flow

manatiaki kōawa
rivers
GROUP

A joint technical interest group of Engineering New Zealand & Water NZ

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NEWSLETTER

Issue 31 | December 2020

FROM THE CHAIR

Heide Friedrich

Reaching the end of 2020, we are all wondering what 2021 will bring. Uncertainty on how we will live, work, travel, meet with overseas family and friends is everywhere. Yet what is certain is that the demand for working together to promote good river management will continue to grow and we in turn need to continue to grow our efforts of advocating for good river management, allowing, amongst others, for the changing climate and science advice related to it. Record rainfalls in 2020 in various regions of New Zealand has caused major flooding, most recently in the Hawkes Bay Region, after we had been starting the year with the big floods in Southland.

I want to thank again everyone for attending our annual conference in Invercargill/Waihōpai in December. We regularly get feedback that we should have more events in the regions. It was exciting being able to hold the annual conference in Southland. Yet we also observed that we had low numbers of participants from the regions at the conference, especially from Southland and surrounding regions. We try to offer more regional events, and hope to see more people from the regions attending, as we know there are often other challenges that prevent participation at events.

In the science and academic communities, besides the need to adapt to the changing climate, the concept of *Room for the River* has also been discussed and worked on substantially, and we understand how protecting or restoring a river's natural flood plain can mitigate floods and ensure thriving ecosystems. It is a concept arising from the Netherlands after their major floods, yet in New Zealand it is still largely seen as practically difficult to be implemented and managed. For the engineers amongst us, nature-based solutions can be intimidating, if compared with well-known and widely applied hard-engineering solutions, yet time also tells us that some traditionally used hard-engineering solutions created new unintended problems, which we now urgently need to address, requiring a re-thinking in our river management practices.

Our 2021 Annual Conference is thus dedicated to the *Room for the River*. The conference is tentatively scheduled for 17-19 November 2021 in Wellington, please make a note in your calendar. We aim to focus on the barriers of implementing *Room for the River* in New Zealand, and welcome any of you to get in touch with us, if you want to be involved in shaping the conference. In this newsletter you can also read what a socially responsible group of scientists are working on, trying to help sharing the concept of the *Room for the River* more widely in New Zealand.

Congratulations also again to Hugh MacMurray, for being the recipient of this year's Arch Campbell Award, and you can read the citation also in this newsletter.

If you have any contributions or articles you want to share, please email nzriversgroup@gmail.com to submit your *FLOW* articles or any news, and keep checking for updates and connect with us through our Website, Facebook, Twitter and LinkedIn.

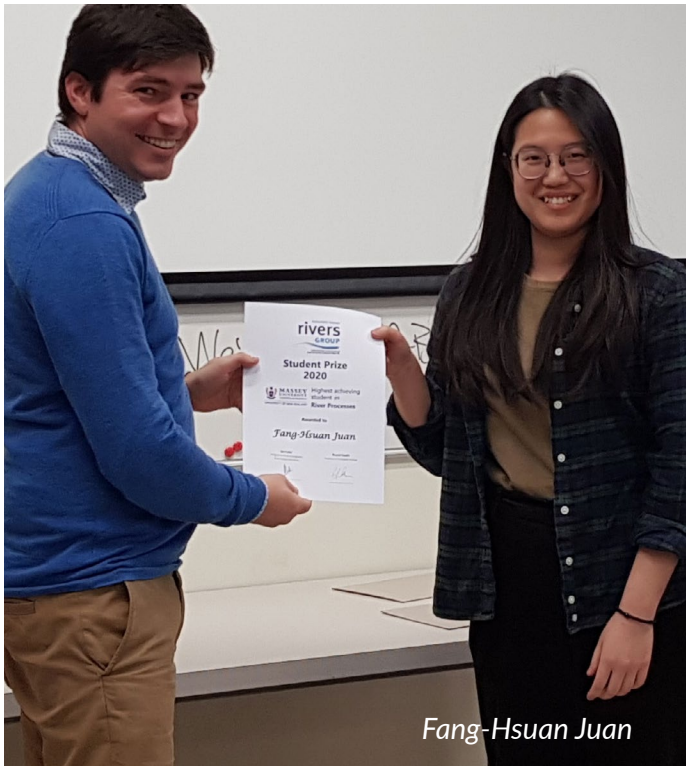
Thank you for your support this year, and I wish you an enjoyable summer break with your family and friends.

