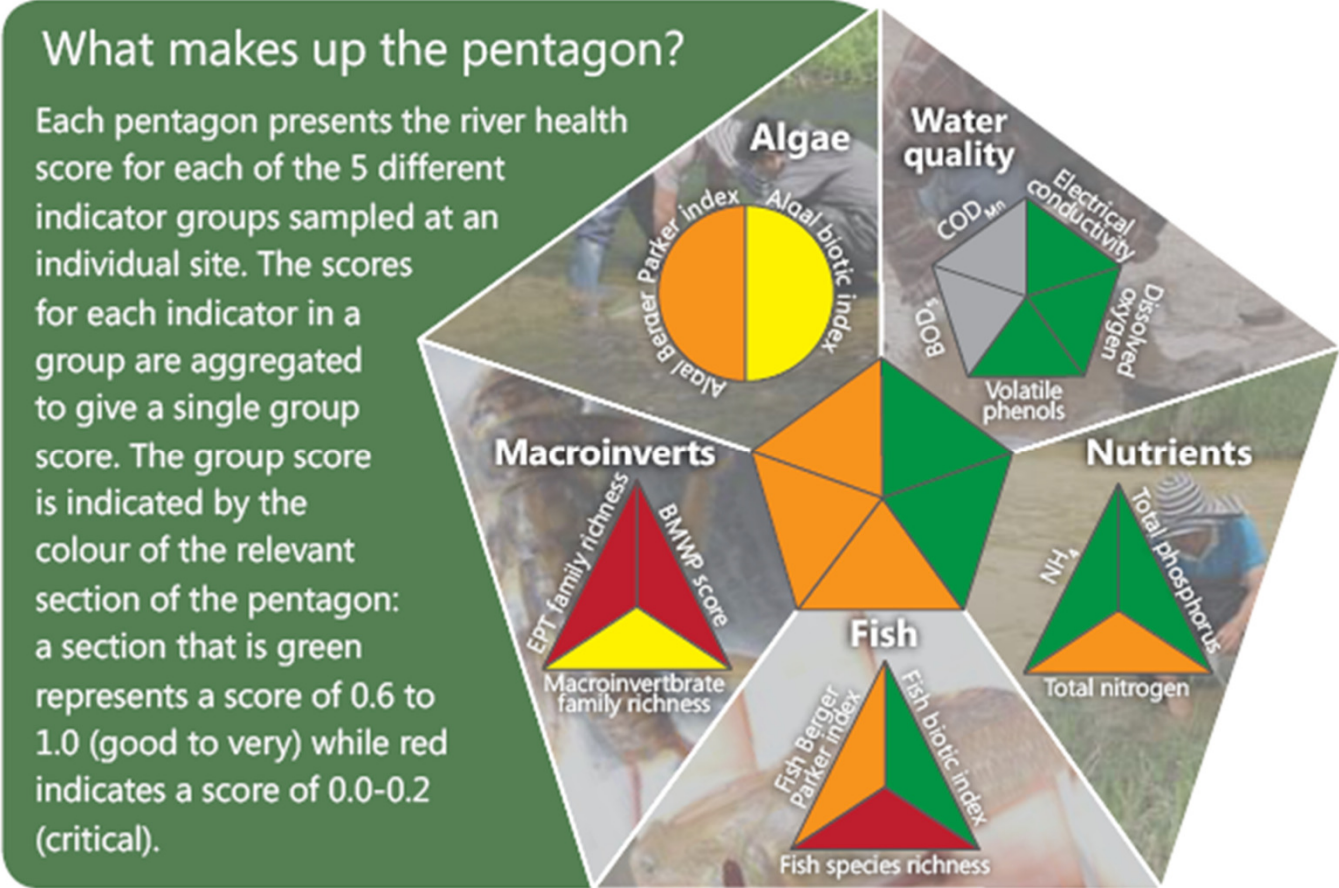
For the Upper River, monitoring data were obtained from sites downstream of the mine (SG1, SG2, SG3, Wankipa) and from nearby reference sites (Upper Lagapi, Pori River, Kuru River, Ok Om). For the Lower River, data from the main Strickland River (SG4, SG5, Bebelubi) and two reference systems (Bais and Tomu Rivers) were used. Data from up to 25 sites in Lake Murray were combined for these regions, according to their proximity to the Herbert River inflows: Southern Lake, Middle Lake and Northern Lake. Inflows from the Herbert River into Lake Murray occur about 10% of the time at times of high flow in the Strickland River due to high rainfall in the mountains.

