Item: 2014 Update SEQ NRM Plan - Science Report
Date: June, 2015

SEQ Natural Resource Management Plan

2014 Update Science Report




Document for the 2014 Update of the SEQ NRM Plan

Acknowledgements

This report would not have been possible without the knowledge and involvement of the scientists and community experts who took part in the Working Groups and Expert Panel (Appendix A).

The University of Queensland at St Lucia provided a room at the Global Change Institute for the Expert Panel. Thankyou to Catherine Lovelock from UQ for organizing the use of this very comfortable and cutting edge venue.

The data and information to support the Expert Panel was provided by a number of state agencies and local governments and research and community organisations.

The maps and statistics for the Expert Panel process were provided by SEQ Catchment's Mapping Unit namely Shannon Mooney, Mik Petter and Melissa Walker supported by Corey Groves and Andrew Davidson.

The 2014 Update Project Reference Group provided support and feedback.

This report was authored by Andrew Davidson with editorial support from Melissa Walker.

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Introduction

The 2014 Update Science Report provides a record of expert input to the science on which the evaluation of progress to achieve targets in the SEQ Natural Resource Management Plan (2009-2031) was based. The resulting report *South East Queensland Natural Assets Status Report: Interim Evaluation of progress against the 2009-2031 South East Queensland Natural Resource Management Plan Targets, June 2014* is Document no. 2 for the 2014 Update of the SEQ NRM Plan.

The Status Report was produced to identity trends in the extent and in some cases the condition of key natural assets in the SEQ Region.

This also identified gaps in knowledge which can become the focus of further research.

Working Groups

A series of Working Groups were conducted between July and October 2013 to identify the availability of updated data sets and how they might be utilised to measure change since the benchmark was set and adopted in 2009. The program of Working Group meetings is shown in Appendix B.

First Draft of the 2014 Update Science Report

The first draft of the 2014 Update Science Report was based on the input from the Working Groups and an intensive investigation of available data and research by the 2014 Update Project Team. The draft included the data, methodology and comparison results between the benchmark year and the most recent update and supporting maps. The draft was made available on Google Docs a month before the Expert Panel for the Expert Panel Network (Appendix A) to access and provide input.

Accessing the document through Google Docs allowed all feedback to be located in one place. This mechanism also allowed the draft report to be reviewed in real time by multiple users at the Expert Panel.

The Google Docs site contained the following information (where available) on all 41 targets:

Background to the target
SEQ NRM Plan Target
Preliminary Results
Comparison
Methodology for Update:
• Benchmark • Update • Issues with data and review process

Results:
• Maps • Statistics • Comparison to Benchmark data and results
Experts were then invited to respond to the following strategic questions:
1. What are the top 5 factors affecting the progression of this target?
2. What are the impacts likely to occur in the future? • Potential Climate Change Impacts on Target • Impacts of growth (development and infrastructure provision etc.) • Other Impacts
3. What are the top 3 initiatives that would enable us to achieve the target by 2031?
4. What short term target should we aim for by 2019 to enable us to meet our 2031 target?
5. Could this target be improved? If so how? Are we measuring the right attribute?

The Expert Panel

The Expert Panel was held on the 4th of December, 2013 with the following objectives to:

1. Reach consensus on the trends in the extent and condition of natural assets covered by the SEQ NRM Plan;
2. Populate a systems model of the SEQ Region informed by the outcomes of Objective 1 (a draft model to be presented on the day as a starting point);
3. Consider the impacts growth and climate projections may have on the resilience of the system.

The Panel was based on Natural Assets with five groups namely:

- Water and Coastal and Marine;
- Land;
- Social;
- Nature Conservation; and
- Regional Landscapes.

Experts joined these groups at the Panel based on interests and expertise.

Outputs from the Panel identified key assets and areas of SEQ where these drivers may have significant impacts on the community, industry and the environment.

Outputs from the Panel also informed components of the systems diagram previously developed by the Systems Working Group (Appendix C). Members of this working group

developed a framework of target relationships and a biophysical hierarchy to simplify the communication of the results of the Panel (Appendix D).

Community Roundtables in February and March 2014 allowed land managers to provide local knowledge of issues and opportunities to address these potential impacts at a property or catchment scale.

Maps

This process provided updated versions of the maps to be used as base layers to overlay drivers of change such as climate and projected land use change. This identified key natural assets and areas in the region that may be impacted by these and other drivers. These areas have been identified as priorities for planning and investment to adapt or mitigate impacts where they are at odds with stated socioeconomic goals of the community.

Maps appear in the 2014 Update SEQ NRM Plan Target Atlas (under development).

Second Draft of the 2014 Update Science Report

The second draft was released after the community roundtables for further feedback from the Expert Network. This review was to originally take the form of another Expert Panel but in the interests of time and resources it was made available via email and any further input was incorporated to provide this final draft.

Land

Expert Panel and Working Group Members

Dan Brough (DSTIA)
Dan Smith (NRM)
Lauren Eyre (NRM)
Angela Pollett (NRM)
Paul Harris (NRM)
Jim Dale (SEQC)
Margie Milgate (SEQC)
David Putland (Growcom)
Andrew Biggs (NRM)
Bronwyn Burke (DSTIA)
Kate Goulding (NRM)
Sue-ellen Dear (NRM)

L1 - Salinity

SEQ NRM Plan Target
By 2031, the area of secondary salinisation in SEQ will be 10% less than in 2008.

Preliminary Results
Increase in salinity of 21ha

Comparison

To achieve the target of 10% less salinity by 2031, the new extent must be 15,929ha. However, increase may be a result of new study areas being added rather than an increase in current salinity extent.

General Feedback:

- Need to understand why the change in salinity extent actually occurred. Why is the change happening and why it's that way in the mapping?
- Land use change mapping being updated through Queensland Land Use Mapping Project (QLUMP). Noosa and Maroochy area finished. All catchments of SEQ by 30th June 2014. Baseline land use is 1999. Update will be for 2011/2012. Need to identify where there is a high percentage change in land use ie good quality agricultural land.
- Possible update of salinity layer to be available.
- Salinity at Roadvale/Purga discovered to be half Great Artesian Bore water (Roger Shaw).
- With the absence of a complete layer for SEQ at a property scale, case studies could be used to show changes in salinity over time.

- Probably won't have salinity change data for the whole region. There may be a new regional extent layer by 2015 but dependent on resources.
- Long term impacts of salinity are unknown.
- Make some observations about what the numbers are saying from case studies of affected areas. Aim to update spatial layers every 10 years.
- Under NAPSWQ, there was about $140 million spent on salinity & water quality in QLD over 7 years. Pretty much all money spent on salinity was outside of SEQ. However >75% of the salt affected land and probably >90% of the economic impacts from salinity are in SEQ.
- Salinity is the number one NRM and planning issue in SEQ. Water quality, erosion etc are all linked back to salinity and related factors.

1. **What are the major factors that have impacted this issue?**

- Improved irrigation practices could have reduced the impacts of rising water tables in irrigation areas. (What role did Land and Water Management Plans play?).
- More deep rooted tree establishment on groundwater recharge areas.
- More tree establishment adjacent to saline outbreaks using salt tolerant species (to pinch off outbreaks) using surface drainage and mounding techniques.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- As water supplies become scarcer due to climate change, salinity-related impacts are expected to rise (Connor et al. 2012).
- Any reduction in annual rainfall may result in less groundwater recharge and consequently less dryland salinity risk and water logging. However, if reduced winter rainfall is offset by increased summer rainfall, dryland salinization may actually increase (John, Pannell &Kingwell 2005).
- Climate change (rainfall, temperatures and frost risk) will change the yields of different land uses, affecting the relative attractiveness of land uses for salinity-management (John, Pannell &Kingwell 2005).
- Climate change may alter production patterns internationally, driving changes in the relative prices of agricultural products, affecting the relative attractiveness of land uses for salinity-management (John, Pannell &Kingwell 2005).
- Changes in yields and prices affect the overall profitability of farms, which affects the capacity of farmers to adopt some of the salinity-management practices that have high up-front costs (John, Pannell &Kingwell 2005).
- If climate change policy leads to the establishment of markets for carbon credits, this would influence the adoption of woody perennials, which are recommended for salinity management in some cases. Likewise, farmers' usage of perennial plants may

change in response to climate change, and so how their ability to manage salinity may be affected (John, Pannell &Kingwell 2005).

- Adoption of woody perennials for purposes of salinity management would sequester carbon and contribute, at least a little, to mitigation of climate change (John, Pannell and Kingwell 2005).

Impacts of growth (development and infrastructure provision etc.)

- Infrastructure (eg Blacksnake Creek Report). Impacts especially on hard infrastructure (pipes, roads). Transport and Main Roads, Powerlink, SEQ Water have all experienced the impacts of salinity.
- Consult with Department of Main Roads on costs to infrastructure.

3. **What are the top initiatives that would enable us to achieve the target by 2031?**

- Learn from the experience of landholders managing salinity.
- Education and support for best management.
- Recognise salinity as a land use management issue in Planning Schemes (Lockyer Valley Regional Council case study)
- Engineering solutions provide options in the short term.
- Continue monitoring.
- Landscape approach to management with the integration of what is already occurring and has worked.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Update mapping of the extent of salinity by 2018/2019.
- Develop 3 or 4 more quality case studies to understand processes and economic impacts - case studies can gather data anecdotally.
- Huge gaps in short term data - it exists, but making the links is difficult.
- Promote salinity as a legitimate reason why NRM is critical eg. costs to infrastructure.
- Work with universities to explore salinity issues (eg PhD Projects).
- Identify salinity hotspots and develop case studies to raise awareness of the affect on society and the economy people – include salinity impacts under a variable climate.
- Revisit and utilize salinity hazard work undertaken under the National Action Plan for Salinity and Water Quality to raise awareness and identify trends.

5. **Could this target be improved?**

- Need to be able to measure it more precisely.

- Issues remain with capturing and understanding spatial data and the landscape processes that lead to salinity.

L2 – Agricultural Land

SEQ NRM Plan Target
By 2031, >90% (>266 667 ha) of SEQ agricultural land at 2004 will be available for sustainable agriculture.

Preliminary results
Review of land use and cover is required to shed further light on the evaluation of this target.

General Feedback:

- Queensland Government Agricultural Land Audit provides direction for the achievement of this target.
- Target relies heavily on the regulatory aspects of the SEQ Regional Plan. The new SEQ Regional Plan will set the scene for how any land use conflicts will be resolved.
- Where does the equine industry and recreational use fit in to land use on agricultural land? To be factored into the recreational targets in the NRM Plan.
- Continuous biophysical dataset has been completed - difficult to compare due to change in mapping methodology driven by policy changes.
- Analyse the change in use of agricultural land as soil doesn't necessarily determine land use. It is also based on other factors eg access to water, infrastructure etc.. However having a high quality soil allows land use versatility.
- Current SEQ Regional Plan Regional Landscape areas based on production and value.
- Agricultural Land and utilisation based on soil, landuse, land suitability, infrastructure, resources (water etc)
- How do we include all aspects of agricultural industry in NRM planning and implementation?
- Industry is not necessarily based on land type.
- Planning and policy gap, not about NRM Planning - covering off on all industries
- Preservation and versatility of good quality agricultural land. Industry change is not as big a deal as land use change.
- Management outcomes are important which ties in with water quality targets.
- Could use this as an opportunity to highlight management shortfalls.
- Fragmentation having impact (monitoring required). Planning solutions to this impact are required.

1. **What are the major factors that have impacted this target?**

- General economic conditions, particularly as they impact on interstate migration and demand for new housing (including availability of finance).

- Agricultural commodity prices and natural disasters as they impact on profitability of agricultural enterprises in SEQ.
- Local Government planning schemes in relation to housing style and density.
- Development of major transport and other infrastructure.
- Urban encroachment accompanied by NIMBY complaints.
- Possible case study approach required to build our knowledge on this target e.g. where do equine industry/holdings exist (DAFF link - Biosecurity Qld).
- It would be helpful to refer to QFF's Guidelines for Planning for Healthy Agriculture, which includes some case studies etc.. [http://www.qff.org.au/policy-projects/our-work/planning/]

2. What are the impacts likely to occur in the future?

Potential Climate Change Impacts on Target

- Annual cropping: The grains industry, Australia's largest crop-based industry, is sensitive to the timing of frosts with respect to the phenology of the plant and to cumulative temperature sums (Steffen et al. 2010).
- Dairy cattle: The dairy industry is one of the more vulnerable to rising temperatures due to the sensitivity of dairy cattle to heat stress (high temperature coupled with high humidity) (Steffen et al. 2010).
- Horticulture: Higher night temperatures are a risk for some late harvested varieties of fruit, maximum temperature limits exist for some varieties, and chilling requirements are common for many varieties (Steffen et al. 2010).
- Yields of horticultural crops may be more closely related to specific events rather than mean climate throughout a growing season (reviewed in McKeown et al., 2006). Temperature can affect horticulture crops in many ways, including the timing and reliability of plant growth, flowering, fruit growth, and ripening. As a result, crop-specific temperature related thresholds are frequently a critical production factor.
- The timing of specific events (eg. hot days) relative to phenological stages can be important.
- There is likely to be a southward movement of pests and diseases as the southern regions warm (Hennessy 2011).
- Moderate warming in the absence of rainfall declines can be beneficial to some agricultural crops, and higher levels of carbon dioxide can stimulate plant growth. Additionally, frost may be reduced and the prospect for a longer growing season for some crops (Hennessy 2011).
- Agricultural productivity can also be disrupted due to damage to crops caused by climate extremes, such as heat waves, storms, droughts, and flooding (Anwar et al. 2012)
- Changes in water availability under a variable climate.
- Loss of bushland and pollinators for crops.

- Effects on quality, appearance, marketability and price of products under a variable climate.

Impacts of growth (development and infrastructure provision etc.)

- Fragmentation of agricultural enterprises and impacts on productivity.
- Pressure for more peri urban and urban land under current population projections.
- Competition for water between agriculture irrigation and stock and urban domestic/industrial use.
- Community pressure for increased restrictions on agricultural activities due to complaints from residential communities adjoining agricultural land e.g. noise, smells, spray drift etc.

Other Impacts

- Succession planning as the age of farmers increasing and a corresponding declining interest from younger generations in agriculture. Farms are being broken up in succession rather than being passed to new farmer.
- Ongoing issues with access to labour.
- Increasing WH&S issues especially as agricultural land and residential land comes into conflict.
- Some adaptation options may require increased energy and water use.
- Potential for production season to shift relative to market window.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

- Agriculture made the priority use of good quality agricultural land e.g. by subdivision limits, by "right to farm' provisions in planning schemes etc.
- Incentives for young people to farm e.g. incubator programs, mentoring programs, Education programs for urban communities eg city farms, farmers markets, volunteer outreach programs.
- Agriculture will move up the list of priority land uses and attractive career options when profitability improves.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- All A/B and priority C land identified in Planning Schemes and protected for agricultural use with provisions related to minimum lot sizes, set backs (on adjoining land) etc.
- Consider attribute about the health of the agriculture industry (eg. participation in farmer incubator programs etc.).
- Produce seamless landuse change and soils mapping for SEQ.

