

# Submission Questionnaire

Draft Far North Coast Regional Water Strategy - Submission Form



## Regional Water Strategies Public Exhibition Submission Questionnaire

*The NSW Government is taking action to improve the security, reliability, quality and resilience of the state's water resources. The Far North Coast Regional Water Strategy will deliver healthy and resilient water resources for a liveable and prosperous regional NSW.*

This draft strategy is being developed by the Department of Planning, Industry and Environment and provides an opportunity to re-shape what we are doing in regional water management and chart a path forward.

We have been working with local water utilities, councils, communities, Aboriginal people and other stakeholders to ensure local and traditional knowledge informs the draft Far North Coast Regional Water Strategy and that it serves the regional community, including First Nations, the environment and industry.

### Your Voice is important

We have prepared this draft strategy to continue our discussions with you. We would like to hear your views on the draft strategy as a whole including the process we used to develop the strategy and the evidence that supports it. We are also seeking your feedback on the options presented in the draft strategy and whether you have any further information that could help us to assess the benefits and disadvantages of any of the options.

Please provide your feedback in the submission form below and email your completed submission to [regionalwater.strategies@dpie.nsw.gov.au](mailto:regionalwater.strategies@dpie.nsw.gov.au) or post to Regional Water Strategies, Department of Planning, Industry and Environment, Locked Bag 5022, Parramatta NSW 2124 by **13 December, 2020**.

The questionnaire includes general questions about the regional water strategy including objectives, vision, modelling, opportunities and challenges. It also includes questions regarding the draft options along with personal information questions.

The questionnaire will take approximately 15 minutes to complete and your response can remain anonymous if you wish (see question 3).

Questions marked with an asterisk (\*) require an answer.

If you have any questions about the questionnaire, please email:  
[regionalwater.strategies@dpie.nsw.gov.au](mailto:regionalwater.strategies@dpie.nsw.gov.au)

## Making your submission public

We collect information about you, which may include personal information, to assess submissions in response to the department's dealings and activities, and perform other functions required to complete the project. This information must be supplied. If you choose not to provide the requested information we may not be able to assess your submission.

To promote transparency and open government, we intend to make all submissions publicly available on our website, or in reports. Your name or your organisation's name may appear in these reports with your feedback attributed.

**If you would like your submission and/or feedback to be kept confidential, please let us know when making your submission.** You will be asked for your confidentiality preference at question 1.

If you request your submission be kept confidential, it will not be published on our website or included in any relevant reports, however it will still be subject to the *Government Information Public Access Act 2009*.

Your submission will be stored securely consistent with the department's Records Management Policy and you have the right to request access to, and correction of, your personal information held by the department.

Further details can be found in our privacy statement available on our website.

<https://www.industry.nsw.gov.au/privacy>

*Information from this form is collected for the purpose of receiving your feedback on the draft regional water strategy. The supply of this information is voluntary. Your details will be stored in NSW Department of Planning, Industry and Environment records. Information will be stored and managed in accordance with provisions under the Privacy and Personal Information Protection Act 1998. It will not be used for any other purpose and will not be given to any other third party except where required by law. To access or correct your personal information, contact us using the information at [dpie.nsw.gov.au/contact](https://www.dpie.nsw.gov.au/contact)*

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### 1. Information on confidentiality and privacy \*

I give my permission for my submission to be publicly available on the NSW Department of Planning, Industry and Environment website.

Yes     No

I would like my personal details to be kept confidential.

Yes     No

## 2. Your details

Email address \*

Name \*

Address \*

Contact phone number \*

Do you identify as an Aboriginal person?

- Yes  No

Are you an individual or representing an organisation?

- Individual  Organisation

## 3. Organisation or business details

Who do you represent?

- Government:**  
 Commonwealth  New South Wales  State other  Local
- Local Water Utility**
- Peak representative organisation:**  
 Environment  Industry  Business group or business chamber  Community organisation
- Other**

Lismore Citizens Flood Review Group

## 4. Draft regional water strategy objectives and vision

The draft Far North Coast Regional Water Strategy is one of 13 strategies (12 regional water strategies and a Greater Sydney Water Strategy) being developed by the department. All regional water strategies are being developed in line with the following objectives:

- **Deliver and manage water for local communities**  
- Improve water security, water quality and flood management for regional towns and communities.
- **Enable economic prosperity**  
- Improve water access reliability for regional industries.
- **Recognise and protect Aboriginal water rights, interests and access to water**  
- Including Aboriginal heritage assets.
- **Protect and enhance the environment**  
- Improve the health and integrity of environmental systems and assets, including by improving water quality.
- **Affordability**  
- Identify least cost policy and infrastructure options.

All draft regional water strategy options need to address at least one of the above objectives.

Our vision for this strategy is to have healthy and resilient water resources (that withstand extreme events and adapt to these changes) for a liveable and prosperous Far North Coast region.

To achieve this, we need to position the region so there is the right amount of water of the right quality, delivered in the right way to meet the future needs of Aboriginal people, towns, communities, industries and the environment

**Do you support this vision for the Far North Coast Regional Water Strategy?**

Yes

No

**If no, please outline your vision for the long term management of water resources in this region?**

Our vision would include all aspects associated with water during both drought and flood. As Lismore 2480 is the most flood affected postcode in the nation, the management of water during flood must also be included in the vision for the long term management of water resources in this region.

## **5. Information and modelling used to develop the Far North Coast Regional Water Strategy**

The draft Far North Coast Regional Water Strategy packages the most up to date information and evidence with all the tools we have – policy, planning, behavioural, regulatory, technology and infrastructure solutions.

We have used the following information to develop the draft Far North Coast Regional Water Strategy:

- **New climate data**
  - Observed historical climate data - recorded rainfall, temperature and evaporation data from the past 130 years.
  - Paleoclimate data - scientific reconstructed data using sources such as tree rings.
  - Climate drivers – key drivers of wet and dry periods.
  - Climate change scenarios.
- **Review of existing studies**
  - to identify drivers and risks for water resource management.
- **Community engagement**
  - Local councils and joint council organisations.
  - Aboriginal peak bodies and Aboriginal community groups.
  - Review of previous water management consultations.

**A) Do you have any comments about the information used to develop this strategy?**

Predominately climate data in relation to drought has been considered. There is little climate data in relation to floods.

**B) Please provide details if there is additional information you think we should consider?**

As Lismore is the most flood affect community in the nation and also (together with Bundaberg Qld) is the most natural disaster prone area in the nation then Flood mitigation must be incorporated in any water strategy for the FNC region

## 6. Stochastic modelling method

We used a stochastic modelling method (based on the statistical characteristics of the new climate data) in order to get a dataset covering up to 10,000 years. This enables us to quantify the natural variability and extremes in the region with greater certainty.

### A) Do you have any comments about the modelling method used to develop this strategy?

Looks like a lot of thought and consultation has gone into the climate modelling method

### B) Is there any additional information that you believe could help us assess the benefits and disadvantages of draft options?

Much has been made of extreme dry periods but there is little reference to the impact of extreme wet periods

## 7. Opportunities and challenges for water management in the Far North Coast region

During the Far North Coast Regional Water Strategy drafting stage, the following opportunities, risks and challenges were identified.

- **Changing climate conditions will increase the pressure on water resources and water management challenges facing the region**
  - Droughts may be more severe in the future and the region is also likely to see seasonal shifts in rainfall patterns.
  - Flooding is a major issue and can adversely affect towns, business and communities.
  - Sea levels are predicted to rise in the region by between 0.31 and 0.88 metres by 2090.
  - Water extraction from waterways to meet community and industry demands is likely to increase due to decreases in rainfall and greater evaporative losses.
- **Towns, communities and industries in the region are susceptible to climate variability and change**
  - Population growth, increased water demand and climate variability will place increasing challenges on town water supplies and industry sectors.
  - The region is not used to managing the extreme dry periods and there is relatively little water storage available.
  - Saline intrusion due to sea level rise will make some supplies unfit for use and affect sewerage treatment plant operations.
  - Sea level rise effects may be magnified as freshwater inflows reduce.
- **Protecting water-dependent environmental assets and native species is challenging**
  - Water for the environment is not actively managed and largely dependent on stream flows.
  - Reductions in river flows and estuary inflows are forecast.
  - Water quality problems are present and projected lower flows, higher temperatures and sea level rise may further reduce water quality.

- **Better management of groundwater**
  - Groundwater is found in fractured rocks, coastal sands and smaller alluvial aquifers.
  - Urbanisation in coastal areas is impacting groundwater recharge patterns and increasing pollution risks.
  - Greater knowledge and information on groundwater is needed to ensure its sustainability across the region.
- **Opportunities to improve how we manage and use water in the region**
  - Link population growth with new investment to ensure water security into the future.
  - New climate information offers opportunities to review and update water sharing and access rules.
  - Diversify town water and industry supplies using new sources such as recycled water and desalination.
  - Involve Aboriginal communities more directly in water decision-making and incorporate traditional knowledge into water management.
  - Options to support the regions farmers to mitigate water security risks and accommodate shifting market trends.
  - Investigate options to improve Toonumbar Dam's low rate of use, reduce its financial burden and maximise its value to the community.

#### **A) Do you have any comments on the opportunities, risks and challenges identified?**

There is a generic statement "Flooding is a major issue and can adversely affect towns, business and communities." but there is no definitive attempt to deal with the impact of flooding and options for flood mitigation throughout the entire document.

#### **B) Are there any additional opportunities, risks and challenges that we should consider and what options could address these?**

The premise of the entire document is flawed as it is only looking at drought. A combined water security and flood mitigation should be the basis of the FNC Water Strategy

## **8. Draft Far North Coast Regional Water Strategy options**

We have developed a long list of options that could be included in the final Far North Coast Regional Water Strategy. The options consider the opportunities and challenges facing the region and meet at least one regional water strategy objective.

### **The 39 options are grouped in different categories, being:**

- Maintaining and diversifying water supplies.
- Protecting and enhancing natural ecosystems.
- Supporting water use efficiency and conservation.
- Strengthening community preparedness for climate extremes.

### **In addition the final long list of options will also include a focus on:**

- Improving recognition of Aboriginal people's water rights, interests and access to water.

Only feasible options will be progressed to the final strategy stage – following a rigorous assessment process.

We are seeking your feedback to inform the options assessment process. Further details on each option is outlined in the strategy documents and a summary included below.

### Maintaining and diversifying water supplies

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- |   |   |
|---|---|
| 1. Interconnection of independent water supplies in the region to the Rous County Council network | 9. Manage aquifer recharge investigations and policy                  |
| 2. Interconnection of Rous County Council and Tweed Shire Council bulk water supplies             | 10. Decentralise desalination   |
| 3. Use Toonumbar Dam to augment town water supplies   | 11. Regional desalination   |
| 4. Connect the regional water system to the South East Queensland water grid                      | 12. Raise Clarrie Hall Dam level                                      |
| 5. Vulnerability of surface water supplies to sea level rise                                      | 13. New Dam on Byrrill Creek  |
| 6. Remove impediments of water use reuse projects   | 14. New Dunoon Dam on Rocky Creek                                     |
| 7. Indirect potable reuse of purified recycled water  | 15. Increased harvestable rights                                      |
| 8. Direct potable reuse of purified recycle water   | 16. Provide purified recycled wastewater for industry and rural users |
|   | 17. Increased on-farm water storage                                   |
|   | 18. A grid of off-stream water storages in the Far North Coast Region |
|   | 19. Raise Toonumbar Dam level   |
- 

### Protecting and enhancing natural ecosystems

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- |   |   |
|---|---|
| 20. Establish sustainable extraction limits for Far North Coast surface water and groundwater sources | 26. Improve fish passage in the Far North Coast region  |
| 21. Establish and/or increase environmental water releases from major storages in the Far North Coast | 27. Addressing cold water pollution   |
| 22. Convert low flow water access licences to high flow water access licences                         | 28. Characterising coastal groundwater resources  |
| 23. Improve stormwater management   | 29. Protecting ecosystems that depend on coastal groundwater resources  |
| 24. Bringing back riverine and estuarine habitat and threatened species                               | 30. Northern Rivers Watershed Initiative  |
| 25. Fish-friendly water extraction  | 31. River Recovery Program for the Far North Coast: a region-wide program on instream works, riparian vegetation and sediment control |
- 

### Supporting water use efficiency and conservation

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- |  |  |
|--|--|
| 32. Improved data collection and information sharing | 34. Regional Demand Management Program |
| 33. Active and effective water markets               | 35. Regional network efficiency audit  |
-

## Strengthening community preparedness for climate extremes

36. Apply the NSW Extreme Events Policy to the Far North Coast region

38. Planning for climate change impacts on coastal groundwater resources

37. Protecting coastal groundwater resources for town water supplies and rural water users

39. Planning for land use pressures on coastal groundwater resources

### A) Which five (5) options do you think are ***most*** important?

Please list the option numbers in order of importance with the first option being most important

Option Number

Option Number

Option Number

Option Number

Option Number

### B) Please comment on why you think these options are most important?

They utilise the available water when it is plentiful during very wet periods and have it available for use when in drought

### C) Which five (5) options do you think are ***least*** important (if any)?

Please list the option numbers in order of least importance with the first option being least important

Option Number

Option Number

Option Number

Option Number

Option Number

### D) Please comment on why you think these options are least important?

We have the highest rainfall in the state.... 5 times the NSW average. There is an abundance of water that falls during the wet periods that should be captured and stored appropriately for use during dry periods. Artificial water production through desalination plants would be reprehensible in this high rainfall region.

### E) Do you have any comments on the draft options?

All the draft options fit under a combined water security and flood mitigation strategy and should also be considered in this context only.

## 9. Option combinations

The option list provided in the draft strategy also identifies potential combinations of options. These combinations recognise that most options require associated works, further assessments and/or legislative, policy and planning changes to ensure they address the risks and challenges identified in the Far North Coast region and do not have unintended impacts.

### A) Do you have any thoughts on how the options could be combined with other options?

Options 9, 14 and 18 could be combined

### B) Are there additional options that we should consider?

All options should be considered only within a combined water security and flood mitigation strategy.

Please see attached detailed written and video response submissions to the Draft FNC Regional Water Strategy document

## 10. Other comments

### Do you have any other comments about the Far North Coast Regional Water Strategy?

The entire document only deals with half the water issue in the FNC region. Without the serious consideration and inclusion of flood mitigation the issue of water will not be appropriately dealt with. For more than 70 years despite many attempts there has not been an effective flood mitigation proposal for Lismore developed and funded. The Far North Coast Regional Water Strategy could be the one and only opportunity for a flood mitigation solution to be found. An effective solution to the flood problem will have a profound effect on the Far

## **11. How did you hear about the public exhibition of this strategy?**

We are interested to know how you heard about the opportunity to make a submission. Please indicate the communication methods below:

- Newspaper
- Radio
- Department of Planning, Industry and Environment website
- Direct email
- Social media
- Have your say NSW Government website
- Communication from peak body
- Other

## **12. Additional Information and submission process**

If you would like to provide any supporting documents to help us understand your view, please either, email these from the same email you provided in this form, or attach supporting documents to this form if you are returning your submission by mail.

All submissions on the draft Far North Coast Regional Water Strategy will be reviewed following the public exhibition period. Further targeted engagement will be undertaken along with the final phase of stakeholder engagement later in the year to review the final documents.