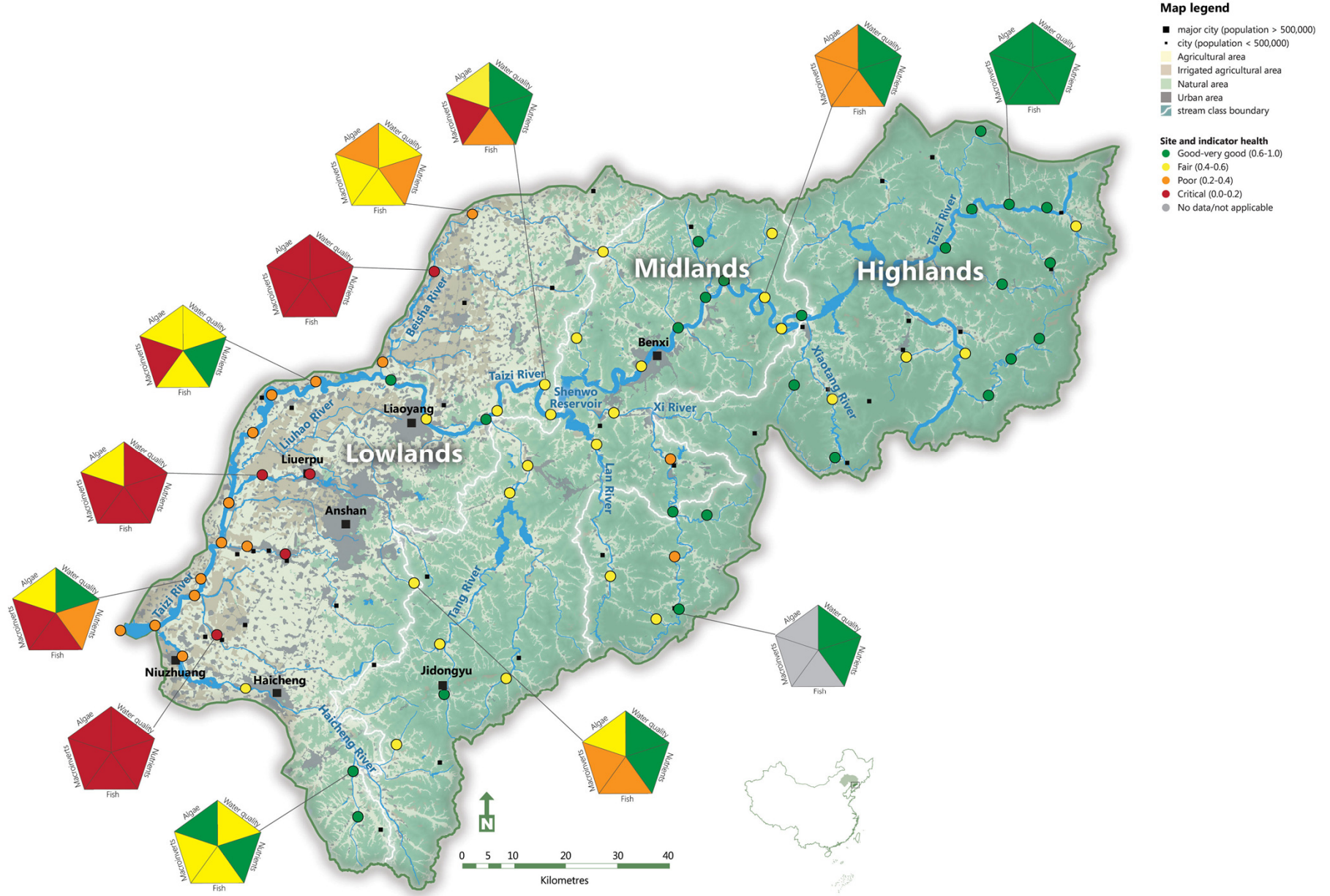
Total rainfall for 2008 at the mine site was 4.15 m, 12% higher than the long-term average of 3.72 m (since 1974). Average daily river flow in 2008 were also higher than the long term average (e.g. 904 cumecs compared with 748 cumecs at SG3).



Strickland River, New Guinea.