Heide Friedrich

Chair

STUDENTS AWARDS AT MASSEY UNIVERSITY

Peter Druskovich



Fang-Hsuan Juan

Katherine Martin

At the start of semester 2 Massey's top rivers students were rewarded for their efforts in semester 1, receiving prizes sponsored by the Rivers Group. The winners were:

- Peter Druskovich, for highest achieving student in river management;
- Fang-Hsuan Juan for highest achieving student in river processes;
- Katherine Martin for highest achieving student at 200 level.

Awards were presented by Andy Brown, from Greater Wellington Regional Council Flood Management, who gave an engaging talk on opportunities and challenges in flood management.

ROOM FOR THE RIVER

James Brasington, Gary Brierley, Heide Friedrich, Ian Fuller, Jo Hoyle, Richard Measures, Jon Tunnicliffe

Rangitata River flooding, December 2019, Source: canterburymaps.govt.nz/news/rangitata-river-flood-december-2019

A group of river geomorphologists met in Christchurch 20-21 October to discuss the need to accommodate 'room for the river'. The need has been highlighted by a recent series of headline floods that have seen rivers breach their imposed boundaries, destroying bridges (Waiho, SH6), eroding and flooding paddocks and state highways (Rangitata, SH1), and redistributing landfill to the coast (Fox). Alarmingly none of these were particularly extreme events (typically 10-20 year ARI). Damage in these moderate floods has been exacerbated by encroaching upon the river channel, narrowing the effective river corridor over time. The dynamics of these rivers would naturally occupy a wider swathe than has been permitted by infrastructure and floodplain development. With climate changing, flood magnitude and frequency is predicted to increase, which means more damaging floods to come and more rivers will be making the headlines.

As a socially responsible group of scientists, we cannot stand by and watch this happen. The outcome of this October workshop will be a series of publications and workshops next year bringing the problem and its solutions to the attention of our society and communities. The fundamentals underpinning our approach are:

- Rivers are disturbance-driven phenomena. This means we need to stop treating rivers as static entities that can be rigidly controlled, especially as the drivers of river dynamics (floods) are set to increase in severity.
- If we continue to deprive the river of its room to move as a dynamic entity, we will continue to manufacture headline-grabbing disasters. Quite simply, the river will fight back.
- We need a whole-of-catchment approach to river management in Aotearoa New Zealand, which embraces the river as a living, dynamic entity, functioning as a coherent whole within its catchment. This means we also need to recognize the history of our rivers and their trajectory.
- We advocate the need to work with rivers and their natural, dynamic, processes of erosion, sediment transport and deposition to improve resilience of our communities to climate change and help decision making in river management in Aotearoa New Zealand.
- With reframing of the RMA, we believe there is a genuine prospect to incorporate a different perspective on society's connections to rivers. Our message aligns directly with te ao Māori and mātauranga Māori.

We hope these are ideas and concepts that will resonate with Rivers Group members as we seek to take this message to policy makers and society at large in the year ahead.

Rangitata River at SH1, 8 December 2019 (Planet.com).

Large cobbles to boulders transported into the middle branch of the Rangitata River, indicating high stream power of flows out of the main channel (Jochen Bind, NIWA).

Destruction of railway track, outside of the permitted Rangitata river channel during December 2019 flood (Jochen Bind, NIWA).

Aerial view of Rangitata flooding, 8 December 2019 (Environment Canterbury)

2020 CONFERENCE – WEATHERING THE SRORM

Conference Summary

Welcome Function

A 'real' in-person conference is truly a privilege in 2020, and all attendees were very grateful the conference organisers pulled off an excellent joint society conference this December.