**Please email your completed submission and supporting documents to [regionalwater.strategies@dpie.nsw.gov.au](mailto:regionalwater.strategies@dpie.nsw.gov.au)**



**or post to Regional Water Strategies, Department of Planning, Industry and Environment, Locked Bag 5022, Parramatta NSW 2124 by 13 December, 2020.**

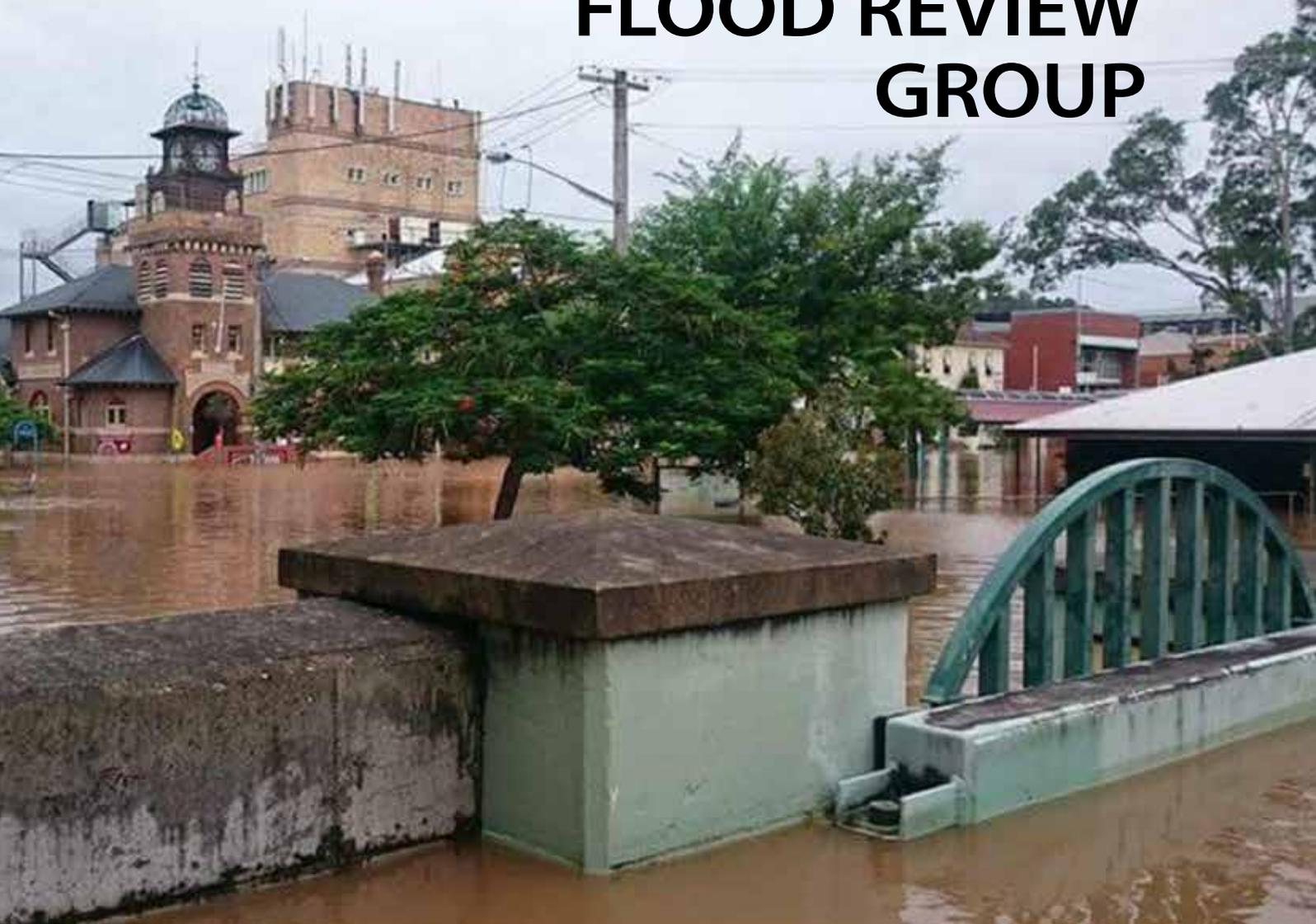


Further details on all regional water strategies can be found on our website <https://www.dpie.nsw.gov.au/regional-water-strategies>

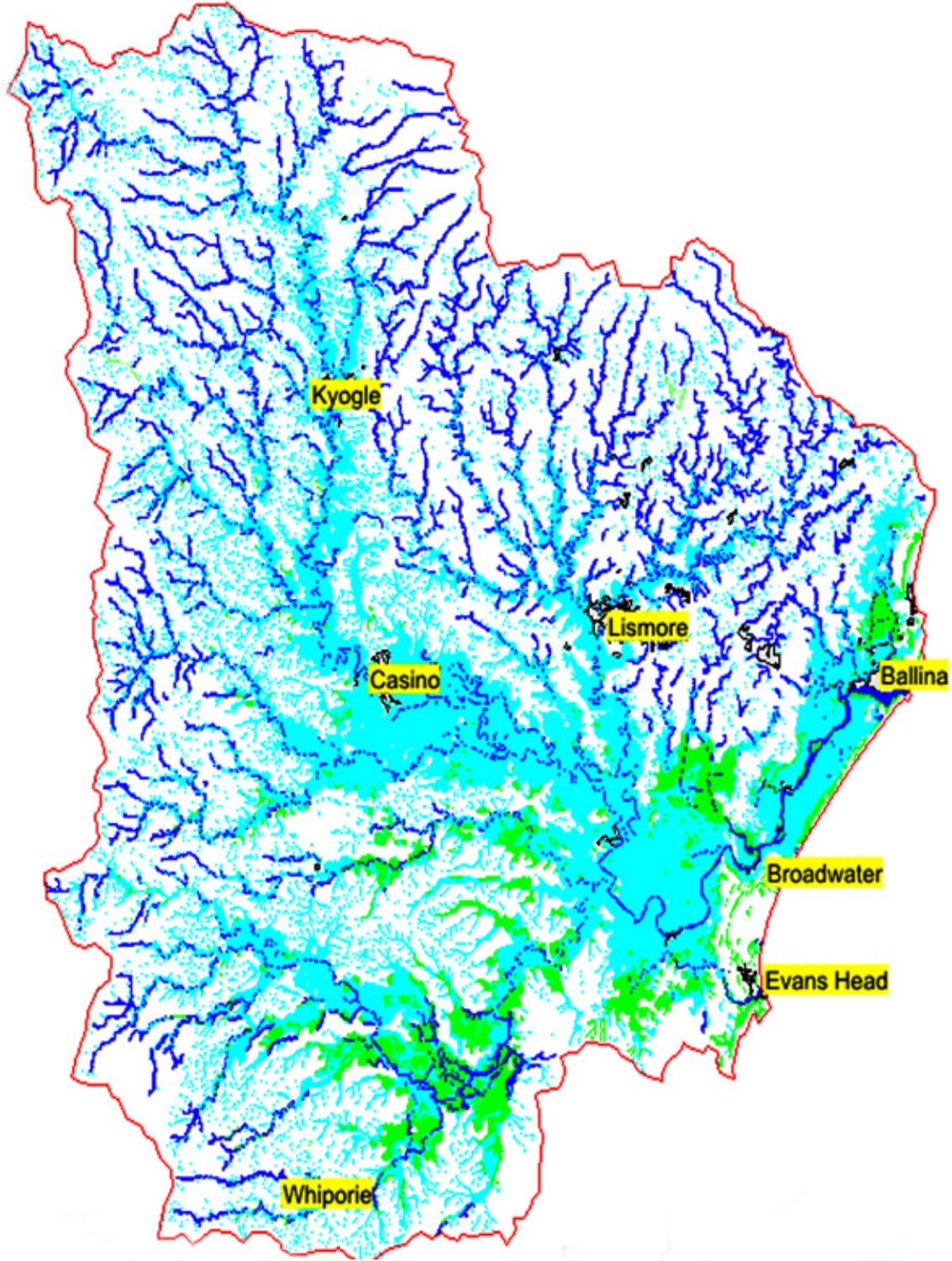
**Thank you for your submission.**

# Draft FNC Regional Water Strategy

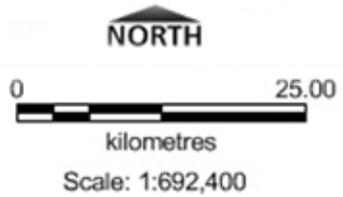
Response Submission from  
**LISMORE CITIZENS  
FLOOD REVIEW  
GROUP**



# Richmond Catchment Floodplain



-  Floodplain
-  Wetlands
-  Rivers/Creeks
-  Catchment boundary



Richmond River County Council - 2015

## Lismore Citizens Flood Review Group

The Lismore Citizens Flood Review Group (*Appendix 1*) was formed following the devastating March 2017 flood. It is made up of local citizens from a range of backgrounds, who have lived in the district most of their lives, been directly involved with the emergency management of floods for up to fifty years at local and regional level, as well as direct involvement in flood mitigation engineering works, local government and flood-affected CBD businesses.

We have spent the past three years continuing to gather relevant information across a range of areas to ensure that the impact of the March 2017 flood never happens again, and flood mitigation and water security issues are progressed.

As the entire catchment is affected, during our investigations we have worked collaboratively with Rous Water, the cross LGA agency responsible for water security and flood mitigation. Whilst the key focus is Lismore, due to population size and business centre, the impact of floods applies to Kyogle, Casino, Coraki, Woodburn, Ballina and Byron—with water security also applying to the same towns in the catchment with the exception of Kyogle.

It is evident that leadership and nationally recognised expertise is needed across all key areas, but this will only occur with appropriate planning at the highest state and national level and appropriate funding.



Woodlark Street intersection, Lismore,  
during the flood in March 2017

# Synopsis

- Rous Water reports water security is at risk with insufficient water available to meet current community consumption by 2024.
- Risk Frontiers reports Lismore NSW 2480 is the postcode most at risk from both natural disaster and flooding in Australia.<sup>1</sup>
- Climate variability and climate change will exacerbate future flooding. Lismore has had 130 minor, moderate and major floods recorded in the last 150 years.<sup>2</sup>
- Risk Frontiers shows the reparation and recovery costs for just four major FNC floods 1954, 1974, 1989 and 2017 is greater than \$10 billion.<sup>3</sup> These costs are unsustainable to government and the taxpayer and will only grow.

## Questions

How is the most flood-affected community in the nation unable to guarantee water supply at current consumption past 2024?

How can the two issues of not enough water and too much water be incorporated and also reduce ongoing reparation costs?

## Answer

A Combined Water Security/Flood Mitigation Solution.

## Proposal

This Combined Water Security and Flood Mitigation Proposal examines a wide-ranging multi-stage strategic solution for the management of water within the framework of the FNC Regional Water Strategy—including social, economic, environmental and Indigenous components, and recognised Cost Benefit Analysis requirements.

## Outcome

A solution to the two key aspects of water that affect the catchment population will lead to the revitalisation of the region through increased population, tourism, employment, agricultural and commercial development, improving the quality of life for all aspects of the community into the future.

## Recommendations

1. That the Combined Water Security and Flood Mitigation Proposal replaces the current platform on which the FNC Regional Water Strategy is based.
2. That this Combined Proposal be considered as a PILOT PROJECT to determine the benefits for other rural and regional areas.
3. That all federal and state government departments and agencies with a remit for flood mitigation be brought together with Rous Water and a regional community knowledge hub in order to resolve the way forward on this complicated issue.
4. That issues in relation to water security in the Draft FNC Regional Water Strategy document be retained as written.
5. That the final FNC Regional Water Strategy document includes comprehensive details in relation to flood mitigation, and the impact of the regular flooding of towns and villages throughout the catchment.
6. That all proposed options to be investigated must progress the development of the region to make it sustainable in the areas of both water security and flood mitigation.
7. That a local technical and community knowledge hub incorporating interested parties who meet a documented criteria be included throughout the planning, design, development and implementation of the project.

[REDACTED]  
**Beth Trevan,**

[REDACTED]  
**Lismore Citizens Flood Review Group**

[REDACTED] LISMORE NSW 2480

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—Mob: [REDACTED]

Email: [REDACTED]  
[REDACTED]

## Executive Summary

Water security touches every citizen in the region. There are very few issues that affect the whole community like water. In our case we have an issue of national significance as, perennially, the most natural disaster-affected community in Australia, and the most flood-risk community in the nation. There is no reference to this in the DPIE documentation and, subsequently, the contextual approach to the Draft FNC Regional Water Strategy is deeply flawed.

It is evident in the DPIE documentation and decision-making process that a comprehensive view of water issues in the Northern Rivers Region has not been considered. As a result, though of equal importance as water security, flood mitigation, the biggest ongoing issue in this region that directly or indirectly affects each and every member of society is not being addressed. Consequently, the local community and broader taxpayers in NSW and nationally continue to pay a very heavy price.

Water has been recorded as both a blessing and a curse on the Northern Rivers for more than 150 years (*Appendix 2*). We are the most flood-affected area in the nation, and yet for more than seventy years an effective solution to the ongoing flood problem has not been found. The decision-making system for flood mitigation is not only flawed but totally ineffective.



The river end of Magellan Street, Lismore, during the 1893 flood

## Proposal

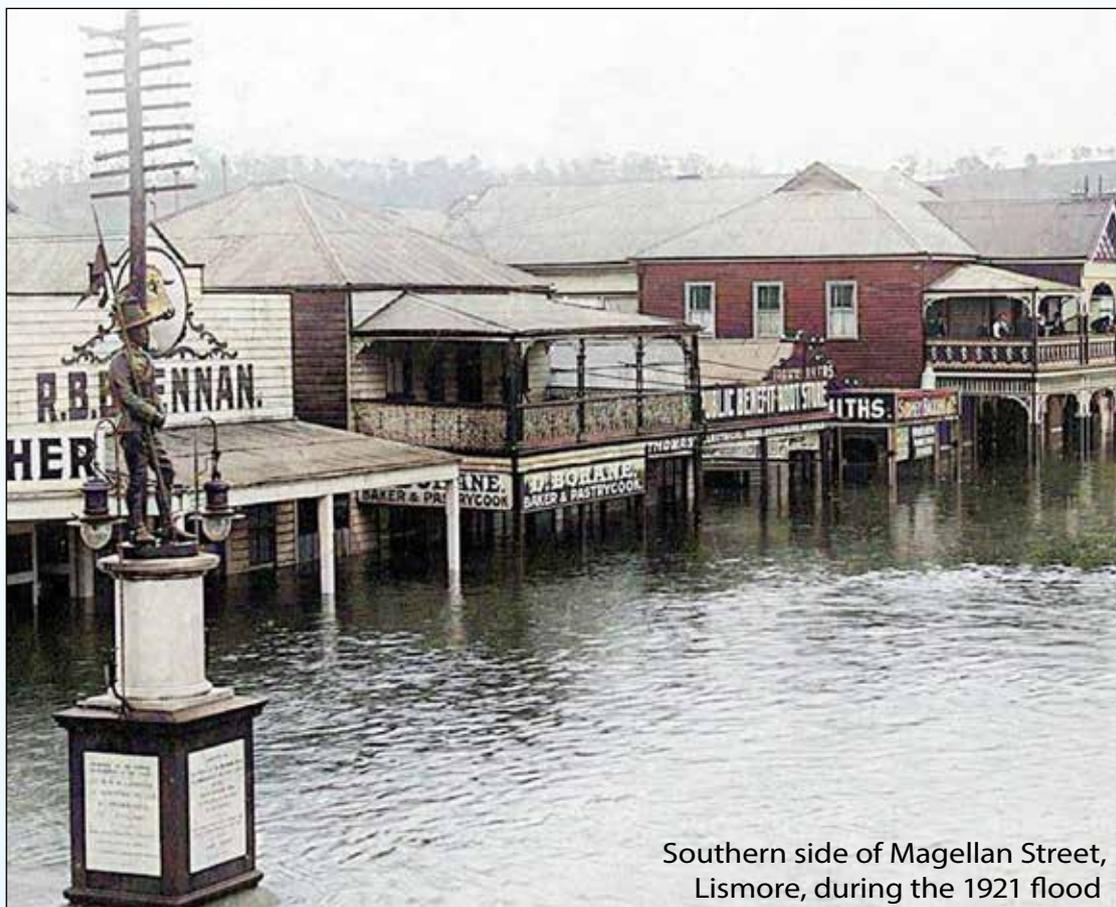
The following is a catchment-wide multi-layered strategic flood mitigation and water security proposal to simultaneously resolve both the Richmond catchment flood and water security issues.

### Water Security

Rocky Creek Dam was constructed in 1953 to provide water services to 50,000 people. Additional resources constructed over the years currently service 100,000 residents. However, work undertaken by Rous, in 2014 and subsequently, has shown additional sources are required by 2024 to ensure the region has a secure water supply. All these issues are comprehensively dealt with in the Draft FNC Regional Water Strategy document.

### Flood Mitigation

The Richmond River rises in the Great Dividing Range, and is joined by twelve tributaries, including the Wilsons River, before reaching its mouth at Ballina. High rainfall intensity and multiple converging systems across 7000 sq.km means there is no simple low-cost mitigation solution.



