Issue 1
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On TRaCK

Tropical Rivers and Coastal Knowledge

Northern water planners need TRaCK knowledge now

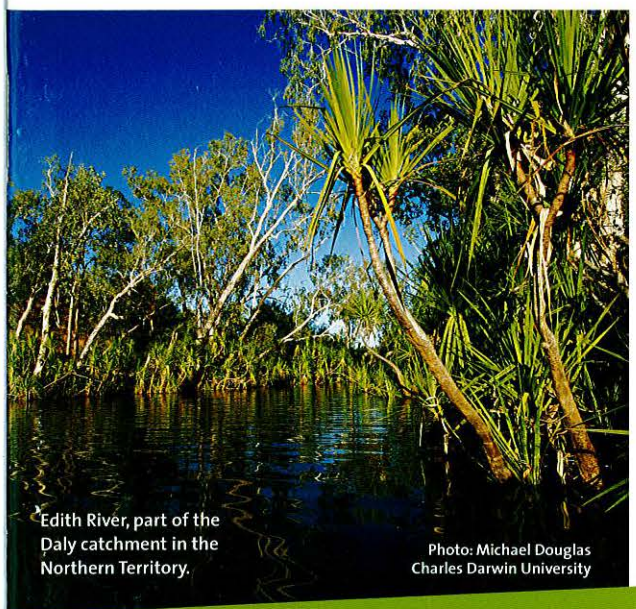
by Jenni Metcalfe

Imagine if those using and managing the resources of the Murray-Darling Basin's rivers 150 years ago could have predicted the consequences of their decisions.

Perhaps with better knowledge and foresight, south-eastern Australia would have been better equipped to deal with the crippling drought conditions of recent years and the increasingly dry conditions brought on by climate change.

This knowledge is exactly what Tropical Rivers and Coastal Knowledge aims to provide the managers and users of northern Australia's tropical rivers and estuaries. As rivers dry up in southern Australia, governments are examining the potential for a broad range of economic development opportunities that draw on the land and water resources of northern Australia.

But these decisions about managing northern rivers need to be made with the best available knowledge.



Edith River, part of the Daly catchment in the Northern Territory.

Photo: Michael Douglas Charles Darwin University

Decisions about river use in Australia 150 years ago were made by people with knowledge and experience of European conditions. Decisions about the further development and use of northern river systems need to be better informed by local knowledge of these rivers—including knowledge that Indigenous people have had for millennia and that ecologists are just beginning to gain.

TRaCK is targeting the knowledge gaps about northern Australian rivers identified by water planners and the various water users of northern Australia—Indigenous communities, pastoralists, miners, horticulturists, tourists, fishers and others.

'We want to answer the basic questions: how do our rivers work, how do people value them, what enterprises could be developed around or from our rivers, and how we can make good decisions about our rivers', says Associate Professor Michael Douglas, TRaCK Director.

State and territory water planners and policymakers want this knowledge now so they can make decisions about water allocation.

'We need the information yesterday, but tomorrow will have to do',

says Dr Peter Whitehead, a water planner with the Northern Territory Government

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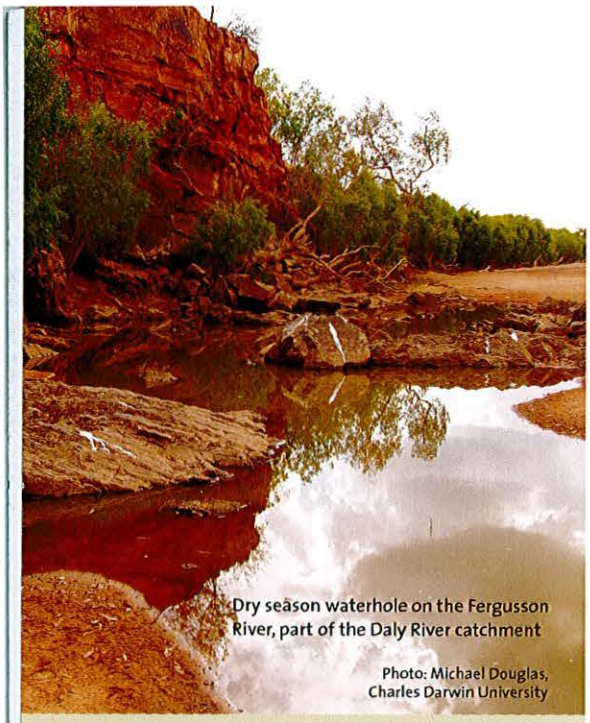


Dry season waterhole on the Fergusson River, part of the Daly River catchment

Photo: Michael Douglas, Charles Darwin University

Australian Government

Department of the Environment, Water, Heritage and the Arts

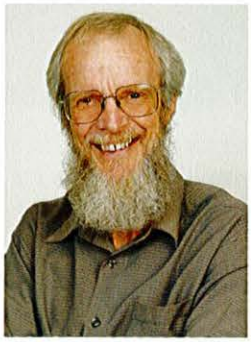
Land & Water Australia

National Water Commission

TRaCK receives major funding for its research through the Australian Government's Commonwealth Environment Research Facilities initiative; the Australian Government's Raising National Water Standards Program; Land & Water Australia and the Queensland Government's Smart State Innovation Funds.

TRaCK brings together leading tropical river researchers and managers from Charles Darwin University, Griffith University, The University of Western Australia, CSIRO, James Cook University, Australian National University, Geoscience Australia, Environmental Research Institute of the Supervising Scientist, Australian Institute of Marine Science, North Australia Indigenous Land and Sea Management Alliance, and the Governments of Queensland, Northern Territory and Western Australia.

Foreword



John Childs
Chair of the Daly River Management Advisory Committee
Chair of the TRaCK Program Management Committee

Welcome to the first edition of *On TRaCK*.

This publication will introduce you to the TRaCK program, by providing a background to some of the science and methodology and outlining what it is trying to achieve.

We have heard about the promise of the north. In fact we've been hearing about it for decades. Many attempts, large and small, have been made to exploit the promise of the north's resources. Unfortunately quite a few of these entrepreneurial endeavours have failed, some in dramatic fashion.

