

# Aligning Community Waterway Monitoring to Regional NRM Needs in the Mackay Whitsunday and Far North Queensland Regions

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**ABSTRACT:** Community waterway monitoring has the potential to contribute valuable social and scientific outcomes for regional natural resource management (NRM). To achieve this, community waterway monitoring programs need to be aligned to regional NRM needs and be supported by all regional NRM stakeholders. However, since regional NRM arrangements are still relatively new, mechanisms to successfully achieve coordinated monitoring programs are yet to be identified and established in many regions of Australia.

To address this issue, an ambitious 18 month project was undertaken in the Mackay Whitsunday and Far North Queensland regions of Queensland. This project used a highly collaborative approach involving multiple stakeholders, including state and federal agencies, regional NRM bodies and community NRM groups in each region. A reference panel was established, involving representatives from each key organisation, to provide strategic direction to the design of community waterway programs in each region. Project officers, based with the state agencies of each region, provided technical support – reviewing and/or developing community waterway monitoring programs and developing strategic training programs to ensure successful implementation of the new monitoring programs.

As a result, community waterway monitoring programs in the Mackay Whitsunday and Far North Queensland regions are more closely aligned with regional monitoring priorities and are providing valuable scientific information for the development and evaluation of water quality targets and management actions. However, the project found that in utilising this approach, care must be taken to ensure community volunteers retain a sense of ownership over community waterway monitoring programs. The strategic aims of the program should also be firmly established and sufficient on-going long-term support secured to enable meaningful outcomes for community volunteers and successful community engagement and retainment. Nevertheless, the approach utilised in this project was successful in achieving greater alignment of community waterway monitoring to regional NRM needs and could potentially provide an effective model for adoption in other regions of Australia.

## INTRODUCTION

Community-based waterway monitoring programs, such as Waterwatch, have been underway across Australia since 1988. These programs have allowed community members to become involved in assessing the condition of local waterways and gathering data to guide management actions [3]. They have also generated increased awareness and understanding of catchment and water quality issues, instilled a sense of trust and ownership of the information collected and promoted wider community stewardship and responsibility for the future health of Australia's waterways and catchments [2, 3, 1, 4].

Since the introduction of regional NRM arrangements across Australia from 2001-2003, there has been an increased interest in aligning community waterway monitoring programs with these new arrangements and ensuring they provide a valuable contribution to regional NRM. As part of these arrangements, regional NRM bodies (known as catchment management authorities in

some states) have been set up in each region of Australia and have been given funding to develop and implement accredited regional plans in partnership with other regional stakeholders and the wider community. As part of their strategic investment, many are beginning to fund community waterway monitoring initiatives in their region, due to the recognition that these programs can potentially provide both scientific and social (educational) outcomes for regional NRM.

Community-based monitoring can potentially provide valuable scientific outcomes for regional NRM through the waterway monitoring data that is collected through these programs. This information could provide an important input to monitoring, evaluation and reporting requirements associated with regional NRM. Regional NRM bodies are obliged to monitor, evaluate and report on the effectiveness of their on-ground investments. To achieve this, long-term water quality information needs to be collected at the local scale [1]. In many states, it is becoming increasingly clear that state-wide agency monitoring programs will not have sufficient spatial coverage at a fine enough scale for regional NRM, particularly in the larger and more remote regions of Australia. While roles and responsibilities between agencies and regional NRM bodies for resource condition monitoring are still being resolved, many regional NRM bodies are interested in using community-collected data to compliment data from agency-based programs. This is because most community monitoring groups have an exclusively local or regional focus, where their proximity to site (spatial coverage) and understanding of context (local knowledge) can make their contributions particularly valuable.

Community-based monitoring programs could also provide valuable social outcomes for regional NRM through their widely recognised role in building community awareness, understanding and ownership of water quality and catchment issues. If community-based monitoring programs are an important part of regional NRM planning and decision-making, community members will have greater understanding, trust and support for regional strategies and management actions relating to improving waterways and catchment condition. This is crucial for the successful implementation of the regional NRM plans.