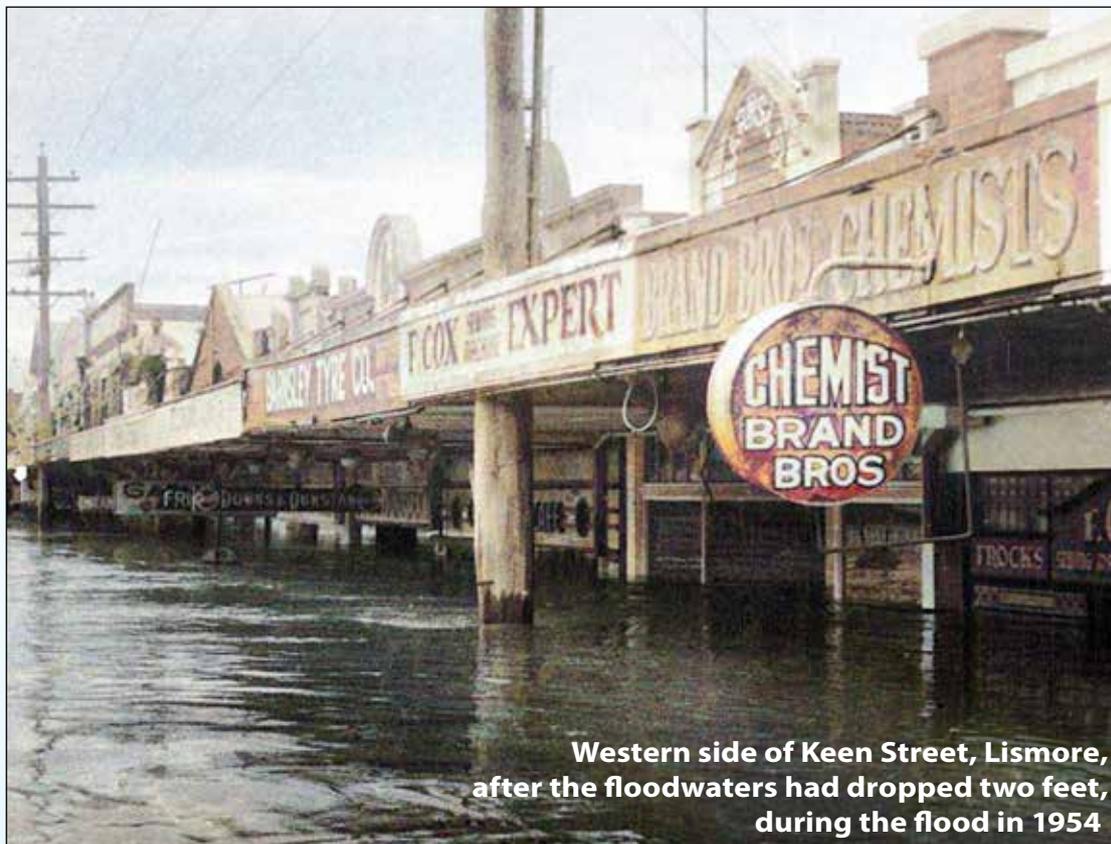
Southern side of Magellan Street,  
Lismore, during the 1921 flood

The Richmond catchment population of 150,000 resides in over eighty towns and villages throughout the Richmond and Wilsons River catchments. Many suffer damaging consequences during floods.

Risk Frontiers describes the Lismore area as the most at peril of flooding in Australia. There have been more than 130 floods recorded in 150 years (Bureau of Meteorology measure greater than 4 metres AHD), twelve would have overtopped the 1:10 year flood levee which was completed in 2005.

For the four biggest floods in the last seventy years—1954, 1974, 1989 and 2017 alone—research by Macquarie University Risk Frontiers and SGS Economics/Deloitte for Suncorp Insurance reported more than \$10 billion (2020 \$s) in reparations and recovery costs to taxpayers, businesses and residents.<sup>4</sup> Between 1954 and 2017 there have been an additional eighty-nine major, moderate and minor floods with recovery and reparation costs to be added to the \$10 billion.

The Draft DPIE Water Strategy information dramatically underestimates the total damages of the 2017 flood and makes no reference to the ongoing historical costs. This significantly distorts the Cost Benefit Analysis of any water strategy decision making process going forward.



**Western side of Keen Street, Lismore, after the floodwaters had dropped two feet, during the flood in 1954**

To be realistic the Cost Benefit Analysis of the FNC Water Strategy must include all direct and indirect costs and social, economic and environmental impacts. Additionally the damage calculation must be factored using per head of population.

Most importantly, the label of a flood-prone city and region has destroyed the confidence or prospect of private capital investment, and commercial progress is now at a tipping point. Private investment is decreasing, and both welfare and the ratio of cash benefits to tax paid is significantly higher than our regional NSW counterparts. A lack of vision has stalled any development across the LGA for the last twelve years.

The focus of almost all the options presented in the Draft FNC Regional Water Strategy also fit our Combined Water Security and Flood Mitigation Proposal, e.g. the Northern Rivers Joint Organisation Watershed Initiative Discussion Paper 2019,<sup>5</sup> enhancing natural systems, supporting water use and delivery efficiency, strengthening community preparedness for climate extremes and improving Aboriginal people's interest, etc.

This Draft FNC Regional Water Strategy Project is the only platform that has the potential to incorporate water security and flood mitigation as an



efficient solution to a costly and serious set of problems that do not go away by not addressing them. The compliance and infrastructure build timelines of a flood mitigation and water security strategy are similar, and the outcome of this project will positively reshape the future prospects of this city and all the towns and villages throughout the catchment.

If Flood Mitigation is not capitalised upon and included within the FNC Regional Water Strategy then there is no reason to think the future will be any different to what has been experienced over the last several generations.

For more than fifty years there have been major challenges to water management in the Richmond catchment particularly in the area of flood mitigation. Now is the time to find a solution once and for all.



**LISMORE CITIZENS FLOOD REVIEW GROUP**

██████████, LISMORE NSW 2480

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Email: ██████████

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The Lismore Wharf,  
at the bottom of Magellan Street, Lismore,  
under water during the 1954 flood



Woodlark Street, Lismore, with the Australian Joint Stock Bank at the left, during the flood in 1893

## Introduction

The Northern Rivers Region is the twelfth largest population basin in the nation with a resident population of >250,000. Lismore is a regional hub and major business centre, with major government infrastructure including the Lismore Base Hospital, Southern Cross University and the District Law Court, which sustain specialists in health, education and the law. Lismore has the infrastructure and amenities of a city of 250,000 people, similar to Hobart or Geelong.

The Richmond catchment sits in the centre of the area between Noosa and Coffs Harbour, and the CSIRO describes it as the most comfortable climatic living conditions on the east coast.

The original settlement of Lismore in the early 1840s was based on cedar timber-getting using the two rivers, Wilsons and Leycester, to transport timber to and from the town. This led to the establishment of earlier growth within the floodplain including the existing Central Business District. As cedar was readily available throughout the entire Richmond River catchment, most towns and villages were developed in the same way for ease of river transport, e.g. Kyogle, forty km west of Lismore, sits on the confluence of Fawcetts Creek and the Richmond River. The Richmond and Wilsons Rivers meet just north of Coraki.

Due to constant flooding, and a failure to implement an effective flood mitigation system, there is now a complete loss of confidence in the business community—particularly in Lismore. Research shows population and economic growth are at a standstill or going backwards. Over the past seventy years many flood mitigation options have been proposed, but to date the issue has only been partially resolved.

The 1954 and 1974 floods set records in Lismore, Kyogle, Casino, Coraki and Nimbin with over 1,000 mm of rain in 3–4 days. A wall of water flowed through the Kyogle floodplain uprooting the railway line (*below*) and the Casino Bridge was washed away.

The Mid-Richmond area also floods with the Bungawalbyn catchment similar in size to the Leicester Creek catchment. During the 1954 and 1974 floods huge amounts of rain fell over this catchment from southwest of Kyogle, Mummulgum, Mongogarrie, Rappville, etc. These waters entered the Richmond at either Tatham or Bungawalbyn maximizing and extending the duration of the Mid-Richmond flood.

The impact of flooding in the Mid-Richmond catchment causes flood waters flowing from Leicester Creek and the Wilsons River to be backed up at Lismore, turning any major flood from a three- or four-day event into one lasting up to fourteen days, such as in 1954 and 1974.



The railway line torn up by floodwaters at Wiangaree, north of Kyogle, in 1954

To improve the current situation in both flood mitigation and water security, it would seem that the time is right for a wide-ranging multi-stage strategic solution regarding the management of water in the Far North Coast.

In the immediate aftermath of the 2017 disaster event the government was prepared to fund projects, but they had to be ‘shovel ready’. However, the requirement for any infrastructure project requires problem assessment and analysis, options generation and assessment and solution prioritisation and, in most cases, this takes years.

The considerable cost in developing a feasibility study and environmental impact statement on a comprehensive solution to this community’s problems, is way beyond the financial capacity of rural local government agencies. A thorough investigation involving flood model development and mitigation option modelling also has a timeframe of several years. Additionally, grant funding comes from a range of different agencies, making it piecemeal, restrictive and inconsistent and adding years to the planning of a project. Given the ongoing development and population increase in the region this puts an effective outcome at risk.

The previously mentioned seventy years of endeavouring to find a solution to water attenuation in the catchment is typical of the defective process. Piecemeal funding has produced some options in the 1960s, 1980s, 1990s and now in 2020 with no successful outcome and, whilst the population of the region continues to grow, water security is at risk, floods continue to occur and so do the billions of dollars in cost for reparation and recovery.



The Casino Bridge washed away during the flood in 1954

During our research we have discovered there is considerable variation between the states on how major flood and drought mitigation projects are determined and managed. In NSW local government is supposed to initiate and fund 33.3% of costs of projects to shovel-ready stage. Most rural local councils are struggling financially or insolvent.

Over the years the NSW Department Planning, Infrastructure and Environment (DPIE) has been restructured, and it appears much of the work is now outsourced. The ongoing turnover of staff in all departments and sections means there is little or no corporate knowledge and little or no consultation with the local community. Then the procedures of NSW Environmental Planning and all other sections of the department choke the delivery of projects rather than drive them.

The Productivity Commission Report into Natural Disaster Funding released in May 2015 showed that 97% of the funding goes into reparation and recovery, and just 3% into mitigation. It is time for the funding percentages to be significantly altered.

In tabling this report, together with the Australian National Audit Office (ANAO) report into national recovery funding arrangements,<sup>6</sup> the then Minister for Justice, the Hon. Michael Keenan, MP, stated ‘the current system is flawed’ with ‘the national focus too much on recovery at the expense of directing resources to better preparing for future disasters’.

The Minister continued:

*... foreshadowed consultations (with the states) on the best way to address the findings of these reports. Mitigation funding will ensure the most disaster-prone states are able to address their greatest risks. We want to work with the states to understand the scope of mitigation projects they wish to pursue, and find a way to support these projects without making dramatic cuts to recovery funding.*

To date there is no evidence of any change in funding arrangements.

# 1. Proposal Background

Whilst the FNC Regional Water Strategy has a general coverage of all issues associated with water, the specific focus seems to be on drought and water security. Flood mitigation is not being seriously considered as part of the FNC Regional Water Strategy, even though we are the most flood-affected region in the nation.

Risk Frontiers in their article, ‘The 2017 Lismore Flood—Insights from the Field’, stated:

*Much bigger floods are possible in Lismore and there is much to be learned from this event. The physical and social impacts would have been far greater had the floods been only a little higher.*

With climate-change modelling showing that there are to be longer and stronger wet and dry periods, it is time to get serious. Our proposal is to take a very strategic long-term view incorporating all key issues mentioned in the draft document to provide ‘resilient water resources for towns and communities, Aboriginal communities, industry and the environment’. Each of these issues is associated with and relate to both water security and flood mitigation.

## 1.1 Flood Mitigation

AIM: To effectively reduce the impact of flooding on towns in the entire Richmond and catchment.

OBJECTIVE:

- a. To develop a high-quality catchment-wide model
- b. To investigate all possible flood mitigation options
- c. To implement the most effective options

### Background

Over the past seventy years there have been many plans and options put forward, but to date there has not been a successful outcome. In the 1950s local civil engineering company owner and resident, [REDACTED], offered to create a flood channel west of the airport to carry water from Leicester Creek.

In 1980, another local resident, [REDACTED] (who had migrated to Australia after WWII and settled in Lismore), paid for a top team of Italian urban hydrologists to come to Lismore to research and evaluate all possible hydrologic, territorial and socio-economic consequences of flooding in the Richmond catchment. Their multi stage proposal was received in May 1981 (*Concept Plan, Appendix 3*).

During the 1980s, despite many submissions to state and federal governments, no funding was forthcoming. Following the devastating 1989 flood local members of the Lismore Chamber of Commerce, including [REDACTED], donated \$138,000 (today \$275,000) to have the Lismore catchment modelled by Sinclair Knight and Partners.

A total of twenty-two options were presented by Sinclair Knight. These were reduced to eighteen, then to nine (*Appendix 4*). The options examined at this time predominately related to levees within Lismore City, and projects ranging from levees to combinations of levees and minor to major diversionary channels including from Leycester Creek west of the airport. The consultants appeared confident of the modelling and this modelling underpinned the levee construction.

After much public debate a compromise was made to a 1:10 year flood levee and funding was received in 2000. The levee was constructed on the eastern side of the Wilsons River in order to protect the CBD and completed in 2005. It was breached for the first time in 2017 with disastrous consequences and there are currently proposals to return to the original 1:20 year levee height.

There was extensive damage sustained throughout the CBD and risk management and insurance company economic formulas suggest the true cost of the Lismore 2017 flood event to be in excess of \$3 billion.

Following the 2017 flood a Three Stage Joint Funding Submission (*Appendix 5*) for flood mitigation was prepared by Rous Water and Lismore City Council, at the request of local state and federal politicians, and presented for funding. Stage I at \$8.2 million has been funded but will have only a 3–10 cm mitigation effect in a 11.6 metre flood. Stage II and III, which contain removal of floodplain impediments and flood modelling, remain unfunded.

## **Flood Mitigation Benefits**

- Reduce the social, economic and environmental impact of floods;
- Avoid property losses;
- Avoid business and education interruption;
- Avoid loss of critical infrastructure;
- Reduce insurance costs;
- Revitalise neighbourhoods;
- Improve public spaces;
- Enhance public safety;
- Increase business and lifestyle security;
- Improve investment.