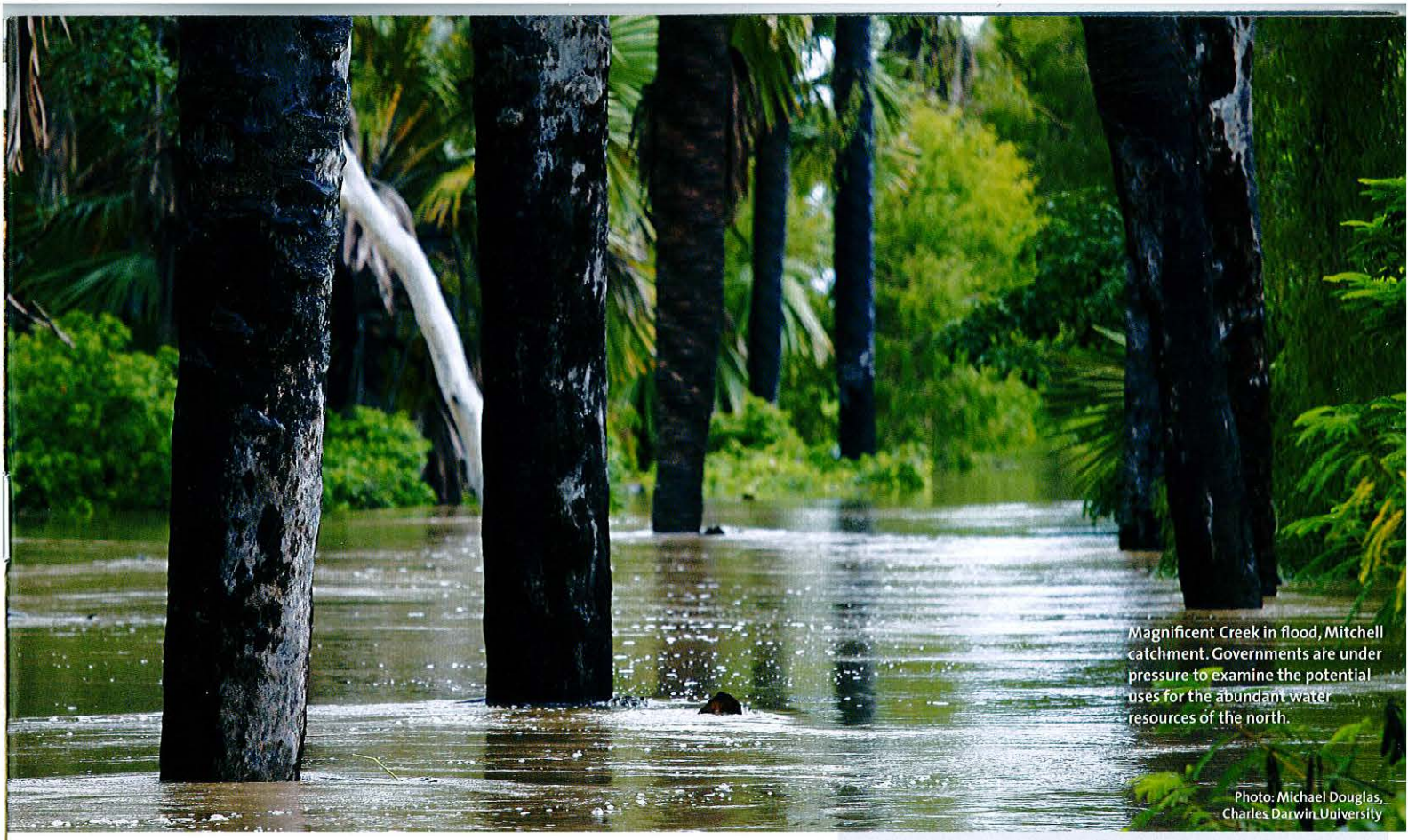
The north is also home to some of the most healthy and spectacular natural landscapes in the world. As a result of a low intensity of settlement, agriculture and fishing, and because large areas are managed by Aboriginal and Torres Strait Islander Traditional Owners, we have the opportunity to sustainably manage these valued ecosystems.

There are considerable pressures to develop northern natural resources for primary production, fishing, tourism and recreational uses. It is essential that we learn from past experiences and traditional knowledge, and conduct research to acquire new knowledge to guide the future development and management of the north's water and coastal resources.

The TRaCK program has been developed to acquire the knowledge needed to sustainably use and manage these resources. The program is participating with local people to ensure the outcomes are relevant and meet cultural and social needs.

The outcomes from TRaCK will influence policy and practice in ensuring the conservation and productive management of these valuable resources.

I hope you enjoy reading about TRaCK and continue to follow its progress. If you would like to contribute to the success of the TRaCK program, please contact one of the team.



Magnificent Creek in flood, Mitchell catchment. Governments are under pressure to examine the potential uses for the abundant water resources of the north.

Photo: Michael Douglas, Charles Darwin University

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'It's hard to identify the single most important question we need answered but a broad question which captures a lot of our needs is

"how much can we change the landscape in river catchments and still have healthy rivers that keep the values of greatest public concern?"

Associate Professor Douglas believes TRaCK is well on the way to providing such knowledge: 'In the Fitzroy [in northern Western Australia] we're well ahead of the planning processes. In the Daly [in the Northern Territory] we're already feeding information into the decisions they're making about water planning now. The Mitchell [in north Queensland] already has a water plan so TRaCK is providing information that can feed into monitoring and future planning activities.

'The late Professor Peter Cullen said we needed a decade of knowledge generation before we could make good decisions about our northern rivers, but events like the southern drought and climate change mean that there is increasing demand for that knowledge much sooner.

'Groups like the Australian Government's Northern Australia Land and Water Taskforce are making longer term decisions and will benefit from the knowledge we gain in the next two years.'

The Rudd Labor Government has moved the taskforce to its newly created Office of Northern Australia and expanded its terms of reference beyond looking at just agricultural development in the north to a broader sustainability focus.

'This move is an indication of just how serious the new government is about attracting and encouraging development opportunities across the country's vast north to deliver social, environmental and economic benefits', says Parliamentary Secretary for Regional Development and Northern Australia Gary Gray MP.

The TRaCK program is working within seven themes:

1. Bringing all the information together from the other themes to ask 'what if' questions about scenarios of potential development and climate change
2. Identifying the river assets of the north and the values placed on those assets by the communities depending on them
3. Identifying the different types of river systems of the north and the associated communities depending on these systems
4. Understanding how changes in land and water management might affect water quality and quantity
5. Understanding what plants and animals are in the rivers, how they interact with each other and how they might be affected by changes in water quality and quantity
6. Identifying sustainable and culturally appropriate enterprises which use the rivers' resources
7. Coordinating, integrating and communicating the research

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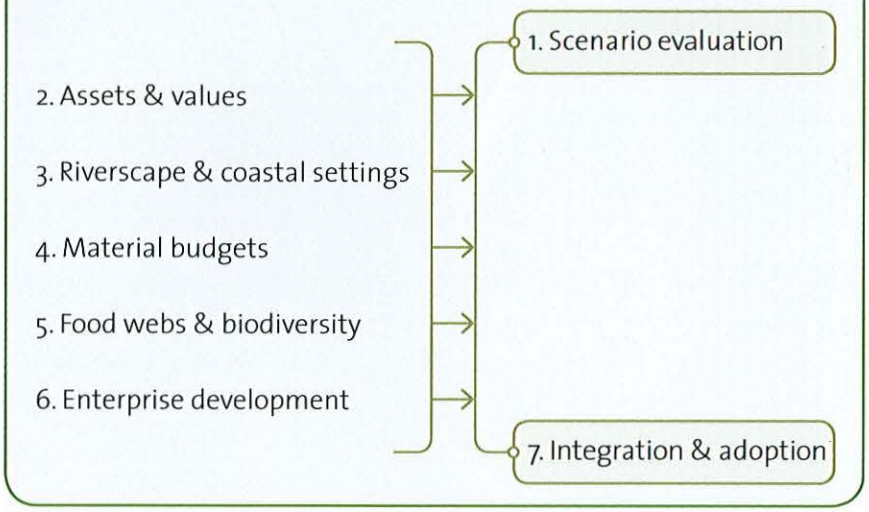
TRaCK already has a team of people working within the first theme, synthesising the existing information and asking 'what if' questions based on that information. The answers to these questions will be better informed as new knowledge feeds into this analysis.

'TRaCK has been going for over a year now and we've got our research networks in place, we've completed all the major planning and our projects are all well underway', says Associate Professor Douglas.

Parliamentary Secretary Gray says he's pleased that TRaCK research is directly relevant to the future work of the Taskforce and the Office of Northern Australia. 'This includes working with stakeholders to better understand the full range of values associated with our tropical rivers, and researching the issue of culturally appropriate and sustainable development in remote and regional communities.

'Research across all seven TRaCK themes is relevant to improving our understanding of the northern landscape, and avoiding the mistakes that have been made in the south.'