Indicators of river health: Liao River





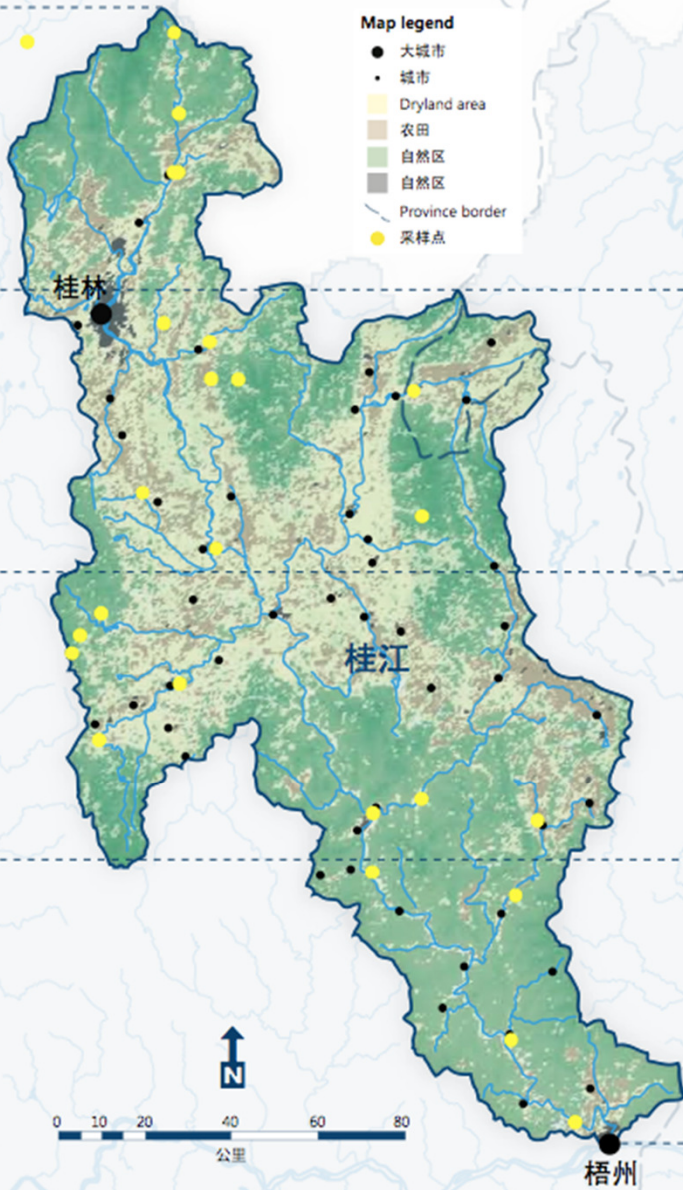
评估报告卡结果

流域上游

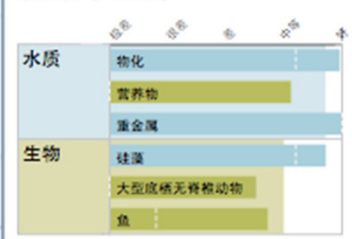


Map legend

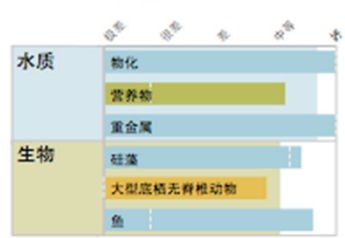
- 大城市
- 城市
- Dryland area
- 农田
- 自然区
- 自然区
- Province border
- 采样点



流域中上游



流域中下游



流域下游



Bar graph legend



Why produce a score card?

- The most important tool for evaluating & communicating health of the regions waterways
- Enable large and often complex amounts of information to be communicated to a broad audience



Strickland River Report Card

This is the first Report Card on the health of the Program/Strickland river catchment. It was produced by the Program/Strickland river catchment, prepared by the Program/Strickland river catchment, prepared by the Program/Strickland river catchment.

What is a Report Card?
An environmental Report Card is a tool that provides a snapshot of the health of the environment compared with what we would like to see. Report Cards enable large and often complex amounts of information to be communicated in a broad range of print and digital formats, making it easy to use in a wide range of contexts. They can be used to identify areas for improvement and to track progress over time.

Background to the first Report Card
The first Report Card on the Strickland River was produced in 2006. It was the first of its kind in the Program/Strickland river catchment. It was produced by the Program/Strickland river catchment, prepared by the Program/Strickland river catchment.

Program/Strickland river catchment
The Program/Strickland river catchment is a large and diverse area. It is home to a wide range of ecosystems and species. The Program/Strickland river catchment is a key area for environmental protection and management.

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Ecosystem Health Monitoring Program Report Card 2008

for the waterways and catchments of South East Queensland

October 2008

Maps Inside

Celebration and ownership by important stakeholders

Lord Mayor of Brisbane and Chair of the Scientific Expert Panel



Increasing community awareness...

Albert & Logan News
Friday 21/10/2005
Page 2
Section: General News
Region: Brisbane Circulation: 40,000
Type: Suburban
Size: 102.71 sq.cms
Published: 1-7--

Plan to stem river's decline

Coolum Advertiser
Friday 21/10/2005
Page: 11
Section: General News
Region: Coolangubra QLD Circulation: 11,838
Type: Regional
Size: 104.44 sq.cms
Published: 1-7--

Maroochy River grades improve

Caboolture Shire Herald
Tuesday 11/10/2005
Page: 19
Section: General News
Region: Brisbane Circulation: 43,693
Type: Suburban
Size: 310.11 sq.cms
Published: 1-7--

Tree planting slows sediment
How waterways rate

Queensland Times
Thursday 28/10/2005
Page: 4
Section: General News
Region: Ipswich QLD Circulation: 13,307
Type: Regional
Size: 628.43 sq.cms
Published: 8/18/15-5

BREMER BETTER BUT STILL FLUNKS
Rivers holding own despite worst drought on record

Southern Star - Springwood
Wednesday 12/10/2005
Page: 4
Section: General News
Region: Brisbane Circulation: 17,301
Type: Suburban
Size: 208.21 sq.cms
Published: 8/1--

Call to plant more trees

The Courier-Mail
Thursday, October 20, 2005
Waterway health vital for region



Waterway quality OK
But freshwater areas continue to decline

Courier Mail
Thursday 28/10/2005
Page: 7
Section: General News
Region: Brisbane Circulation: 211,270
Type: Capital City Daily
Size: 677.54 sq.cms
Published: 8/18/15-5

Population surge poisons Bay
Catchments hit by urban sprawl

Jimboomba Times
Wednesday 5/10/2005
Page: 21
Section: General News
Region: Jimboomba QLD Circulation: 10,000
Type: Regional
Size: 107.48 sq.cms
Published: 1-8--

Redland Times
Friday 21/10/2005
Page: 3
Section: General News
Region: Brisbane Circulation: 43,693
Type: Suburban
Size: 121.26 sq.cms
Published: 1-7--

River's rating tipped to rise

Our poor waterways are sick

Richard Times
Friday 21/10/2005
Page: 2
Section: General News
Region: Brisbane Circulation: 43,693
Type: Suburban
Size: 201.11 sq.cms
Published: 1-7--