5. **Could this target be improved?**

- Measurement of actual area of productive agricultural land required for food and fibre production.
- If agricultural production is the concern consider something more directly related to production eg balance of trade for farmers.
- Future losses of agricultural land might result in increased areas of biodiversity, which maybe a good outcome for other targets in the NRM Plan.
- Include regular land use change monitored using remote sensing of land uses that exclude land from agricultural use long-term eg urban, infrastructure, resource extraction, water storages etc.
- A/B land is largely horticultural and C largely grazing - the threshold lot size would logically be very different ie much greater for C class than for A/B. More like 5-10 ha for A/B and 50-100 ha for C.
- Mention in background information about impact that subdivision has on land value per unit area ie alternative uses to agriculture are able to pay a higher price per ha for smaller parcels.
- According to AFI 2012 the total area of farmland in SEQ has declined on average by 2.8% per year 1997 to 2009.

L3 – Soil Acidity

SEQ NRM Plan Target

By 2031, the area of acidified agricultural soils within SEQ will be reduced by 50% from the 2008 baseline.

Preliminary Results
No new updates. Qld Land Use Mapping Program update required.

General Feedback:

- Need to know more about acidity (Risk Map).
- Currently looking at the rate of change of acidity (buffering capacity).
- This is tied with soil health (L4) target.
- Refer to data capture plan for Wide Bay.

1. **What are the major factors that have impacted this target?**

- Changing land uses and management practices (local scale impact) - good agricultural practice rather than BMP.
- Climate especially the wet weather.
- Re use of grey water and other systems (mgmt).
- Need further refinement of where acidity occurs.
- Where is it occurring and at what depth? It is a bigger problem down south when trying to grow legumes.
- Refer to work on soil health done by Phil Moody (NRM) and Ian Layden (DAFF).
- More education required to make land managers more aware of the risk.
- Rate low to high risk based on soil type, crop and land management.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Alterations of the rainfall patterns on a large scale occurring as a consequence of climate change and variability will have an effect on soil pH that has yet to be modelled and eventually quantified over the relevant time scales (Rengel 2011).
- Further impacts on soils from extreme through events - more sodic and less buffering capacity.

Impacts of growth (development and infrastructure provision etc.)

- Not covered by panel.

Other Impacts

- Concern about other industry usage ie CSG.
- Processes that cause acidic soils:
    - Removal of plant and animal products,
    - Leaching of nitrogen (When there is more nitrate in the soil than the plants can use, the nitrate can leach into the groundwater system, leaving more hydrogen ions in the soil),
    - Excessive build-up of organic matter (e.g. through long term and regular use of particular fertilisers on improved pastures),
    - The mismanagement of artificial nitrogen fertilizers.

3. **What are the top initiatives that would enable us to achieve the target by 2031?**

- Better understanding of where the problem areas are and what management regimes are in place (monitoring).
- Identify cluster areas (hot spots).

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Better understanding and start monitoring.
- Identify management practices that are impacting on soil acidity.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- Need acidity benchmarks for high intensity farming on different geological strata and hence supporting different underlying soils with different inherent pH profiles.
- The regular angular outlines of the risk areas on the change maps suggests that DCDB boundaries have been used which further suggests that salinity risk has been aligned with certain land uses which might cause water tables to rise as a result of contemporary practices.
- A surrogate measure can't be used with any degree of accuracy, particularly if land use has changed over time, or there had been a substantial improvement in best practice.
- Example Dairying: No of properties involved has decreased dramatically, effluent disposal systems have improved etc.

L4 – Soil Organic Matter

SEQ NRM Plan Target

By 2031, the level of soil organic matter (carbon in t/ha) in agricultural soils will be higher than in 2008 or baseline year.

Preliminary Results

No new updates.

General Feedback:

- We have a lot of historical point data. Not much data on extent and condition.
- Monitor soil types in 1 or 2 industries.
- Case studies required, integration of current effort or awareness.
- Explore options to capture existing soil monitoring data and integrating for SEQ.
- Refer to www.soilhealth.org
- No one has come up with a way to sustainably increase organic matter?
- A lot of issues tie in with soil acidity particularly management.
- If we had monitoring we could tick a lot of targets.
- Review the title of the target ie soil condition or soil resilience. Look at options to group other targets under this Asset area. Need to monitor soil health.
- Refer to the Soils National R and D program.

1. **What are the major factors that have impacted this target?**

- Unable to measure this target with any degree of accuracy. Consider using it as a "How statement" for improving soil health through best practices such as:
  - cane trash blanketing
  - green fertilizer applications
  - tree head mulching in final crop operations
  - conservation tillage systems
  - etc.
- Measure the productivity outcomes.
- Monitor the change of management.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Soil is potentially a major carbon (C) sink due to its C storage potential, which is generally greater than that of vegetation and a relatively stable pool of various organic and inorganic C fractions (Vågen&Winowiecki 2013).
- In response to the strong impact that agricultural management can have on the amount of organic carbon and nitrogen stored in soil and their rates of biological cycling, soils have the potential to reduce or enhance concentrations of greenhouse gases in the atmosphere. Concern also exists over the potential positive feedback that a changing climate may have on rates of greenhouse gas emission from soil. Climate projections for most of the agricultural regions of Australia suggest a warmer and drier future with greater extremes relative to current climate. Since emissions of greenhouse gases from soil derive from biological processes that are sensitive to soil temperature and water content, climate change may impact significantly on future emissions (Baldock et al. 2012).
- Hotter and drier conditions mean that carbon will burn off a lot quicker.

Impacts of growth (development and infrastructure provision etc.)

- Growth provides opportunities for improvement, increased food production, nutrient recycling, sustainable food production.

Other Impacts

- The outcomes of the carbon farming initiative, direct action plan etc. are currently unknown.

3. **What are the top initiatives that would enable us to achieve the target by 2031?**

- Productivity outcomes.
- Monitoring the change of management.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Introduce a monitoring program.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- Organic matter as a target is hard to achieve. Possibly as a result of changing from cropping to grazing. Pay landholders to change land use.
- Modify the target to include maintain organic matter as it is hard to increase organic matter.

L5 – Acid Sulfate Soils

SEQ NRM Plan Target

By 2031, the area of 'severe' acidification caused by the disturbance of ASS will be lower than in 2008.

Preliminary Results

- Area at risk calculated from unmodified state (and local?) survey and other data and mapping.

- Increased measured overall extent of ASS through additional mapping projects that have increased the baseline measurement on which the area of disturbance is analysed. However the over arching area of disturbed ASS is increasing.

- Comparison not valid as the Landcover mapping methodology has changed. Note road network is more accurate in 2009 example and sand bodies covered by shallow water in 2006 are now classified as ocean.

General Feedback:

- Real indicator is how much ASS is being disturbed.

1. **What are the major factors that have impacted this target?**

    - Urbanisation.
    - Plantation forestry practices.
    - Ongoing disturbance and planning developments approved (Councils tend to take a management approach),
    - Some of the old cane lands are PASS.
    - Minimal impacts from cropping.
    - Ground water level rising has potential to impact.
    - Physical risk of flooding.

2. **What are the impacts likely to occur in the future?**

    Potential Climate Change Impacts on Target

    - Projected climate change models highlights the possibility of an increase in the frequency and severity of extreme weather events such as droughts and heavy rains, which is likely to accelerate the acid generation in some circumstances and increase the frequency and magnitude of acid discharge. Sea level rise as a result of global warming will cause additional problems with coastal acid sulphate landscapes (Lin 2012).

- …predicted impacts have direct relevance to coastal acid sulfate soils landscapes, through either exacerbating sulfide oxidation by drought, re-instating reductive geochemical processes or changing the export and mobilisation of contaminants (Bush et al. 2010).
- The interaction of specific land management factors such as man-made drainage will also have a significant role in how the predicted impacts of climate change affect these landscapes (Bush et al. 2010).
- The increased likelihood of extreme weather events such as drought and floods and rising global temperatures are directly relevant to the redox and hydrological processes that influence acid sulfate soil behaviour and their impact on the environment (Bush et al. 2010).
- Understanding the potential impacts of climate change for coastal lowland acid sulfate soils is particularly important, given the utility of these areas for agriculture and urban communities, their unique capacity to cause extreme environmental degradation, and their sensitivity to climatic factors such as temperature and hydrology and susceptibility to sea-level inundation (Bush et al. 2010).

Impacts of growth (development and infrastructure provision etc.)

- Development will be constrained by ASS.
- New growth area at Caloundra South has potential to disturb ASS.

Other Impacts

- Not covered by panel.

3. **What are the top initiatives that would enable us to achieve the target by 2031?**

- Best practice infrastructure development on “at risk” soils.
- Land acquisition for environmental purposes and VCA/Land for Wildlife activities (link to wetland conservation).
- Planning limits land use change on ASS.
- Minimise and manage disturbance (transferable development rights etc.).
- Improved regional mapping to allow local government to better plan development and avoid high risk areas.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Conduct a case study/literature review of impacts of ASS on built infrastructure, similar to soil acidity (eg. economic cost of replacing piping damaged from acid).

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- Need to identify what areas have been disturbed.
- Improvements need to be made on how ASS is reported (disturbance and remediation),
- Closure reporting.

L6 – Soil Erosion

SEQ NRM Plan Target

By 2031, the extent of erosion from hill slopes and gullies will be reduced by 50% from the 2008 baseline.

Preliminary Results

Not currently available

General Feedback:

- Need to identify where the erosion is coming from and what is the process is.
- Recent studies indicate that hill slope contributes minimally.
- LiDAR becoming available to assist identification or areas and processes.
- Spatial tracing has been conducted.

1. **What are the major factors that have impacted this target?**

- Erosion has occurred at a large scale which is difficult to manage.
- Greater understanding of erosion at a property level is required.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Current prediction of climate change effects on soil erosion is subject to uncertainty due to the many interactive processes including rainfall erosivity, soil erodibility, and vegetative cover and landscape characteristics (Blanco-Canqui and Lal 2010).
- More intense rainfall events will increase flooding, affecting movements of nutrients, pollutants and sediments, erosion and riparian vegetation (Hughes 2010).

Impacts of growth (development and infrastructure provision etc.)

- Not covered by panel.

Other Impacts

- Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

- Understand the sources and types of erosion.

- Identify the potential of erosivity in other areas (based on the above).
- Undertake targeted works.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

    - Re run models in 2019 to see how accurate they were in predicting erosion.
    - Types and sources modelling (Jon Olley) to be applied for SEQ.
    - Build case study on evidence from modelling and local implementation.
    - Consolidate studies and reports (on the economics associated with erosion) e.g. SEQ Water study, Port of Brisbane, Managing what Matters.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

    - Match the target with erosion type and broaden erosion types listed – develop indicators.

L7 – Grazing Land Condition

SEQ NRM Plan Target

By 2031, 75% of grazing land in SEQ will be in a 'good' condition.

Preliminary Results

Not currently available.

General Feedback:

- Needs to be monitored on an annual basis.
- Need to set up `25' sites to monitor throughout the region and coordinate.
- Grazing Land Management outputs could feed into monitoring program.
- Surrogates including Bare Ground Index/Green Fractional Cover can provide temporal extent of ground cover.
- Find information available and link it back to target.
- Difficult to get traction through hobby farmers.
- Reference where grazing land statistics have come from e.g. QLUMP (1999).
- Action - We need an economic base to inform this target and show what outcomes are being received.
- Erosion is an easy target to elevate unlike the other targets e.g. soil acidity
- Need to align monitoring effort across targets.

1. **What are the major factors that have impacted this target?**

- Management.
- Monitoring and benchmarking what current condition is for grazing lands.
- Representativeness of monitoring sites.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- More intense rainfall events with no change in total rainfall quantity can lead to lower and more variable soil water content. As a consequence, the above-ground net primary production is reduced. This reduction is accompanied by a decrease in the livestock carrying capacity, which leads to an exacerbation of overgrazing (Tietjen and Jeltsch 2007).

- A 20% reduction in rainfall could reduce pasture productivity by 15%, and livestock weight gain by 12%, which would substantially reduce farm income (Hennessy 2011).
- Higher temperatures are likely to intensify water stress through increased potential evapotranspiration. However, increased atmospheric carbon dioxide (CO2) could mitigate these effects by increasing water use efficiency (Tietjen and Jeltsch 2007).
- Species composition may change in favour of woody shrubs, with negative implications for nutritive values" (Tietjen and Jeltsch 2007).

Impacts of growth (development and infrastructure provision etc.)

- Not covered by panel.

Other Impacts

- Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

- Complete an economic analysis of GLM good condition verse GLM poor condition and establish economic returns and drivers.
- Action – Develop a program to collect statistics on management change and uptake of improved practices.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Action - Consolidate GLM information for regional snapshot.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- Not specified.

L8 – Land Contamination

SEQ NRM Plan Target

By 2031, existing contamination sites and off-site impacts will be reduced; and no new sites will be created over the 2008 baseline data.

Comparison

- Not currently available

1. **What are the major factors that have impacted this target?**

    - Chemical company recycling of bulk herbicide containers, and disposal services for smaller containers.
    - Drum Muster programs.
    - Improved Council handling and recycling facilities (provided that they continue to be within acceptable cost).
    - Asbestos regulations.
    - EPA regulation and monitoring.

2. **What are the impacts likely to occur in the future?**

    Potential Climate Change Impacts on Target

    - Not covered by panel.

    Impacts of growth (development and infrastructure provision etc.)

    - Not covered by panel.

    Other Impacts

    - Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

    - Not specified.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

    - Not specified.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

    - Right attribute but need area data.

- If things are going the right way, the areas should not increase significantly other than to accommodate increased burial/storage at existing sites.

L9 – Extractive Resources

SEQ NRM Plan Target

By 2031, extractive resources within "key resource areas" in SEQ will be available for their highest use with no net loss of other environmental and landscape values.

Preliminary Results

26,527 ha (92%) of the total 28,845ha covered by proposed KRAs contain remnant Vegetation. Endangered and Of Concern REs represent 1,642ha (6%).

General Feedback:

Other values to consider:

Environmental:

- Vegetation Fragmentation and Connectivity- consider also the impact of dedicated transport infrastructure required for resource extraction activities
- Wetlands
- Air and Noise pollution
- Agricultural land
- Soil
- Land contamination?

Landscape:

- Heritage sites
- Scenic Amenity

1. **What are the major factors that have impacted this target?**

Not specified.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- The industry has both direct and indirect dependence on suitable natural conditions – including a habitable climate, access to water resources, and presence of supporting infrastructure.