## 1.2 Water Security

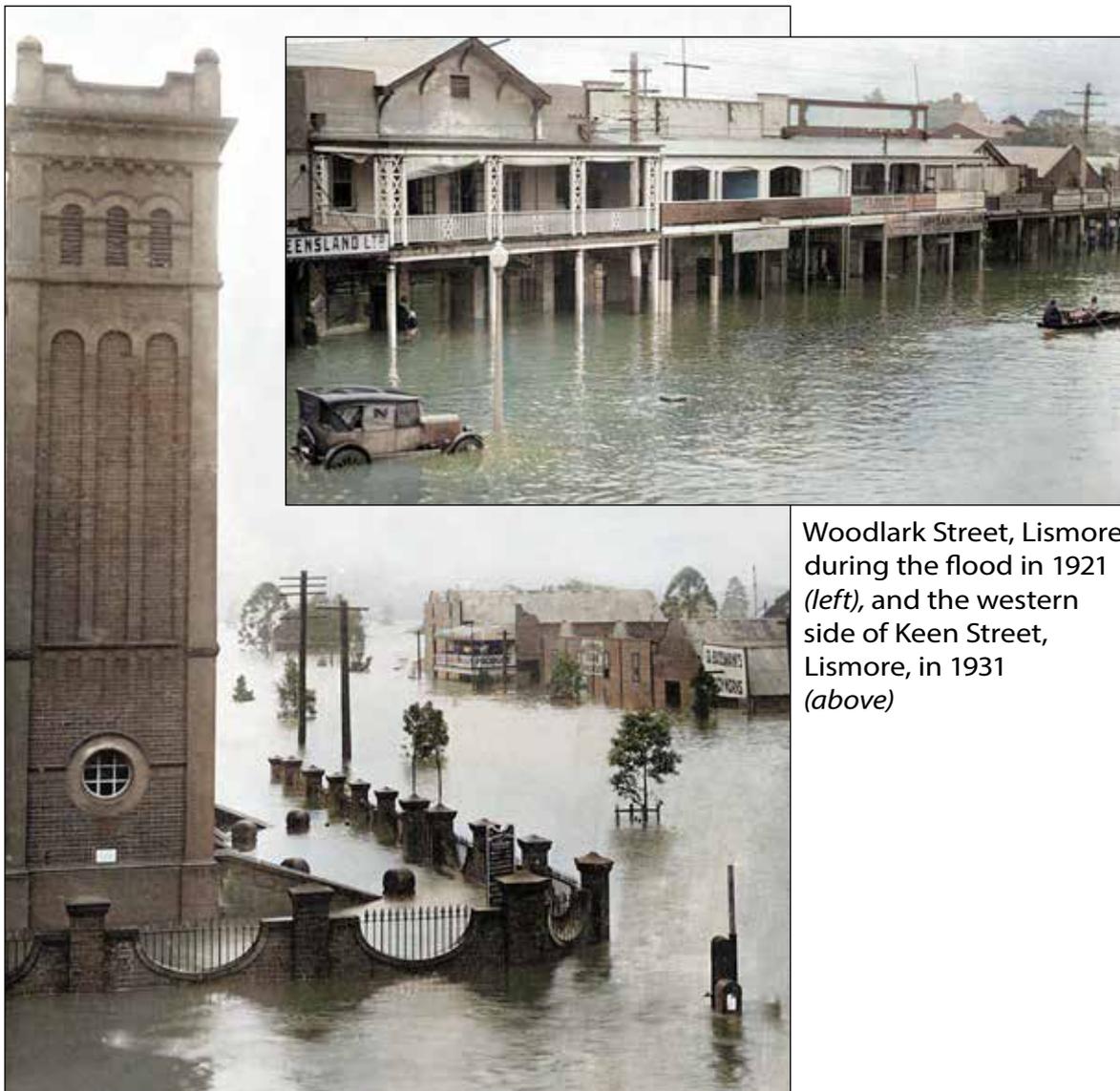
Dams provide a range of economic, environmental, and social benefits, including flood control, water supply, hydro-electric power, waste management, river navigation, wildlife habitat and recreation.

AIM: To provide water security for a population of 250,000 through to at least 2060.

OBJECTIVE: The construction of a water storage system at Dunoon to provide water security.

### Background

The history of the Rocky Creek Water Supply Scheme can be traced to the 1880s, and in 1891 the area was proclaimed a water reserve. In 1935 approval was obtained for investigations to be carried out into the catchment area, dam site, pipe lines and reservoir sites



Woodlark Street, Lismore, during the flood in 1921 (left), and the western side of Keen Street, Lismore, in 1931 (above)

In 1948 further investigations were carried out and it soon became evident that a very satisfactory water supply could be economically given to Lismore, Byron Bay, Bangalow and also Evans Head, Woodburn, Broadwater and Coraki. Designs were prepared to supply water in bulk to Lismore City, Byron Shire and Woodburn Shire, who were then to construct their own reservoirs and install their own distribution systems

The scheme was pioneered in the district and, for the most part, built by local contractors. Construction of the dam began in 1949 and was completed in April 1953. The village of Bangalow was the first town to receive water from the dam in November 1953.

Rocky Creek Dam was constructed across Rocky Creek to store water during dry years. The lake behind the dam is >200 ha and holds 14 gigalitres, which was about five years' supply for the population in the 1950s. The serviced population at that time was 25,000 and is currently 100,000 with an additional six million domestic and international tourist overnight stays within the area annually. The two key drivers for additional water sources are population growth and climate variability.

The dam is the principal source of water for the Rous Regional Supply and is supplemented by Emigrant Creek Dam, the Wilsons River source and several bore sites in Alstonville and Woodburn. These additional sources are brought online as the security level in Rocky Creek Dam drops to help secure our water supply and avoid water restrictions.

However, in 2003 the water level at the dam dropped below 20% and the region was subject to severe water restrictions. Because of this it was decided by Rous County Council to augment the Rocky Creek Dam supply by developing another source on the Wilsons River near Lismore, treating it at an upgraded Nightcap Water Treatment plant at Rocky Creek Dam. The emergency Wilsons River source was completed in 2003, and the fully-developed Wilsons River source and upgrade of the Nightcap Water Treatment Plant was completed in 2008.

## **Service Need**

Rous County Council reports that over the next fifty years, changes to climate and rainfall patterns are expected to reduce the reliability of rainfall for the region. At the same time, water use is forecast to increase as population grows. Based on these predictions, by around 2024 demand for water will match what current sources can reliably supply.

By 2060, expected demand would exceed reliable supply by 6.5 gigalitres per year, or approximately half of our current supplies. To meet the shortfall,

a combination of improved water conservation and new water sources are proposed over the next ten years.

Water security will become a critical issue in the region by 2024. Requirements are:

- Construction of a dam at Dunoon to service increased population and industry requirements;
- This may include multiple small attenuation devices downstream of the Dunoon dam, picking up water from Terania Creek estuary and other suitable valleys in the catchment area, and a large solar farm or even a floating solar farm on or near the smaller dams.

### **Water Security Benefits**

- Increased security of long-term water supply to at-risk urban areas with less requirement for demand management measures;
- Water security for more than 250,000 people through to 2060;
- Smaller dams will provide water attenuation and irrigation opportunities;
- Smaller dams may improve flood mitigation options via the Terania Creek estuary;
- A solar farm (either fixed or floating) will generate energy for a variety of uses;
- A range of recreational activities and water sports such as competitive national championship events in rowing, dragon boat racing, sailing, triathlon, wake boarding, SUP paddle boarding, winter aerial sports training facility;
- An eco-tourism destination for picnicking, fishing, camping, bushwalking and birdwatching;
- Opportunity to incorporate a rainforest regeneration area;
- Opportunity to incorporate a Regional Aboriginal Information Centre;
- Opportunity to include a koala habitat and breeding area and tourist centre;
- Tourism will be increased throughout the region;
- Small and medium size enterprise development platform;

## **MOST SIGNIFICANTLY —A VISION FOR THE REGION**

## 2. Hydrologic Modelling

Only climate-change modelling has been included in the Draft FNC Regional Water Strategy document. This only tells half of the water story.

Catchment-wide hydrologic modelling of the highest calibre is the only way to answer the water security and flood mitigation question. This is central to all the affected towns and villages in the catchment realising their full potential and reversing the damage and restrictions of the past. The answer to Lismore's flooding may very well be a mitigation strategy upstream from Lismore, or further down the river system in the mid-Richmond.

Various hydrologic models from across the years exist in the Lismore, Kyogle, Richmond River, Ballina and Byron LGAs, but these are localised and of various modelling generations and quality.

Following the 2017 flood historical information was collected. Perusal of a box file on the flooding issue in Lismore, collected by the late Florian Volpato between the early 1980s and 90s, reads almost like we are reinventing the wheel.

Whilst the file is incomplete, the first priority now would seem to be to carry out a desktop review of all the work carried out to date, and seriously evaluate the ten most obvious recommendations for modelling evaluation.

Rous County Council had access to two models developed by Patterson Britten and BMT WBM in the 1990s, neither being absolutely operationally complete. Both were improved and upgraded for the construction of the Lismore Levee in 2005.

In 2012 at the Floodplain Management Australia Conference a presentation entitled 'Towards a Catchment-Based Model after Two Decades of Modelling in the Richmond' was given by Caddis et al (*Appendix 6*).<sup>7</sup> It was reported that there had been over thirteen flood models built in twenty years for different areas of the catchment using various software and various schemes (1d, quasi-2d, 1d/2d). The WBM document was suggesting issues that were already ten years old at the time of writing (2012) and their approach showed:

- Inadequate coverage of rural areas;
- Poor synchronisation of FRMPs (Flood Risk Management Plans);
- Discrepancies at model interfaces;
- Inconsistent modelling and mapping approaches;
- Inadequate use of flood information for flood response.

Caddis et al continued:

*The catchment-based model provides a platform for multiple uses. Locally it has been used in a post-doctoral study for modelling sea level rise and the associated impacts on coastal wetlands and water quality, developing a retreat strategy for asset management, and improving flood risk management across rural areas where population growth is a major consideration.*

In relation to the emergency management of floods, the paper went on to say:

*Further, a collection of localised flood models has limited use for flood warning purposes. Response agencies require an overview of the complete hydrologic system, rather than having to waste time making interpretations between separate sources of information.*

Unfortunately, eight years after this presentation there is still no high-quality catchment-wide model. Without it there can be no progress in the area of flood mitigation, water attenuation, water security or effective emergency management of floods. This submission endeavours to move the issue forward by having catchment-wide hydrologic modelling included as part of the joint project.

The Combined Water Security and Flood Mitigation Proposal is a large-scale water management and infrastructure proposal that is capable of benefiting the entire Richmond/Wilsons catchment. This will occur by reducing the impact of floods in the many towns and villages on the floodplain, ensuring water security for an increasing population of up to 250,000 through to 2060, and securing environmental, social and economic benefits for the future.

The Northern Rivers annually receives the highest rainfall in NSW, i.e. 2800–3300 mm (*Appendix 7*) and sixteen of the twenty wettest places in NSW are in the FNC area (*Appendix 8*). The combination of these two projects will ensure benefits across the agricultural, construction, tourism, business and associated sectors.

High-quality modelling is required for both the investigation of flood mitigation options and the siting and other hydrological investigations associated with the construction of the proposed 15-gigalitre dam at Dunoon. Through this modelling, all options can be assessed to ensure there are no unintended consequences.

## **Hydrologic Modelling Benefits**

Development of a model of the entire Richmond catchment and modelling of the ten most superior options will:

- Determine whether there are any flood mitigation possibilities;
- Provide the best option to directly benefit homes and businesses on the floodplain including the Lismore CBD, Kyogle, Casino, Coraki and Woodburn as well as flood effects on rural properties;

- Provide information that may keep the flood peaks below the current Lismore CBD and South Lismore Levees;
- Provide a valuable catchment-wide data validation tool;
- Provide information for the emergency management of floods;
- Provide the capability of considering differences in climate and physical properties when transposing the calibration made at a key gauging station;
- Maximise the potential of limited available flow data within the catchment;
- Provide improved basin representation compared to traditional lumped modelling approaches;
- Identify potential deficiencies in the reference flow data across the catchment;
- Help deliver improved modelling results in situations where gauged flow data are of variable quality;
- Identify potential issues with other input datasets;
- Help to improve the accuracy and reliability of water resource assessment in the long term;
- Reduce uncertainty by taking into account spatial consistency, leading to more robust predictions.

In addition, the modelling cost can be amortised and is also required for the following agencies:

- Private investment opportunities;
- Long-term water security strategies;
- Rous projects;
- Local government projects;
- Emergency services flood management;
- Single source digital emergency services management system;
- Insurance company requirements;
- SCU National Flood Research Centre projects;
- Lismore City Chamber of Commerce and Industry portal;
- Lismore City Council (LCC) dashboard;
- Northern Rivers Watershed Initiative.

### 3. Public Interest Considerations

Throughout the entire Draft FNC Regional Water Strategy document it is evident that there has been no input from water-associated community organisations such as the NSW Irrigators Council, in relation to the both water security and the impact of floods. Presumably, their input will be included in 'community consultation'.

The change in employment status to fixed-term contracts in government agencies has introduced an additional challenge in developing infrastructure projects particularly in rural areas.

In all three levels of government departments in particular, key issues are:

1. Revolving door of senior key decision makers in all departments;
2. Lack of local and corporate knowledge in decision making;
3. Lack of continuity;
4. Decision makers with 'no skin in the game';
5. Number of government departments involved.



Residents and shopkeepers cleaning up the mess in Molesworth Street, Lismore after the 1954 flood

In order to ensure that local knowledge is included it is recommended that throughout the planning, design, development and implementation stage of all rural infrastructure projects that directly impact the community, there is input from a local knowledge hub made up of technical and community representatives from business, local water-related agencies and the community who meet specific criteria. In this proposal relating to the Richmond catchment, it would include agency and community representatives from Rous Water Senior Management, Kyogle, Richmond Valley, Ballina, Byron and Lismore local government areas.

In order to guarantee the knowledge hub consultative committee has local flood knowledge and technical expertise the definitive criteria for community participation should fit into the following four categories:

- >10 years as business owner with floodwater-affected property;
- >10 years of local flood knowledge and mitigation engineering experience;
- >10 years' experience holding volunteer or salaried local flood intelligence or flood management positions;
- >10 years flood-affected long-term resident of the floodplain.

The reason for the ten-year requirement is to ensure understanding of the water needs of the local community, multiple flood experience, historical knowledge and on the ground understanding of the variation in water behaviour, i.e. no two floods are the same.

Consultative meetings with the appointed expert body should be at least every three months. An alternative community member who fits the designated criteria should also be appointed for each area to ensure that there is representation and input for each of the stakeholders at each planning meeting.

The impact of floods on the residents and businesses is felt for very many years. We live with the consequences and there are social, emotional, economic, financial and environmental outcomes that remain hidden once the first flush of support is over.

A demonstration of how the issue lies dormant beneath the surface without any public outcry was shown when Austin Curtin, a young local farmer, stood as a candidate in the 2019 election with flood mitigation one of his key platforms. In less than four weeks he managed to collect over 3,600 signatures on a petition that resulted in the \$8.2 million government grant (mentioned in the Draft Water Strategy document) to get Stage I of the Joint Funding Submission put together by Lismore City Council and Rous Water.

Unfortunately, Stage II and III remain unfunded and probably will remain so, due to the DPIE funding system that does not work for impoverished rural councils.



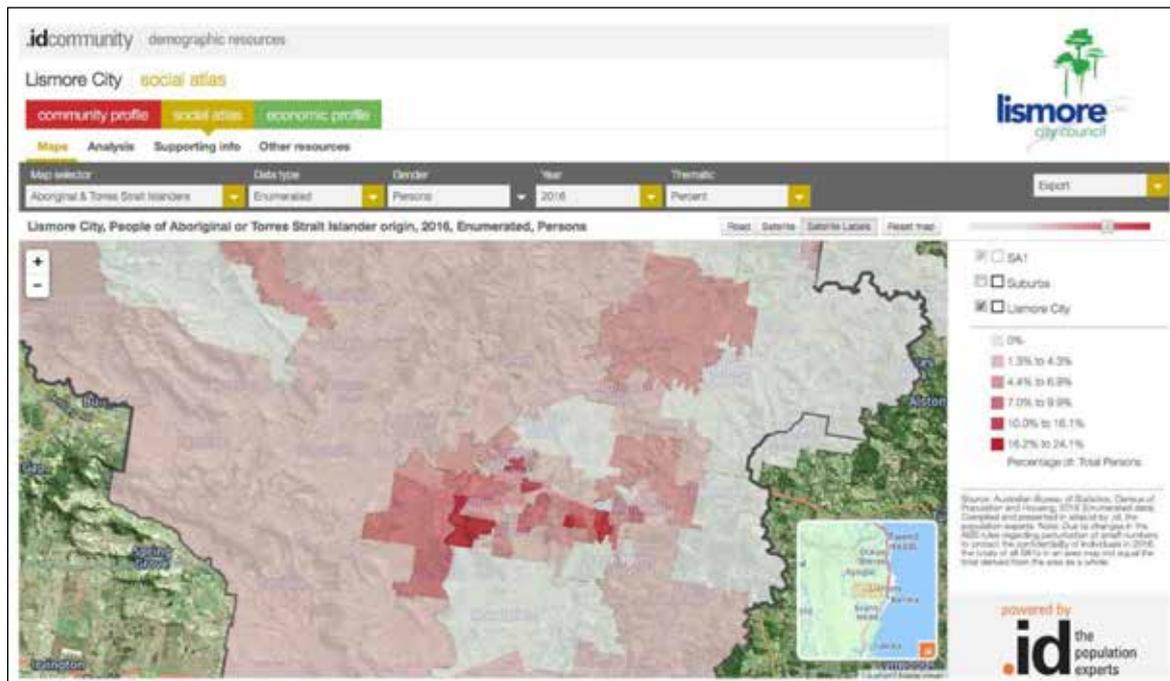
A group of Aborigines at the Richmond River, near Lismore, c.1865

## 4. Aboriginal Considerations

Within the current Draft FNC Water Strategy document it is pleasing to see the serious consideration of issues that are so important to Aboriginal peoples. The issues and benefits have been clearly documented.