To ensure these outcomes are achieved, community-based monitoring programs need to be incorporated into regional NRM processes and structures, particularly the regional monitoring, evaluation and reporting strategies. In most cases, this will involve reviewing and slightly modifying existing programs, such as their objectives, site locations and sampling methods, or establishing new programs aligned with regional NRM monitoring needs. This process will require input from a wide variety of stakeholders to determine the information needs and gaps for regional monitoring and evaluation and strategies for addressing these that involve the integration of both agency and community-based monitoring information.

However, the best approach for successfully aligning community-based monitoring programs with regional NRM needs remain somewhat unclear. Questions remain around how to coordinate the input of all relevant stakeholders, including agencies and scientists, whilst ensuring communities retain ownership over their programs. There are few available case studies of this process that focus on ensuring both social and scientific outcomes from community monitoring programs and developing strategies that integrate agency and community-based monitoring programs. It is clear that this will require an unprecedented level of cooperation with state and federal agencies, regional NRM bodies, scientists, local community groups (such as Landcare) and other local stakeholders.

In Queensland, an ambitious 18 month project was recently undertaken in the Mackay Whitsunday and Far North Queensland regions to explore this issue and trial an approach for aligning community waterway monitoring with regional NRM needs. The approach involved a

high level of collaboration between a wide range of stakeholders, including state and federal agencies, regional NRM bodies and community NRM groups in each region.

The involvement of both the Mackay Whitsunday and Far North Queensland regions allowed the approach to be trialled with community monitoring networks at opposite stages of development. The Mackay Whitsunday region already had an established regional community monitoring network, supported by the regional NRM body, and was therefore interested in reviewing and realigning their current activities. In contrast, the Far North Queensland region had not had a strong network since the difficult changeover period between NHT 1 and NHT 2. Therefore, in this region, the aim of the project was to focus on rebuilding community monitoring networks and establishing new programs aligned to the regional NRM needs.

This paper outlines the outcomes and learnings from this project, which may prove useful for others wishing to align community waterway monitoring programs with regional NRM activities across Australia.

## **METHODOLOGY**

The project was delivered using a highly collaborative approach. It was managed by the State Community Waterway Monitoring Team (Waterwatch Queensland) within the Department of Natural Resources and Water in Brisbane and delivered by the agency's offices in the Mackay Whitsunday and Far North Queensland regions. It was implemented in close collaboration with Mackay Whitsunday Natural Resource Management Group, terrain NRM (formerly FNQ NRM Ltd), Great Barrier Reef Marine Park Authority, local community NRM groups and the project funding body, the federal Department of the Environment and Water Resources.

A project officer was employed in each region and based within the Department of Natural Resources and Water. The project officers received guidance from a project reference panel, which involved representatives from each key organisation. The panel met quarterly to provide strategic direction to the project, including the development and refinement of the project officer's workplan and the endorsement of key project outputs, such as the new community monitoring plans.

The first key activity undertaken was an analysis of the priorities, needs and gaps for community waterway monitoring in each region. Based on the outcomes of this analysis, the project officers then undertook the following activities in each region:

- developed a database of community monitoring programs;
- developed and documented new community monitoring plans (Far North Queensland) or documented and refined existing programs (Mackay Whitsunday) in consultation with the project reference panel, local scientists, community monitoring groups and other local stakeholders;
- developed and delivered strategic training programs to ensure successful implementation of the new monitoring plans; and
- delivered community forums to seek wider input and understanding of the new monitoring plans and their contribution to addressing regional water quality issues and actions.

In the Mackay Whitsunday region, an additional activity was undertaken based on a critical need identified in the needs and gaps analysis. Analysis and reporting of the results from the past three years of the regional community monitoring program was undertaken to increase community engagement and commitment to the program.

The framework used to develop and document the new community-based monitoring plans for this project was based on the monitoring plan framework developed by the State Community Waterway Monitoring Team (Waterwatch Queensland) for use by community monitoring groups across Queensland. This would ensure standardised reporting and recording of all metadata associated with community monitoring programs across the state, leading to increased confidence among all stakeholders in the data collected through these programs.

## **OUTCOMES**

### **Mackay Whitsunday**

Two regional community-based waterway monitoring programs have been underway in the Mackay Whitsunday region since 2003, through support from the regional NRM body, the Mackay Whitsunday Natural Resource Management Group (MWNRM), and the Mackay office of the Department of Natural Resources and Water. These programs largely involve volunteers from the region's three key Landcare and Integrated Catchment Management groups.