What is TRaCK focusing on?



Associate Professor Douglas believes that what makes TRaCK particularly unique is the strength and breadth of its coordination, engagement and integration.

'From the start of the program, we have had over 70 people from different disciplines focusing on the same issues in the same regions and working within an integrated framework. We're using a multi-disciplinary approach to give us a more complete picture of our river assets, the processes that underpin these and how it all fits together at the landscape level—from the catchment headwaters to the floodplains and on to the estuaries.

'And in all our research projects, we're addressing the agreed needs of northern Australia's land and water managers and policymakers, natural resource management groups and local communities, many of whom are directly involved in our research.'

Dr Whitehead agrees: 'TRaCK not only meets pressing needs for knowledge of how river systems respond to various stressors, it is also finding out about what people value most about rivers and the sort of changes, if any, they are prepared to tolerate. And it reaches people whose voices are often muted.'

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On TRaCK

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TRaCK chooses four catchments to study top end rivers

by Adriana Velez & Michelle Riedlinger

TRaCK covers a large area across the top end but it focuses its research on four key catchments.

One dilemma for the TRaCK program is how to investigate all the different river systems across the vast top end of Australia and provide useful information for decision-makers.

The TRaCK program encompasses the region between the tip of Cape York Peninsula in Queensland and Broome in Western Australia. Most parts of the region are difficult to access, especially during the wet season. With such a widespread population, researchers can find it difficult to organise regular meetings with local communities.

While studying the whole region would be ideal, it is not feasible.

TRaCK researchers are focusing their efforts on catchments that represent the different types of rivers in the region.

TRaCK researchers have selected four focal catchments: the Daly in the Northern Territory, the Fitzroy in Western Australia, and the Flinders and Mitchell in Queensland, to represent the wide range of river systems in Australia's tropical north.

TRaCK consulted communities and interest groups in these areas to make sure the catchments met three key criteria. Firstly, the catchments needed to be representative of different types of rivers in the region. Secondly, they needed to confront a wide range of future development pressures. And thirdly, the communities in these catchments needed to support and be interested in TRaCK research.

TRaCK researchers and communities were faced with a problem when deciding on catchments that would be representative. 'The four catchments we selected couldn't be atypical because we needed to be able to extrapolate the information to other catchments, but they had to be different enough from each other to capture the wide range of river settings and development pressures of the whole region', says Professor Stuart Bunn of Griffith University, Deputy Director of TRaCK.

While researchers have chosen the focal catchments to represent a diversity of river systems and a variety of development pressures, they acknowledge that the information they are collecting may not be applicable to all catchments in the region.

'To extrapolate the information to other catchments we need to compare apples with apples, but the region is very diverse so we cannot make generalisations for the entire region', says Professor Bunn.

The focal catchments selected have distinct physical and hydrological characteristics separating them from each other, but they share these characteristics with other tropical rivers in their region.

For example, the Daly River in the Northern Territory has clear water, and permanent springs maintain the river's flow throughout the year. Plants, animals, and communities close to the river rely on this permanent flow for their survival.

The Daly supports eight of the twelve freshwater turtles found in the Northern Territory, including the pig-nosed turtle. This turtle is an iconic species in the Daly River and an important food resource for many Indigenous communities.

Although the Mitchell and Flinders Rivers are both in Queensland, they are very different from each other. They were selected because they represent two of the most common river types in north Queensland.

The Mitchell is one of the biggest rivers in the state, covering diverse habitats from the wet tropics to inland savannas. It has clear waters similar to the Daly and immense biodiversity, with swamps, waterholes and savannas providing a range of habitats for a unique range of fauna and flora. The Flinders, by comparison, is a turbid, muddy river that shrinks into a series of pools by the end of the dry season.

Researchers know very little about the hydrology of the Fitzroy River in Western Australia, although they recognise that it has many unique environmental features. It provides habitat for around 40 species of fish, including the threatened northern river shark. It is also home to the largest population of freshwater sawfish in the region.

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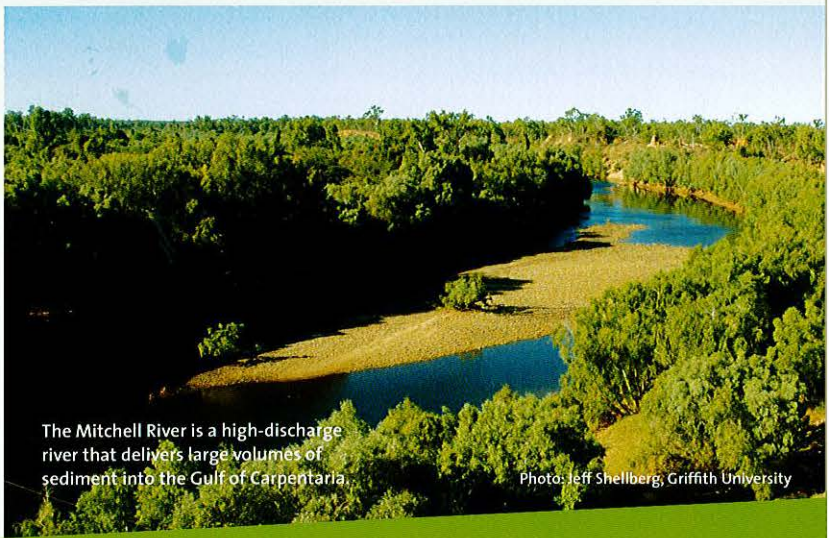

The Mitchell River is a high-discharge river that delivers large volumes of sediment into the Gulf of Carpentaria.

Photo: Jeff Shellberg, Griffith University

In selecting the focal catchments, researchers also needed to consider the developmental pressures these catchments faced or were likely to face.

Some tropical rivers are already experiencing the impact of development, while for others those pressures are just starting to emerge.

All rivers in the focal catchments face future pressures related to how much water will be extracted for human use. The Fitzroy and the Mitchell catchments face further development of the grazing and mining industries. The Mitchell is already experiencing high levels of erosion and TRaCK researchers will explore how sediment is moving through the river system.

Researchers also needed to consider the level of community support in the catchments. The Daly is recognised worldwide as one of the best rivers for fishing. The local community also relies on it as a critical water resource.

'The town of Katherine is located within the Daly catchment. It depends on the Daly for water, particularly from groundwater, for consumption and irrigation', says John Childs from the Daly River Management Advisory Committee.

'There are several Indigenous language groups living in the catchment and they use the Daly for food and for cultural ceremonies. It is also a very important river for recreation and tourism, especially the Katherine Gorge which attracts a lot of tourists', says Childs.

Indigenous groups have traditional lands within the Mitchell catchment. Three main groups own much of the land in the river's delta. Many of these people live in the community of Kowanyama and, for them, taking care of the Mitchell is a priority. The Kowanyama community actively sought support for the Mitchell to be included as one of the key northern rivers for research.

'We [Mitchell River Watershed Management Group] were the first catchment management group before Integrated Coastal Management legislation in Queensland', says Viv Sinnamon, head of the Kowanyama Aboriginal Land and Natural Resources Management Office in the Mitchell region.

'We believed the Mitchell had the capacity as a region to support researchers and there was sufficient reason for it to be one of the focus catchments chosen', says Sinnamon. 'We are already seeing the economic benefits of caring for country.'

Charles Curry from Southern Gulf Catchments believes the work in the Flinders catchment is essential as several shires want to develop agricultural industries around the river in a responsible way.

'They are looking at water infrastructure, dams and off-river storages but they want to make sure this will not cause future environmental problems for the river', Curry says.