November 2020 marks 150 years of flood records in Lismore. The highest recorded flood was 12.46 metres in 1890—some eighty centimetres above the 2017 flood height. Over the years Aboriginal elders have reported flood heights around the area greater than those recorded in the past 150 years. One such report was of water going over the hill at the cathedral, and this has been corroborated by historical anecdotal evidence from 1852. This very important information must be taken into consideration given the future climate change predictions.

In support of the Aboriginal elders' information, following the 2017 flood the senior intelligence officer at the Lismore City SES Unit, with over fifty years local flood experience, calculated that had the same amount of water fallen just eleven kms to the east on the Wilsons River catchment that fell on the Leicester Creek catchment, in the same period of time the river height in Lismore would have been some 2.6 metres higher bringing it to over 14 metres. Results for everyone including a large proportion of the Aboriginal community would have been catastrophic.



Currently more than 50% of local ATSI population live on the Richmond/Wilsons floodplain. Consequently, the following flood issues related to Aboriginal peoples should be seriously considered within this submission:

- Every time there is a moderate or major flood they are seriously impacted;
- With the number of floods currently experienced and predicted to be larger and more frequent due to climate change, the impact on this already struggling community is going to be even greater;
- Most in the ATSI community struggle in the lower socio-economic stream;
- The unemployment rate is high at 19%;
- Without flood mitigation and further regional development the local ATSI community will continue to be impacted physically, financially, socially and emotionally.

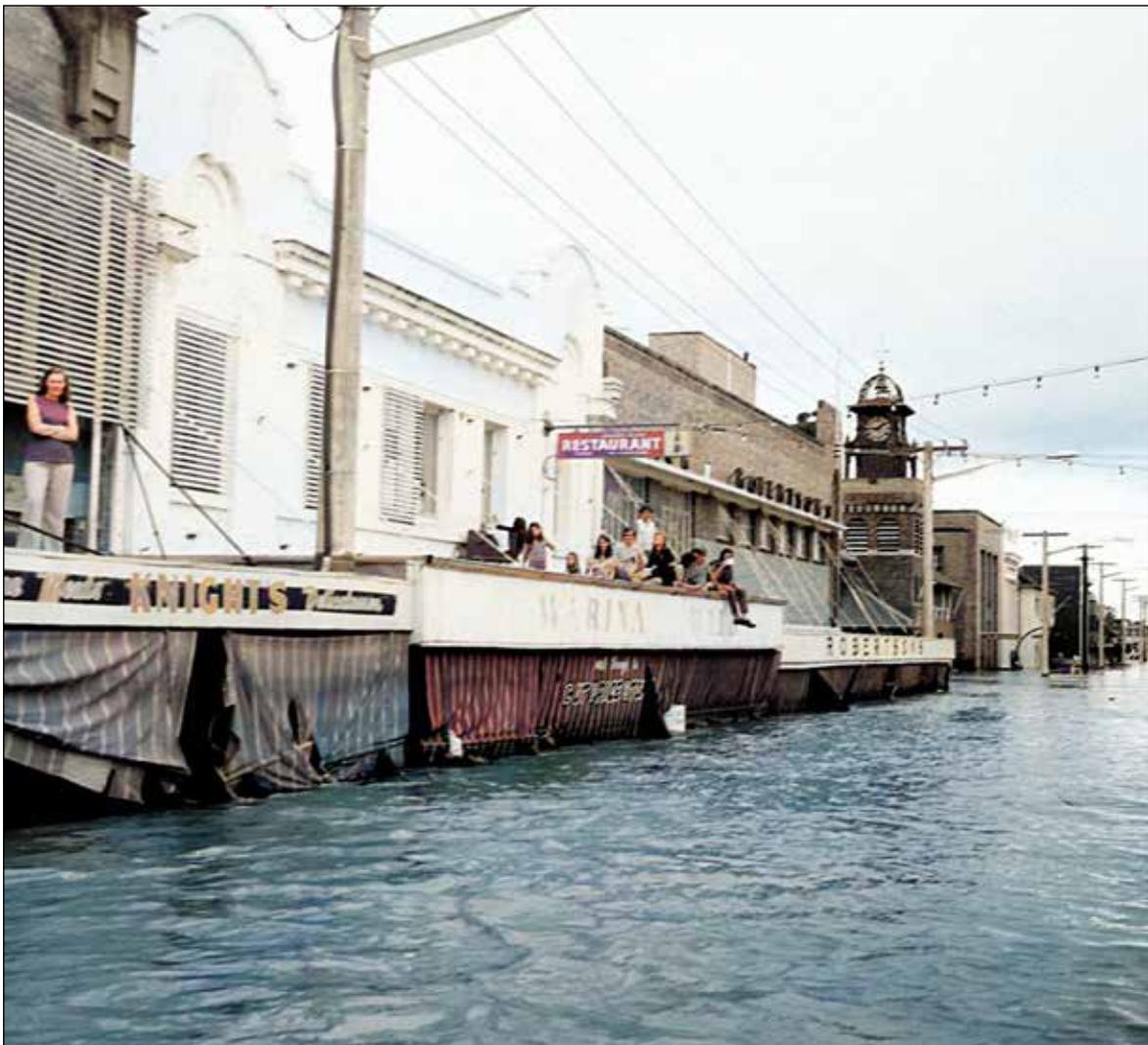
An effective flood mitigation solution will reduce the impact of floods, alleviate a perennial problem and greatly improve the quality of life for the majority of the ATSI community residing in the catchment.

## 5. Options

When considering adding another option to the Draft FNC Regional Water Strategy document it became evident that in fact our Combined Water Security and Flood Mitigation Proposal is a water strategy platform in itself. It enlarges and enhances the platform of the current document.

When assessing all the options it is apparent that our Combined Proposal does not really fit within any option except maybe Option 28: Characterising Coastal Groundwater Resources, and Option 30: Northern Rivers Watershed Initiative.

But, on further investigation both Options 28 and 30 fit well under our Combined Water Security and Flood Mitigation Proposal, as do the majority of the other thirty-seven proposals and issues—such as water access rights, on-farm storage, the size of dams on properties and aquifer recharging that are mentioned within the current Draft Water Strategy document.



Molesworth Street, Lismore, during the 1974 flood

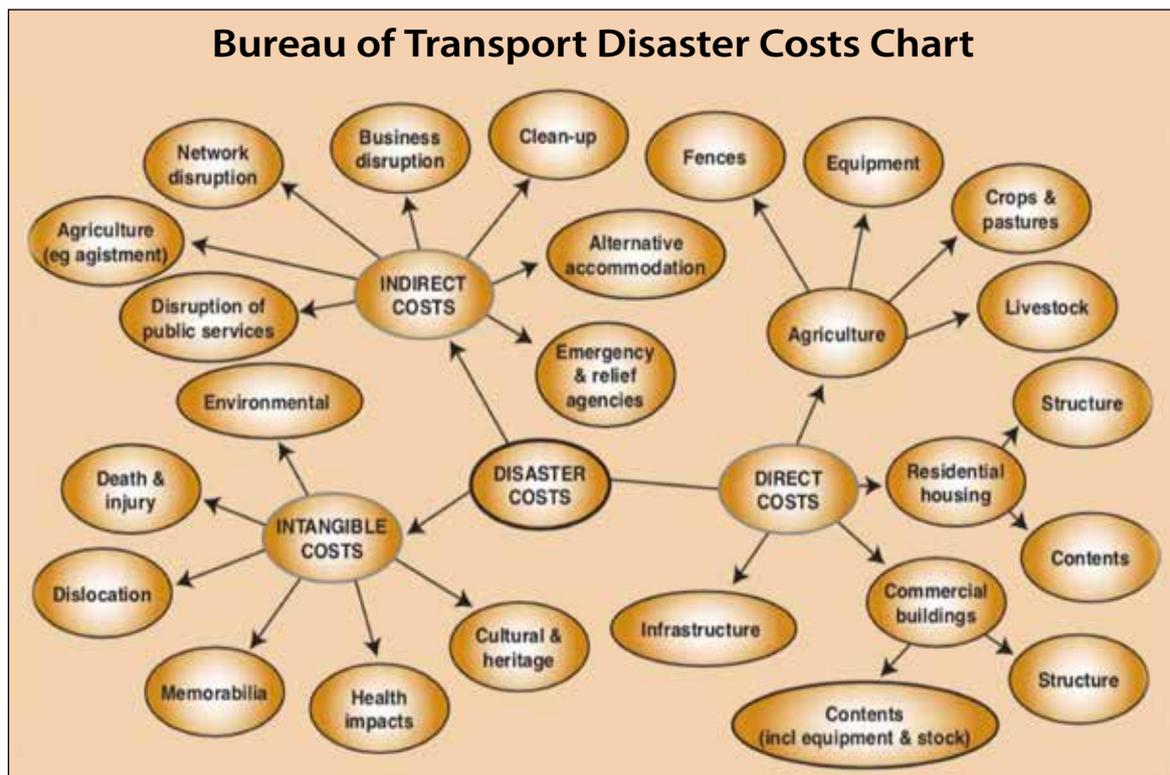
## 6. Cost Benefit Analysis

In reading the DPIE Far North Coast Regional Water Strategy document it is apparent that COVID-related logistical difficulties were experienced throughout the formation period of the project. As a result, it seems that consultation has been undertaken with local constituent councils more so than any other entities.

Understandably, the recent issue of *Drought* holds priority in the DPIE Regional Water Strategies document. However, in the sixteen-year period between our region's most recent drought periods the Far North Coast experienced twenty floods.

The issue of Lismore floods has traditionally been seen as too large and complex to attempt to find a solution. Documentation and development costs are deemed too expensive for the local council to confront within the bottom up NSW Government (DPIE) funding system. As a result of these preliminary project development costs, flood mitigation is not on the agenda of the LCC or Rous Water. No local government agency can or will waste financial resources on the issue that requires them to incur 33.3% of the project development costs when they don't have the funds. Only the most superficial attempts are made in order to appease statutory requirements.

In and amongst all of the other combination of proposed solutions, it is clear reading the Draft FNC Regional Water Strategy document, there is no impetus from DPIE or council to address the biggest single issue in this jurisdiction.



The single most costly impact to the community both socially and financially is not given the appropriate weight in any water security conversation that it so urgently requires.

To be realistic the Cost Benefit Analysis of the FNC Water Strategy must include all direct and indirect costs and social, economic and environmental impacts. Additionally, the damage calculation must be factored using per head of population.

The reference to local flood damages in the DPIE Water Strategy information dramatically underestimates the total damages of the 2017 flood, and makes no reference to the ongoing historical costs. This significantly distorts the cost/benefit analysis of any water strategy decision-making process going forward. The Bureau of Transport Disaster Costs Chart (*previous page*) shows an example of all the direct and indirect costs to be included in a Cost/Benefit analysis. This incorporates far more costs than the \$89 million mentioned in the Draft FNC Water Strategy document. This amount is only quoting the estimated government damages and the estimated agribusiness losses. There are no private sector losses or the uninsured, tangible and intangible losses.

In ongoing dialogue with the Insurance Council of Australia (ICA) they informed us that the March 2017 flood in Lismore resulted in three hundred and fifteen million dollars of total insured losses (TIL) being paid out in the private sector alone. But only a select few businesses have any flood specific insurance and that is mainly through national blanket policies. The overwhelming majority

**INSURANCE COUNCIL OF AUSTRALIA**

## Lismore Flood Mitigation

Lismore has suffered consistent significant flood events in the past from the confluence between the Wilson River and Leicester Creek.

The last event occurred in 2017 following Cyclone Debbie when the river flooded and overtopped inadequate flood defences for the CBD, designed to prevent only a 1:30yr flood event, causing an estimated \$315 million dollar loss.

Flood risks to community in this location are very high and the existing flood defences so inadequate that they are barely considered for underwriting purposes by some insurers. Insurance premiums for flood exposed properties are, consequently, expensive. The median premium in Lismore where flood risks exist is \$1750 compared to \$812 where floods do not occur.

If improved flood risk mitigation works were implemented and the existing flood risk removed, an average premium reduction of \$700 (40%) is possible. In some locations with extreme flood exposures the premium reductions could be higher.

Additionally, little data is held about the buildings in Lismore. Floor height survey data could substantially reduce flood-related premiums if available, by an estimated \$290 (14%) where it is shown that the floor height is above flooding.

There are no permanent engineering solutions to reduce flood risk currently being considered by Lismore City Council (LCC). A number of engineering concepts exist that would deliver a significant and permanent reduction to the flood risks. It is unclear what LCC is considering as feasible. Until the risks are mitigated properly, flood insurance prices will necessarily remain high and community safety will be at risk.

**Action required:**  
Grant LCC up to \$25,000 to survey floor heights, inserted into NBD

**Premium reduction possible:**  
Average of 14% for floor height above flooding data  
Average of 40% if high flood risk mitigated away

of citizens and businesses are self-insured when it comes to flood-specific insurance as the costs are simply prohibitive.

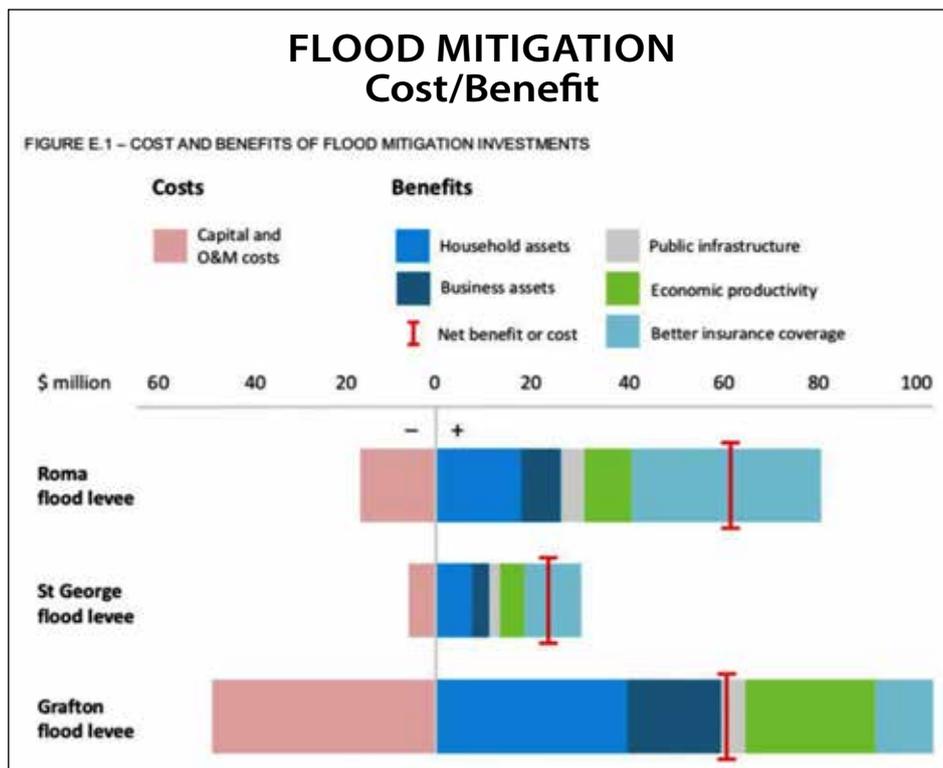
The majority of the 4,000 local businesses are sole traders or small and family owned. They just do not have the financial capacity to afford the high premiums that are charged due to the fact that there is no suitable mitigation system in place. Some insurance companies won't even offer insurance.

The ICA Top 12 Mitigation List was presented to Treasurer Frydenberg and Minister Littleproud in late 2019. The document states:

*A meaningful mitigation solution would compress insurance costs by an estimated 40% or more and reduce premium costs by \$700 or more. The median premiums where flood risks exist is \$1750 compared to \$812 where floods do not occur.*

In 2019 SGS Economics documentation, 'Economic Recovery after Disaster Strikes—A Report for Suncorp',<sup>8</sup> quotes the Department of Transport and the Deloitte Research method to calculate the true cost of an event based on a 10–22 times the total insured loss (TIL). This includes the direct and indirect costs across the normal five- to six-year recovery period. Based on the minimum calculation (10 x \$315m) the cost to this catchment in 2017 was greater than \$3 billion.