The ambient monitoring program covers four major water basins, 48 sites and involves approximately 60 community volunteers. Across the same area, the event monitoring program involves 20 sites and 21 community volunteers. Three of these four basins are specified as posing a high-risk to the health of the Great Barrier Reef, due to their poor condition and high-levels of pollutant run-off.

Both programs are part of MWNRM's broader Healthy Waterways Integrated Monitoring Program and aim to collect useful information for their Water Quality Improvement Plan and Sustainable Landscapes Program. The programs also aim to contribute valuable information to the joint Australian and Queensland Government's Great Barrier Reef Water Quality Protection Plan.

The needs and gaps analysis conducted at the start of this project highlighted the following key issues in relation to the ambient monitoring program:

- Objectives and design (such as site locations) of program were in need of review to align with strategic regional NRM priorities and best available science.
- Documentation of program (design and procedures) was not sufficient to ensure data confidence among all stakeholders.
- A lack of understanding among monitoring participants about the purpose of the program was contributing to decreased retention and commitment of volunteers.
- Insufficient frequency in the reporting of results (this was not done since 2003) and limited assistance with the interpretation of results was contributing to decreased retention and commitment of volunteers.
- Increased understanding of water quality issues and solutions amongst the volunteers (and the wider community) was also required to improve commitment and capacity levels and enhance regional stakeholders' confidence in the data collected through the program.

The priority issue identified for the event monitoring program was a lack of appropriate health and safety protocols.

The following section details how these issues were addressed through this project and the resultant outcomes for the region.

A database including volunteer contact details, level of training, site locations and risk assessments, was compiled and continues to be updated.

The aims and design of the ambient monitoring program was reviewed to make the program more strategically aligned to regional NRM needs. Clearer objectives were developed and these defined how the program would contribute information to the region's NRM planning and also the desired community engagement outcomes of the program. Based on these objectives, the design of the monitoring program was reviewed and modified. Increased quality control measures were also put in place to ensure the quality of the data.

A detailed monitoring plan for the ambient program was then documented. This included the objectives, study design and protocols of the program and allowed this information to be clearly defined and available for succession planning. The monitoring plan was endorsed by key regional stakeholders including MWNRM and the Integrated Catchment Management and Landcare groups through the project reference panel meetings. It was also reviewed and endorsed by the technical advisory panel of the Mackay Whitsunday WQIP.

The monitoring plan for the ambient program included a data management plan. This plan was implemented, resulting in all data collected since 2003 being captured in a central database for the first time. This allowed the data to be interpreted and reported on.

A forum was held for all monitoring participants to increase their understanding of the aims of the monitoring program. This also provided an opportunity to engage the network on regionally significant water quality issues and build their commitment. Over 40 volunteers attended the forum representing nearly 80% of the network.

A training program for existing monitoring participants was developed to ensure all participants were able to undertake monitoring in accordance with the new monitoring plan. All volunteers received one-on-one training from the program's catchment coordinators. Three additional training days were held to increase the volunteers' ability to record and interpret water quality information by relating it to broader ecosystem and landscape issues.

A training regime for all monitoring participants was established and delivered by the catchment coordinators. The training ensures all new monitoring participants have a suitable level of capacity and will increase the quality assurance of the monitoring program. In addition, a workshop on 'how to deliver to effective training' was conducted for the catchment coordinators to ensure all training delivered to the volunteers is of a high standard.

Three years of ambient water quality data collected through the volunteer program from 48 sites was collated, analysed and interpreted. The analysis and interpretation was reviewed by the regional science panel to ensure scientific rigour. Reports were developed and provided to the monitoring participants, regional NRM body and other interested stakeholders (including Great Barrier Reef Marine Park Authority, Bureau of Sugar Experiment Services, Mackay Conservation Council and Central Queensland University). Reporting occurred at both the regional and catchment and sub-catchment scale to ensure all stakeholder information needs were met. This was a significant output of the project as it was the first time data from this program had been reported. It led to greater volunteer enthusiasm and educational outcomes and allowed the data to be utilised by the regional NRM body for a range of NRM planning activities, such as the development of the region's WQIP.