Manatiaki Kōawa - Rivers Group, NZ Hydrological Society, and Freshwater Science Society hosted the Rivers 2020 conference in Invercargill – Waihōpai, from 1-4 December, with the theme Weathering the Storm. This seems appropriately metaphorical for 2020, not least due to the pandemic, but also due to the large flood events experienced by Northland, Southland, and Napier, as well as looking to the future where climate change will increase challenges on our fluvial environments. The conference included 3 days of oral and poster presentations, as well as some fantastic Plenary Speakers, followed by a day of Field Trips. Conference papers covered all aspects of Hydrology, River System Management and Freshwater Science.

Joint conferences like these provide a unique opportunity to learn from colleagues who view the river systems from different perspectives and technical lenses, and participation in these events is part of achieving one of the River Groups goals of fostering collaboration. We hope to secure the ability for slides and videos of the presentations to be made available in our members' area of the website.

A range of papers were presented on advances in hydrological and climatic observations and modelling that will soon make early flood warning a reality for NZ emergency managers. Ali Shokri from the University of Waikato, presented on using the existing cellphone infrastructure as a novel technology platform for high-resolution, real-time rainfall monitoring, providing a supplementary resource to support rain radar data. This data will need to be cleverly integrated into future early warning systems, a topic explored by Tonkin + Taylors Dr Bapon Fakhruddin in his presentation "Foreseeable future: seamless integration of weather and climate information for long range early warning system".

Selene Conn introduces the keynote speaker, Professor Peter Wilcock (Utah State University)

The rapidly advancing use of drones in freshwater science was demonstrated by NIWA's Hamish Biggs in his work with Greater Wellington Regional Council. Hamish's presentation "Drones in freshwater sciences: remote sensing toxic cyanobacteria and river flow" showed how clever use of multi spectral cameras, and thermal imaging to detect the distribution of cyanobacterial and ground water inflows into two rivers within the Wellington Region.

River's group members will be interested in the discussions held across several sessions dedicated to riparian buffers where ecologists are experience challenges in quantifying and tracking the progress made through this work. Moving further along this idea of river and stream buffers, a key theme emerged. This theme was summarised concisely in Amanda Deaths presentation on "What are the benefits of giving a river more room?". Dr Ian Fuller's presentation on "Rivers and climate change: resilience, floods and tipping points" noted that heavily constrained river systems will be far less resilient to climate change tipping points and could prove an unsustainable challenge to manage in the future. This theme will be central to the River Group committees' activities in 2021, and our ambition will be to host a symposium targeting the challenges of creating room for our rivers.

There were many more stand out presentations that members can find in the conference programme nzhsrivers2020.co.nz.

The conference dinner on Thursday evening was held at the Transportation History Museum. Amidst a backdrop that petrol heads and classic car admirers relished, the Arch Campbell award was presented to Hugh MacMurray, member's boogies into the night to the live band. The committee would like to give a special thanks to Kyle Christensen and the rest of the conference organising committee for pulling off this capacity event.

Poster session

Thumbs up for the 2020 conference

REFLECTIONS FROM THE 2020 CONFERENCE

Kyle Christensen, New Zealand Rivers Group Committee Member

Conference dinner

Having the privilege of attending all of the Rivers Group Conferences since the first one in 2010 I can confidently say that Weathering the Storm, the combined conference of the Rivers Group, Hydrological Society and Freshwater Sciences Society held in Invercargill/Waihōpai has been the best yet. I have a number of reasons for this including personal and professional. Prior to the formation of the Rivers Group I was a member of the unofficial "rivers sub group" of the Hydrological Society (HydroSoc). This was where applied rivers science and engineering lived within the NZ professional society scene.