This \$3 billion cost amount is similar to that calculated by Roche et al in a research article, 'The Australian Great Flood of 1954: Estimating the Cost of a Similar Event in 2011'.<sup>9</sup> Interestingly, the financial outcome was almost the same



even though a different methodology was used. There were no insured losses included in the methodology of this flood event as insured loss records only commenced in 1967.

Additionally, these ongoing floods cause much greater losses to the budgets of local, state and federal governments. Due to the effects of regular flooding, the government-funded recovery and reparation costs as well as the welfare costs are never-ending and continue to grow.

In 2003 and again in 2018/19 Lismore experienced drought conditions with severe water restrictions. In that fifteen-year period between 2003 and 2018 Lismore also experienced three major floods (2005, 2009 and 2017) plus seventeen minor and moderate floods, all with a cost impact as mentioned above. Some floods occurred before the five/six years' major recovery period was completed and each flood incurs an annual ongoing cost to the local economy.

The Lismore City Council Floodplain Committee was recently handed the findings of the 2020 Flood Modelling Study by Engeny Water Management based in Brisbane. This study concluded the annual recurring cost of floods on the local economy was \$63m. This represents 3% of our Gross Regional Product. In the last financial year Lismore's economy retracted at -1% and has not grown since 2008. How is it possible for this city to ever reach its potential?

Three and a half years after the 2017 flood a walk should be taken around the CBD to see the sheer number of vacant shops post-2017 flood. It is shocking to everyone who knows Lismore to see whole arcades and dozens of empty shop fronts. The vacancy rate is now five times what it was pre-2017 flood.

As the regional centre to the twelfth-largest population centre in Australia it is inconceivable that Lismore has no significant NSW Regional Economic Development Strategy (REDS) plans, and does not comply with any of the five NSW Special Activation Precinct project criteria. There are no plans for Lismore.

There have been no plans for Lismore since the natural maturity of the last wave of private investment in the agribusiness sector. This was initially based on government tax incentives that played out through the Macadamia Nut Industry. The surrounding district of Lismore became the largest macadamia producing region in the nation until recently, where the Bundaberg region of Queensland has surpassed it, on the back of the water security provided by the Paradise Dam and all levels of government-enabling growth.

This Draft FNC Regional Water Strategy Project is the only platform that has the potential to incorporate water security and flood mitigation as an efficient solution to a costly and serious set of problems that do not go away by not addressing them. The compliance and infrastructure-build timelines of a Flood Mitigation and Water Security Strategy are similar, and the outcome of this

project will positively reshape the future prospects of this city and all the towns and villages throughout the catchment.

If flood mitigation is not capitalised upon and included within the FNC Regional Water Strategy, then there is no reason to think the future will be any different to what has been experienced over the last several generations.

A dam water security solution is a non-profit cost neutral project over a period of some fifty years. When combined, a water security/flood mitigation solution is economically viable on one side with the upside potential, with flood impact and avoidable damages and costs being significantly reduced on the other.

The Productivity Commission Report into Natural Disaster Funding released in May 2015 stated:

*Analysis highlights that flood mitigation assets have the potential to provide economic payoffs which exceed \$2.2 benefit for each dollar spent.*

On this basis it has been calculated that the Lismore 1:10 year levee construction in 2005 has kept twelve moderate and major floods out of the CBD, with estimates that it has paid for its \$21 million construction cost twice over through reduced flood damages. More needs to be done. The 1:10 year levee provides flood impact reduction up to the lower end of our major flood height spectrum.

	ROMA	ST GEORGE	GRAFTON
<b>Impacts</b> (NPV, \$ millions)			
<b>Costs</b>			
Total capital costs (including O&M)	\$16.4	\$5.9	\$49
<b>Protective benefits</b> (avoided costs)			
Household assets	\$18.4	\$7.6	\$41.6
Business assets and stock	\$7.6	\$3.8	\$20.8
Public infrastructure	\$4.5	\$2.3	\$5.3
Economic productivity	\$10.9	\$5.4	\$29
Better insurance coverage	\$39.7	\$12.6	\$11.4
<b>Total benefits</b>	<b>\$81.1</b>	<b>\$31.6</b>	<b>\$108.2</b>
<b>Net benefit</b>	<b>\$64.7</b>	<b>\$25.7</b>	<b>\$59.2</b>
<b>Benefit cost ratio</b>	<b>4.9</b>	<b>5.4</b>	<b>2.2</b>

Note: Columns may not total precisely due to rounding.  
Source: Urbis estimates

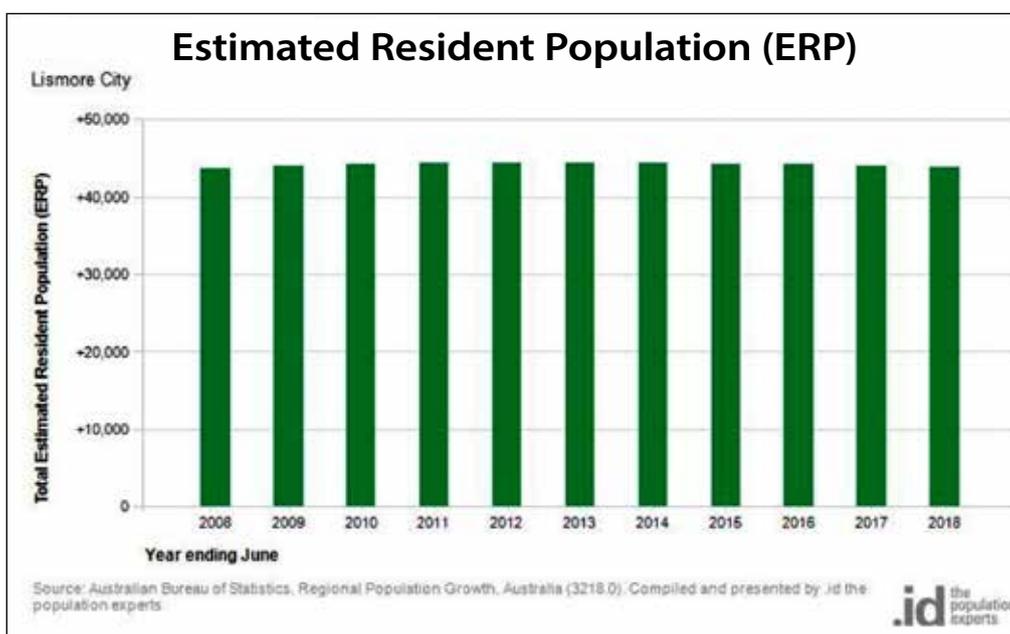
A breakdown of flood mitigation benefits associated with the above three examples of Roma, St George and Grafton from Deloitte Access Economics in ‘The Economic Cost of the Social Impact of Natural Disasters’ is featured on the previous page.

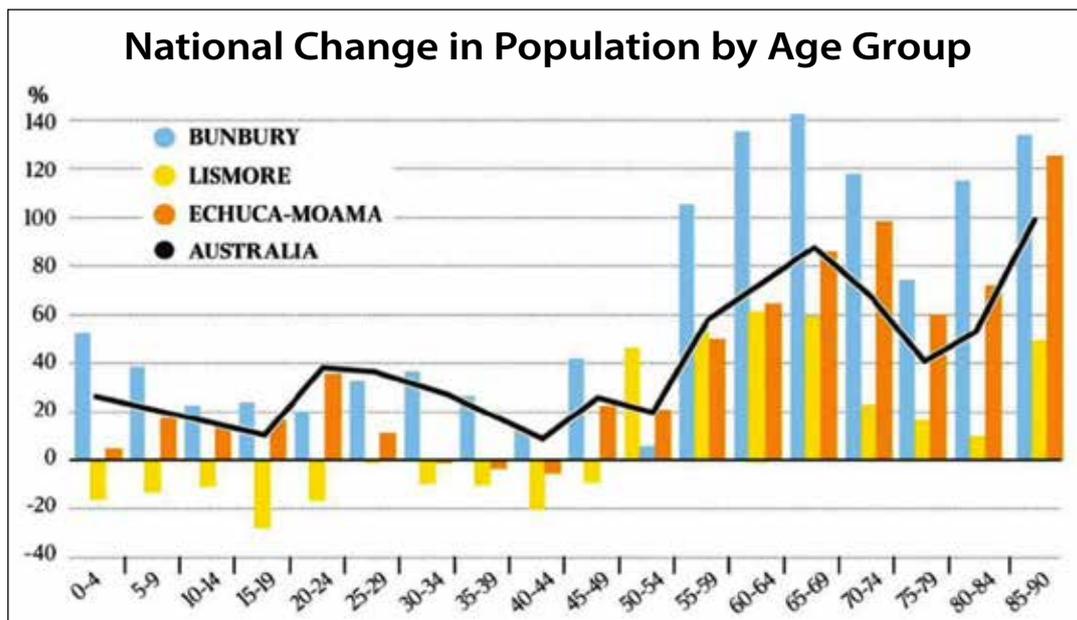
The proposed combined water security and flood mitigation infrastructure investment is a platform to develop a myriad of nature-based and environmentally-conscious solutions, and simultaneously takes real steps to support and foster meaningful opportunities for our most aspirational and vulnerable members of the community; particularly those with no voice—including many in the indigenous community who live on the floodplain.

## 6.1 Social Impact

Although recognised as the centre and regional hub of the Northern Rivers, Lismore is dying. Being known across the nation as ‘the city that floods’ has resulted in lack of private investment, a stagnant population with an underlying economy that has not grown since 2008. In the last decade unemployment has been high and pre-COVID unemployment remained above the national average; private enterprise is disappearing and welfare is the largest income generation.

There are many social factors that become evident within the community following a flood that affects a large residential and business area, particularly if there have been fatalities or serious injuries. There is an increase in mental health issues, alcohol misuse and ill health resulting in family violence and relationship breakdown. The closing of businesses creates short-term and long-term unemployment, and impacts the hiring and retention of qualified staff resulting in people leaving the areas and considerable community dislocation.





Lismore is currently a test case for extreme national mobility especially in the 18–49 age bracket.<sup>10</sup> It has lost an entire generation of its most productive citizens and skewed the demographics to now be a national case study on what our nation’s preeminent demographers refer to as a see-saw population. With a disproportionately older population and a drastic under representation of young families. With hundreds of young families with children leaving the area looking for opportunity.

Following the 2017 flood the University Centre for Rural Health produced a paper entitled ‘Northern Rivers Community Recovery After the Flood’.<sup>11</sup> The document states:

*Populations living in the Lismore Town Centre flood footprint exhibited significantly higher levels of social vulnerability over a range of factors; in particular, almost 82% resided in the most disadvantaged socio-economic quintile neighbourhoods.*

*The flood-affected areas of Murwillumbah and Lismore regions included 47% and 60% of residents in the most disadvantaged quintile neighbourhoods compared to 27% for whole region and 16% for Sydney. This pattern of increased vulnerability was also apparent from the 45 and Up study; participants residing in the Lismore Town Centre flood footprint had significantly higher rates of riskier lifestyle-related behaviours (smoking, alcohol consumption), pre-existing mental health conditions (depression and anxiety) and poorer health.*

*This detailed case study demonstrates extreme local vulnerability of flood-exposed populations, over and above the already highly vulnerable regional rural populations. This information is important to inform disaster planning and response and also reinforces the importance of having a detailed understanding of affected populations.*

The Lismore LGA of the FNC region is a low socio-economic society with entrenched welfare and in the recent past (2015) had 11.5% unemployment. This was 2.5 times the nation's average at the time and well above regional NSW average. Wages are low, there are no meaningful jobs resulting in population flight and brain drain.

The long-term average rise in house prices is just above CPI, and with low equity ratios this means not only the town but also the region is left behind. With the whole world now operating on equity and borrowing capacity this does not auger well for the future unless an effective flood mitigation option is implemented.

## 6.2. Environmental Impact

Ocean Watch Australia has stated:

*Floods are a natural occurrence that can provide negative and positive important environmental impacts. They help spread organic material, nutrients, and sediments which enrich floodplain soils. They also replenish water resources and trigger life processes such as bird breeding events, migration, and seed dispersal in flora and fauna adapted to these cycles, while good soil moisture can allow crops and pastures to be established.*

*Time is a major factor to consider with deciding upon flood impacts. In the short term an individual flood event may appear to be an ecological disaster, with unsightly sediment and debris smothering beaches and natural areas. However, in the long term, flood events that are part of the natural cycle will ensure plants and animals adapted to flood-prone environments and the functioning of those ecosystems.*

*The speed of flooding is another major factor, flood waters that rise slowly allow animals to escape immediate effects. However, the impact of fast flowing water, particularly on small or burrowing animals would have been more serious usually resulting in death.*

*Food and habitat shortages also present longer-term impacts on those that survived, and certain endangered species can be at risk after flooding events.*

*The major impacts on marine environments can be sedimentation and turbidity; litter and human-built waste deposited from the land; toxins, nutrients and mineral deposition. These impacts can affect the health of the seagrass and coral communities along the coast, and those species on which they depend.*

*Only time will tell and when the flood waters recede we will begin to understand the full impact of this environmental cycle.<sup>12</sup>*

Some locally experienced impacts are:

## **Fish Kill**

Acid sulphate and the de-oxygenation of river waters results in the ongoing problem of fish kills in the lower Richmond River. In the days preceding the 2017 flood, after a couple of weeks of saturating rains, a major fish kill event occurred.

This was small in comparison to the 2008 event where fifty tons of sea life was collected and taken to the Ballina Waste Facility with an estimated additional 450 tons of sea life washed out to sea. This resulted in a prolonged recreational and commercial fishing ban which had huge knock on effects across a number of industries to the downstream communities.

Fish kills have been recorded as far back as the 1800s in the Richmond River where deoxygenated acidic topsoil in drier times settles in the drainage channels and eventually make their way into the estuaries and river systems.

There needs to be investigation of a combined infrastructure solution in the Tuckean Swamp area. High quality modelling would facilitate the following projects in the evaluation phase including:

- A water attenuation device to store flooding rains and run off from the Alstonville Plateau; and
- the continual release of water through the Bagotville drainage system.

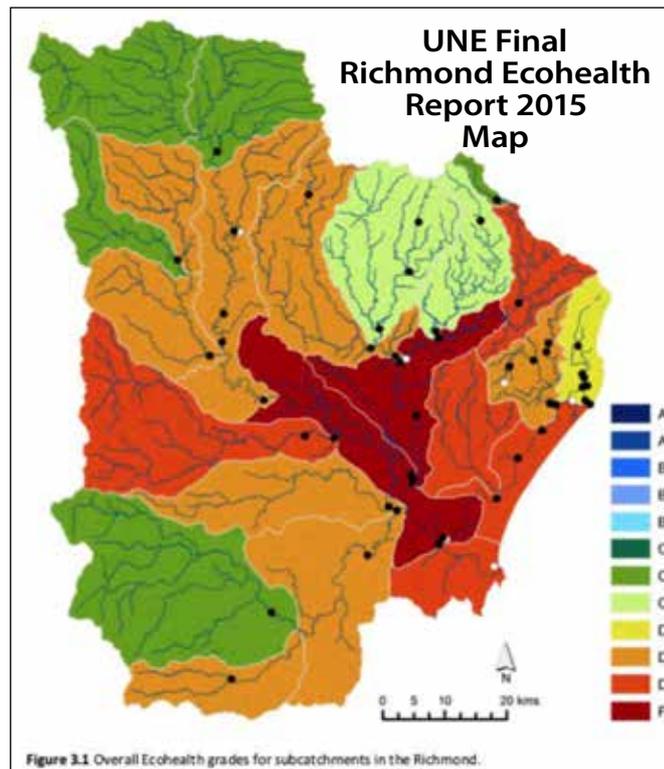
This will continually move stagnant pastural drain waters into the river and eliminate the de-oxygenation issue. These waters could then be used for agricultural use in drier times and may offer a more balanced way forward.

An efficient, multifunctional use of downstream infrastructure to elevate these two long standing issues with the same hardware could be a start to significantly reducing the impact of these expensive and historical problems at hand. This would go a long way to eliminating the reoccurring devastation to the coastal communities that rely on a healthy river and sea life for their livelihoods.

## **Natural Solutions**

Any flood mitigation solution changing the landscape may need water speed to be adjusted. Using natural solutions is traditionally an efficient way to do this. Filling the valley with tea tree or hardy resilient crops on an annual harvesting rotation may be part of a combined solution between man-made and natural solutions.