The results of the community monitoring programs (ambient and event) were presented to a large public audience of over 90 people at the Mackay Whitsunday Healthy Waterways Science

Forum. They were also presented to a regional stakeholder forum at a Healthy Waterways working group meeting. This increased wider public awareness of the program and local water quality issues. Five broader extension activities were also carried out to increase wider community understanding of water quality issues throughout “Healthy Waterways” month in May 2006. This involved over 200 participants.

## **Far North Queensland**

In contrast to the Mackay Whitsunday region, a regional community-based monitoring program did not exist in Far North Queensland at the start of this project. A regional Waterwatch program was underway prior to the introduction of regional NRM arrangements in Queensland in 2003, however the program ceased at that time. A small number of community groups had continued their monitoring activities, however these were largely independent of regional NRM processes, priorities and support.

The needs and gaps analysis conducted at the start of this project identified a number of regional and state-wide initiatives that community-based monitoring in Far North Queensland could provide a valuable contribution to. These included:

- collecting baseline data on the condition of the region’s waterways;
- development of water quality targets for regional Water Quality Improvement Plans and monitoring progress towards their achievement;
- assessing the effectiveness of stream restoration works and other management actions undertaken by community groups and landholders; and
- agency monitoring programs for the Great Barrier Reef Water Quality Protection Plan.

The needs and gaps analysis report highlighted the need to develop new community-based monitoring programs in three priority catchments, the Douglas, Tully and Barron, to support these objectives. Water Quality Improvement Plans were being developed and implemented in these catchments, therefore local scale water quality information was needed from the community to compliment data collected by state agencies.

However, it was clear that the development of new community-based monitoring programs in this region would require a cautious and gradual process of community engagement. This was due to a combination of several factors, common to many community water monitoring programs throughout Queensland, such as:

- community expectations raised and then not met, as a result of the regional Waterwatch program not being funded post 2002;
- negative perception of the value of community-collected data by the local science community;
- fear among landholders about use of water quality data for further regulation of land management, particularly through target setting process for Reef Plan and WQIPs; and
- lack of trust in state agencies among many community members, partly due to uncertainty of roles, responsibilities and actions of different agencies and organisations involved with water quality monitoring and management.

In the Douglas catchment, a new community-based ambient monitoring program was established in partnership with Douglas Shire Council. The program aims to assess the ambient condition of waterways in the Douglas Shire and will directly support monitoring and evaluation associated with the Douglas Water Quality Improvement Plan. The program also aims to develop regionally applicable protocols for equipment kits, monitoring procedure guides (including use of equipment), data management procedures, health and safety procedures,

communication and reporting mechanisms for ambient community-based monitoring programs across the whole region.

The first phase of the Douglas monitoring program has commenced and involves monthly ambient monitoring of basic physico-chemical parameters – dissolved oxygen, pH, water temperature, electrical conductivity and turbidity. In future, the program may expand to include the assessment of other aspects of stream health, such as in-stream flora and fauna, riparian vegetation and nutrient loads.

The monitoring plan for Phase 1 was developed in consultation with the community, Douglas Shire Council, the regional NRM body and scientists involved with the development of the original Douglas Water Quality Improvement Plan. Formal reviews involving all key stakeholders are planned at regular future intervals.

Two community forums were held to identify interested participants for the program. Training was delivered to the group as a whole, then individually to all volunteers at their specific sites of interest.

In the Tully catchment, a monitoring plan was developed for a new landholder-based waterway monitoring program. The program was designed to collect information to directly inform the development of the Tully Water Quality Improvement Plan. More specifically, the program aimed to assess the effectiveness of a particular management action proposed as part of the Plan – the use of sediment lagoons (silt traps) for reducing sediment run-off from local farms into waterways. The monitoring plan was developed in consultation with scientists involved in monitoring for the WQIP.