'More agricultural development would increase the vitality of communities around the river as it would reduce their reliance on the cattle industry.'

Curry also believes that controlling the spread of weeds on the river and better protection of the riparian vegetation are important factors to consider in any agricultural development.

The Fitzroy has come under development pressures in the past and this pressure is likely to increase as water becomes scarcer. Some groups are demanding action to protect it from further damage and so far these actions have effectively stopped the damming of the Fitzroy.

'It's important we have a solid base of research', says Gary Scott, campaigner at Environs Kimberley, the regional environment group. 'The community needs to be engaged and that's why TRaCK is not only focusing on scientific research but also on consultation of both Indigenous and non-Indigenous communities to increase their capacity to participate in water planning.

'A large number of Indigenous people live in the catchment and this project could be a model for Indigenous engagement in water planning processes', says Scott.

To complement the research in the focal catchments, TRaCK researchers are also looking across the whole region at the physical characteristics that make up tropical rivers.

Through this large-scale investigation, they will categorise the rivers according to their differences and similarities, to determine which other rivers share common features with the rivers in the focal catchments. This information will aid the transfer of information from the focal catchments to other catchments in the region.

'We're trying to cover as many rivers as possible while recognising that not all the rivers are the same', says Professor Bunn.

This year, TRaCK researchers in the Daly are looking at the river's biodiversity, improving our understanding of the water resource, and studying the value of the river for Indigenous communities. In the Mitchell, they are working together with communities, businesses and the government to identify the uses and values of the river. And in the Fitzroy, they are finding ways to engage with Indigenous and non-Indigenous communities to build their skills in water management. Work in the Flinders is just getting underway.

Sir John Gorge, one of the many gorges along the Fitzroy River, is home to a variety of animals and plants that depend on it for their survival.

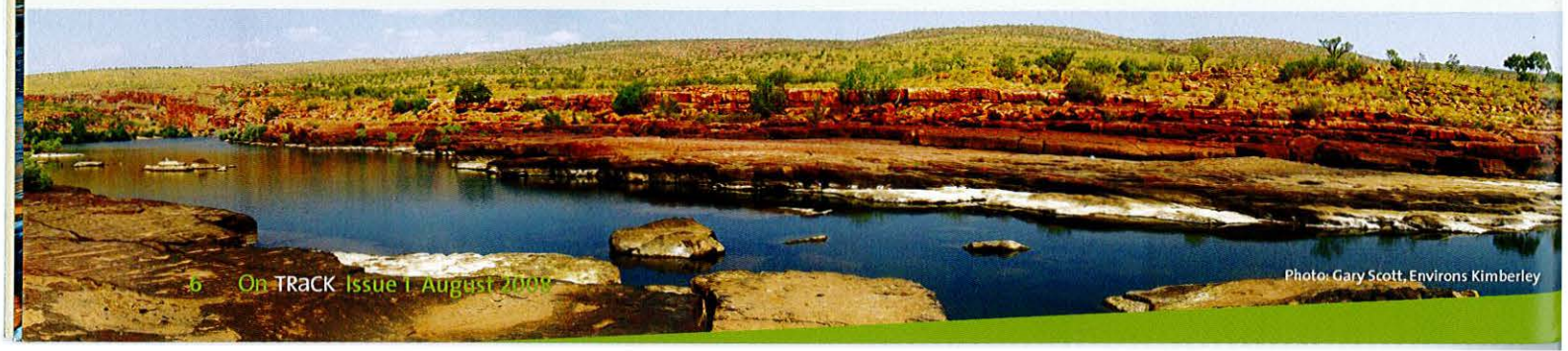

Photo: Gary Scott, Environs Kimberley

Photo: Michael Douglas, Charles Darwin University

Tourists and locals use the Tjuwaliyn (Douglas) Hot Springs Park for recreation. The Park is located on the Douglas River, part of the Daly catchment in the Northern Territory.

Ask the locals: communities have their say on tropical rivers

by David Powles

Indigenous people have known it for tens of thousands of years: rivers are an indispensable part of life for local people.

Communities depend on rivers for food and goods, transport, leisure and relaxation, and as part of their cultural life. So it's essential that they play a central role in shaping water management policies for their catchments.

It's not surprising then, to find that TRaCK researchers are working closely with community groups in the Daly, Fitzroy, Mitchell and Flinders catchment areas on more than 20 interrelated projects assessing the social, cultural, economic and environmental status of Australia's tropical rivers. Every TRaCK project is required to engage with local communities. This engagement provides researchers with local geographical and historical knowledge and helps them tailor their research to meet local needs.

A vast array of groups and interests exist in the four catchments TRaCK is studying. Indigenous groups, landholders, government departments and river management groups, as well as tourism, industry, and recreational groups all have a stake in the rivers' resources and management.

Dr Neil Collier, a researcher at Charles Darwin University, says all of these groups have stepped up to contribute to TRaCK in a variety of ways.

Talking about river use with a mining industry representative can be quite different from talking to recreational fishers, which can be different again from talking to Indigenous ranger groups.

'Interactions with the community have been very diverse', says Dr Collier.

'A huge range of people have expressed their opinion and contributed to the TRaCK program so far.'

Dr Collier and his colleagues are modelling scenarios for TRaCK, exploring the many different ways tropical river systems could look in the future. They use extremely sophisticated techniques and integrate cutting-edge research into river flow and the biophysical processes of a river environment from a variety of scientific disciplines. But Dr Collier reckons a casual chat with the locals is just as important for shaping his scenarios.

'People provide anecdotal evidence by telling us stories about the ways they've seen the rivers change in their lifetime, and about what they'd like to see happen for the river in the future', says Dr Collier.

'Our involvement with the local community has been very positive.'

Dr Collier is integrating a broad cross-section of community and stakeholder

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perspectives into his research. Tropical rivers are used for agriculture, mining, fishing, recreation and as part of cultural life. With such a wide variety of often competing interests, he says there is no shortage of strong opinions on offer.

'Advocacy is definitely alive and well up here', he adds with a wry chuckle.

Local river management organisations, such as the Mitchell River Watershed Management Group, are particularly enthusiastic about the opportunities provided by the research. In the Mitchell catchment many people are questioning the impact of alluvial mining on the river's water quality. The group's chairperson, Hilary Kuhn, says the research will be the first comprehensive assessment of the Mitchell catchment to combine scientific, economic and cultural perspectives.

'We're really excited about the project, because it will offer management tools based on scientific data and appraisals that we urgently need', says Kuhn.

Indigenous people have their own traditional river management practices, and their cultural links to river systems date back thousands of years. This gives them a unique historical and cultural perspective on their catchments.

Dr Collier explains that, despite having arguably the strongest ties to water resources of all community members, Indigenous people too often feel left out of decisions about the way these resources are managed. For Indigenous groups, TRaCK provides an opportunity to have a say in how tropical river resources are managed on a policy level.

To encourage greater engagement with water policy decision making at levels often dominated by non-Indigenous people, the program is providing targeted training to Indigenous groups. Researchers are running hands-on workshops with Indigenous participants to introduce TRaCK's methods, and are encouraging Indigenous people to develop scenarios and visions for the future that reflect their own aspirations for river management.

'We hope TRaCK will be a way of increasing the skills and confidence of Indigenous participants so they do feel like it is worth getting involved in planning policy that will affect how the rivers are managed in the future', says Dr Collier.

Along with the knowledge gained from its research, TRaCK is also bringing new perspectives on tropical river systems to the catchment areas, giving local communities new ways of looking at their familiar river environments.