Impacts of growth (development and infrastructure provision etc.)

- Not covered by panel.

Other Impacts

- Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

    - Not specified.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

    - Not specified.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

    - Not specified.

Water

Expert Panel and Working Group Members

James Udy (HW)
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Cameron Wearing (Seqwater)
Ashley Bleakley (DNRM)
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Mal Cox (QUT)

W 1 – Environmental Flows

SEQ NRM Plan Target

By 2031, environmental flows will meet aquatic ecosystem health and ecological process requirements.

General Feedback:

- Water Planning for environmental flows depends on models and decisions made – Water Resource Plans and Moreton Plan just released - no alignment between State and Federal environmental flow guidelines – lack of quantitative more a narrative guideline – change in land use and dynamics has more of an impact on flow then water resource plans.
- WRP determine flow requirements but do they actually met requirements? Need to access information – John Marshall monitoring species that are sensitive to water flow as an indicator of the dynamics of environmental flow.
- Consult with Satish Choy and Peter Negus (NRM) for further information.

1. **What are the major factors that have impacted this asset?**
    - Dam operating procedures - modelling environmental flows (ie consistent releases all year round or mimicking the natural ebb and flows of the original river flows).
    - Lack of resources to actually understand current environmental flows.

- Agricultural use.
- Urban development.
- Lack of understanding of hydrology and inorganic carbon loads together to optimise re-aeration.
- Lack of understanding about "what the optimal flow" is of many ecosystems.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Climate change presents new uncertainties about the variability of river flows, potentially leading to increased water-engineering responses and escalating ecosystem stress (Arthington et al. 2006).
- A global analysis of the potential effect of climate change on river basins indicates that rivers impacted by dams or extensive development will require more management interventions to protect ecosystems and people than basins with free flowing river (Palmer et al. 2008).

Impacts of growth (development and infrastructure provision etc.)

- Not covered by panel.

Other Impacts

- Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
    - Dam optimisation studies underway for Somerset, Wivenhoe and North Pine dams, provided that there is recognition for providing flood compartments.
    - Water Sensitive Urban Design (WSUD) is important in managing the hydrology in urban systems.
    - Increase in riparian revegetation.
    - Improved agricultural and grazing practices.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
    - Understand the relationship between DOC loads, hydrology (flow), and re-aeration.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**
    - Needs to be framed in terms of flood mitigation on the basis that there are regular releases to maintain the flood compartment.
    - Refer to target edits above.

W 2 – Groundwater Levels

SEQ NRM Plan Target

By 2031, 75% of SEQ Groundwater Resource Units will have ground water levels within identified acceptable annual ranges.

General Feedback:

- Need to establish what an acceptable annual range is. Establish the level that aquifers do not drop below (was 2007 the lowest in recent times).
- Need to establish the upper limits to avoid salinization eg Moreton Vale and Plain Creek in Lockyer Catchment discharges poor quality water but majority of times at low volumes but flows into Lockyer Creek and Brisbane River under dry it did influence.
- Still high salinity in surface water in Mid Brisbane River from Lockyer.
- Climate extremes influence levels with the build up to the 2011 floods meant the aquifer was nearly full anyway – capacity of aquifer is limited in large flow events– consider maintaining groundwater at a level where it can store some flood energy. Storing alternative supplies of water such as treated water to keep aquifer full may not be a good outcome if flood events cannot be stored.
- Modelling with MIKE etc. shows that an acceptable level is hard to define. Lots of done has been done over time.
- Inland and coastal different – salt water intrusion near coastline not as bigger issue for agriculture based inland in SEQ.
- Dry period impacts not run it too low through water efficient management - more benefit out of water for longer.
- Water quality becomes an issue as deeper bores are tapped. Sandy Creek Forest Hill in the Lockyer not being used as much due to change in cropping intensity. Poor quality water now heads down into Laidley Creek.
- Flows from Flagstone Creek in the Lockyer held back from Lockyer Creek but dry may see it flow to Lockyer.
- 40 bores monitored in Lockyer every 3 years – quality being collected but not accessible yet.
- Aquifers are not always on the alluvium – other areas as well.
- Results from representative bores being analysed to present the change in groundwater storage – difference between full and empty – establish trends in six areas in the Lockyer (6 areas) Warrill Bremer Crestbrook Stanley – Logan Albert Bribie South Straddie Moreton but not same process.
- NAP Bores were monitored outside of declared areas – expands knowledge of groundwater.

- Drilling logs for bores sunk outside of declared also another potential source of data. If drilling deeper than 6 metres, bores must be licensed.
- First areas – volume and percentage – 2007 – National Water Accounts.

1. **What are the major factors that have impacted this asset?**
    - Not specified.

2. **What are the impacts likely to occur in the future?**

    Potential Climate Change Impacts on Target
    - Increases in CO2 concentrations could result in changes to recharge of the order of 10%.
    - Increases in temperature are likely to result in substantial increases to recharge; however, this may be negated by land use change or ecological succession.
    - A 1% change in rainfall results in approximately a 2% change in recharge; however, this may be amplified in water limited environments.
    - Changes in recharge due to changes in vapour-pressure deficit are fairly minor, with a 10% increase only decreasing recharge by 1%.
    - Changes in recharge due to solar radiation show that recharge decreases 1–2% for a 1% increase in solar radiation.
    - Changes in recharge due to changes in rainfall intensity are specific to the environment being modelled (McCallum et al. 2011).

    Impacts of growth (development and infrastructure provision etc.)
    - Not covered by panel.

    Other Impacts
    - Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
    - Not specified.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
    - Not specified.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**
    - Not specified.

W 3 – Groundwater Quality

SEQ NRM Plan Target

By 2031, ground water quality (nutrients and EC measurements) in all SEQ Groundwater Resource Units will be within identified acceptable annual ranges.

General Feedback:

- Focus is still on the alluvium – need to expand.
- Groundwater also feeds waterfalls which tourists find nice to look at – deeper bedrock not a quality as much as quantity issue.
- Cameron Schulz has conducted work on groundwater systems models particularly on how to measure properties like quality. Questions about does it add anything to our understanding and measurement? Satish Choy is working on a process to prioritise methods to see if we can even measure some of these things.

1. **What are the major factors that have impacted this target?**
   - Not specified.

2. **What are the impacts likely to occur in the future?**

   Potential Climate Change Impacts on Target
   - Climate change presents new uncertainties about the variability of river flows, potentially leading to increased water-engineering responses and escalating ecosystem stress (Arthington et al. 2006).
   - A global analysis of the potential effect of climate change on river basins indicates that rivers impacted by dams or extensive development will require more management interventions to protect ecosystems and people than basins with free flowing river (Palmer et al. 2008).

   Impacts of growth (development and infrastructure provision etc.)
   - Not covered by panel.

   Other Impacts
   - Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
   - Not specified.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Not specified.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**
    - Not specified.

W 4 – Groundwater Dependent Ecosystems

SEQ NRM Plan Target

By 2031, the condition of groundwater ecosystems and groundwater dependent ecosystems will be within identified acceptable annual ranges.

General Feedback:

- Recommendation to use the Bureau of Meteorology groundwater data until the State Government's Groundwater Dependent Ecosystem mapping available in late 2014.
- Further input needed from Rod Fensham and Tim Ryan.

1. **What are the major factors that have impacted this target?**
   Not specified.

2. **What are the impacts likely to occur in the future?**

   Potential Climate Change Impacts on Target

   - The areas with the highest threat are associated with regions where groundwater abstraction is particularly intensive. Increasing water demand, which in a drying climate is likely to be accompanied by high rates of groundwater abstraction, may pose a further risk to groundwater-dependent ecosystem (Barron et al. 2012).

   Impacts of growth (development and infrastructure provision etc.)

   - Not covered by panel.

   Other Impacts

   - Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
   - Not specified.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
   - How to measure function and values of the groundwater dependent ecosystems (see below).

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- 2 targets should be set (1) no net loss of natural groundwater dependent ecosystems or change in their type and (2) no net loss of the groundwater dependent ecosystem functions and values.
- Mapping will soon be finalised for the first target to be measured against, however the second target will require a short term target to be set (i.e.)

W 5 – High Ecological Value Waterways

SEQ NRM Plan Target

In 2031, High Ecological Value waterways in SEQ will maintain their 2008 classification.

1. **What are the major factors that have impacted this target?**
    - Urban development;
    - Catchment management issues;
    - Land use;
    - Pest fish; and
    - Aquatic weeds.

    Refer to Coastal and Marine targets for marine impacts.

    Improvements due to activities like Water Sensitive Urban Design (WSUD).

2. **What are the impacts likely to occur in the future?**

    Potential Climate Change Impacts on Target
    - Being the interface between terrestrial and freshwater ecosystems, riparian ecosystems are affected by changes that occur to watercourses, catchments and riparian zones themselves (Catford et al. 2012).
    - Rapid changes in climate may reduce or eliminate habitable space for many species, alter species distributions, prompt changes in biotic interactions and will potentially alter ecosystem processes and services (Catford et al. 2012).
    - Human-mediated introduction of non-indigenous species is altering community composition at an ever-increasing rate. Predictions suggest that, under climate change, non-indigenous species will expand and reproduce in previously inhospitable areas and higher temperatures will favour traits that are usually possessed by non-indigenous species, facilitating their dominance (Catford et al. 2012).

    Impacts of growth (development and infrastructure provision etc.)
    - Not covered by panel.

    Other Impacts
    - Not covered by panel.

3. **What are the top initiatives that would enable us to achieve the target by 2031?**
    - River restoration;
    - Planning controls;
    - Same as those under Coastal and Marine targets;

- Investment required (should be in all targets);
- Protected areas.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
    - Strategies have been identified and being implemented to achieve target.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**
    - Maintain or improve the 2008 condition.
    - Needs more explanation around target to be easily understood to those not involved in establishing the HEV's initially.

W 6 – Waterways Maintenance and Enhancement

SEQ NRM Plan Target

In 2031, scheduled water quality objectives for all SEQ waterways will be achieved or exceeded.

General Feedback:

- Use the subcatchment health index (SC HI) etc. as surrogate with criteria related to Water Quality Objectives – weight one or drop one.
- Can models show that even if we fully vegetate riparian zones etc. that WQOs can even be met? Need a spatial representation of what SEQ needs to look like and whether it is worth continuing to try an achieve WQOs if not achievable.
- Model the extremes and then some scenarios in the middle around the 50% rule for both point source and diffuse management to understand how effective different investment activities are.
- 50% could assist achieve WQO just by coincidence – linked to ecological values as well – 10-20% riparian revegetation in right spots give the reduction in N and P – catchment action plans plus GDE SHI/John Olley's work – work on the 19 reporting catchments – one methodology could calibrate the other.
- Nitrogen an issue as it comes out in different forms.
- This target could inform water quality offsets.
- Establish the natural asset value. Raise awareness of the businesses that rely on these values.
- Consult with Andrew Moss.
- Healthy Waterways involvement in terms of objectives.
- Are the objectives set correctly?
- Target needs to clearly articulate what the objectives are within the target. Currently "objectives" could refer to anything.
- There is significant overlap between this target and a whole range of other targets. Need to ensure WQ issues aren't duplicated within the plan.
- Very easy to measure and record progress against the target if it is well set with measurable objectives.

1. **What are the major factors that have impacted this target?**
    - Not specified.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Floods and droughts are the main impacts of climate change on water availability (Delpla et al. 2009).
- Water pollution is directly linked to human activities of urban, industrial or agricultural origin, and climate change could lead to degradation in surface water quality as an indirect consequence of these activities (Delpla et al. 2009).

Impacts of growth (development and infrastructure provision etc.)

- Not covered by panel.

Other Impacts

- Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
    - Not specified.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
    - Not specified.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**
    - Yes - refer to general comments.

W 7 – Waterway Restoration

SEQ NRM Plan Target

By 2031, waterways classified as ranging from slightly to moderately disturbed and/or highly disturbed will have ecosystem health and ecological processes restored.

General Feedback:

- Rehabilitation needs to occur on catchment slopes not just riparian – Integrated Catchment Management required.
- Sediment sourcing recognising the key areas of channel and gully – John Olly's work can inform this.

1. **What are the major factors that have impacted this target?**
   - Not specified.

2. **What are the impacts likely to occur in the future?**

   Potential Climate Change Impacts on Target
   - Not covered by panel.

   Impacts of growth (development and infrastructure provision etc.)
   - Not covered by panel.

   Other Impacts
   - Not covered by panel.

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
   - Not specified.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
   - Not specified.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**
   - Not specified.

Nature Conservation

Expert Panel and Working Group Members

- Liz Gould (SEQC)
- Craig Hempel (EHP)
- Lindsey Jones (EHP)
- Mike Ronan (EHP)
- Christine Hosking (UQ)
- Narelle McCarthy (SCEC)
- Mik Petter (SEQC)
- Don Butler (Qld Herbarium)
- Robyn Kelly (SEQC)
- Paula Peters (EHP)
- Catherine Lovelock (UQ)

NC1 – Remnant and Woody Vegetation

SEQ NRM Plan Target

By 2031, the 2001 extent of regional vegetation cover – including both remnant vegetation (35%) and additional non-remnant woody vegetation (22%) – will be maintained or increased.

General:

- Clearing polygons (2001-2010) account for up to 4,272 extra ha of loss

1. **What are the top 5 factors that have impacted on this target?**
   - Clearing for development (rural residential) and associated infrastructure
   - Clearing for pasture land (rural residential and pasture conversion)
   - Mining

2. **What are the impacts that are likely to occur in the future?**
   - Increased incidence of fire (Likely; serious. For high-value, unique systems: likely; catastrophic - probably applies to all impacts)
   - Change of FPC and loss of small fragments - change of ecosystem type (Likely; serious. For high-value, unique systems: likely; catastrophic)

3. **Impacts of growth (development and infrastructure provision etc.)**
   - Would it be feasible to use netting factors to screen out road areas eg. National Parks and Conservation Parks (1%), State Forests (5%), rural areas (5% +), and urban areas (say 10%). These percentages would need to be determined by line transect sampling.
   - Infrastructure

- Development

Other Impacts

- Expansion of use under existing tenure (e.g. ecotourism, national parks, logging of state forests, grazing)
- Changes to legislation

4. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
   - Significant reforestation (private land, forestry) targeting restoration of ecological function based on ecosystem services
   - Minimise clearing for future development
   - Encourage offsetting

5. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

   ● Incorporate the financial consequences of the loss of ecosystem services in decision making;

   ● Minimise future losses through improved planning scheme and state infrastructure decisions;

   ● Encourage management and retention of re-growth for its land management and nature conservation values; and

   ● Re-establishment of native vegetation in high-priority areas aiming for 2000 ha per annum.