In the Barron catchment, a draft monitoring plan was developed for the Trees for Evelyn and Atherton Tablelands (TREAT) community revegetation group. This was in response to a request from the group to get involved with water quality monitoring, which resulted in an 'introduction to water quality monitoring' workshop being facilitated by the project officer. As a result of this workshop and a number of follow-up workshops, involving the catchment group, local science advisors and the regional NRM body, the monitoring program objective was refined. The new program's aim is to determine the long-term condition and trend of water quality (dissolved oxygen, temperature, turbidity, electrical conductivity and pH) within one of the catchment's waterways. Riparian revegetation work has been undertaken by the catchment group for a number of years and future work is proposed to complete revegetation of the riparian corridor through the regional NRM body's Regional Investment Strategy. Therefore, the program will provide valuable information for monitoring and evaluation associated with the region's Regional Investment Strategy.

While the project focussed mainly on the Douglas, Barron and Tully catchments, the project officer did provide some technical support to catchment coordinators and community groups in other catchments. A number of presentations, workshops and training sessions were delivered to improve community awareness and understanding of water quality issues within the region and assist with planning monitoring activities. This included where to access various sources of expert science advice and the level of resources required to undertake high quality, robust monitoring programs.

## **Overall**

Community monitoring programs have now been developed in both of these regions that are supported by best available science and are designed to collect data with high levels of quality assurance. This has largely occurred through the development of monitoring plans in close

consultation with local scientists and endorsed by the regional scientific taskforces. The community monitoring programs are based on Queensland best practice standards and follow many of the quality assurance protocols practiced by scientific agencies and promoted by the State Community Waterway Monitoring Team within the Department of Natural Resources and Water.

As a result, these community monitoring activities now compliment regional NRM priorities and needs in regards to NRM planning and decision-making.

In Mackay Whitsunday, the volunteer ambient and event monitoring programs have always been a significant component of the region's Healthy Waterways Integrated Monitoring Program, which aims to deliver on many key activities identified in the Mackay Whitsunday's Regional NRM Plan. However, this project has increased stakeholder confidence in the data collected through these monitoring programs, particularly the ambient program, and allowed the data to be utilised for regional NRM planning for the first time. This is a significant achievement. The data is now being used to:

- Increase understanding of current waterway resource condition and identify gaps in knowledge. Activities are now being planned to fill these gaps and the resource condition information is being used for the development of the region's Water Quality Improvement Plan.
- Assist the community to identify environmental values for the purpose of the Water Quality Improvement Plan.
- Develop local water quality guidelines – this is also a requirement for the development of the resource condition targets as part of the Water Quality Improvement Plan.
- Prioritise and recommend on ground works activities as part of the MWNRM's Sustainable Landscapes program.
- Assist landholders to develop Land and Water Management Plans.

In Far North Queensland, new community-based monitoring programs across three priority catchments have been developed that directly inform key regional NRM initiatives. Data from these programs will be used for:

- monitoring and evaluation (progress towards scheduled Water Quality Objectives) associated with the Douglas WQIP
- evaluation of a particular (and common) management action for the new Tully Water Quality Improvement Plan
- assessing the effectiveness of riparian restoration management actions in the Barron catchment as part of the regional NRM plan and the proposed Water Quality Improvement Plan .

As a result of the project, community monitoring in Mackay Whitsunday and Far North Queensland regions better compliment state and federal agency monitoring programs. Community monitoring programs in both regions now follow current state agency monitoring practices where possible, particularly in regards to quality assurance protocols. Furthermore, the documentation of community monitoring plans, including all monitoring procedures, is likely to facilitate greater communication and collaboration between community-based and state agency monitoring programs in the future.

The project has made significant progress towards increasing community support, trust and ownership of state-wide and regional waterway monitoring programs associated with key NRM initiatives, such as the regional NRM plans, Water Quality Improvement Plans and the Great Barrier Reef Water Quality Protection Plan. Through involvement in the community-based monitoring programs developed and/or refined through this project, community members have

increased their knowledge and ownership of these key NRM initiatives and activities. For example, in the Mackay Whitsunday region, the number and overall commitment of the monitoring participants increased from 30 to over 50 individuals and only a small amount of turnover. This is vital for the successful implementation of the regional NRM plans and achievement of resource condition targets.