Dr Anna Straton, principal investigator for TRaCK's 'Valuing tropical river ecosystems' project, is asking local communities to consider how important their rivers are and is encouraging them to examine tropical rivers through an 'ecosystem goods and services' approach.

Under this approach, ecosystem goods are the material things that a natural environment can provide us; things like fish and water from the river, or trees from the surrounding land. Ecosystem services are less tangible. They are the important benefits provided by a natural ecosystem, such as clean air and water, which sometimes are not appreciated until they're threatened or gone.

'Communities tell us about which ecosystem services are most important to them', says Dr Straton. 'We integrate this into our research and try to establish just what kind of values can be ascribed to these benefits in economic terms.'

Dr Straton's research tries to place a quantitative, real-world economic value on these less obvious services provided by a river ecosystem, to help local communities think about what type of river environment will bring them the most value.

A new mining development upstream could bring enormous economic income to a nearby community, but this might seem less appealing after deducting the income lost from tourism and recreation should degraded water quality force these activities to move elsewhere.

Dr Straton believes that examining rivers from this perspective encourages communities to ask important and sometimes difficult questions about the value they place on the services their river provides to them, and about the way they want the river ecosystem to be managed into the future.

'The ecosystem service approach can lead to really interesting discussions about the pros and cons of putting a dollar value on the environment—it can be a contentious issue', she says.

Assisting TRaCK researchers with their work provides clear benefits to the community, by ensuring that the research stays relevant to the end-users of river resources. The community response to the TRaCK project has so far been overwhelmingly positive and Hilary Kuhn believes the people she represents in the Mitchell catchment are enthusiastic about the project.

'A lot of studies conducted by the government are long-tem, and people often get "burnt out", if you like, because it takes so long for their feedback and input to produce results', she says.

'But the community really does see the value in this project, because TRaCK researchers are presenting their activities and findings to us as they go along. This makes the benefits of the research very clear to the community, and also helps to keep them engaged.'

The Mitchell River Watershed Management Group collaborates with researchers.

Photo: Mitchell River Watershed Management Group Inc.

Scientists and Indigenous people share their knowledge of fish in the Daly River

Photo: Michael Douglas, Charles Darwin University

Understanding Indigenous river values and use critical for river management

by Jenni Metcalfe

'That river himself, he was pretty and now he's wider and shallower.'

These were the concerns of Biddy Lindsay, an elder of the Malak Malak people, about the Daly River as expressed five years ago to CSIRO researcher Dr Sue Jackson. The Daly River is the Northern Territory's largest river and Indigenous people are concerned about increased agriculture causing erosion of river banks, increased weeds and reduced water quality.

The Wagiman people also depend on the Daly River, and Robert Liddy, a Traditional Owner, says he's noticed that the banks of the river have widened by 30 to 40 metres.

'There's a lot of sand coming down and shallowing out areas where we used to be able to boat and swim', he says.

And this is all before drought focused the attention of southern Australia on the seemingly plentiful water of the north, with talk of new agricultural schemes and pipes to southern capital cities; a drought whose effects many believe were made worse by two centuries of poor river management, especially in the Murray-Darling Basin.

TRaCK is providing northern water managers with the chance to do things differently, but according to Dr Jackson, a TRaCK project leader, this has to happen with Indigenous involvement and knowledge.

'Indigenous people make up a large proportion of northern Australia's population and this is growing', she says. 'They are the landowners of half of the NT. There are very healthy river systems flowing through Indigenous land and Indigenous people have a very strong attachment to their land and water.'

'We use the river to its fullest extent for hunting and fishing', says Liddy, talking about the Daly River. 'We take wallaby, bream, barramundi and catfish.'

According to Dr Jackson, scientists know very little about these rivers compared to southern rivers and she believes we can learn a lot from the people who have interacted with the rivers for thousands of years.

TRaCK research projects are aiming to help Indigenous people share their knowledge with scientists, monitor their own waterways and have a say in planning and policies that might affect them.

Continued page 10

'Too often, water planning and policy has been dominated by non-Indigenous interests',

says Dr Jackson. 'Yet our research is identifying just how much Indigenous people rely on their rivers and creeks for culture, food and their economic wellbeing.'

For Indigenous people, water can be a defining element of their connection to country. Water sources and rivers are seen to be derived from the Dreaming—when the world formed its present state.

Indigenous mythology includes accounts of poor water management and the need to wisely manage and share water resources.

Rivers are important to Indigenous people, providing bush tucker, art supplies and medicine. TRaCK research is estimating the value of aquatic resources to Indigenous households and what might happen to those resources if the river's flow was changed by storing, extracting or diverting its water.

For example, fish such as the barramundi swim up to the floodplains during the wet season. They often stay there for a couple of years before they get to breeding age and head back down to the mouth of the river. But barramundi will be harder for Indigenous people to find if water is diverted and floods don't fill the billabongs anymore. And erosion of river banks is also changing the abundance of barramundi in the Daly, according to Liddy: 'With the shallower water, we're catching less deep-water fish like barramundi in our usual hunting areas and we have to access more of the river to find these.'

Freshwater prawns are found in river pools in the dry season and provide food and bait to Indigenous people. But if too much water is taken from rivers in the dry season, they will be much harder to find. Even plants that are used for food, such as waterlilies, might be affected if a river's flow changes.

'These considerations are often left out of government decisions. Farmers and mining companies can make a strong case for using water based on the value of that water to their businesses', says Dr Jackson. 'But it can be harder to see how important this water is for the daily life and culture of Indigenous people. Changing a river might have detrimental effects on the household diet of Indigenous people, many of whom are already economically disadvantaged.'

TRaCK will survey Indigenous people to find out what they use from rivers and wetlands and the value of these resources. Researchers are also looking at what might happen to these resources if the flow of the rivers were to be changed. In this way, water managers can make better decisions about how the water is shared.

TRaCK is asking Indigenous people:

1. Where do people go for fishing, hunting and collecting plants?
2. What plants and animals do they take from the rivers that reduce the need to shop?

TRaCK has written a story book to explain the work it wants to do with Indigenous communities in the Daly River and the Fitzroy River in Western Australia over the next three years.

'We've been taking this story book out into the regions and going through it with people', says Dr Jackson. 'It is important that participants understand why the research is being done and what benefit it will serve. We have tried to explain our methods clearly and we find that people really enjoy seeing photos of themselves, their families and their country.

'Explaining the project well and building trust requires that we spend a lot of time in the community talking about use of resources from rivers. We know that asking questions about resource use can be seen as intrusive; people are concerned about how the information will be used.

'People need enough information to make decisions about participating in the research. They have to have the option to say whether they are interested or not'.

But Dr Jackson and her team have been pleased with the response so far from the Indigenous people they've met with. In the Daly River region, this has largely been based on relationships that have developed through past research.

For example, Dr Jackson has been working with the Wagiman Rangers for several years. The Wagiman Rangers are one of about 34 Indigenous community ranger groups across the top end that are managing the country through support from Natural Heritage Trust funds, Community Development Employment Projects program and the Northern Land Council's Caring for Country initiative. TRaCK is also working with the Malak Malak Rangers in the lower Daly River region.

'This research is very important, because as our rivers are changing our lifestyle is also changing', says Robert Liddy. 'It's also changing the animals. In places where they couldn't cross the river before, they now can, which also changes the way we hunt them.'