The annual HydroSoc conferences were great experiences and soaking up the presentations and technical expertise of the likes of Brin Williman, Peter Blackwood, Graeme Smart, Murray Hicks, Alastair McKerchar and others was invaluable for my professional development. At the recent conference I caught up with Graeme Smart who reminded me of the olive trees I transported down to Christchurch for him after the 2002 HydroSoc conference in Blenheim. He commented on how he still enjoys walking amongst the now large olive trees that he planted 18 years ago....for me the understanding and knowledge that Graeme shared with me through his always insightful presentations and follow on discussions at conferences is something that has been hugely valuable.

At the recent conference I enjoyed an excellent presentation by Carrie Hopkirk from Cardno on prioritising sites for high flow gaugings within the Wellington Region. Alistair McKerchar, regarded by many to be one of the "godfathers" of NZ hydrology was also in the audience and had some follow up discussion with Carrie after her presentation. I had a similar experience with Alistair some 16 years earlier when I presented a paper about back calculated Rational Method coefficients at the 2004 HydroSoc conference in Queenstown. After Carrie's presentation I had a conservation with Alistair who was reminiscing about the first HydroSoc conference he attended 59 years ago...with presentations by slide projector before the use of OHPs! It is the

HydroSoc 60th Anniversary conference next year in Wellington which I would encourage all to attend.

The point of the above is that I probably would never have met Graeme or Alistair if I had not been involved with HydroSoc and reconnecting with them, which generally only happens at conferences, is something that I thoroughly enjoy and derive huge value from. I still hugely value the relationship with HydroSoc and the connections I have made and maintained over the years but am also very happy that the Rivers Group has evolved to have its own identity and a growing membership of not only engineers but ecologists, hydrologists and geomorphologists to name a few.

Since 2010 the Rivers Group has held an annual conference with the 2014, 2016 and 2020 conferences being joint ones held with the HydroSoc. The integrated nature of river engineering and management with the ecology of river systems has become a much stronger driver in all river related work and our connection with the NZ Freshwater Science Society (NZFSS) has been strengthening over time with joint conferences held in 2014, 2017 and 2020. I hugely value the knowledge sharing between the respective societies and think that we can all improve our practice by learning more about the other disciplines that shape the decision making in the NZ river whanau. This learning needs to be a two-way street with the awareness of risk and liability constraints that engineers are faced with needing to be communicated better within this space so that creative, innovative solutions can be developed.

With this in mind I had some constructive conversations with ecologists that had some strong views about their generalisations of river engineers in NZ. No doubt there are still examples of "old school" "engineering at all costs" that exist around the country but from my experience I see that the evolution towards more holistic river management is occurring and it is underpinned by ecological, cultural & social values. The Rivers Group has a key role in facilitating this inter-disciplinary approach and bringing people together to have, sometimes challenging, conversations to move towards the evolving best practice is important for everyone. After the conference I reflected on the gaps in my own knowledge and decided that it was about time I joined the NZFSS, I would strongly encourage everyone to consider other professional societies that would build on your own knowledge and understanding in related disciplines.

I would also like to mention the "Room for the River" philosophy that the Rivers Group has been advocating for the last few years. There was a fantastic presentation at the conference by Amanda Death from GWRC about the benefits of "Room for the River". This presentation sparked great discussion from all in attendance including ecologists, engineers, scientists, and policy people. Off the back of this there was a "huddle" of Rivers Group committee members that decided that next year's conference would be focussed solely on "Room for the River" and would be taking it to the next step about breaking down barriers for implementation rather than preaching to the converted about the benefits of it. This would bring in cultural values, social impacts, economics, riparian landowners, operational issues, policy structure and reframing it as a form of climate change response managed retreat.

All of the above elements left me feeling energised and excited about the challenges ahead and the opportunities to continue contributing to advancing our engineering and management practice in NZ. So….. definitely the best conference so far but we'll be aiming to top it next year!