6. **Could this target be improved? If so how? Are we measuring the right attribute?**

   ● Target seems right, and attribute seems OK

   ● Investigate inclusion of condition measures looking at declines in values with respect to climate resilience and ecosystem services - resilience/refugia.

NC2 – Vegetation Fragmentation and Connectivity

SEQ NRM Plan Target

By 2031, there will be no net fragmentation of larger tracts (greater than 5000 ha), and 20% of priority smaller tracts (less than 5000 ha) will be better connected than the 2003 baseline.

1. **What are the top 5 factors that have impacted on this target?**
    1. Clearing (and re-establishment) of plantations (unlikely to affect the remnant component of this target;
    2. Possibly hot firing and other disturbance factors at critical measuring times and vulnerable locations (e.g. edges and pinch points);
    3. Development (urban expansion) for agriculture and housing;
    4. Road construction and other linear infrastructure; and
    5. Resource extraction.

2. **What are the impacts likely to occur in the future?**
    - All of the above
    - Similar to NC1 - smaller tracts are more vulnerable.
    - Will have flow-on effects to NC1 target - given 45% already impacted by fragmentation.

    Potential Climate Change Impacts on Target
    -

    Impacts of growth (development and infrastructure provision etc.)
    -

    Other Impacts
    -

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
    1. Identification of pinch-points and priority reconnections;
    2. As per NC1;
    3. Identification of corridors and potential corridors in the planning scheme and state planning policy; and
    4. Mitigate impacts of infrastructure on connectivity.

5. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
    - Investigate reconnecting the >5000 ha tract that was fragmented (Greenbank)
    - Investigate other opportunities to reconnect other tracts to get another >5000 ha
    - 17 greater than 5000 ha tracts

6. **Could this target be improved? If so how? Are we measuring the right attribute**?
    - The target is good, it's just that we can't assess it with existing tools. Presumably LiDAR technology would work to give us what we want, and it might be case of

waiting for improvements in SLATS to give this degree of detail in future evaluations of vegetation cover.

- Attribute confirmed.
- Supplement with measures that look at fragmentation impacts

Action – develop case studies that show impacts of fragmentation.

NC3 – Wetlands

SEQ NRM Plan Target

By 2031, the 2008 extent and condition of SEQ wetlands will be maintained or increased.

General

- Slight decrease in extent of some natural systems and increase in extent of modified systems.

1. **What are the top 5 factors that have impacted on this target?**
    1. Drainage and filling for urban development and also potentially changing from palustrine to lacustrine
    2. Changes in hydrology for agriculture, urban development, industry and infrastructure
    3. Prolonged drought (changing the ecological composition of the wetland over time)
    4. Weed and feral animal incursions
    5. Grazing
    6. Groundwater pumping
    7. Sand mining (NSI) and other extraction activities

2. **What are the impacts likely to occur in the future?**

    Potential Climate Change Impacts on Target
    - Advice of EHP that planning and land use decisions are likely to have a greater impact
    - Importance of wetlands as climate change refugia is not accounted for
    - Impact of sea level rise on coastal freshwater wetlands could be significant

    Impacts of growth (development and infrastructure provision etc.)
    - incompatible land uses, ie. that alter the structure and/or function of the wetland
    - Above impacts will be exacerbated

    Other Impacts

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
    1. Significant restoration required to improve ecological function based on ecosystem services
    2. Minimise modifications by future development
    3. Encourage re-establishment that creates functioning wetlands with significant natural values
    4. Come up with a wetland and riparian rehabilitation prioritisation to maintain and increase the extent

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

    - Establish a pilot programme using the prioritisation measure to re-establish 200 ha of wetlands (ideal if connected)
    - Condition target required.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

    - Not sure that the extent of wetlands can be increased other than by artificial formation (eg Swan Lake), or with better identification than is available within the benchmark.
    - Condition can certainly be improved
    - the condition component of this target needs further investigation as to how it can be measured using ecological functions and values Action - Case Studies?
    - 2 targets be set (1) no net loss of natural wetlands or change in their type and (2) no net loss of wetland functions and values. (consistent with targets in reef plan). Mapping is available for the first target to be measured against and this data has already been used to evaluate progress against the current target. For the second target, a number of tools are available that could be used to measure wetland functions (including the wetland field assessment tool) although these are not funded to be implemented as yet.
    - Separating wetlands into 'wetlands' and 'coastal wetlands' sections creates confusion.
    - The 'wetlands' and 'coastal wetlands' sections would sit better as one section in the 'water' division.

NC4 – Vulnerable Ecosystems

SEQ NRM Plan Target

By 2031, at least 4% of the original pre-clearing extents of vulnerable regional ecosystems will be represented in protective measures.

General:

Between 2001 and 2009, 4 poorly conserved ecosystems have reached the >4% target of pre-clearing extent represented in reserves. 21 poorly conserved ecosystems have had some extent reserved, but not met the 4% threshold. 14 ecosystems have had no change in status. The protected areas have been split into two categories, to represent potential loss of reserved ecosystems if the current State legislation review opens some reserves for timber extraction.

1. **What are the top 5 factors affecting the progression of this target?**
    - VCA's (but only Nature Refuges included, not Council VCAs; Nature Refuge program not operating strongly in SEQ);
    - Buffering activities;
    - Weed, fire and pest control; and
    - Limited acquisition of land for the purposes of conservation

2. **What are the impacts likely to occur in the future?**

    Potential Climate Change Impacts on Target
    - Many of these ecosystems are naturally restricted and/or highly fragmented and highly vulnerable to climate change impacts

    Impacts of growth (development and infrastructure provision etc.)
    - Similar to NC2

    Other Impacts
    - Change of state forest tenure;
    - Relaxation in protection and clearing controls for endangered and of concern ecosystems;
    - Feral species;
    - Outcomes of protected areas review still uncertain and could decrease the amount that is protected; and
    - Increased activity in protected areas that may be detrimental to ecosystem conservation

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**
    - Offset land acquisitions and subsequent constructive land management activities;
    - Seek exclusion of vulnerable ecosystems from detrimental activities resulting from change of tenure;

- A targeted programme for getting these areas into voluntary conservation measures (investigate VDEC and other eligible protections);
- Investigate threshold vulnerable ecosystems for priority recovery;
- Encourage EHP to continue to nature refuge programme; and
- Encourage Land for Wildlife and council VCA properties in areas with vulnerable ecosystems to increase the level of protection.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**
    - Prioritise vulnerable ecosystems and protective measures in the Moreton Basin (need to establish measurable target).
    - Ensure that 20,000 ha of vulnerable ecosystems in state forests are in conservation or protected status.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**
    - Categories and definitions need to be clarified without weakening the target

NC5 – Native Species

SEQ NRM Plan Target

In 2031, the 2008 conservation status of native species will be maintained or improved.

1. **What are the top 5 factors affecting the progression of this target?**

    - The factors affecting the status of native species in SEQ are many and varied. The most recent comprehensive analysis of major threats to a group of threatened species in SEQ is provided by DERM 2010 South East Queensland NRM region 'Back on Track' Biodiversity Action Plan. This plan assessed the major and minor threats to 96 priority species for the South East Queensland NRM region: 56 plants, one mollusc, three butterflies, seven fish, one frog, eleven reptiles, eight birds and nine mammals. The most critical threats to a large number of priority species for the South East Queensland NRM region are identified as 'Urban development' which was identified as a major threat to 31 species. Other major threats that affected large numbers of priority species were: Inappropriate fire regimes (30 species); Weeds (25 species); Clearing of vegetation (23 species); and Clearing of vegetation (resulting in fragmentation of habitat) (18 species). This provides an indication of the major factors affecting the status of native species in SEQ.

    - But also note there are important threats that are specific to some species (e.g. aquatic species) not included in the largely 'terrestrial' threats mentioned in the previous paragraph. These include Flow regime (major threat to 10 species) and Water quality (major threat to 6 species).

    - STC frequency and process affects this target (backlogging of listings was cleared in 2009 changes leading to major changes in status for large numbers of species)

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Generalist species are thought to deal with rapid environmental change, while it is likely;
- Climate change negatively impacts biological systems by directly affecting species and that species with more specialized ecological niches will face more severe challenges (Muñoz, Márquez& Real 2013);
- The ecological processes that sustain them as well as additively and synergistically exacerbating the impacts of other stressors (Prowse & Brook 2011); and
- Need to investigate species particularly vulnerable to climate change impacts (e.g. naturally restricted species).

- Modelling of climate change refugia by NCCARF/JCU may indicate which species are likely to lose their current 'climate envelopes' in SEQ;

- Exacerbation of existing threats (e.g. more severe and frequent fires); and
- Loss of habitat by sea level rise (directly, and by human movement away from inundated areas).

Impacts of growth (development and infrastructure provision etc.)

- Ongoing habitat loss and fragmentation;
- Death and injury to animals by vehicle strike (including boat strike); and
- Increased stress may also impact on animals through increased susceptibility to disease and lower rates of reproductive success (evidence may be available).

Other Impacts

- Lag effects / extinction debt. i.e. it may take some time for recent/current threats/changes to the landscape to become apparent in changes to species' status.

3. What are the top 3 initiatives that would enable us to achieve the target by 2031?

- Ensure STC meetings and process does not interfere with target review
- Identify how conservation status of the species that were listed at the beginning of the reporting period progresses or has changed (species by species)
- To establish a regional process to establish and review the priority species and their threat level
- Initiatives need to be broad if we wish to address all (or even most) major threats to native species (terrestrial and aquatic). For example:
- Increase / improve habitat for threatened species by halting habitat loss and reducing habitat degradation, and restoring habitat and connectivity.
- Effectively manage feral species (including weeds) in priority areas to achieve improved status of threatened species.
- Implement appropriate fire regimes in priority areas to achieve improved status of threatened species.
- Otherwise, we could select 3 more specific major threats that impact a large number of threatened species, and focus on these. The risk of this approach is that you may not be addressing all the threats impacting each individual species, so you may not improve species' status.
- Alternately, we could focus on addressing all of the threats to a small group of priority species at selected locations that are important for these species. The Back on Track Action Plan suggests priority species, threats and actions, and gives some location details.
- Another area that needs attention is improving the data on species' status by systematic surveys and targeted monitoring. Otherwise we will not be able to assess the effectiveness of our management actions and progress towards the target.

4. What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Establish a regional process

5. Could this target be improved? If so how? Are we measuring the right attribute?

- Not sure that it matters if survey areas don't fully coincide with regional boundaries, it is more important that the region is generally covered by surveys.

- Attribute seems right (provided that the criteria don’t keep changing regularly)
- Intent of the target is sound, but difficult to measure

NC 6 – Habitat for Priority Species

SEQ NRM Plan Target

By 2031, the 2001 extent and condition of habitat for priority taxa will be maintained or increased.

1. **What are the top 5 factors affecting the progression of this target?**

    - Vegetation loss/loss of habitat

2. **What are the impacts likely to occur in the future?**

    Potential Climate Change Impacts on Target

    Impacts of growth (development and infrastructure provision etc.)

    Other Impacts

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

    1. Improved information on species through habitat mapping and the collection of species records
    2. Use of species habitat data to prioritise restoration and re-establishment of habitat areas
    3. Ensure protection of the habitat to help maintain extent

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Establish a working group to determine a method for mapping and measuring this target more appropriately and accurately

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

Regional Landscape Asset

Expert Panel and Working Group Members

Membership of Expert Panel (4th December, 2013) and Working Group (27th August, 2013):

- Steve MacDonald (Regional Landscape and Open Space Advisory Committee)
- David Batt (Queensland Outdoor Recreation Federation)
- Piet Filet (Community)
- Darryl Low Choy (Griffith Uni)

RLA 1 – Landscape Heritage

SEQ NRM Plan Target

By 2031, at least 90% of the 2011 area of regionally important landscape heritage will be retained within each local government area.

General Feedback:

- Hard data June 2014 and the numbers would have grown (protected estate)
- A Cultural Heritage report was produced through DIP during the development of the SEQ Regional Plan.
- Need to confirm that council reserves are included
- Need to ascertain if there is any anecdotal evidence of condition/management of landscape over time.
- Griffith University has an IBISCA project looking at the history of iconic landscapes.
- Include land use mapping - down to the property scale - forestry, native forestry - will have a change data set from 1999 - 2011/12
- Also links to other targets
- Need to realize that targets about extent not so much management.
- This target is really open to interpretation, also overlaps many other targets, tries to do too much.
- Indigenous sites brings into issues of connection to country and privacy issues. This data can be hard to access. Also scale issues.
- Topography plays a large part in this target.
- Need to confirm that all protected heritage is on the register.
- Current maps are tenure blind.
- Jane Lennon as a consultant for the State of the Region Report (SORR) looked into the literature on this issue.
- Confirm that State forests and plantations included.
- Develop narratives around changes in tenure under NCA etc as part of the evaluation of this target.
- Check if update on Heritage Register has been made public.

- Is there a layer available illustrating the railway network?
- Brisbane Valley Rail Trail getting 30,000 visitors/year.
- Cunningham line etc.
- Rail Trails Australian Website may contain information on the usage of these assets.
- Good contact - Noel Thompson (Queensland Rail) – ph. 3306744 – noel.l.thompson@tmr.qld.gov.au
- Wikipedia entry on closed rail lines in Qld available.

Preliminary Results:
Inconclusive until further analysis of data.

1. **What are the top 5 factors that have impacted on this target?**

- Illegal dumping, fire - management (more the extent)
- Also illegal access (Beerburum forestry plantations)
- Landuse change data 1999-2011
- Weeds, pests etc (impacts)
- To be tenure inclusive
- Peri urban have no ability to manage weeds and pests - management regime - no capacity and time poor - Tie land use into this target.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Typically many species and biomes are predicted to be "driven out of reserves" by climate change. Communities and ecosystems will become less diverse as they will lose some species, and while other desirable species will theoretically experience increased ranges, they may not actually be able to migrate to reserves because of local geography and landscape barriers such as agricultural and urban areas (Dunlop et al. 2008).

Impacts of growth (development and infrastructure provision etc.)

- Indigenous representatives to talk anecdotally about heritage? Link to indigenous target??
- Bring it back to condition (loving to death?)
- Regional plan - projected growth for western corridor - 60% of population growth will be south of Brisbane River. Access to public land will be North of the river - travel will be difficult. Need to increase public and private providers for land access.
- Links to other targets - RLA2 and RLA 3

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Develop indicators that focus on true heritage values and what they actually are across SEQ
- Legislation change to identify cultural landscapes
- Define and describe landscape heritage
- Link to Qld Heritage Council that currently doesn't recognise cultural landscapes

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- These data appear to be measuring the areas of SF, NP, CP, and various other declared areas of marine conservation. ie. the boundaries are artificial in terms of landscape heritage values. Given that other targets use largely the same measurement criteria, perhaps this target can be deleted in preference to better describing and measuring other targets.