Trees needed at waterways

Judgement on our waterways to be released

Noosa News
Friday 21/10/2005
Page: 4
Section: General News
Region: Noosa QLD Circulation: 22,423
Type: Regional
Size: 81.34 sq.cms
Published: 1-7--

Bid to restore health of system

Health of SE Qld waterways to be unveiled on 19 October

Noosa News
Friday 21/10/2005
Page: 1
Section: General News
Region: Noosa QLD Circulation: 22,423
Type: Regional
Size: 82.34 sq.cms
Published: 1-7--

Noosa River scores a straight A

River, the life-giver

State of SEQ rivers to be revealed soon

River scores an A

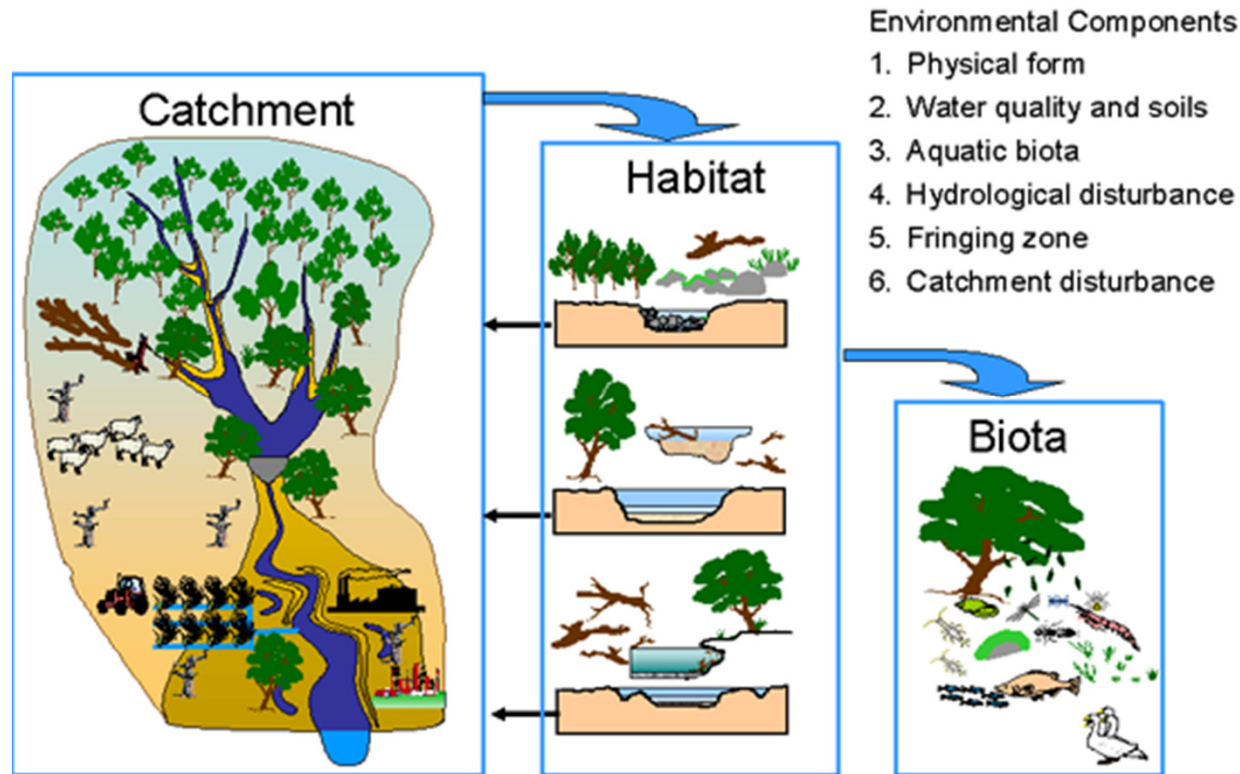
Why produce a score card?

- The most important tool for evaluating & communicating health of the regions waterways
- Enable large and often complex amounts of information to be communicated to a broad audience
- Provide a framework for monitoring and communication activities
- Can provide accountability; measuring the success of a particular effort
- Identify regions or issues of concern