Upstream represents more opportunities with natural solutions and water attenuation devices; constraining water prior to it arriving in the Lismore area. catchment-wide modelling would facilitate the location and dimension of these water attenuation devices. These options require modelling as part of water security and dams.



## State of the River

In a study of NSW river systems the Richmond River Catchment Health Report results came in amongst the state's worst. The Richmond and Wilsons River Systems have a very poor rating in the key metrics of water quality, riparian (riverbank) vegetation, geomorphic (channel) condition and macro-invertebrates (water bugs).

The Watershed Initiative, Option 30 in the FNC Regional Water Strategy Options, is in place involving large scale investment in catchment areas that restore natural hydrologic function that deliver both improvements in stream bank conditions and river health that also contribute to reduced flood risk within the catchment.

## 6.3. Economic Impact

In 2012 the Independent Local Government Review Panel investigated grouping options for Northern Rivers Councils consisting of Tweed, Byron, Ballina, Lismore, Richmond Valley and Kyogle.<sup>13</sup> The five councils in the catchment grouping were assessed with a moderate to weak sustainability rating due to operating deficits, with a deteriorating financial position anticipated to continue over the next three years.

No council in the group was able to achieve the required Treasury Corporation benchmark by reducing operating deficits and returning a surplus, or to demonstrate the ability to service any additional debt, creating substantial

and growing infrastructure challenges particularly for the Byron, Kyogle, Lismore and Richmond Valley councils.

As predicted, the financial situation has continued to deteriorate over the following years (e.g. in 2019 the Lismore City Council ran a \$6 million operating deficit). Ongoing budgetary restraints plus the devastating impact of the 2017 flood in all council areas has made the maintenance of existing assets extremely difficult, and the construction of new infrastructure impossible. The situation is desperate.

In 'Counting the Cost and Facing the Future', a report on the 31 March 2017 natural disaster for the Lismore Business Flood Recovery Taskforce,<sup>14</sup> states:

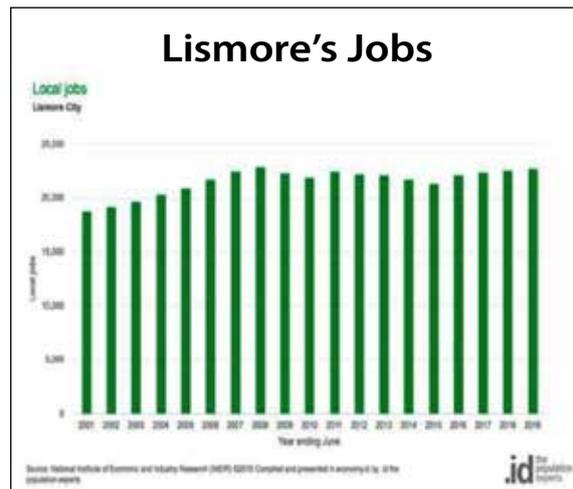
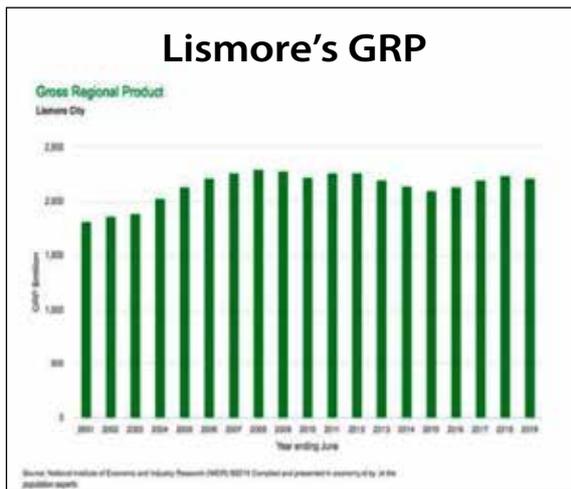
*Extent of disaster relief for the city and LGA Lismore City Council has estimated up to \$20M will be required for Roads Emergency and Restoration Works, and the window available to Council to have these funds fully expended is usually 2 years.*

*Council's insurance claims for damage to its insured properties will be in the vicinity of \$3.5 million to \$5 million, with \$1 million of this likely total already advanced in good faith by Council's insurers. The amount of flood damage to NSW Public Works infrastructure has not been assessed at this stage, but it is possible to estimate that the total of disaster relief available for Lismore will not exceed \$26 million.*

*Restoration and repair works have to go through a tender process. This could see local companies winning contracts on merit and subsequent financial benefits to the city (and by extension the CBD) through wages and purchases. There is no 'silver bullet' for the CBD specifically in terms of a single disaster relief payment. The CBD is going to have to trade its way out of the current situation. This makes the post-flood marketing campaign a critical tool, but it can't do the job of reinvigorating the city centre on its own. The revitalisation of the CBD is of equal importance: in other words, 'getting the product right'.*

There are a considerable number of factors involved in determining the economic impact following a major flood; whether insured or uninsured, amount of damage to the home or business and the time required for building repair or to find alternative accommodation. More than 90% of residents and small businesses in the catchment cannot afford the high cost of insurance premiums so are uninsured.

Damage to commercial property and loss of stock can amount to hundreds of thousands of dollars and the agricultural production and livestock losses can be considerable.



On the Northern Rivers a large amount of sugar cane is grown on the lower floodplain. It is a two-year rotational crop and often farmers lose three years of production in one flood. Similarly, if livestock owners do not get early warning of impending floodwaters, they do not get sufficient time to move their stock to safer ground (as occurred in 2017) and as a result the stock losses for some farmers were devastating.

Following a flood the immediate costs can usually be calculated however the longer term impacts are more difficult to quantify. There are usually years of weak economic conditions and decrease in value of properties and businesses. In 2017 many small businesses went to the wall as the losses were so great that re-establishing was not possible. Many had mortgaged their home against their business and were consequently bankrupted and lost their homes as well.

Maintaining broader economic momentum is difficult in those towns whose main business area is close to the river. In Lismore, in the recovery period, shop owners in the CBD reported a drop in trade up to 40% in the first financial year and three and a half years on have not reached pre 2017 flood trade. The number of businesses that ceased operating and left empty shops and the consequent reduction in foot traffic added to the challenges of those businesses that remained.

With the reputation throughout the country as ‘the place that floods’ it is extremely difficult to encourage large economic development opportunities to base themselves in Lismore. Such developments underpin confidence and ensure that families stay in the region and businesses reopen. Given the experience of regular flooding, in the past ten or more years population, house and land values and economic growth have flatlined. This is not a short term issue and is becoming intergenerational.

# 7. National and State Frameworks

## 7.1 National

Australia is a signatory to the International Sendai Agreement Disaster Risk Reduction, which refers to actions that will reduce the impact of hazardous events. Examples include implementing infrastructure measures to ‘divert flood water’ and ‘increase water storage capacity in order to maintain water supply in times of drought’. Our Combined Flood Mitigation and Water Security Proposal fits this criteria.

The Australian Government has a National Strategy for Disaster Resilience. Under this banner is the Infrastructure Australia Priority List, which has ‘Ensuring towns and cities have safe and secure water supplies’ as a requirement. The proposed new Dunoon Dam meets this requirement. The Flood Mitigation Proposal also meets the ‘Protecting coastal regions from inundation’ requirement.

In order to deal with major natural disaster issues at the national level there should be a group consisting of representatives at least from Insurance Council of Australia, Risk Frontiers, Australian Institute of Disaster Resilience, Federal and State Departments of Infrastructure and Regional Development, etc. who meet annually to list and evaluate the nation’s greatest mitigation threats and needs.

The group could draw up a list of priorities to be established and mitigation projects developed and funded in priority order, each to be jointly funded by the Federal Government and relevant state.

The top 20 electorates (by the number of land parcels exposed):	
1.	Herbert (QLD) 55,460
2.	Kennedy (QLD) 35,284
3.	Maranoa (QLD) 31,452
4.	Blair (QLD) 27,310
5.	Flynn (QLD) 26,560
6.	Page (NSW) 26,067
7.	Fadden (QLD) 25,881
8.	Leichardt (QLD) 25,424
9.	Griffith (QLD) 24,988
10.	Moreton (QLD) 24,940
11.	Brisbane (QLD) 24,603
12.	Oxley (QLD) 22,469
13.	Moncrief (QLD) 21,592
14.	Dawson (QLD) 21,392
15.	Newcastle (NSW) 20,078
16.	McPherson (QLD) 19,205
17.	Ryan (QLD) 17,861
18.	Wide Bay (QLD) 17,142
19.	Lyne (NSW) 16,041
20.	Dobell (NSW) 15,857

In a recent discussion with the National Risk Manager of the Insurance Council of Australia (ICA), we were informed that Lismore was one of twelve mitigation case studies to be discussed with Treasurer, the Hon. Josh Frydenberg, MP and then Minister for Regional Development and Infrastructure, the Hon. David Littleproud, MP, some two days following our discussion. Ballina was also listed just outside the twelve nominated cases.

At the federal level the top twenty electorates by number of land parcels exposed is listed. Page electorate, which covers much of the Far North Coast, is No. 1 electorate in NSW and No. 6 nationally. Superseded only by the vast expanses of the Far North and inland Queensland.

NRMA Insurance and Suncorp in *Choice Magazine*, 2017,<sup>15</sup> states:

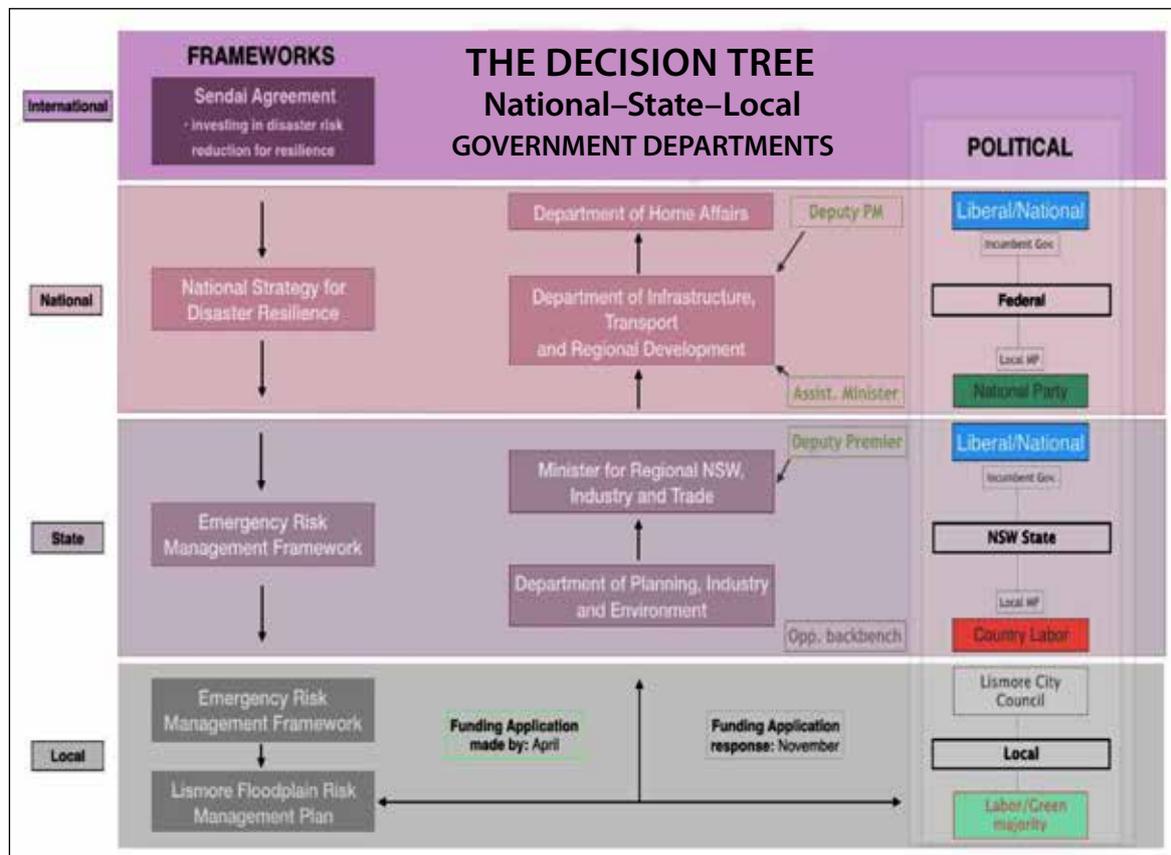
*Co-ordination of data between local, state and federal government and insurers is required so government can mitigate the impact of natural disasters such as flood on the community, and so consumers can make informed decisions about the potential impact of home insurance premiums on their budget and their home values.*

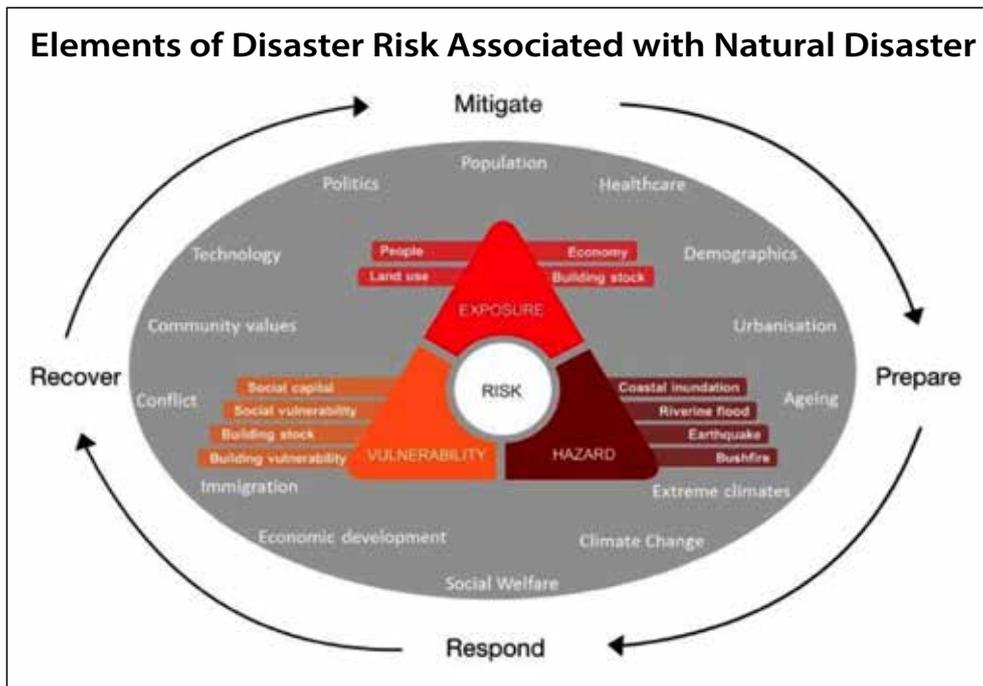
*As it stands, the insurance industry thinks governments should do more to prevent natural disasters from destroying or damaging homes through improved mitigation infrastructure, such as dams and levees.*

*Governments in disaster-prone areas want insurance companies to find a way to make home insurance more affordable. Home owners just want to be able to protect their most critical asset at reasonable rates. Meanwhile, they continue to face steep premium increases, often with inadequate explanations of how the higher costs relate to risk.*

## 7.2 State

The NSW State Government is bound by the Emergency Risk Management Framework. Under this requirement the DPIE has developed the Far North Coast Regional Water Strategy ‘which is to be completed in 2021 and will consider challenges and identify options to deliver healthy and resilient water resources for the region’. The focus of this document is solely on drought.





The NSW Department of Industry Extreme Events Policy also focuses entirely on drought and mainly in relation to the Murray Darling Basin. It states:

*The definition of an extreme event in this context does not include flood events ... Flood emergency planning is done under a separate process consistent with the State Emergency and Rescue Management Act 1989.*

Herein is a demonstration of the problem faced by the Northern Rivers. We have been unable to find flood mitigation as a priority in any of the many government departments with water responsibilities, despite being the most disaster prone and flood impacted town in the nation. Even with over \$10 billion in reparation and recovery costs in the last seventy years there is no effective flood mitigation infrastructure mechanism available, so the catchment continues to suffer and the taxpayer continues to pay.

The Royal Commission into National Natural Disaster Arrangements Report incorporated the above diagram showing the management of Natural Disaster Risk.

The Royal Commission report states: ‘A narrow focus on response and recovery will leave Australia vulnerable.’