RLA 2 – Outdoor Recreation Settings

SEQ NRM Plan Target

By 2031, the 2011 extent of regional outdoor recreation settings will be maintained or increased.

Preliminary Results

Inconclusive until further analysis of data.

General Feedback

- Outdoor recreation occurs across all settings – outdoor vs indoor
- Wellbeing is not impacted by settings – people prefer more natural settings – conflicts with increased use and remaining natural.
- Semi natural areas being converted to different settings
- Settings 1-2 is primarily made up of estates/bushlands
- Urban Development Areas make difference
- Diversity for recreation and having a sustainable mix of recreational opportunities
- Light green areas on RLA Map could be targeted for public/private recreation
- Make it less complex – make it simple
- Heritage of Glenrock Regional Park is important
- Soldier Settlement Program – value beyond economic - eg Patrick Estate
- Sugarcane – Rocky Point
- Community Greenspace
    - Springfield Conservation Park
    - Calculate % of LGA by protected area
    - Sporting shooters properties not protected
    - Areas of low elevation not well represented.

1. **What are the top 5 factors that have impacted on this target?**
    - Range of activities that people do will increase but the relative popularity of each activity might change over the time. The type of recreation uses of the different landscape settings will generally increase over the time.
    - Recreation succession is a major issue in landscape classes 1-5 as generally speaking those areas tend to become more developed (less “natural”) over the time.

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Because outdoor recreation is resource-based, it has the potential to be impacted directly and indirectly by climate change (Richardson & Loomis 2004).

- The visitor's utility from his or her recreation experience may be directly affected by the weather. Changing temperature and precipitation may affect the visitor's decisions about the frequency or duration of future visits (Richardson & Loomis 2004).
- Changes in climate patterns may affect wildlife populations and the composition of vegetation in the park, and these changes may indirectly affect visitation behaviour (Richardson & Loomis 2004).

3. What are the top 3 initiatives that would enable us to achieve the target by 2031?

- Multiple use in light green areas (setting number 2)
- More outdoor recreation opportunities on private land
- Greater recognition of landscape recreational settings in planning

4. What short term target should we aim for by 2019 to enable us to meet our 2031 target?

-

5. Could this target be improved? If so how? Are we measuring the right attribute?

-

RLA 3 – Outdoor Recreation Demand

SEQ NRM Plan Target

By 2031, 90% of the demand for outdoor recreation will be met through a mix of public land, waterways and the voluntary provision of opportunities on private land.

Preliminary Results

Inconclusive until further analysis of data.

General Comments:

- Travel effort is a better measure of demand and usage
- What recreation areas are available close to urban expansion?
- Western corridor:
    - Southern side not much area
    - Northern side of Brisbane River
- Gold Coast City Council acquisitions not shown on current map.
- Future Growth Areas in SEQ Regional Plan now called Priority Development Areas (PDAs)
- Review the landscape map in current SEQRP
- DSDIP has assessed development potential of landscapes in SEQ based on a number of criteria conducive to development.
- Future and current use of pine plantations hugely contested. Subject to impacts from 4wd and motorbikes – cost of damage and policing could force timber industry out of these areas leaving it prone to real estate development.
- Alternative trail bike venue being explored elsewhere on the Sunshine Coast.
- Seqwater land removed from current analysis – 5% of SEQ, 50% of public owned green space. Recommendation is to put this land back into map.
- Confirm the area occupied by the BVRT. Connected trails across the region would provide efficient use of resource and recreation.

The current draft map shows travel time (as radii from a centroid town or suburb) – a poor surrogate for OR demand. May be able to do better as follows:

- Advice from QPWS is that 2012 QPWS camping permit data for QPWS-managed areas – NPs, State forests, & Recreation Areas - will (or is planned to be) available from the Qld Government data website (https://data.qld.gov.au/organization/national-parks-recreation-sport-and-racing) by mid Jan 2013. The QPWS camping permit data include:- home post code: # of people camping; # nights camped in each location; type of vehicle (if any) & destination location.
- From this data set, you may be able to analyse/mine to show recent/current participation in camping; travel distance/time from SEQ residence. Residence location in SEQ could be represented as a series of

centroids as per the current map. Assuming the same participation rate, we could also estimate increased demand from the OESR population growth projections (http://www.oesr.qld.gov.au/subjects/demography/population-projections/index.php)

- **Note 1:** Some data will be for inter-regional, inter-state and international campers – irrelevant for participation by SEQ residents but relevant for estimating total i.e. SEQ + inter-regional+ inter-state + international demand.
- **Note 2:** "Camping" usually involves participation in other outdoor recreation activities, depending on the particular site, including: bushwalking; swimming in creeks, rivers, lakes and the sea; fishing; mountain biking; rockclimbing; horse riding; etc. It may be possible to correlate the QPWS camping permit data with participation and unmet demand data from the 3 SEQ outdoor recreation demand studies and the associated "Trends report". See: http://www.nprsr.qld.gov.au/recreation/
- Note: Similar data from SEQ local government-managed camping grounds, caravan parks, and vehicles-on-beach permits (probably only Redland City Council for the latter) could also be used.

1. **What are the top 5 factors that have impacted on this target?**

- We have no measures of demand. It is an abstract value, therefore 90% is meaningless! What is usually used as a demand surrogate is the number of people who turn up ie. usage numbers. These are always increasing, but are not very well measured.
  Outdoor recreation demand surveys (last one done 1997, 2001 and 2007), other data available from Exercise Recreation and Sport Surveys (2001-2011) showing participation is significantly larger than participation in most of major sports. Camping permit data available not necessarily direct but indirectly QPW, Redland city council, sunshine coast councils.
- Confirm that Public land (including beaches), waterways and private land opportunities are the only opportunities for outdoor recreation ie 100% of demand.
- Population growth and concentration on the southern areas where the supply of recreation is less than in the north (Disparity of current and future distribution).
- Population growth across the region will continuously increase the demand for outdoor recreation activities.
- There's a strong correlation between outdoor recreation and tourism opportunities (eg: ecotourism, nature based, adventure) on private lands. It is highly likely that demand will increase and supply options will diversify for these type of activities

- The area of public owned land available per person has decreased from 0.17 ha per person in 2001 to 0.15 per person in 2007 (SORR 2008) which it has remained at to 2013.

  21.36% of SEQ is greenspace which is an increase from 2008 when it was 16% however this increase has not keep pace with population growth .

2. What are the impacts likely to occur in the future?

Potential Climate Change Impacts on Target

- "Outdoor recreation is intimately associated with the quality of the environment and the development of land use policies which preserve and enhance the renewable biophysical resources on which it rests. The state of these resources is climate dependent" (Smith 1990).
- Hazards of extreme weather events (bushfires, storms-lightening, very hot weather) will increase the potential for significant injuries and death in outdoor recreation activities.

Impacts of growth (development and infrastructure provision etc.)

- Loss of public and private foreshore land due to urban development

3. What are the top 3 initiatives that would enable us to achieve the target by 2031?

- Outdoor recreation demand would be influenced by the availability of opportunities eg trails, camping sites, accommodation, facilities etc.
- Improved access to areas, rather than restricted access.
- Not all outdoor recreation requires rich biodiversity or closed forests.
- Improved waterway health (better WQ) would encourage picnicking and swimming, canoeing etc.
- Encourage private enterprise outdoor recreation services on private land to complement outdoor recreation on public land.
- Better management of outdoor recreation across the entire landscape – on both public lands and private properties with owners 'consent.

4. What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Encourage private landholders to provide more outdoor recreation opportunities on their lands.

5. Could this target be improved? If so how? Are we measuring the right attribute?

- There is a nexus here! Better NRM will lead to better landscapes which presumably will attract more visitors. If access is not improved as well, then it is a moot point whether this will hold true.
- demand=visitor usage is dependent on a variety of things viz
    - airline strikes
    - disease epidemics
    - exchange rates
    - state of the economy (petrol prices)
    - competing attractions (1st test, Broncos home game etc)

RLA 4 – Regionally High Scenic Amenity

SEQ NRM Plan Target

By 2031, the area of regionally high scenic amenity will be maintained or improved from the 2004 baseline.

Preliminary Results

Overall, there was an increase in smaller lots and a decrease in larger lots. At least 1.1% of Regional Scenic Amenity has been affected by a reduction in lot size to <16ha. Updated scenic amenity map to be produced for consideration in the SEQ Regional Plan. Advice on updated scenic amenity map received from Rob Preston.

General comments:

- Have to be careful with target as we need to know what the landscape looked like before change.
- PDA sites – most impact on amenity
- Buildings and infrastructure detracts from scenic amenity
- 500kVa powerline requires a 500m buffer
- Change at least by one category with landscape features
- Glasshouse Mountains and development
- Narrative
- Quality of scenic amenity is also important.
- Scenic amenity is greatest value
- 8/9/10 NP clearing? SLATs clearing polygons
- Natural hazards SPP
- Bushfire map coming out
- Floods – datasets – flood studies
- Landslip
- 15% slope trigger
- Maybe higher?
- Geomorphology more important
- Development on edge of basalt plateaus

DEM – does not show actual ground level views eg can have quarries behind trees
Combination of elements – eg lake and mountain
AILA issues with the visual exposure /view sheds – dependent on road and if they put a road in then it becomes higher amenity?
Scale – urban vs non urban
Landcover based on spectral analysis? 200yr old forest vs regrowth – can do with Lidar
Low amenity based on adjacent LG exposure?
Only the scenic value that is seen by people – additional data that can improve?
5,6,7 could be valuable if linked with another feature eg wild area etc.

AILA keen to work together to iron out issues raised.
Some LGs have refined the mapping – how does this reconcile with regional values?
Toondah Harbour? New map seems to pick up foreshores better
LG data included? Not at that scale at the moment.
Don't use implementation tool in current RP.
Tweak look up table to bring more pinks in or fold groups of 9s together for a 10
Road vs walking amenity?

Group to provide recommendations to enhance?
Regional important views?

1. **What are the top 5 factors that have impacted on this target?**

- Subdivision
- Clearing
- CSG
- Road network upgrades/infrastructure corridors - Powerlines
- Building heights on slopes/mountains
- Appreciation and greater awareness of scenic amenity and views

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

- Decisions to locate large scale renewable power generation to reduce CO_2emissions have been made in lieu of scenic amenity values (Mercer 2003).
- Vegetation changes
- Landslip scars and headwater protection/management

Impacts of growth (development and infrastructure provision etc.)

- 3,680ha of Regional Scenic Amenity have been affected by clearing.
- Sound barriers on the major roads

Other Impacts

- Potentially more significant on Sunshine Coast

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031?**

- Maintain integrity of the Urban Footprint concept
- Potential for offsets - unsure of what the mechanism would be...
- Promotion as an asset - tourism

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Largely planning controls, tie in with new SEQ Regional Plan

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- The words scenic amenity are right, it's just that the concept varies in the eyes of the viewer. Some people like gazing at undisturbed bushland, others are similarly moved by city vistas ie from the Wheel of Brisbane. Basically it depends on where you come from and what you like.
- Not sure that the measure technique is sound enough to draw conclusions
- regionally important scenic amenity (target wording)

RLA 5 – Locally Important Scenic Amenity

SEQ NRM Plan Target
By 2031, at least 80% of the 2004 area of locally important scenic amenity within each local government area will be retained.

Performance against target:
Overall, there was an increase in smaller lots and a decrease in larger lots. At least 1.4% of Local Scenic Amenity has been affected by a reduction in lot size to <16ha (2/3 of which is a reduction to <1ha). Updated scenic amenity map to be produced for consideration in the SEQ Regional Plan. Advice on updated scenic amenity map received from Rob Preston as follows:

- Map changes in positive and negative features where mapping is available
- e.g. positive features (i.e. contributing to high scenic preference
  - changes in water body extent
  - changes in native forest cover
- e.g. negative changes
  - industrial or commercial land use
  - tall buildings (e.g. areas with height limit of more than 7 storeys)
  - powerlines
- Cropping, roads and residential development are towards the middle of the range, so best to assess those components that are clearly + or – ve!
- Strongest impacts are within 500m, but also highly dependent on visual exposure, so tend not to buffer – just map raw changes in extent of the above factors.

General Comments:

- Cleared/developed/house decreases amenity – Rob Preston
- Powerline in high sensitive scores
- Pipeline
- Scenic amenity combination of
  - Quality
  - Preference

1. **What are the top 5 factors that have impacted on this target?**

- Urban development expansion
- Road network and limited opportunities facilities for scenic viewing by the road

2. **What are the impacts likely to occur in the future?**

Potential Climate Change Impacts on Target

-

Impacts of growth (development and infrastructure provision etc.)

- 18,700ha of Local Scenic Amenity have been affected by clearing.
- Loss of public and private foreshore land due to urban development

Other Impacts

3. What are the top 3 initiatives that would enable us to achieve the target by 2031?

- Limit peri urban development.
- Retain urban footprint concept
- Identify high scenic amenity value sites for public use

4. What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Identifying and developing high scenic amenity value sites for public use. Case studies of existing and like-potential sites can inform this process.
- Encourage all local governments to use the scenic amenity methodology to identify, protect and maintain amenity areas, view corridors and viewpoints.

5. Could this target be improved? If so how? Are we measuring the right attribute?

Air and Atmosphere

Working Group Members

Working Group on the 6th February, 2014:

David Wainwright (DSTIA)
Helen Fairweather (USC)
Julie Dean (UQ School of Population Health)
Paul Jagals (UQ)
Lidia Morawska (QUT)
Neil Tindale (USC)
Peter Waterman (USC)
Tadhg O'Loingsigh (Griffith Uni)
Michael Petter(SEQC)

A 1 – Greenhouse Gases

SEQ NRM Plan Target

By 2031, the region will make an equitable contribution to the national and regional targets for reduction in greenhouse gas emissions.

General

- State the justification for the air and atmosphere targets
- Mining and regulations - community groups
- Public health is a component of this asset area
- Need to adopt a holistic approach to air quality - lungs and vegetation
- High flouride from coal and impacts on vegetation are unknown
- Impacts on natural systems researched but not well known
- Is a focus on air and atmosphere the right approach or should we look at overall air quality?
- Adaptation at the local scale but mitigation needs to be in the mix somewhere.
- Mitigation seen as a larger scale action at Federal level while adaptation is a State, Regional and Local scale action.
- Climate refugia mapping is available for Ipswich City Council (ICC). Whole region to be done soon.
- Need to factor in emissions from natural systems and agriculture. Remote sensing work being done by Peter Grace. - Aspendale work
- How do we measure and map resilience and climate change? Identify vulnerability and develop action to address.
- Road emissions need to be factored in. Need access to road networks and road volumes to model. Department of Main Roads and Transport need to be approached for data. Does QUT have the data?