The project also has resulted in more general educational outcomes for the community monitoring participants and the wider community in each region. For example, in both regions, numerous training sessions and community forums lead to increased knowledge among the community of water quality issues and how they are being addressed in each region. The most significant educational outcomes occurred through the 'hands-on' involvement of community members in waterway monitoring across the regions. Ongoing community involvement in these programs and reporting of results to the wider community will further build knowledge and capacity of the community in regards to water quality management. A community who is well informed about key NRM issues and the latest scientific knowledge in regards to these is vital for successful regional NRM arrangements.

However, ongoing community support, trust and ownership of these monitoring programs does require continued investment and appropriate levels of state, regional and local support and will be at risk if these are removed. In the Far North Queensland region, the engagement of community volunteers in the new monitoring programs was limited by the absence of clear long-term support for these programs from the regional NRM body. It was also clearly affected by historical events involving the reduction of funding and support for community-based waterway monitoring programs across the region.

Another difficulty encountered in the Far North Queensland region was the absence of a regional water quality monitoring strategy and a clearly defined role for community monitoring in the region, relating to the needs of the region's NRM planning. This also affected community engagement in the programs as community members only wanted to become involved if their data was going to be used for improved natural resource management and local environmental outcomes. Throughout most of the project, the regional NRM body were still in the early stages of defining their water quality information requirements and had not yet identified the gaps in agency-based programs at the local scale that could be filled by community programs for regional NRM purposes. In the Tully catchment, the Water Quality Improvement Plan and related monitoring and evaluation strategy was still being developed, whilst in the Barron catchment, development of a Water Quality Improvement Plan had not yet begun. A Water Quality Improvement Plan, including a monitoring and evaluation strategy had been developed in the Douglas catchment, therefore the water quality monitoring needs in this catchment were clearer. However, an unresolved disagreement between the regional NRM body and state agencies on roles and responsibilities for water quality monitoring across the region meant that the design of new strategic community-based monitoring programs remained difficult.

Another issue encountered during the project in both regions was how to ensure community members retained a sense of ownership of the program after it was aligned to regional NRM needs. Most community members participated in the programs to assist with collecting useful data for NRM planning, but their interest was largely with local NRM issues or the condition of a particular area of their local waterway. In some cases, sites of interest to the community did not align with the region's priority sites for NRM monitoring and evaluation and could not be included in the regional monitoring programs due to limited resources. Similarly, local water quality issues, such as point source pollution, identified by the community could not always be addressed through the regional monitoring program due to the regional NRM bodies' focus and investment in broader catchment scale issues. For example, in Far North Queensland, regional

NRM priority issues are currently those impacting on the health of the Great Barrier Reef, whereas community members were found to be more interested in issues impacting on the health of their local waterways. In this project, these issues were addressed by educating community volunteers about the broader purpose of the regional monitoring programs and where possible, providing support to these groups to develop separate monitoring plans specific to their local area of interest.

## **KEY LEARNINGS**

One of the key learnings from this project was that community-based waterway monitoring programs can provide a highly valuable role in achieving both community education and data outcomes for regional NRM. In the Mackay Whitsunday region, community-based waterway monitoring programs are filling a large gap in information on waterway condition needed for regional NRM, such as the development of the Water Quality Improvement Plan and monitoring of progress towards resource condition targets. This is complimenting information collected through state-wide agency-based monitoring programs. In Far North Queensland, it is clear that the community-based monitoring programs developed through this project will perform a similarly crucial function.

The project also demonstrated that community engagement and satisfaction in monitoring programs can be greatly enhanced by aligning monitoring programs to regional NRM needs and ensuring community-collected data is used for NRM planning and decision-making. For example, in the Mackay Whitsunday region, the analysis and reporting of data from the regional community monitoring program resulted in extremely positive outcomes as community participants finally felt that their data was being 'taken seriously' and providing a valuable contribution to local NRM outcomes. In the Far North Queensland region, community participants were reluctant to become involved in the new programs until it was shown how the data they collect could be used for their own local NRM planning and/or for NRM planning at the regional scale.

However, the project highlighted that when aligning programs to strategic regional NRM needs, care needs to be taken to ensure community members retain a sense of ownership over the program. Development and/or refinement of community monitoring programs should always be done in close consultation with community participants and the reasons for any refinement of objectives to align with regional NRM needs be carefully communicated and explained. This can be done through stakeholder reference panels, regular community forums and the use of documented monitoring plans, as practiced in this project.