The Aboriginal Reference Group (ARG) works with TRaCK in the Daly catchment, connecting researchers with crucial Indigenous knowledge resources and providing the program with

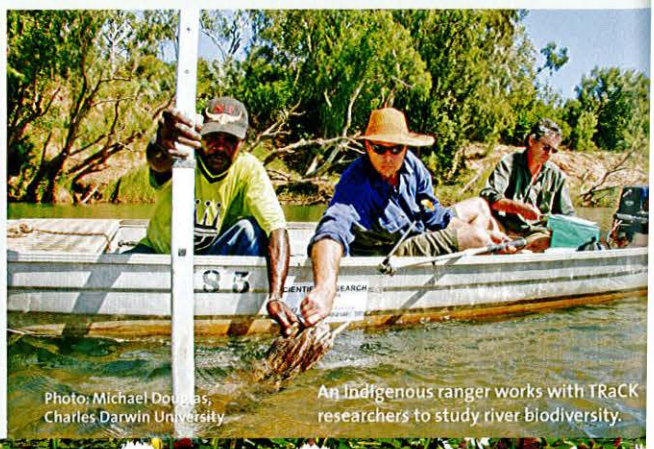


Photo: Michael Douglas, Charles Darwin University

An Indigenous ranger works with TRaCK researchers to study river biodiversity.

Waterlilies can be an important source of food for Indigenous people and could be affected by changes in river flow.

direction and advice on its engagement with Indigenous people. Mona Liddy, spokesperson for the ARG, emphasises the key consultative role the group plays in TRaCK's activities in the Daly:

'Indigenous people have no scientific records on the history of the river, but we have a lot of stories about the country, and it's good to combine that with the scientific data.'

'We find that a lot of the stuff we've been telling the scientists about what we've noticed happening in the river has proven true, and our cultural knowledge has proven very useful to them', she says.

Indigenous land councils are another important group for gaining access to Indigenous communities and TRaCK has spent time this year negotiating a relationship with the Kimberley Land Council.

'They're keen for TRaCK research to be undertaken in the region, but they have certain provisos', says Dr Jackson. 'They want to see remuneration for Indigenous participation and protection of Indigenous intellectual property. They also want to make sure there is sufficient reporting back and communication between scientists and Indigenous people.'

Dr Sue Jackson talks with Harry Watson about his country in the Fitzroy Valley of the Kimberley. Two-way communication between researchers and Indigenous people is important for TRaCK's success.

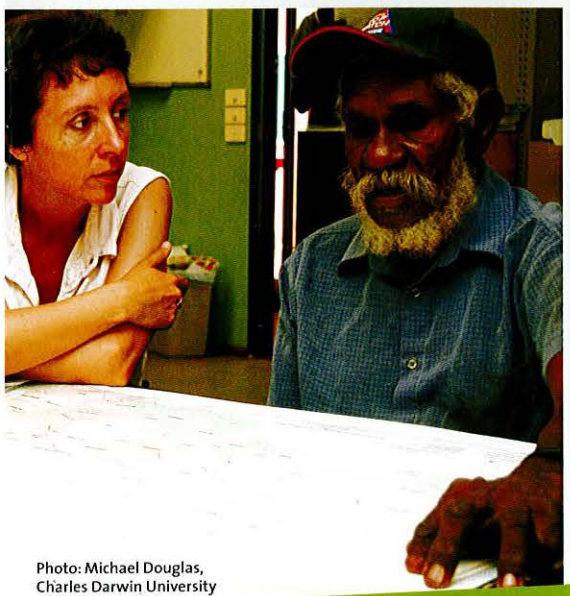


Photo: Michael Douglas, Charles Darwin University

TRaCK is negotiating research agreements with Indigenous people in its focal catchments, which include:

- protecting intellectual property and cultural information
- protecting the information people might put on maps
- making sure the project pays people for their knowledge
- identifying methods for recording information
- identifying training and employment possibilities

'The people we have been speaking with want to record their own stories about rivers so decision makers will consider these interests, values and priorities when looking at river flows and when making decisions that can affect rivers', says Dr Jackson.

Indigenous communities are concerned that the death of their old people may mean the loss of important knowledge and they want their stories collected. The Wagiman Rangers, for example, have done video courses so they can make their own videos of the old peoples' stories. TRaCK will further help Indigenous communities record their stories, and will also seek to access and where appropriate further promote such stories to help their own understanding of the rivers.

'The Malak Malak people are keen for people to know more about their connection to the Daly River', says Dr Jackson. 'Hundreds of tourists visit each year and lease out campsites. The Malak people want to encourage respectful interactions with their country.'

Indigenous knowledge is crucial for TRaCK researchers seeking a good scientific understanding of the top end rivers. TRaCK director Dr Michael Douglas cites the TRaCK project looking at fish populations and environmental flows as an example of the importance of Indigenous knowledge:

'We caught a garfish in an area where we'd never seen them before. But the Indigenous people told us those fish were there all the time', he says. 'They have a lot more long-term knowledge than we have of their rivers. We'll go in and research the ecology of a river reach over three weeks, but this does not tell us what has happened over the last decade.

'We need to draw on all sources of information to be as confident as we can be in our decisions.'

Dr Jackson says Indigenous people want to be involved in monitoring their rivers because they're concerned, like Robert Liddy, about the changes they've already witnessed with increased agriculture, aquaculture, and tourism.

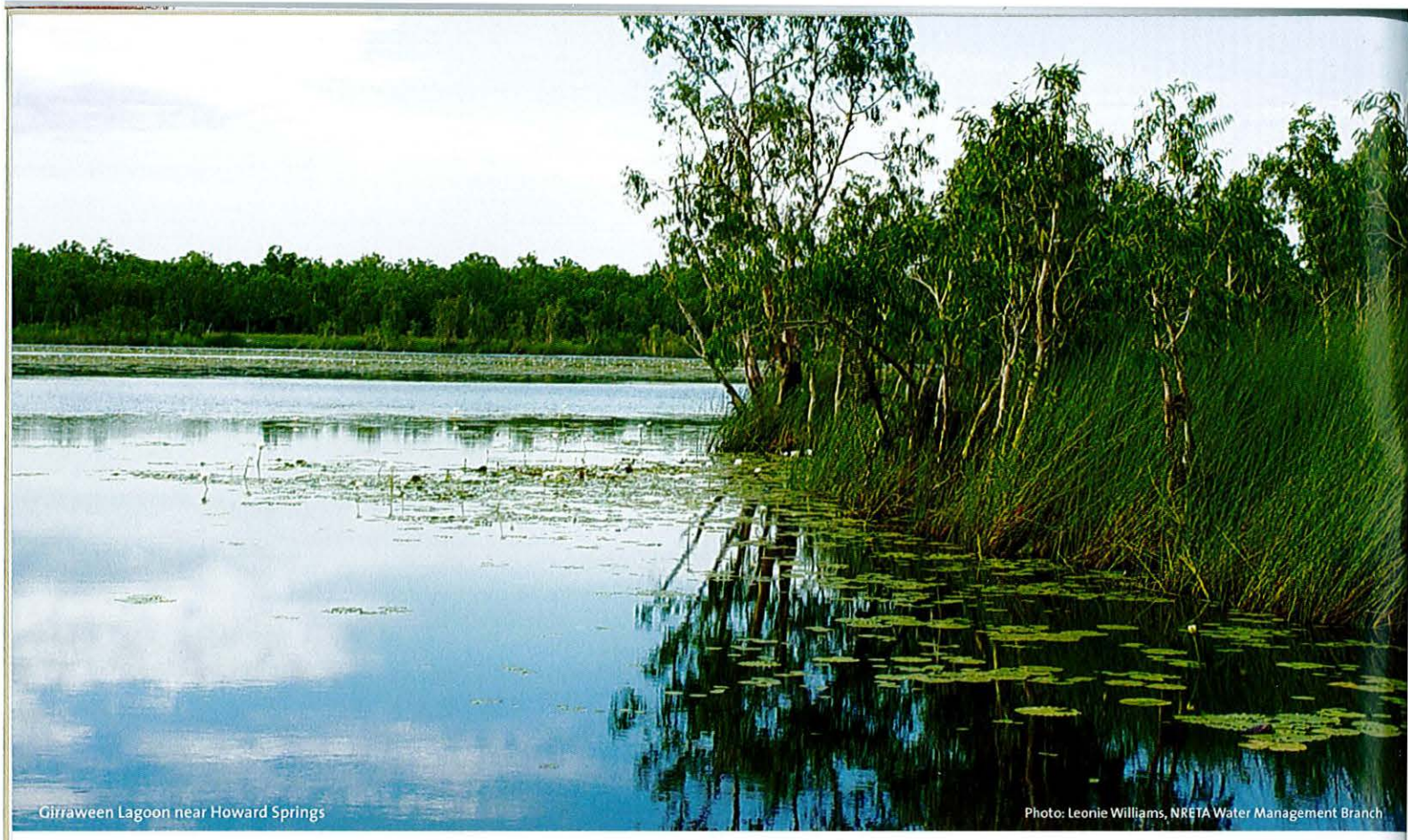
'They want to have a say in any new developments that might affect their rivers', she says. 'They know there are increased water pressures and they want information on how this might affect the resources they depend on.' Liddy agrees:

'We need to find out what we already have on our land and in our rivers, what we've already lost and what we need to protect for future generations.'

TRaCK will be providing training to those Indigenous people who want to be involved in monitoring their favourite sites.

Significant time is required to develop relationships with and build the research skills of remote Indigenous communities. And it's a slow process to develop plans that accord with community values and aspirations. But Dr Jackson believes spending this time is a critical investment for governments seeking to make wise decisions about northern Australia's rivers.

'Involvement of communities with a crucial stake in river and wetland management, especially those with culturally distinct landscape perspectives, values and management aspirations, is central to sustainable management of our northern resources.'



Girraween Lagoon near Howard Springs

Photo: Leonie Williams, NRETA Water Management Branch

Beyond consultation: collaborative water planning in Northern Australia

by Melanie McKenzie

Graziers, irrigators, resource managers, scientists, Indigenous communities and catchment managers are learning from each other and contributing positively to decisions about water sharing in a bid to better manage water across Australia's top end.

The community are being invited to become collaborators in water planning through a TRaCK initiative being led by researchers from Griffith University and the CSIRO.

'Integrated water reform on a continental scale, like what's happening in Australia, is globally unprecedented and calls for new approaches', explains Dr John Mackenzie, a research fellow from Griffith University.

Australia's National Water Initiative has prioritised community partnerships as a way of effectively managing and equitably sharing water resources. And this means governments are expected to engage water users through transparent decision-making and improved public access to information.

TRaCK's collaborative water planning project is identifying clear, accessible ways for the community to engage in making decisions about our rivers and groundwater.

Dr Mackenzie says the TRaCK research team's initial case study evaluations looked at community participation in current water planning processes in the Gulf of Carpentaria in Queensland and in the Ord River region in Western Australia. The researchers found that the communities in these regions were very aware of the link between their water resources and their future viability.

'The people we interviewed in northern Australia understand that water planning plays a decisive role in stimulating economic opportunities for sustainable growth and future development', he says.

'While they see the need for water reform, they want to know that if they participate in consultative planning processes, their input will contribute to the final decision.

'Everyone understands how important scientific research is in helping make decisions about how water is allocated, but they also feel that locally-held, community expertise could be better used to supplement the technical analyses.'

Participatory Action Research (PAR) is one approach for giving the community a collaborative researching role. PAR participants own the research by informing project design and methods, helping with research activities, and being responsible for putting the

results of the research into action. PAR is particularly useful when long-term change is needed. In particular, it makes sure the research outcomes are relevant and applicable to the needs of the local community.

TRaCK researchers have already negotiated agreements with government water planners to initiate PAR in two water planning regions: the wet tropics in Queensland, and Darwin in the Northern Territory.

'We'll be working with water agencies, Indigenous communities, industry and the wider community to test new collaborative tools and approaches', Dr Mackenzie says.

'Together with the planning staff and local communities, we will assess the most pressing issues, decide which tools and approaches we will pilot,and work together to test and evaluate their success.'

One of the communities the research team has chosen to work with is located on the southern outskirts of Darwin. This community uses the Howard East groundwater store or aquifer. Planners have started developing the water allocation plan for the Darwin region, where the catchment is under pressure due to the effects of urbanisation.

'People are still living the rural lifestyle and living on production land supported by the aquifer. At the same time, the Darwin water supply uses the aquifer to supplement their dam supply for urban water use', says Chris Wicks, a water resource planner from the Northern Territory Department of Natural Resources, Environment and The Arts.

Photo: Emma Woodward, CSIRO

'We have a lot of different issues to deal with in this relatively small region', says Wicks. 'We need to start looking at what is acceptable and what isn't as a lot of things can happen to the region in the future.'

The effects of subdividing the region's highly productive land into large blocks and residential areas need to be considered by the community.

The region also boasts Howard Springs Nature Park, a place where locals visit for recreation and where Indigenous people gather. The park's waterways, which feed into the Howard River, rely heavily on groundwater for most of their flow after the wet season.

'Hydrologists can tell us how much groundwater we need to retain to keep the Howard River from drying up. They can give us a maximum extractable limit. If this limit is more or less than what is currently being used or will be used in the future, we need to find out how people feel about the way water is allocated. These things need to be discussed', says Wicks.

Wicks says one of their biggest challenges with water allocation planning is getting a good measure of environmental and cultural requirements. He feels the work they are doing with the TRaCK water planning research team will get the community involved in planning from the start—as true collaborators in the project.

'We won't be telling them what is going to happen. This process is on a different scale of collaboration', he says. 'Collaborative water planning is about the community's interaction with that resource. If the plan requires certain behaviours from the people involved, they need to fully agree with that behaviour from day one.'

Wicks believes collaborative water planning also needs to incorporate the weighting that the community gives to the different economic and environmental issues.

'It isn't just about their reactions to the technical data; the community has a lot of local expertise', he says. 'I know that there are some Indigenous elders who were here around wartime when development was just beginning. They have pictures of what their area used to be like—what it would look like naturally. They also tell stories of billabongs that never completely dried up before filling again during the wet season.

'This information is very important for understanding people's concepts of the environment. We have to listen to what they're saying.'

Wicks and the TRaCK research team expect the first steps in building the foundations for collaborative water allocation planning for the region to take time to develop and involve several iterations over the next year.

'Good water planning is about making trade-offs—getting the right balance between water allocated for water users and for the environment, between river health and community needs', Dr Mackenzie says.

'The challenge is to make such trade-offs clear and equitable, so that people can understand the challenges faced by decision makers and how these decisions will impact on the future of their water.'

Through the pilot programs, including the one near Darwin, the TRaCK research team is hoping to develop guidelines for engaging the public in the water planning process in a way that integrates technical information, Indigenous cultural values and knowledge, and local experience. In this way, water planning will be a true collaboration between researchers, planners and the community.

Melanie Bradley, CSIRO landscape ecologist, and Tibby Quall, Larrakia research assistant, check map images with real features on the ground at Gunn Point in the Howard River water planning catchment area.

TRaCK researchers join forces with the Kowanyama Aboriginal Land & Natural Resource Management Office.