The National Pollutant Inventory 2005 (NPI) data was mapped. Data is point source only, primarily from large stationary sources. Carbon Monoxide (COx) was mapped using density function, grouping point source emissions for a 500 m radius. In urban areas, motor

vehicles are the major source of carbon monoxide. Power stations, domestic wood heaters and bushfires are other sources of carbon monoxide.

Results from Tarong Power Station are included in brackets because although the power station is not officially in the SEQ Airshed it is presumed to contribute pollutants to the Airshed.

What about other greenhouse gases relevant to NRM, eg. methane, nitrous oxide?

Currently unable to accurately map movement of compounds in SEQ airshed.

What short term target should we aim for by 2019 to enable us to meet our 2031 target?
An x reduction in private car use in metropolitan areas by 2019.

A2 – Air Quality

SEQ NRM Plan Target

By 2031, the levels of air pollutants in the SEQ air shed will be at or below the quality objectives in the appropriate Schedule of the Environmental Protection (Air) Policy 2008.

General:

- Air quality impacts on scenic amenity due to dust, aerosols, sea salt, emissions from pine plantations Studies on haze available from USA.
- Currently no monitoring in rural areas eg Upper Brisbane adjacent to Tarong Powerstation.
- PM 2.5 is a particular concern as it impacts on the respiratory system getting get down in the bottom of the lungs like asbestos.
- Is air quality currently measurable? Need to focus on impacts now but restricted to a certain range of factors.
- Regular monitoring of ultrafine particles conducted at QUT.
- There are criteria for impacts on vegetation criteria in EPP Air.
- Any work available on impacts on crop health?
- BOM have wind field data?
- Factor in wind direction from the road on distribution of emissions.
- SEQ Regional Air Quality Strategy (SEQRAQS) developed in 2008 – anything that can be brought forward to the Update?
- There was an ozone exceedance in 2011 due to bushfire but what is a natural event as they are not included in current data. Opportunity to build this into NRM.
- State of Environment (SoE) included mapping of where dust etc is coming from.
- There have been some NTox studies in Brisbane – David Wainwright has further information.
- Need to ascertain the total cumulative loads within the airshed/catchments and where they end up.
- Show links to health etc.
- What are the link to National Air Quality Targets and WHO guidelines?
- National Plan for Clean Air to be released sometime in 2014.
- End of 2012 - Burden of Disease study conducted – Particulate Matter is first environmental risk with lead also high. Update of this document needed - Qld data provided to the original study.
- Certain population groups particularly at risk. What is the risk to wildlife? Some work done on respiratory illness in cattle.
- Are there studies on impacts on plants and water quality?
- Study between 1958-62 of sheep in Canberra after dust storms showed a rise in tooth decay in sheep caused by abrasive dust on grass eaten by sheep. Dust storms transport iron to sea and contributes to algal blooms etc.
- There is evidence of bacterial species landing on the Great Barrier Reef in dust storms.
- CSIRO and EPA in Victoria studied nitrogen deposition. David Wainwright has details.
- Impacts on Birds is unknown.
- Land management practices can also lead to air quality issues.
- Actions - sources outside of the region and Qld

- Action could be to establish monitoring programs in target areas.
- Number of stations currently 12-13 in Greater Brisbane Area - none in Western Catchments of SEQ. CSIRO suggested a site in Lockyer.
- Are there appropriate on ground actions that can take nitrogen out of waterways above dams?
- Portable Monitoring station available – used for measurement of micro scale pollutants eg near roads - concentration measured – would it be available for monitoring to support the measurement of NRM Plan targets?
- WHO is developing a global platform of ground based satellites and models and integrate for use in health risk assessment – could this be done on a regional basis - eg what extent can satellite monitoring assist ground based monitoring?
- BOM ARC linkage project looked at the history of soil erosion back to 1860.
- If there were major urban downwind of pollutants then maybe but most think the pollutions just blows out to sea.
- Public awareness of air quality issues is low. Public awareness to promote action by governments into research etc. as SEQ used to be one of the hotspots for air quality issues.

- EHP Monitoring Network. Industry undertakes monitoring as per Environmental Authority conditions.

- Emissions from Port related traffic (i.e. trucks) is significant and increasing at an exponential rate. Air quality should be a major driver in logistics planning for new industrial rail access.

- New draft Air Quality NEPM has been released for public comment.

A 3 – Thermal pollution

SEQ NRM Plan target

By 2031, SEQ thermal pollution will be at or below 2003 levels.

General:

- Heat island
- Temp of waterways - carpark temp of water measured in EHMP and WW? Not continuous
- Stress
- Greater number of extreme days projected into the future.
- Planning and investment should support activities that reduce temperature effects.
- Target - heat island data and status of vegetation - based on scale too
- Infra red remote sensing
- Future cities Monash -heat island expert
- Identify which streams don't have riparian vegetation for revegetation to maximise cooling function of waterways.
- BOM heat island factor in forecasts
- Impacts of heat into riparian and water? WSUD?
- Option: MODIS thermal surface imaging may be available.

1. What are the top 5 factors that have impacted on this target?

- Land use planning.

A 4 – Noise Pollution

SEQ NRM Plan Target

By 2031, SEQ noise pollution will be at or below 1998 levels.

General:

- Wind and white noise change perception of noise
- Vegetation play a role in reducing noise?
- QT - physical not vegetation
- link to NRM?

1. What are the top 5 factors that have impacted on this target?

- Noise increases as a result of increased population, industry activity and transport. These are matters subject to regulation, which traditionally have not been applied so vigorously as to cause noise levels to decline significantly overall.

2. What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Get some measurement happening

3. Could this target be improved? If so how? Are we measuring the right attribute?

- Noise levels should continue to be monitored and reduced at the source of origin. The target should be able to be monitored and measured.
- Noise meters measure the amount of noise generated. If we measured the amount of noise occurring at a particular site over a period of years, we would probably expect an increase due to population increases that would likely mask reductions as a result of new technology eg vehicle road speed/noise interactions, quieter newer cars, quieter planes etc.

A 5 – Light Pollution

SEQ NRM Plan Target

By 2031, SEQ light pollution will be at or below 1998 levels.

Impacts on:

- Turtles etc.
- Human impacts - sleep, cancer etc.

Coastal and Marine

Expert Panel and Working Group Members:

- Jen Loder (Reef Check Australia)
- Arthur Knight (Wetlands Expert)
- Catherine Lovelock (UQ)
- Joel Bolzenius (SEQC Bay and Islands Community Engagement manager)
- Chris Roelfsema (UQ)
- Thomas Schlacher (USC)
- Julian O'Meara (SEQC)

Working Group and out of session contributions:

- Dr Janet Lanyon (UQ)
- Dr Alistair Grinham (SEQ Water)

CM 1 - Sea Grass and Mangroves

SEQ NRM Plan Target

By 2031, the extent and condition of seagrass and mangrove ecosystems (including salt marsh) in bays and estuaries will be greater than or equal to that in 1988 and 2001 respectively.

General:

- Action – For Moreton Bay use 2004 and 2011 data sets and indicative cover based on Seagrass Watch sampling outside of Moreton Bay.
- Action - investigate coastal data portal
- Difficult target to meet as seagrass and mangroves are susceptible to major weather events which can have significant impacts on coverages.

What are the top 5 factors that have impacted on this target?

1. Water quality changes flowing into Moreton Bay (catchment condition and decline) - Number 1 issue

- turbidity
- inorganic nutrients
- sedimentation
- Other sprays and pesticides associated with Ag activity
- Lyngbya & epiphetic organisms
- Degradation associated with floods.

2. Hydrology changes

- flooding impacts

- Mangrove invasion of salt marsh

3. Development of major infrastructure

- dredging in/around Moreton Bay

4. Recreational & Commercial Use Impacts

- Moorings & boat use, recreational use of ecosystems (e.g. 4WDs in saltmarsh, worm digging, pedestrian use,)
- Increased population of recreational users in Moreton Bay
- Pedestrian impacts
- Caleurpa invasion as a result of disturbance.

5. Our ability to measure and record seagrass, mangrove and samphire etc growth (and loss) these ecosystems? Mostly suspected rather than hard evidence.

6. Changes to surrounding landscapes such as shoreline armoring resulting in changes to hydrology.

Impacts of growth (development and infrastructure provision etc.)

- Dune and bank erosion
- Siltation from erosion.

What are the top 3 initiatives that would enable us to achieve the target by 2031?

1. Remove all recreational impacts if possible (worming, moorings, pedestrian issues, 4x4 destruction impacts)
    - Improve catchment water quality
    - gully and stream erosion
    - landholder engagement
    - stormwater management
2. Manage all coastal infrastructure development smarter to avoid impacts.
    - WSUD principles adopted across SEQ - Link to community initiatives such as catchment groups etc.
    - Sediment and erosion control

What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Implement programs above.

Could this target be improved? If so how? Are we measuring the right attribute?

- Seems to be a suitable attribute to measure coastal health.
- The target talks about extent and condition but condition isn't currently measured within the Plan.
- Needs to be clearer that extent relates to each ecosystem rather than combined.
- Statistics need to be specific for each ecosystem (maps, tables etc.)
- Consider how realistic this target is.
- Target needs to be based on a long term average rather than a comparative figure.

CM 2 – Coral

SEQ NRM Plan Target

By 2031, the condition and spatial distribution of soft and hard corals will be maintained at least at 2005 levels.

General:

- Investigate the availability of 1999 Benthic Flora dataset that measured algal cover.
- Investigate availability of data on soft corals.
- Follow up some previous work done on reef composition and condition with Reef Check.

What are the top 5 factors affecting the progression of this target?

1. Similar impacts as with seagrass in terms of Water Quality impacts:

- More highly susceptible to water quality impacts including siltation, pollutants and nutrient levels
- Fire retardant has widespread distribution in storm water? Impact on coral unknown?

2. Anchor damage

3. Fishing pressures

4. Rubbish & Stormwater

- Recreational/Commercial impacts? - refer seagrass target

5. Loss of connected ecosystems

- Impacts of sea surface temperature changes?
- Impacts of marine debris on critical species
- Impacts from Drupella snails? (minimal but some hotspots observed)
- Impacts from Aquarium trade
- Discussion around pros/cons of Artificial reefs – What are the benefits and considerations in regards to how they may draw away resources - both natural and financial
- Changes taking place related to ecosystem processes and species ranges relating to climate change

6. Climate change

Investigate whether warm northern currents replenishing coral.

What are the top 3 initiatives that would enable us to achieve the target by 2031?

1. Water quality (Refer CM1 above)
2. Connectivity of habitats
3. Anchoring issues managed
4. Identification of key sites for protection
5. Community education about unique reefs of Moreton Bay

What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Specific health condition indicators identified & measured demonstrating maintenance of condition.

How could this target be improved? If so how? Are we measuring the right attribute?

- Marine habitat environments could possibly be combined through the 1 target (Combined with CM1) and incorporate issues that relate to whole ecosystem function (such as connectivity between ecosystems). Macroalgae should also be included as a specific ecosystem type. Refer to beaches target for discussion as to whether this could also be included (mudflats). Need further health measurements beyond extent, as this dataset will likely not be collected on regular basis (but can be long-term check-point). Suggest looking to percent hard and soft coral cover at key locations, algal communities, indicator invertebrate and fish abundance, visual reef health condition indicators such as coral bleaching, disease, damage and debris.
- target needs to be based on a long term average rather than a comparative figure.

CM 3 – Beaches

SEQ NRM Plan Target

By 2031, the condition of open coastlines (headlands, beaches and dunes) will be at or better than in 2006.

General:

- Other important goods and services that beaches provide are the recycling of nutrients, filtering of large volumes of seawater, irreplaceable habitat for iconic species that are valuable to people (e.g. turtles, seabirds), fisheries resources (e.g. surf-angling, bait collections), land for development (e.g. highly valuable real estate) and recreational opportunities (this is especially important in SE Queensland where much of the regions outdoor recreation is often concentrated on open beaches, particularly on the barrier islands such as North Stradbroke Island, Moreton Island and Fraser Island).
- This target could be firmed up by including some key ecological attributes and processes that should not decline over time.
- The target does not currently include area, this needs to be included (no net loss of natural coastal dune areas or 80% or 75% of current etc.)
- Need to measure the extent and condition of the primary dune.
- Ecological targets need to be incorporated (shorebirds, marine carbon processing rates)

More on beach ecosystem services:

- Dugan, J.E., Defeo, O., Jaramillo, E., Jones, A.R., Lastra, M., Nel, R., Peterson, C.H., Scapini, F., Schlacher, T., Schoeman, D.S. (2010) Give beach ecosystems their day in the sun. Science, 329(5996), 1146-1146.
- Schlacher, T.A., Schoeman, D.S., Dugan, J.E., Lastra, M., Jones, A., Scapini, F., McLachlan, A. (2008) Sandy beach ecosystems: key features, sampling issues, management challenges and climate change impacts. Marine Ecology - Evolutionary Perspective, 29 (S1), 70–90.

1. What are the top 5 factors that have impacted on this target?

1.) Habitat loss and changes: conversion of coastal dunes for human uses, shore armouring, beach nourishment;
2.) Ecologically destructive recreational use practices (e.g. 4WD vehicles);
3.) Invasion of conservation areas by dogs (non-feral) and foxes;
4.) Lack of explicit conservation planning for beaches and lack of protected areas;
5.) Detrimental human-wildlife interactions and fishing;

- Weather (storms/cyclones)

- Oil Spill
- Flooding debris accumulation
- General litter accumulation
- Development
- Increased usage of the beach

6.) Sea level rise

More on factors impacting on beaches and dunes:

- Defeo, O., McLachlan, A., Schoeman, D.S., Schlacher, T.A., Dugan, J., Jones, A., Lastra, M., Scapini, F. (2009) Threats to sandy beach ecosystems: A review. Estuarine Coastal and Shelf Science, 81(1), 1-12.
- Schlacher, T.A., Weston, M.A., Lynn, D.D., Connolly, R.M. (2013) Setback distances as a conservation tool in wildlife-human interactions: testing their efficacy for birds affected by vehicles on open-coast sandy beaches. PLoS ONE, 8(9), e71200.
- Schlacher, T.A., Dugan, J., Schoeman, D.S., Lastra, M., Jones, A., Scapini, F., McLachlan, A., Defeo, O. (2007) Sandy beaches at the brink. Diversity and Distributions, 13, 556-560.

2. What are the impacts likely to occur in the future?

There are no explicit and specific predictions for future changes to beaches. However, based on known response of beach ecosystems to human pressures (reviewed by Defeo et al 2009) and likely changes associated with global changes (IPPC fourth assessment) , and coastal growth in SE Queensland, a number of predictions are likely:

1.) Continuing urbanisation of sandy coastlines is THE major threat category, accelerating ecological changes, largely due to increased recreational use, habitat loss and deterioration, and contamination;

2.) Beaches are increasingly being trapped between rising seas on the marine sided and development on the land side: this 'coastal squeeze' is expected to amplify ecological impacts on coastal dunes and ocean beaches.