Ngā manaakitanga

Kyle Christensen

ARCH CAMPBELL AWARD 2020 RECIPIENT DR HUGH MACMURRAY

Award Citation

Name: Dr Hugh MacMurray
Organization: Barnett & MacMurray Limited
Position: Director

Category Nominated In: *a notable contribution over a number of years to the advancement of knowledge or practice in the fields of catchment hydrology, catchment management or river engineering.* In particular Dr MacMurray has made an outstanding contribution to the understanding of river sediment morphological issues.

Career History

Hugh has been at the forefront of river engineering and computational hydraulic modelling practice in NZ for over 30 years. During that time he has undertaken numerous investigations into river hydraulic behaviour, flood hazards, river sedimentation and morphological issues and urban stormwater problems throughout NZ and internationally.

Hugh studied agricultural engineering at Lincoln College, completing a PhD in 1985. His PhD thesis was entitled *"The use of the salt-velocity method for the precise measurement of resistance to flow in rough-boundary open channels"*. From 1985-1988 he worked as a Research Engineer at the Laboratory for Hydraulics, Hydrology and Glaciology at the Swiss Federal Technical University in Zurich (ETH Zurich).

On his return to NZ, Hugh joined Dr Alastair Barnett at Barnett Consultants. During that time he was deeply involved in establishing the burgeoning computational hydraulic modelling industry in a consultancy setting. Key projects that Hugh led in that time included developing a computational hydraulic model of the Hutt River and floodplain, the first major MIKE11 study in the country, and developing a computational sediment morphological model of the Lower Waikato River to investigate sediment transport issues.

In 1990 Hugh worked on the Bah Bolon Irrigation Project in North Sumatra, setting up and running computational hydraulic and morphological models of the Bah Bolon River Delta. The Bah Bolon River provides the water resource for the Bah Bolon Irrigation Project which includes most of the river delta area. The delta is morphologically very dynamic and the need to model it arose as, during construction of the irrigation network, the branched river system in the delta area changed course, resulting in loss of river water supply to approximately half of the irrigated area.

The computational modelling which Hugh carried out used a pre-issue version of the MIKE11 morphological module, probably the first time it had been used in the Asia / Pacific region. The modelling exercise extended over a 2 month period. The modelling results formed the design basis for three bifurcation structures needed to manage distribution of river flow in the river branches in the Bah Bolon River Delta, necessary to provide irrigation in the delta area.

The Lower Waikato River project involved building and calibrating hydraulic models of the river system based on river surveys carried between 1962 and 2007. The morphological model was governed by sediment transport parameters, sediment supply and sand extraction. Using historical river flows and tidal records, the model was calibrated across one decade and verified across another. Meticulous calculation checks during the calibration revealed a bug in the software. Hugh was instrumental in documenting and troubleshooting this issue, together with the software programmers. The morphological model was then used to forecast sediment transport and therefore trends in erosion or aggradation over the coming 50 years, given various sand extraction regimes.

These projects typified Hugh's strong grasp of hydraulic theory, his ability to apply that knowledge in a practical way to real world problems and an enjoyment of working with a diverse range of people. All good traits in a river engineer.

Hugh enjoyed a brief spell working for MWH New Zealand from 1996-2001 before establishing with Alastair Barnett a new consultancy business Barnett & MacMurray Ltd. Hugh remains a director of this consultancy today providing services to regional and local councils, government agencies, power companies and private individuals. Some of the other notable projects he has been involved in include:

- Development of a floodplain management scheme for the Kaihu River in Northland
- Peer review of a physical hydraulic model of the Shotover River Delta carried out for the Otago Regional Council
- Supervision of the development of a computational sediment morphological model of Kawarau River using physical hydraulic model predictions of sediment input from the Shotover River Delta
- Development of a model to predict the hydraulic effects of salmon farm rafts moored in the Upper Waitaki Hydro Scheme canals
- Development of a computational hydraulic river and floodplain model for the Waihou and Piako River Flood Scheme on the Hauraki Plains
- Hydrodynamic study of mussel farm effects on tidal currents in Whangaroa Bay
- Peer review of the specimen design and then the detailed design for flood conveyance works on the Peka Peka to North Otaki Expressway

Nomination Supported By
Phil Wallace (DHI Water and Environment Ltd)
Grant Webby (Damwatch Engineering Ltd)
Vicki Henderson (Barnett and MacMurray Ltd)

CONFORM TO REFORM:

What are the immediate challenges that the Three Waters reforms bring?
Tony Cussins, Water Science Director at Tonkin + Taylor

After attending the Water NZ, Building Nations and IPWEA conferences recently, and talking to the wide range of people involved in the water sector, there are some common themes emerging about the reforms, the process and the Water Services Bill's implications.