Photo: Michael Douglas, Charles Darwin University

Scenario modelling: putting the pieces together

by David Powles

Dr Kostas Alexandridis and Dr Colette Thomas of the CSIRO have been visiting people whose lives and work are linked to the Mitchell River system, because they want them to predict the future.

As researchers for the TRaCK program, they are working with local communities and policymakers in the catchments of the Mitchell, Daly and Fitzroy Rivers, helping them to envisage possibilities for managing rivers, through simulations known as scenario models.

TRaCK's scenario models are visions of possible futures; ways of telling stories about the different potential outlooks for tropical river systems. They use the latest scientific knowledge to give people realistic projections about what possible courses of action could mean for the river environment around the bend.

Of course, scenario models don't really predict the future, and they can't tell us exactly what the future will hold for Australia's tropical river systems. But with the latest data from more than 20 TRaCK projects behind them, the models can provide some pretty big hints about what may lie ahead. This will be enormously helpful to those responsible for deciding how we will use the resources of our tropical rivers and estuaries in years to come.

Australia's tropical rivers are intricate networks where environmental, social, cultural and economic components all intersect. TRaCK is examining these complex systems through more than 20 individual projects.

'There are many different drivers of change in these river systems, and they operate on different scales', says Dr Alexandridis. 'There's the local, national, regional and even the global scale, when you think about the effects of things like global warming. So we ask, "how are they connected?"'

'There is obviously interplay between all these elements of change, and we want to try to explore them through the research.'

Using the latest research techniques and spanning multiple scientific disciplines, TRaCK is generating a wealth of vital data on many aspects of tropical river systems. The economic, environmental, social, and cultural spheres are all being examined, along with the biophysical aspects of the rivers themselves—water quantity and quality, sediments, nutrients, food webs, ecosystem processes, flora and fauna. The research is both intensive and broad-ranging.

But what will this mountain of raw scientific data mean to an Indigenous ranger group concerned about maintaining river fauna in the Kimberley? Or a water planner in Darwin faced with the challenge of deciding how and where to allocate a precious and finite resource?

How can so much in-depth scientific work be kept grounded and useful?

Dr Alexandridis believes that scenario modelling can answer these questions and more, and can help to keep the

Tropical rivers are complex systems where environmental, ecological, social and cultural factors all intersect.

research relevant to people working in the 'real world' of practice and policy.

Scenario models integrate data from many sources to create a practical working tool that can be used by the people on the front line of tropical river management, to better understand the likely consequences of their decisions.

To make sure that these tools are useful, they are being developed in conjunction with the people that will use them.

'We have taken a participatory approach; conducting visioning exercises with local groups, trying to understand what they see as the main drivers of change in these river systems, and how these are likely to effect the river system in the future', says Dr Alexandridis.

'We talk to them about the needs and challenges for the rivers and for the communities, and we ask, "how do we address these challenges?"'

Scenario modelling involves taking all of the data from all of the sources, and combining it in ways that can be used to predict what might happen if certain circumstances were met, or certain action taken. It's all about asking 'what if' questions.

For example, what would happen if a significant percentage of the water was drawn out of a river system for irrigation? This would no doubt increase the production capacity for irrigators in the region but it would also potentially have a range of negative consequences for the river environment.

'We encourage the participants in our research to envision different worlds, where different inputs and decisions result in different outcomes,' explains Dr Alexandridis.

'We ask them questions like, "What if all the decisions about managing a river were made according to market value? What would a market-driven world look like for the river? How might this be different from a world where management of the river was driven by the community itself, or different again from a world where the dialogue was set by a regional or national approach to looking at the river system?" We spend substantial time talking to people about what they think these different approaches could mean for the river', he says.

A team of researchers from Charles Darwin University is performing similar work for TRaCK in the Northern Territory's Daly River catchment. John Childs, Chair of the Daly River Management Advisory Committee believes TRaCK's research is already delivering positive benefits to people managing the Daly River.

'We've been particularly pleased about the effort TRaCK has made to engage the local community with its research', says Childs. 'The scenario modelling work really helps us to get a clear picture of what the future of the Daly might look like. The research is providing very useful results for us concerning things like the effects of land management practices, such as tree clearing, on the river environment and water quality.'

Childs says that the committee is especially excited about the work being done on the biophysical processes of the Daly River system, such as how flora and fauna connect in food webs.

'The work on water fauna in the Daly River has been particularly interesting for Indigenous people, who have noticed changes in the biodiversity of the area.'

All the data collected feeds into TRaCK's ultimate objective: allowing planners and decision makers to make better-informed choices about the way river systems are used. To achieve this objective, the researchers are also trying to identify conflicting aspirations among different parties, and resolve these as well as possible with the help of realistic scenario models.

What this means is that a government water planner and an Indigenous ranger can both ask the same 'what if' question and have the model realistically predict the consequences of a particular course of action. With a realistic picture of the river's possible futures on the table, potentially conflicting parties can discuss how to strike the best balance between their differing needs.

'Working out how to use these river resources well includes making sure that the balance is right between industry, conservation, social and cultural concerns', says Childs.

Dr Alexandridis says that while his engagement with various groups has gone smoothly, working with scenario models can be a new and challenging experience for many people.

'Not many people think about the future on an everyday basis, in terms of predicting outcomes as part of a complex system.

'It's a new way of thinking for many participants, so part of the challenge for us is encouraging people to think in that way. I suspect down the road different stakeholder groups will have a better understanding of what the needs and aspirations of the other groups are', he says.

This is perhaps one of the most important insights that working on TRaCK scenario modelling provides to users of tropical rivers. They become more keenly aware that they are not isolated from each other but rather exist as part of a complex system, and that the way they use a river's resources can have significant consequences for others, or for the system as a whole.

'People tend to focus on their own locality, and often don't have a comprehensive understanding of the dynamics of a tropical river system and the part they play in the bigger picture', says Hilary Kuhn, chairperson of the Mitchell River Watershed Management Group '. TRaCK is really helping to fill in those blanks for many people.'

On TRaCK

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If you would like more information on the TRaCK program, the following fact sheets are available at the TRaCK website:

Scenario evaluation fact sheet 1: River futures in Australia's tropical north

Scenario evaluation fact sheet 2: Building better Indigenous participation

Scenario evaluation fact sheet 3: Collaborative water planning

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River and coastal settings fact sheet 1: People and the economy

River and coastal settings fact sheet 2: Classifying river landscapes

River and coastal settings fact sheet 3: Sorting Australian rivers by ecology and flow

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Material budgets fact sheet 1: Sediment and waterholes

Material budgets fact sheet 2: Sediment and nutrient loads

Material budgets fact sheet 4: Water budgets

Food webs and biodiversity fact sheet 1: River food webs

Food webs and biodiversity fact sheet 2: Waterhole food webs

Food webs and biodiversity fact sheet 3: Floodplain food webs

Food webs and biodiversity fact sheet 4: Healthy estuaries

Food webs and biodiversity fact sheet 6: Estuarine fish

Food webs and biodiversity fact sheet 8: Diversity of river life

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TRaCK in the Mitchell catchment 2008

More fact sheets will be added as the program continues.

On TRaCK is the flagship publication of the Tropical Rivers and Coastal Knowledge program.

TRaCK was established in 2007 as a research hub under the Commonwealth Environment Research Facilities Program to provide the science and knowledge that governments, communities and industries need for the sustainable use and management of Australia's tropical rivers and estuaries.

The research consortium is led by Charles Darwin University, CSIRO, Griffith University, Land & Water Australia, the North Australia Indigenous Land and Sea Management Alliance and the University of Western Australia.

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