3.) The major impact associated with climate change is increased erosion of sandy shorelines, largely driven by predictions of stronger storm events. There is, however, considerable uncertainty about the future trajectories of storm frequencies and magnitudes. By contrast, sea level rise predictions are unambiguous (IPPC latest assessment) and this will force beaches and dunes to migrate inland.

Impacts of growth (development and infrastructure provision etc.)

Growth in region will impact on beaches and coastal dunes in three principal ways:

1.) Direct loss and habitat area and extent through development and provision of infrastructure;

2.) Increased recreational use (beaches are THE most attractive recreational site for coastal inhabitants) leading to impacts on habitats and wildlife (e.g. fishing, trampling, vehicles, camping, dogs…);

3.) Shore stabilisation engineering: beaches and dunes naturally migrate inland in response to changing energy conditions (e.g. waves and storms). If beaches can no longer respond because of development on the land, society intervenes with engineering solutions to safeguard human assets: armouring the shore with seawalls, or nourishing with sand; these engineering solutions are known to have widespread impacts on beach ecosystems.

Develop case studies of beach management as full condition assessments for all SEQ difficult.

Investigate use of landcover mapping to map extent more accurately.

3. What are the top 3 initiatives that would enable us to achieve the target by 2031?

1.) Systematic conservation planning for beaches and dunes

Implement conservation and land-use planning that explicitly recognizes the ECOLOGICAL values and process of beach ecosystems (i.e. establish a network of protected areas that encompass beaches and their associated surf-zones and dunes across the region, move from viewing beaches as being mere accumulations of sand to viewing them as functional ecosystems).

2.) Environmentally compatible recreational use practices, such as:

- curtail the use of vehicles on beaches and dunes;

- reduce impacts of dogs on wildlife;

- wind back beach/dune camping;

- review and regulate recreational fishing impacts;

3.) Protect Dunes and limit shore stabilization projects

- control access by fencing;

- limit the extent of seawalls;

- limit the use of sand nourishment / pumping / reprofiling

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

1. No net loss of coastal dune extent and ecological condition;

2. No net loss of wildlife dependent on these ecosystems (e.g. populations of resident specific)

3. No net loss of carbon processing on beaches.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

Two most essential elements which are highly applicable for the SEQ NRM Plan are:

1.) Targets need to be ecologically meaningful (e.g. the extent of intertidal beach/width has very little bearing on the ecological values for sandy shores; what is more pertinent is that the proportion of dunes converted for human use is kept to a minimum, that the extent of seawalls does not increase and that beaches are allowed to migrate landward – intertidal width as such will not provide a sensible measure of ecological condition or habitat value).

2.) Targets need to comprise habitat aspects, biological processes, and ecological structures (i.e. a tripartite melange of metrics). From work undertaken in SE-Queensland and experience from overseas, some of the most appropriate indicators (which can be translated into targets) include:

- Population sizes and breeding success of birds (and/or turtles) dependent on beaches and dunes;
- Processing of beach cast and carbon transfers in beach food webs;
- Size, dimensions and ecological status of frontal dunes.

3.) Target should possibly be specific to different coastal ecosystems

Action - investigate data (LIDAR) on slope of beach as indicator of health?

More on beach indicators / values / human impacts / and carbon processing:

- Schlacher, T.A., Jones, A.R., Dugan, J.E., Weston, M.A., Harris, L.L., Schoeman, D.S., Hubbard, D., Scapini, F., Nel, R., Lastra, M., McLachlan, A., Peterson, C.H. (in press) Open-coast sandy beaches and coastal dunes. Chapter 5. In: J. Lockwood, B. Maslo & T. Virzi (Eds). Coastal Conservation. Cambridge University Press, Cambridge, U.K. accepted 11 Sep 2012.
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- Schlacher, T.A., Nielsen, T., Weston, M.A. (2013) Human recreation alters behaviour profiles of non-breeding birds on open-coast sandy shores. Estuarine, Coastal and Shelf Science, 118, 31–42.
- Harris, L., Nel, R., Holness, S., Sink, K., Schoeman, D. (2013) Setting conservation targets for sandy beach ecosystems. Estuarine, Coastal and Shelf Science, published online http://dx.doi.org/10.1016/j.ecss.2013.05.016.

CM 4 – Fish Stocks

SEQ NRM Plan Target

By 2031, wild fishery stock condition will be sustained at sufficiently high levels to support commercial, recreational and Indigenous cultural fisheries, based on the 1995–2005 benchmark (ten-year rolling average).

General Comments:

- Possibly the stock was already severely depleted at that time. Benchmark may be too low.
- What data is available for 1995-2005?
- Is the target appropriate for what we are trying to achieve?
- The target relates to economic sustainability rather than how the population relates to ecosystem health.
- The target should not be about sustaining the fishing industries but about sustaining the ecosystem function of Moreton Bay.
- Refer to papers by Manson.

1. What are the top 5 factors that have impacted on this target?

1. Fishing
   - commercial
   - recreational
   - beach
2. Connectivity between habitats
3. Water Quality and flows (refer CM1)
4. Key habitat condition and extent
5. Development impacts

2. What are the impacts likely to occur in the future?

3. What are the top 3 initiatives that would enable us to achieve the target by 2031?

1. Try to source some reliable data. There should be some positive impacts with the recent declaration of extended marine parks.
2. Restrictions on fishing to maintain fish populations at ecologically sustainable levels.
3. Habitat protection mechanisms initiated

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

- Key population measures implemented to provide indications of population health (Needs fisheries input)

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

- Anecdotal evidence of increasing fish stocks associated with commercial fishing. Licence buybacks needs to be supported by scientific monitoring. Need to know if fish stocks are going up or down.

CM 5 – Key Marine Species

SEQ NRM Plan Target

By 2031, the extent and condition of the habitat of bottlenose and Indo-Pacific humpback dolphins, dugongs, sharks, turtles and wader birds will be equal to or greater than that in 2001 for each species.

General:

- Subject to factors outside of the regional area (national and international pressures). Perhaps the target should be based more around habitat conservation and protection than the species themselves (or include both).
- Wader birds is too general - should relate to resident shorebirds and seabirds and coastal birds of prey. Confirm if there is adequate data.
- Needs to include migratory waders also. Although they are subject to international pressures, it is important to maintain their habitat in the SEQ region.
- A target for marine habitats already exists therefore this target should be about the actual health of these species and abundance (using health indicators such as toxicology reports etc, nesting frequencies & breeding success). Action – Confirm if there is data available. This target is a surrogate of key species in the food chain. Consider a map of predator abundance.
- Investigate the useability of Manta Watch data.

1. What are the top 5 factors affecting the progression of this target?

1. Direct human impacts (cars, foxes, dogs, boat strikes etc.)
2. Habitat loss
3. Reductions to food resources
4. toxic pollutants
5. declining quality of habitat

2. What are the top 3 initiatives that would enable us to achieve the target by 2031?

1. Limit human impacts
2. Reverse habitat decline
3. Ascertain sources of toxicology impacts

3. What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Maintain health
- Maintain breeding success of these species

CM 6 – Coastal Algal Blooms

SEQ NRM Plan Target

By 2031, the extent and frequency of coastal algal blooms(CAB) will be reduced from the 2002–05 benchmark (five-year rolling average).

General:

Change the benchmark year to 1998 in line with new data.

This target should be part of CM1.

Data for other nuisance algal blooms required.

CM 7 – Coastal Wetlands

SEQ NRM Plan Target

By 2031, the condition and extent of SEQ coastal wetlands, particularly those connecting fresh and estuarine/marine habitat (including fish passage), will be equal to or greater than that in 2007.

General:

- Consider the benchmark year at 2001.
- Target should refer to specific ecosystems rather than the whole.
- State how climate change impacts upon the target.
- Distribution of ecosystem types (natural) as an indicator.
- Greater extent could actually indicate degradation and impact so may not be appropriate.
- Consider the stability of natural wetland ecosystems and their variable processes as the aim of this target.

1. What are the top 5 factors affecting the progression of this target?

1. Infrastructure provision
2. Hydrology changes
3. Water quality
4. Land use changes (poultry, landfill, etc.)
5. Clearing, grazing, fire, ferals

2. What are the top 3 initiatives that would enable us to achieve the target by 2031?

- Catchment rehabilitation works
- Buffer protection of wetlands
- Protect and maintain important connectivity between wetlands and neighbouring ecosystems
- Better mapping of groundwater ecosystems and how they are connected.
- Priority recovery works identified to protect and maintain specific wetlands across the region. This could be complemented by risk mapping of pressures on wetlands.

3. What short term target should we aim for by 2019 to enable us to meet our 2031 target?

- Implementation of actions above.

- Condition and pressure assessment completed. Case studies of wetland functioning over time.
- Targets should align directly with those being refined as part of the revised EHMP monitoring program as they very much cover the same ground.
- A short term target would be to identify and map estuarine and marine habitats (this will be completed in a year or so). This will be required to measure the target against.
- Separating wetlands into 'wetlands' and 'coastal wetlands' sections creates confusion.
- The 'wetlands' and 'coastal wetlands' sections would sit better as one section in the 'water' division

Community/Social and Economic

Expert Panel and Working Group Members

Helen Ross (UQ)
Julie Dean (UQ)
Jim Binney (Mainstream Economics)
Tim Smith (USC)
Jeanette Durante (DSTIA)
Peter Chapman
Donnell Davis (Friends of SEQ)
Fred Tromp (Friends of SEQ)
Darryl Low Choy (Griffith Uni)
Mellinni Sloan (QUT)
Melanie Cox (Griffith Uni)
Noel Ainsworth (SEQC)
Crystal Ellis (UQ)

SEQ NRM Plan Target

By 2031, natural resource managers, government and non-government organisations will be resourced and working together to implement the SEQ NRM Plan.

Background to the target

Note: This statement infers that the target is actually about the community's capacity and participation in voluntary work, as well as on-ground management and the community's capacity to participate in planning etc.

However, the current NRM plan target only relates to resourcing of managers, not mobilising the community.

Need three NRM Plan targets here:

1. Broad community involvement and volunteering.

- ABS Social survey volunteerism – SEQ scale? ABS capacity and OESR
- Map it to correlate with community groups
- UK experience is that depending on the notion of "big community" did not increase volunteers
- Impacts of peak oil on disadvantage - Vampire index created by Griffith Uni
- Peaks in volunteerism

2. Effort of land managers.

- AG survey picks up effort, issues, expenditure (commercial enterprise)

3. Capacity of supporting organisations (governments, NGOs etc).

- Investment in these groups over time

Committed communities? Engaged governance around NRM. Community infrastructure woven through collaboration especially in terms of people who do not usually work together working together when needed.

How do we influence these over time? Link it to our efforts?

Refer to Helen Ross's 2010 report using North Queensland as a case study for community resilience.

Resilience:

- Are Socio Economic Landscapes (SEL) covered in the NRM Plan? It was agreed that current work is not social enough.
- Resilience of individuals is an important dimension.
- Resilience in terms of disaster management is covered.
- Use ecosystem services related to resilience

How do we put a resilience lens across this?

Social capital and networks are important. Is the mantra "Healthy country, healthy people"? That is, if the natural assets are healthy and functioning at optimum levels is resilience built in?

Public Health and settings for recreation – this is big picture relying on other engagement processes and not just NRM Groups.

Values and how people use assets – eg waterways and how people perceive the assets themselves - how do we connect people with the assets and management?

Greenspace literature in health – settings based - references on this subject available.

People and environmental couplings that are desirable – normal and disaster – related to NRM (creating space and using it).

Greenspace provides flood management. Should other low lying areas that did flood be converted to floodplains? Infrastructure needs to be looked at in terms more as a regional planning perspective what are the important relations.

Might be stronger acceptance of riparian vegetation etc. in terms of flood mitigation. Political support important for natural asset management.

Investigate the social aspects being covered in the Qld Plan.

Helen Ross's 2010 report and what regional bodies can do regards capacity – enhance social strength in an area where there is an ecological issue eg. reef guardians.

Positive capacities for resilience why do some people come through things better than others?

Chris Fleming links between quality of life and natural assets spatialising as well

The region has a history of voluntary community action supported by industry and government investment and human capital. The majority of the region is managed by private landholders. Enhancing and maintaining the capacity and ability of the community to engage in planning, implementation and monitoring of local actions to support achievement of regional targets is therefore a priority.

Remodel the target to reflect Strong communities are assets and beneficiaries.

The target is not based around the outcome and connected to the system process.

“The community” - “The Public” a region like SEQ is made up of many interests and values. this should be about tapping into the social capital. Including stewardship groups with collaborative management efforts as well as private land management.

*suggestion: a foot note regarding “the community”.

Compile data base of NRM groups across SEQ and map these to give a picture of the objective/size/membership numbers and hours of activity of the group to identify gaps and/or overlaps.

A collective calculation of all registered members in a SEQ NRM group/organisation. Number of organisations regularly reviewing the NRM plan

* how will this be weighted? eg. 5 small landcare groups compared to 1 larger more resourced landcare group.

Use of the NRM plan by any group or individual, measures are number of site hits, number of references.

Community involvement and volunteering

There are two freely available ABS statistical publications that provide a rough proxy for volunteerism:

- ABS. 4159.0 - General Social Survey. This survey has been undertaken in 2002, 2006 and 2010 (latest). Does include questions on volunteering (including environmental work). Potential to undertake statistical analysis to track relative participation and effort over time.
- ABS. Census of population and housing. Community involvement also covers participation in volunteering in the past months. Not as detailed (by activity) as General Social Survey

The bottom line is that it would be relatively easy (a few days work for an expert) and cheap (drawing on existing data) to develop a simple measure of community environmental volunteering that can be tracked every 5 years (i.e. aligning with NRM Plan updates). If the current measure is (say) 5% of adults do some environmental volunteering, a target for 2031 could be established (say 10%) and measured.

Effort of land managers

ABS 4620 Natural Resource Management on Australian Farms. Data is available for NRM regions on problems (e.g. weeds, pests etc) and actions. A simple measure of landholders NRM practice could be developed based on the available statistics and traced over time.

Capacity of supporting organisations

Statistics could be periodically generated via the process outlined in the methodology section.

Comparison to benchmark year

Not currently available

What is important are the trends. Both sets of statistics can be tracked over time based on their frequency of availability.

Methodology

Keep it simple, keep it cheap, and develop longitudinal measures of progress.