National reporting framework

River and wetland health assessment – Australian national framework



<http://www.water.gov.au/>

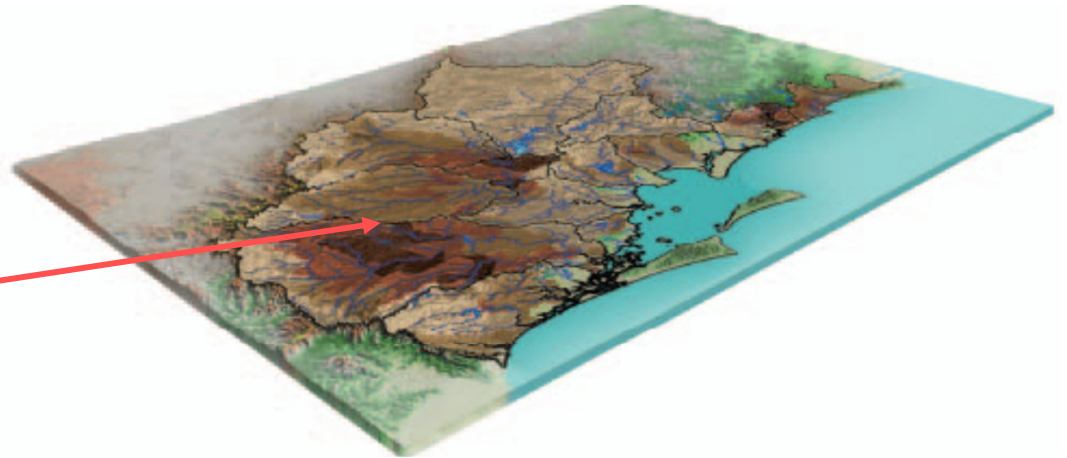
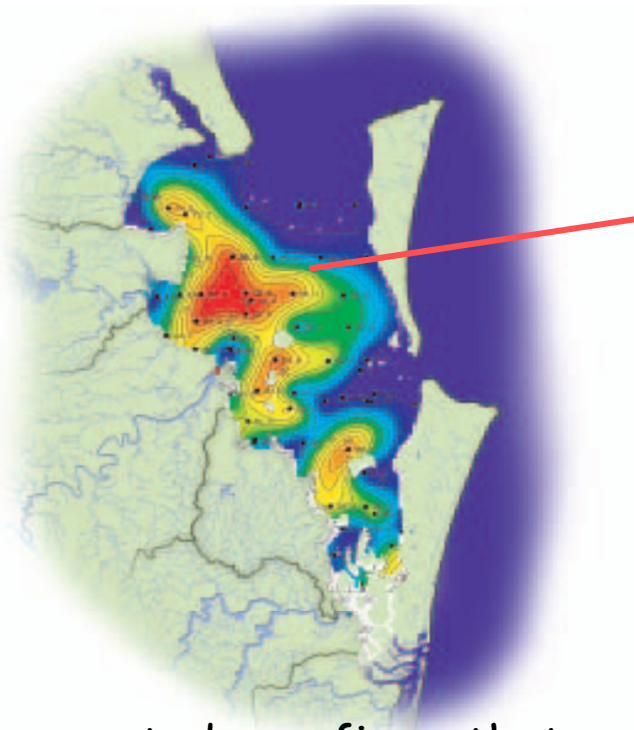
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- Can provide accountability; measuring the success of a particular effort
- Identify regions or issues of concern
- Directed / focused management action

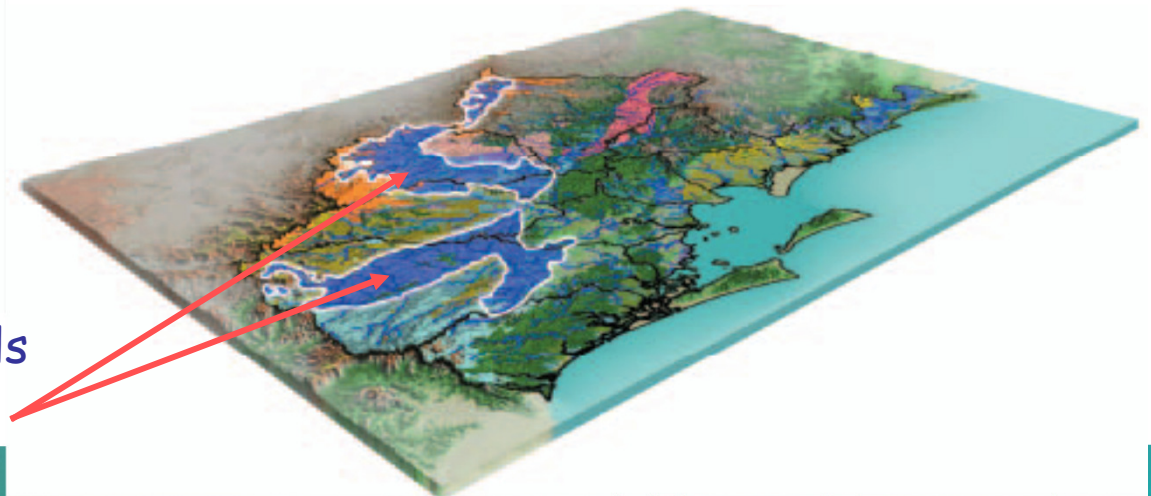


Identifying the source of sediment loads

Modelling suggests 70%
sediment in Bay comes from
<30% catchment area



Tracer study confirms that
most sediment comes from soils
on Marburg formation rocks



Dispelling some myths

- You do not need large quantities of data
 - Focus on key indicators
 - Use of experts
- The final rating is not as important as the message
 - What is working well – what is not
 - What can we do to improve things
- The benchmarks and reference sites are the key
 - Must be relevant, realistic but representative
 - Use of indices allow you to convert to measurements

Linking science with policy



A Partnership Approach: *The Healthy Waterways Partnership*

- Special collaboration between government, industry, researchers and community
- Working towards understanding, planning for and managing the use of waterways and catchments in South East Queensland (SEQ)
- Includes 6 Queensland (State) government agencies, all 11 local governments in the region, 3 water utilities, 4 universities, 30 major industries and 38+ catchment, landcare, environment and community groups