Community ownership can also be fostered by ensuring community members feel their individual motivations and desires for becoming involved in the program are being met, due to their significant investment of personal time and energy. These motivations often relate to local NRM issues and can be addressed by ensuring analysis and reporting of results is done at local as well as regional scales and is meaningful to local scale issues, where possible. If there is community interest in local issues outside the priorities and focus of regional monitoring programs, support can be provided to these groups to develop separate monitoring plans specific to their local area of interest. The benefits of this approach were shown by the positive outcomes of these activities in the Mackay Whitsunday region.

This project has provided a model of how community monitoring programs can be supported and refined to ensure both educational and data outcomes for regional NRM. It is likely that this

model, or at least aspects of it, could be successfully applied in other regions of Queensland, particularly those in the Great Barrier Reef catchments, and possibly the rest of Australia.

The management and delivery of the regional project officer positions by the Queensland Department of Natural Resources and Water on behalf of the regional NRM body was an effective way to ensure:

- increased confidence among regional NRM stakeholders (especially state agencies) in the quality of data collected through community monitoring programs;
- increased alignment of community monitoring with monitoring methodologies used by state agency; and
- increased integration between waterway monitoring activities lead by the Department of Natural Resources and Water and regional NRM bodies.

The use of a strategic regional reference panel involving key stakeholders, such as state and federal agencies, the regional NRM body and community-based monitoring groups, was an effective way to ensure:

- community monitoring programs are more aligned to the range of NRM stakeholder needs;
- increased confidence in community data meaning that data is more likely to be used for NRM planning; and
- greater integration of all waterway monitoring programs across the region.

However, it is clear from this project that a key challenge of this type of approach is ensuring community participants are not confused by the wide range of objectives of the monitoring program. Coordinating and reporting on programs involving such a large number of stakeholders also proved challenging. However, these challenges can be overcome through open and effective communication between all stakeholders on a regular basis using the reference panel approach. Healthy working relationships built on mutual respect and trust are also critical and can only be built through stable long-term arrangements.

The project also highlighted the importance of having clearly defined scientific and social aims for community-based programs and firmly established long-term support, prior to commencing their development and seeking community involvement. Ideally, a regional water quality monitoring and evaluation strategy should already have been developed, the potential contribution of community groups in this strategy defined and long-term regional support and investment in these programs secured. This greatly assists the process of designing community monitoring plans that are aligned to regional NRM needs and contribute valuable data for NRM planning and decision-making. It also significantly enhances community engagement and satisfaction with these programs. The presence of these factors in the Mackay Whitsunday region contributed to the highly positive outcomes of the project in this region. Since these features were less established in the Far North Queensland region, challenges were encountered in designing the regional programs and engaging community participants. Subsequently, the future of these programs in this region is less certain.

## **CONCLUSION**

The outcomes of this project have demonstrated that aligning community-based waterway monitoring programs with regional NRM needs can have valuable scientific and social outcomes. By providing important water quality information for local and regional NRM planning, communities obtain greater satisfaction from their involvement and have increased understanding, ownership and trust in regional NRM activities.

This project has provided a model of how community monitoring programs can be established, refined and supported to ensure these outcomes for regional NRM. A collaborative approach, involving regional NRM bodies, federal and state agencies and the community NRM groups themselves, proved highly successful. It ensured programs were developed to meet the needs and expectations of all regional stakeholders and obtained widespread scientific credibility and support.

However, before developing or refining community monitoring programs, regional NRM needs should be clearly defined and long-term regional support and investment secured. Ideally, regional water quality information requirements and the potential role of community groups in addressing these should already be defined to assist the development of strategic monitoring plans. This will ensure meaningful outcomes for community participants, enhancing community engagement and retainment.

The project has also shown that care must be taken to ensure community participants retain a sense of ownership of the programs. Programs should be established and refined in close consultation with community participants, in addition to broader regional NRM stakeholders. Outcomes of programs, such as the reporting of results, should retain relevance to local scale issues of concern or alternative local monitoring plans developed to address these.

The approach utilised in this project was successful in achieving greater alignment of community waterway monitoring to regional NRM needs and could potentially provide an effective model for adoption in other regions of Australia.

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