Community involvement and volunteering

A simple statistic representing community involvement in environmental volunteering, based on existing ABS data (see below). The simple assumption is that "more is better".

a) Effort of land managers

The more time and resources land managers devote to NRM activities the better. In the absence of major landholder surveys (very expensive), it may be possible to track relative changes in effort and expenditure by farmers through the ABS report Natural Resource Management on Australian Farms. This will be an underestimate as it does not include non-commercial land managers. However, it will cover the bulk of the area. The simple assumption is that "more effort is better".

b) Capacity of supporting organisations

Capacity is difficult to measure without spending a fortune on the measure. Changes in relevant expenditure could be used as a proxy for the capacity of supporting organisations. This is essentially an accounting exercise. Some of this data is already collected and collated (e.g. local government expenditure on the environment), while some is available from

financial reports etc. The problem is to avoid double counting (e.g. the Commonwealth Government provides a grant to SEQ catchments, which is then spent by them).

A simple accounting-like framework could be developed and then applied (relying on reported figures, augmented by a simple survey/interview approach of accounts people.

1. What are the top 5 factors affecting the progression of this target?

1. Lack of recognition and investment in **coordination** at a local and regional level.
2. Level of interest and engagement in consultation demanded by policy makers has decreased, with recognition of media/political agenda influencing the public agenda.
3. Federal State **continuity of support and approach** for regionally and community based NRM
4. The ability to build on and **capitalise on the momentum built up after critical events**. False sense of security and crisis relief expectation creating delusion of government bail-out and expectation - must understand that crisis is a normal periodic occurrence that is highly connected to a community's resilience. Flexibility to meet peaks in community interest.
5. Competing demands and information rich environment overload for all NRM agents at all levels

2. Potential Climate Change Impacts on Target

- extreme events can be motivators
- an extreme event can leave a lot of losers, changing their priorities and values. This can be a detraction or possibly an addition to the collective social participating pool.
- can generate new resources or result in a redirection of resources, but set back to community efforts and investments.
- vulnerable people can potentially be made more vulnerable.
- change of demography with climate change refugees migrating
- potential to change landscape regimes
- changing viability of resource dependent industries and therefore peri urban demography
- shifts in perceptions on work on threatened species etc is worth while
- the climate change impacts exponentially amplifying synergies between all NRM components

Impacts of growth (development and infrastructure provision etc.)

- change of demography with intensification and gentrification
- sense of community needs to be re kindled and due to the influx of people and their mobility in and around the region.
- perspective or resignation to the idea that development will continue to happen and loss of vegetation and greenspace is inevitable

- NRM planning becomes negatively impacted by the lack of urban growth boundary
- positive impact is that there are changes to the number of people available to provide input.

Other Impacts

- potential government policy to increase retirement age will detract from volunteering pool.
- Aging volunteer cohort, particularly in the operational mechanisms of the community group, due to lack of time to take on a role. However, lack of employment (particularly in specialised fields) for youth can increase volunteering.
- doubling volunteers initiative by Volunteering Queensland

3. **What are the top 3 initiatives that would enable us to achieve the target by 2031? (please add to the list below)**

Finding and identifying those folk that are willing to volunteer and engage and focus resources on supporting them. Including Volunteering Queensland who has done quite a bit of research.

Re-map the fabric of local healthy community groups and stewardship groups around the region. mapping the supportive relationships and strategic relationships with regards to NRM. Include those groups whose core business are not NRM but have been identified as potential NRM enactors.

ACTION: Map the fabric between the local level stewardship groups and what is the supportive networks out there. Overlay this with the NRM hotspots to give priorities.

Using media/social media making the connection between NRM and peoples daily lives. Use it to mobilise initiatives through piggy backing on existing, successful initiatives.

4. **What short term target should we aim for by 2019 to enable us to meet our 2031 target?**

Identify and approach those whose core business is not NRM and engage them in innovative NRM activities. For example prisons, scouts, church and service groups.

All the Natural Asset Plans developed by local governments and having all local governments and key stakeholders knowing how their activities contribute to the NRM plan.

5. **Could this target be improved? If so how? Are we measuring the right attribute?**

Needs to include building community appreciation and values relating to NRM through the promotion of a public sense of connection to nature

Need for a new social compact, re-invent what community engagement is and what our responsibilities are towards NRM.

The model of how the regional work is funded needs to be a more enduring form of engagement.

Community resilience is not about attributes so much as agency get up and go - ability to self organise and empower.

Re-invent NRM agents' relations within communities. For example, we are seeing a new form of community being developed where the community wants to take more control of their direction and planning.

Develop strategic partnerships and networks for those people who support factoring broader education platforms.

Address the awareness issue and then seek to communicate and engage.

Enable the smaller details of peoples natural experiences be the platform for understanding reliance and value for ES etc.

Providing hope by putting targets in the realm of positivity to overcome the hopelessness or the perspective that climate change impacts are inevitable.

Improving the effectiveness of the engagement rather than the amount, however awareness and education must still be provided to the whole community.

Alternative view of target:

This is fundamentally an input (rather than an output or outcome).

Measuring the overlaps and double ups of funding and organisation objectives

If we consider the Why (the background) , the What (the target), the When (the timeline applicable to the target) the How (what we are going to do to get there), we are left with the Who. Basically the community is the Who.

ALL of the targets that we are reviewing contain these elements with the Who common to all (if we include Government with the rest of the community)

Resilience building through collaboration of community members through volunteering and NRM participation. This builds social connection to place.

Develop a Map:

Where do we have community-based organisations?

- stewardship groups of all types (and catchment management)
- consider advocacy groups too

(can overlay with other maps eg green spaces, riparian vegetation conditions)

= area covered. How well is region covered, are they active where most needed?

(and how does it map with SEIFA index, socio-economic status?)

Detail:

How healthy are their committees (and succession?)

- memberships
- resources
- logistical & social support
- SEQC CPMs?
- BCC/Council's supportive arrangements
- other (some NGOs - Wildlife Qld, providing similar logistical support to some catchment bodies)

Impressions: SEQ

- a rich institutional landscape of local groups (but with all the well known issues of voluntary group and resources)
- complex (and messy) web of larger-scale support and co-ordination
- SEQC: flexible and holistic
- catchment bodies: some of the web ones are in name only, not really a nested supportive arrangement with the local groups
- A couple of NGOs entering the space, helping with logistics (Wildlife Qld helping with financial arrangements)
- groups falling through cracks, opportunities missed, participation and benefits could be much better.

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Appendix A - Expert Panel Network 2014 Update SEQ NRM Plan

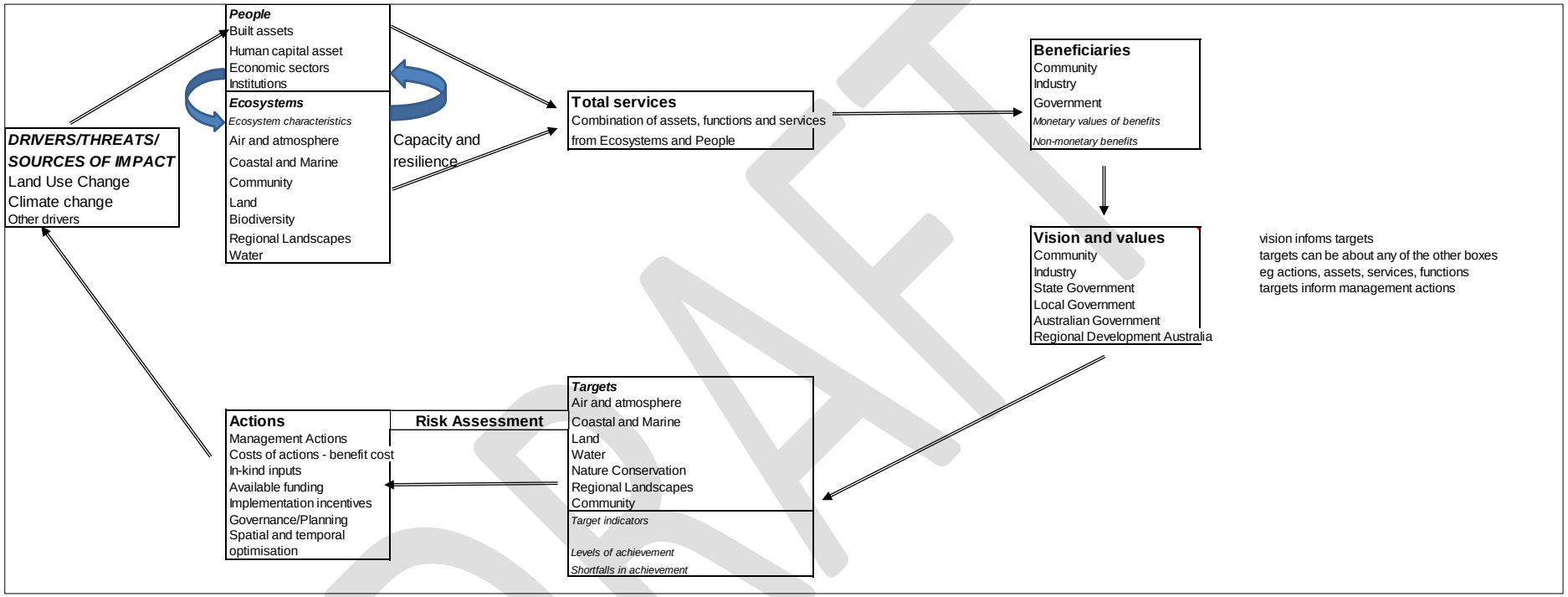
Name	***Organisation***
Coastal and Marine	
Mike Ronan	DEHP
Naomi Edwards	Griffith University
Kurt Derbyshire	DNPRSR
Andrew Olds	Griffith University
James Udy	Healthy Waterways
Prof Helen Marsh	James Cook University
Jen Loder	Reef Check
Joel Bolzenius	SEQC
Dr Megan Saunders	University of Queensland
Dr Janet Lanyon	University of Queensland
Catherine Lovelock	University of Queensland
Prof Thomas Schlacher	University of the Sunshine Coast
Simon Baltais	WPSQ
Nature Conservation	
Lindsey Jones	DEHP
Craig Hempel	DEHP
Paula Peeters	DEHP
Mike Ronan	DEHP
Teresa Eyre	DSITIA
Don Butler	Qld Herbarium
Narelle McCarthy	SCEC
Liz Gould	SEQC
Michael Petter	SEQC
Robyn Kelly	SEQC
Luke Shoo	University of Queensland
Morena Mills	University of Queensland
Martine Maron	University of Queensland
Christine Hosking	University of Queensland
Arthur Knight	Community
Land	
Lauren Eyre	DNRM
Dan Smith	DNRM
Sue Dear	DNRM
Angela Pollett	DNRM
Kate Goulding	DNRM
Andrew Biggs	DNRM
Paul Harris	DNRM
Phil Moody	DSITIA
Bronwyn Burke	DSITIA
Paul Lawrence	DSITIA
Dan Brough	DSITIA
David Putland	Growcom
Jim Dale	SEQC
Margie Milgate	SEQC
Water	
Dr Adrian Volders	AR Volders Environmental Consulting
Mike Ronan	DEHP
Mathew Fullerton	DEHP

Name	***Organisation***
Ashley Bleakley	DNRM
David Logan	Healthy Waterways
James Udy	Healthy Waterways
David Simmons	Healthy Waterways
Malcolm Cox	Queensland University of Technology
Andrew Watkinson	SEQ Water
Cameron Wearing	SEQ Water
Joadie Hardy	SEQC
Michael Petter	SEQC
Tony McKew	SEQC
Dr Alistair Grinham	University of Queensland
Dr Badin Gibbes	University of Queensland
Dr Alison Specht	University of Queensland
Air and Atmosphere	
David Wainwright	DSITIA
Tadhg O'Loingsigh	Griffith University
Lidia Morawska	Queensland University of Technology
Michael Petter	SEQC
Julie Dean	School of Population Health, University of Queensland
Paul Jagals	School of Population Health, University of Queensland
Helen Fairweather	University of the Sunshine Coast
Neil Tindale	University of the Sunshine Coast
Prof Peter Waterman	University of the Sunshine Coast
Regional Landscape	
Piet Filet	Filet Consulting
Darryl Low Choy	Griffith University
David Batt	Queensland Outdoor Recreation Federation
Steve MacDonald	Regional Landscape and Open Space Advisory Committee
Nathacha Subero	Griffith University
Social and Economic	
Helen Ross	University of Queensland
Julie Dean	School of Population Health, University of Queensland
Dr Jim Binney	Mainstream Economics
Jeanette Durante	DSTIA
Peter Chapman	Consultant
Donnell Davis	Friends of SEQ
Fred Tromp	Friends of SEQ
Darryl Low Choy	Griffith University
Susie Chapman	SEQC
Noel Ainsworth	SEQC
Mellinni Sloan	Queensland University of Technology
Dr Melanie Cox	Griffith University
Crystal Ellis	University of Queensland
Tim Smith	University of the Sunshine Coast
Systems	
Dr David James	Ecoservices Pty Ltd
Dr Melanie Cox	Griffith University
Dr Jim Binney	Mainstream Economics
Dr Bruce Taylor	CSIRO

Appendix B – Program of Working Group meetings

Asset	Meeting Dates	
Regional Landscape	27th August, 2013	28th April, 2014
Nature Conservation	17th September, 2013	
Water Asset	23rd July, 2013	20th November, 2013
Coastal and Marine	7th November, 2013	4th December, 2013
Air and Atmosphere		6th February, 2014
Land	12th September,2013	13th November, 2013
Community	14th November, 2013	

Appendix C – Systems Diagram for the SEQ Region



Appendix D - Headline Targets and relationship to Supporting Targets

Headline Targets	L2- Agricultural Land	NC1- Remnant and Woody Vegetation	NC3- Wetlands	CM1- Seagrass and Mangroves	CM3- Beaches
Supporting Targets	L1- Salinity (Land)	NC2- Vegetation Fragmentation and Connectivity	CM7- Coastal Wetlands	CM5- Key Marine Species	CM2- Coral
	L3- Soil Acidity	NC4- Vulnerable Ecosystems	W4- Groundwater Dependent Ecosystems	CM6- Coastal Algal Blooms	CM4- Fish Stocks
	L4- Soil Organic Matter	NC5- Native Species			
	L5- Acid Sulfate Soils	NC6- Habitat for Priority Species			
	L6- Soil Erosion				
	L7- Grazing Land Condition				
	L8- Land Contamination				
	L9- Extractive Resources				

W6- Waterways Maintenance and Enhancement	**A2- Air Quality**	**RLA2- Outdoor Recreation Settings**	**RLA4- Regionally High Scenic Amenity**	**C1- Community T1- Traditional Owners**
W5- High Ecological Value Waterways	A1- Greenhouse Gas Emissions	RLA3- Outdoor Recreation Demand	RLA5- Locally High Scenic Amenity	RLA1- Landscape Heritage
W7- Waterway Restoration	A3- Thermal Pollution			
W1- Environmental Flows	A4- Noise Pollution			
W2- Groundwater Resources	A5- Light Pollution			
W3- Groundwater Quality				