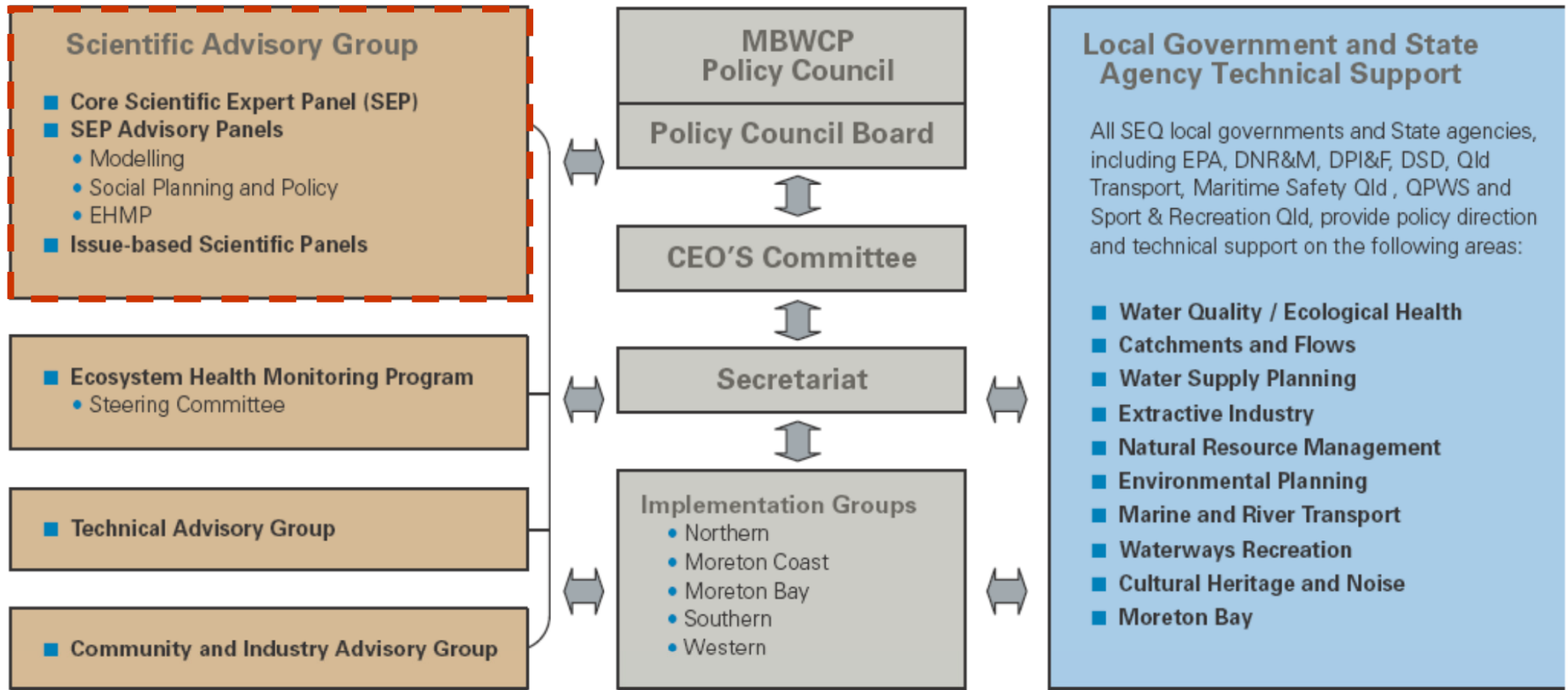


- Special, voluntary collaboration between government, industry, researchers and community
- Working towards understanding, planning for and managing the use of waterways and catchments in South East Queensland (SEQ)

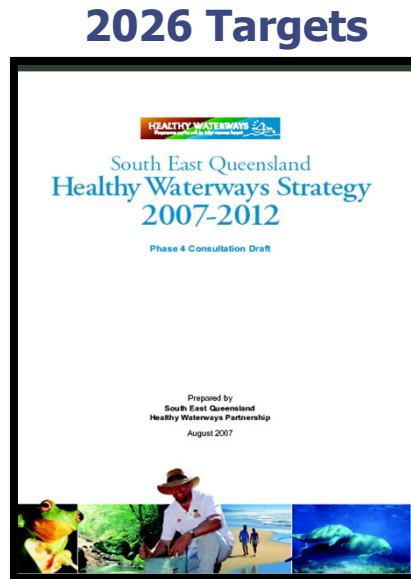
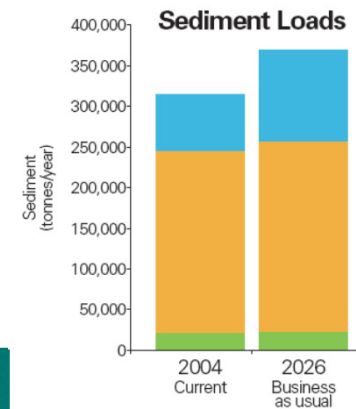
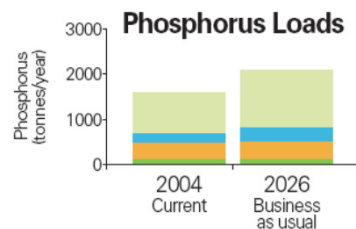
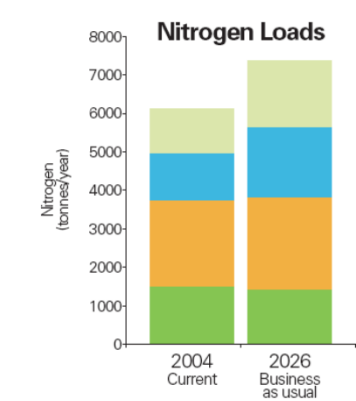
Healthy Waterways Vision

Our waterways and catchments will, by 2026, be a healthy ecosystem supporting the livelihoods and lifestyles of residents and visitors and will be managed through collaboration between community, government and industry.