Local government CEOs and politicians are trying to anticipate what new structures, infrastructure and investment will be needed once the Water Services Bill becomes law. The conversations we are having in that space are around what the new aggregation structures will look like, how councils can position for it and what the costs and benefits are likely to be.

Asset and Three Waters' managers, who will be charged with implementing the reforms, are thinking about the shape of the new aggregated entities, funding streams and procurement processes. They're also trying to anticipate what capabilities and capacity they will need to ensure compliance and continuity of service.

These are all important questions, and we have discussed potential options and answers at great length, but in reality, it is too early to be sure what will actually happen.

The next three to six months will be critical in clarifying the possible shape of the new water services entities and their extent. While a lot of work is currently being done by the DIA and others to establish the structure and processes, it's too early to be certain about new structures during the Water Services Bill's passage through Parliament, and subsequent regulation.

However, I think we're likely to see between two and seven asset-owning multi-regional water services corporations that will deliver Three Waters' services to their constituent councils. These entities will be designed to produce significant economies of scale and efficiencies in Three Waters' service delivery.

Ultimately, I think our common hope is that the water reforms will deliver safe drinking water for all New Zealanders, improved wastewater discharges to ensure we have clean waterways and swimmable watercourses for our children and mokopuna.

I'm looking forward to next year and being involved in helping to shape this new future. If you would like to reach out and discuss the reforms and their impacts with me, I welcome you to do so.

Meri Kirihimete to you and your whānau.

Tony Cussins

Please also consider taking a look at this short video "Why are NZ's water reforms so important? Iwi and water specialists explain":

youtube.com/watch?v=jPUMXHgppuE&feature=emb_logo

CALL FOR CONTRIBUTIONS

For our newsletter FLOW we are always looking for articles from our membership. Please consider submitting an article, case study, update or notice for the next issue of FLOW.

Issue	#	Deadline for contributions
March 2021 issue	#32	Monday, 15 February 2021
June 2021 issue	#33	Monday, 17 May 2021
September 2021 issue	#34	Monday, 16 August 2021
December 2021 issue	#35	Monday, 15 November 2021

Please format your contribution as follows:

- Length of 500 – 1500 words, in Microsoft word format (Articles should include name of the author(s), affiliation, titles and section headings and illustrations are strongly encouraged)
- Attach images in jpg (file size 300KB-1MB) and at high-resolution separately
- Provide credits and captions for your images

If you have articles which are longer, please email us.

For our 'Fortnightly Reads' email, you can email us News items, announcements, event details, recognitions, guidelines news – anything of interest for our community.

Please email nzriversgroup@gmail.com to submit your FLOW contributions or any news you want to share through our 'Fortnightly Reads' email. We look forward to receiving your contribution.

RIVERS GROUP MANATIAKI KŌAWA MISSION STATEMENT

The New Zealand Rivers Group Manatiaki Kōawa was formed in 2009 to provide a forum for 'Working together to promote good river management'. It is a place for people with an interest in rivers, flood risk management and the operational and environmental issues of catchments and river systems to come together.

We currently have over 250 members, and promote a multi-disciplinary approach to river management, reflecting cultural and societal diversity in an integrated and holistic manner. Our membership reflects this, with our members coming from a wide range of river management, science and engineering, and planning backgrounds - working as consultants, or in local, regional and central government, research institutes and universities.

New members can sign up here riversgroup.org.nz/joining-the-rivers-group/.

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