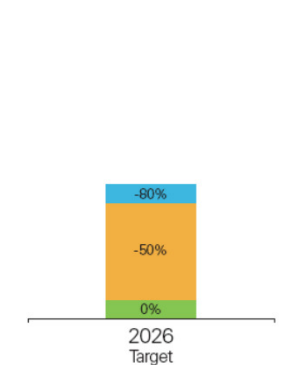
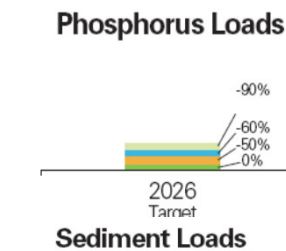
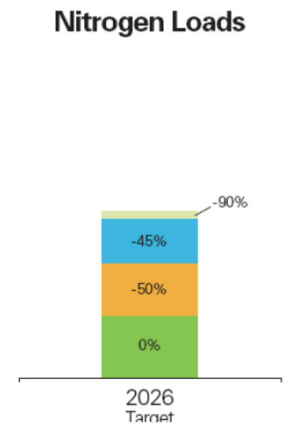
Science plays a critical role in the Partnership



A framework for Action: SEQ Healthy Waterways Strategy



- **500 Physical & Enabling Actions**
- **Physical Actions**
 - *Wastewater reuse*
 - *Water Sensitive Urban Design*
 - *Riparian Restoration*
 - *Protection of High Ecological Value areas*
- **Enabling Actions**
 - *Research*
 - *Monitoring*
 - *Communication, Education & Motivation*



Achievement of Water Quality Objectives

Australia-China Environment Development Partnership: River Health and Environmental Flows in China



Australian Government
AusAID



YELLOW RIVER

INTERNATIONAL
WATERCENTRE

Project objective

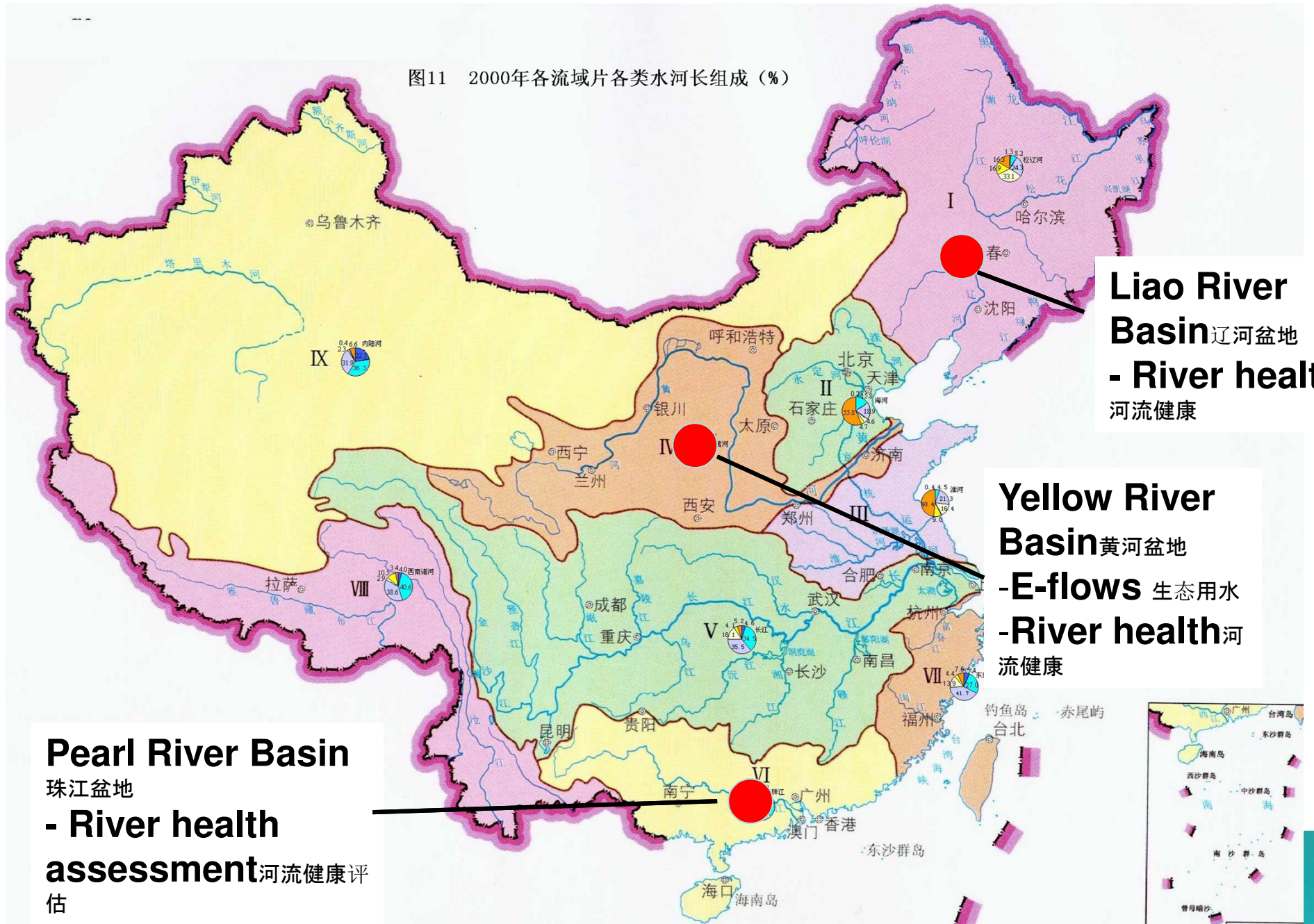
- Trial international approaches to river health assessment and environmental flows assessment
- Consider application to national-level policies

River health assessment methodology

Underlying philosophy

1. River health is important
2. River health is much more than the quality of the water
3. Biological indicators can be more sensitive to changes in river condition and climate change impacts
4. Biological monitoring programs can provide valuable support to management for effective decision making
5. Monitoring should focus on assets of importance

图11 2000年各流域片各类水河长组成 (%)

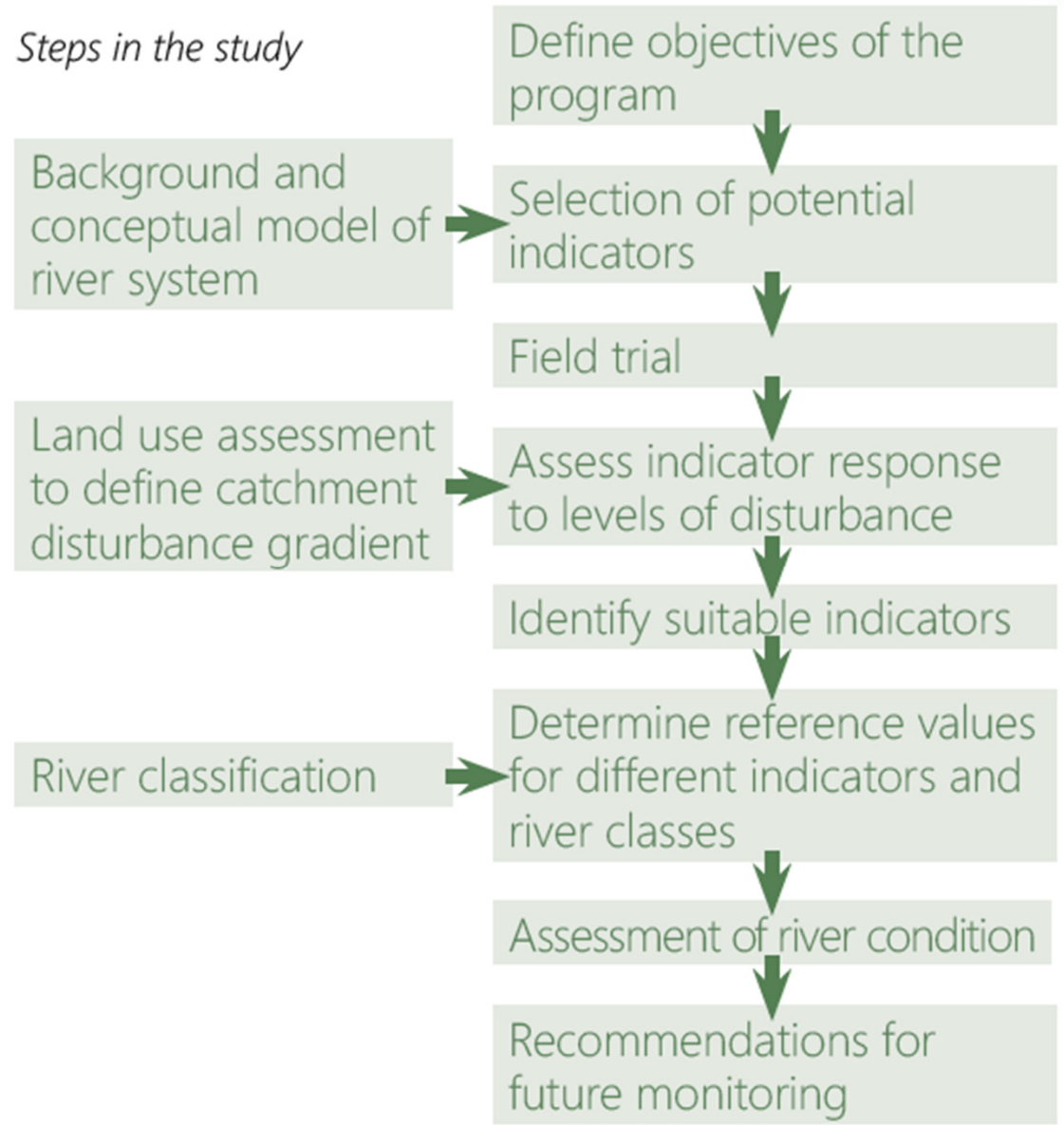


Liao River Basin
辽河盆地
- River health
河流健康

Yellow River Basin
黄河盆地
- E-flows 生态用水
- River health 河流健康

Pearl River Basin
珠江盆地
- River health
assessment 河流健康评估

Steps in the study



River classification: Liao River