What is the definition of MITIGATE?

- Make (something bad) less severe, serious, or painful;
- To make something less harmful;
- Lessen the gravity of a situation;

Mitigation can be improved on two fronts:

- Infrastructure and Emergency Management.

The Australian Business Roundtable for Disaster Resilience & Safer Communities Submission to the Royal Commission into National Natural Disaster Arrangements, page 3:

*1. Investment in mitigation is the first priority.*

*The Australian Business Roundtable's commissioned White Paper (2013) Building our Nation's Resilience to Natural Disasters found that a simple cost-benefit analysis demonstrates how government funds would be saved over the longer term by placing a greater level of investment in pre-disaster resilience measures. The paper demonstrated that carefully targeted resilience investments of \$250 million per annum have the potential to generate budget savings in the order of \$12.2 billion for all levels of government"*

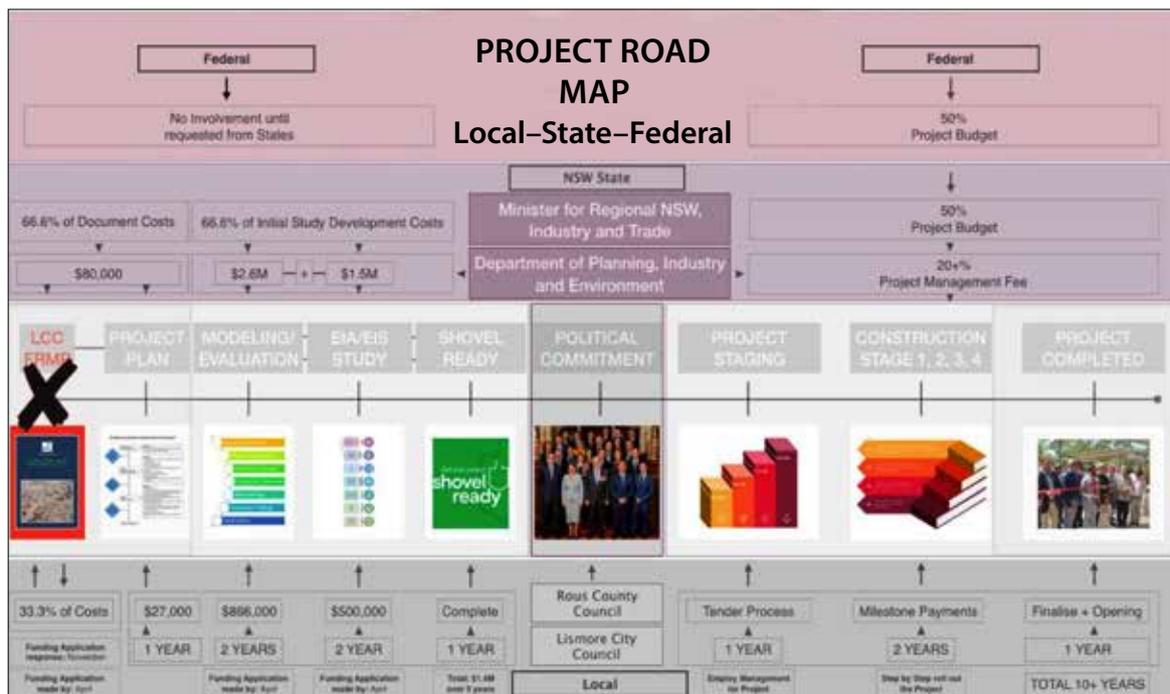
*The second, or double benefit, of mitigation targeting resilience are 'co-benefits' that accrue even in the absence of a disaster. Such co-benefits support economic growth and social capital in Australian communities and are an important driver of regional investment decisions.*

There has never been a flood mitigation proposal encompassing the entire Richmond/Wilsons River catchment. The Richmond/Wilsons River catchment is made up of six local government areas with only five being included in the Richmond River County Council. Rous Water responsibilities include water security but also flood mitigation through a convoluted proclamation. Each LGA is responsible for producing its own Flood Risk Management Plan so there is no co-ordination or combined approach.

The NSW Emergency Risk Management Framework requires local government to produce a Floodplain Risk Management Plan every five years or after a major flood event. The plan is the foundation of any application for funding and includes concepts for investigation to develop and resolve mitigation issues. The most recent Floodplain Risk Management Plan was developed by LCC in 2014.

To achieve government funding for major mitigation/infrastructure projects they must be 'shovel-ready'. To reach this stage involves considerable cost such as developing models, evaluating modelling options, contracting EIS studies and other specific requirements. These preparatory investigation costs run into millions of dollars and are way beyond the financial capacity of most rural constituent councils and rural water authorities.

Following the destructive major flood in March 2017, with no mitigation requests forthcoming from Lismore City Council, in December 2017 local politicians requested a definitive project from the Lismore Floodplain Committee and gave \$80,000 towards developing a suitable proposal.



Some fifteen months after the flood LCC and Rous Water (the local Flood Mitigation Infrastructure Authority) jointly presented a 3-stage project based on an EIS and other shovel-ready documentation acquired in 2004, and a DA approved in 2006. This documentation had remained dormant since 2006 as there had been insufficient council funds available to move the project forward since that time.

In November 2018 in the lead up to the NSW March 2019 election, the Deputy Premier, the Hon. John Barilaro, MP, announced \$8.2 million NSW funding for Stage I of the Joint Project. In this instance LCC was not required to produce 33.3% toward the cost. Stage I is ostensibly the movement of 410,000 cubic metres of soil to develop additional saleable land for the LCC industrial estate in order to assist their financial position. From a mitigation point of view according to LCC reports this will result in an improvement of only 30 mm up to 100 mm in an 11.6 metre flood.

No funding has been requested by LCC or allocated by DPIE for Stage II and III, which in broad terms includes modelling of the Richmond catchment and the removal of impediments in the floodplain. Rous Water anticipates that impediment removal could have mitigating benefits for the catchment of up to a depth of 600 mm in a 10.6 metre flood. With sufficient funding of \$4.2 million (33.3% cost to LCC = \$1.4 million) both these stages could be carried out concurrently and provide the required documentation at least to shovel-ready stage, but due to the near insolvency state of Lismore City Council, the project will remain dormant.



Debris left in Keen Street, Lismore, after the 1974 flood

Given that local councils and Rous Water are required to fund 33.3% of the cost for all requests to the NSW DPIE up to Shovel Ready stage, it is understandable that many local government councils have no capacity to even commence the very first stage of developing a Flood Risk Management Plan.

Despite being the most natural disaster-prone and flood-affected community in the nation, Lismore and associated councils struggle to even get to the very first step on the funding ladder to find a solution—so the community continues to suffer and the taxpayer continues to pay.

This process clearly shows why for more than seventy years an effective flood mitigation solution to flooding of the Lismore CBD, in particular, has not been suitably investigated let alone achieved. With an estimated \$10 billion in government and community reparation costs, it could be said that the current system does not work and the ongoing costs are unsustainable.

## **THERE NEEDS TO BE A WHOLE OF CATCHMENT PLAN**

## 8. Decision Making & Funding System

The Department of Planning, Industry and Environment's website states:

*The Department of Planning, Industry and Environment brings together the functions from the former Planning and Environment and Industry clusters.*

*The Department has six Ministers overseeing different areas of the cluster. The department represents a change in how NSW administers its planning, industry and environment portfolios. Together, these portfolios form the engine room of the state economy from agriculture to resources and industry.*

*The leadership team is collectively responsible for leading the organisation, and individually accountable for the strategic and operational activities of their specific areas.*

It would appear that within the department the following sections have some involvement in flood mitigation decision making:

- Strategy and reform;
- Environment, energy and science;
- Aboriginal strategy and outcomes;
- Place, design and public spaces;
- Planning and assessment;
- Water;
- Planning delivery unit.

Within the environment, energy and science group there is the biodiversity and conservation division. This group has the responsibility relating to biodiversity, Aboriginal cultural heritage, National Parks and Wildlife Service, state, climate change, sustainability, flooding coastal and estuary matters most of which are associated with flood mitigation.

Water and flood mitigation also appears to come under the umbrella of six different NSW government ministries. So, the political cycle and election requirements are also part of the decision making framework.

Given there has not been an effective solution put forward in over seventy years, it is evident that the planning, design, development and implementation of a complicated NR catchment-wide flood mitigation project is way beyond the capacity of the DPIE, due to the sheer number of disparate sections and Ministries directly involved in making a decision—and the system is only getting worse.

Additionally, the lack of corporate knowledge in every sector and the fifteen to twenty years involved in bringing a project of this magnitude to fruition,

means that those that are directly involved in the initial decision making are not likely to be in place for many of the development years of the project.

## Developing a Flood Risk Management Plan

Within the state-level Emergency Risk Management Framework it is a requirement that local government update their Floodplain Risk Management Plan every five years or after a major flood.

Local councils in rural areas, particularly on the NSW North Coast have for many years been struggling across many areas as reported by the Independent Local Government Review Panel (2014).

<https://ballina.nsw.gov.au/files/Northern%20Rivers%20regional%20group%20options.pdf>

Financial sustainability						
Results presented within these tables are derived from the 2012 TCorp analysis of NSW councils.						
	Ballina	Byron	Kyogle	Lismore	Richmond Valley	Tweed
Sustainability Rating	Moderate	Weak	Weak	Moderate	Weak	Moderate
Outlook	Neutral	Negative	Negative	Negative	Negative	Neutral

The financial situation for Northern Rivers Councils in 2014 was documented (above) and the document goes on to report:

### *Regional Outlook*

*The outlook for councils within this grouping is challenging. All councils (with the exception of Tweed) are running substantial operating deficits. Most are also underspending on asset maintenance and facing increasing infrastructure backlogs. Based on TCorp’s assessments, most councils within the grouping will see a deterioration in their financial position over the next three years, with three ultimately being rated as ‘very weak’. This means these councils will have limited capacity to deal with economic downturns or unforeseen events and may need to cut services to survive ...*

In the past decade the Northern Rivers NSW suffered ‘unforeseen events’ in the form of six moderate and major floods, bushfires in several LGAs and now the COVID-19 pandemic. The impact of the 2017 flood on Lismore was devastating and, at present, Lismore City Council (LCC) has the potential to be insolvent by December 2020. It is our understanding that the maximum amount of funds have been borrowed from TCorp (NSW government agency), and LCC is currently considering further borrowings from banks to keep operating.

As a result, many projects in the LCC 2020/21 budget have now had to be deferred or cancelled.

The latest Lismore Floodplain Risk Management Plan was produced in 2014. There were no funds available to update the plan following the 2017 flood, it was deferred in the 2019/20 budget and also in the 2020/21 budget, and has now

been deferred to the 2021/22 budget. Preliminary studies are currently being undertaken but the LCC has no funding to take these studies further. They are totally reliant on the DPIE grant process described below which will take years to come to fruition.

Similarly, Kyogle, Richmond River and Ballina councils have not updated their Flood Risk Management Plans since 2009, 2010 and 2014 respectively. Byron Shire is currently updating theirs. Local rural councils do not have the qualified personal or capability to produce their own plans and the cost of having it done professionally is mostly beyond their financial capability.

The process to fulfil the requirement of developing and implementing the required plan is as follows:

1. By April in any year a submission for a grant is made to the NSW Department of Planning, Infrastructure and Environment (DPIE) for funding to contract an agency to develop the Flood Risk Management Plan.
2. In November–January the council is notified by DPIE as to the success or otherwise of the grant submission.
3. If the grant application is unsuccessful then the process is repeated by April the following year.



Lismore during the disastrous 2017 flood

4. If the grant is successful council is given 12-18 months to organise the production of the plan and at this time is required to supply 33.3% of the cost.
5. Whenever the plan is finalised it then moves to a study development stage (but only if council has the 33.3% cost available). Once again by April a submission for a grant is made to DPIE for funding to progress the Flood Risk Management Study to the next stage.
6. In November–January the council is notified by DPIE as to the success or otherwise of their study development submission.
7. If the study development submission is unsuccessful then it is resubmitted by April the following year.
8. If a grant request is successful the next step is for council to progress the study to become a project. The project is to be worked up and developed in greater detail (such as modelling, EIS, etc.) and completed in 12–18 months. The council is required to pay 33.3% of the cost of this documentation which can be several million dollars.
9. With no capacity to pay the council 33.3% share of project development it cannot proceed and thus remains dormant.

This process clearly shows why for more than seventy years an effective flood mitigation solution to flooding of the Lismore CBD in particular has not been suitably investigated—let alone achieved. With an estimated \$10 billion in government and community reparation costs, it could be said that the current system does not work and the ongoing costs are unsustainable.

It is evident the system is not only flawed but broken. Systemic change is required in the manner in which decisions for mitigation projects across all natural disasters are progressed and funded. The current system that ‘local governments ensure accountability for, and compliance with, land-use planning or hazard management obligations designed to mitigate and increase resilience to natural hazard risks’ is not working for either financially constrained local councils, the suffering community or the taxpayer.

## 9. Conclusion

Within the framework of the Draft FNC Regional Water Strategy document this proposal covers a water risk assessment for the Richmond catchment, which faces the double challenge of too much water resulting in floods, and insufficient water to provide water security in times of drought for a growing population. The emergency management of natural disaster must also be considered as a risk factor.

Rous Water is tasked with the responsibility of managing these water cycles. On investigation it is evident that for many decades proposed solutions have been and continue to be impeded by piecemeal funding and bureaucratic red tape through political cycles and the process requirements of multiple agencies, and levels of government at the local, state and federal level. It is time for change.

This Draft FNC Water Strategy Project is the only platform that potentially incorporates water security and flood mitigation as an efficient solution to a costly and serious set of problems that do not go away by not addressing them. The compliance and infrastructure build timelines of a flood mitigation and water security strategy are similar, and the outcome of this project will positively reshape the future prospects of this city and all the towns and villages throughout the catchment.

If flood mitigation is not capitalised upon and included within the FNC Regional Water Strategy, then there is no reason to think the future will be any different to what has been experienced over the last several generations.

From a citizen's perspective we believe that our Combined Water Security and Flood Mitigation Proposal demonstrates the way forward to benefit water security and flood mitigation across the entire catchment.

**>\$10 billion has been spent on flood reparations  
in the last seventy years.**

**This ongoing level of reparation and recovery cost  
is unsustainable but this**

**Combined Water Security and Flood Mitigation Proposal  
may provide the solution to our blessing and our curse:**

*...Water*



Aftermath of the Lismore Flood, 2017

## Endnotes

- 1 *Risk Frontiers Newsletter*, Volume 18, Issue 4, October 2019, 'What areas of Australia are most at risk from natural perils?', Andrew Gissing and Foster Langbein, page 2, Table 3.
- 2 Bureau of Meteorology measure greater than 4 metres AHD.
- 3 'The 2017 Lismore Flood—Insights from the field', Andrew Gissing, Katharine Haynes and James O'Brien.
- 4 'Economic Recovery After Disaster Strikes', May 2019.
- 5 Northern Rivers Watershed Initiative Discussion Paper, February 2019.
- 6 <https://www.anao.gov.au/work/performance-audit/administration-natural-disaster-relief-and-recovery-arrangements-emergency>
- 7 'Towards a Catchment Based Model After Two Decades of Modelling in the Richmond', Caddis et al.
- 8 'SGS Economics documentation Economic Recovery after Disaster Strikes', a report for Suncorp.
- 9 'The Australian Great Flood of 1954: Estimating the Cost of a Similar Event in 2011', Roche et al.
- 10 'Lismore Demographics', Bernard Salt, article, *The Australian*.
- 11 <https://ucrh.edu.au/after-the-flood/>
- 12 Excerpt from *Oceanwatch Australia*, 'What are the negative and positive impacts of flooding on the environment?', following Cyclone Debbie.
- 13 Independent Local Government Review Panel, Northern Rivers Regional Grouping Options, 2012.
- 14 'Counting the cost and facing the future', a report on the 31 March 2017 natural disaster for the Lismore Business Flood Recovery Taskforce.
- 15 <https://www.choice.com.au/money/insurance/home-and-contents/articles/flood-cover>





## PROPOSED CONCEPT PLAN FOR A POSSIBLE SOLUTION TO THE LISMORE FLOOD PROBLEM—

Submitted to: [REDACTED]

Minister for Primary Industries and Energy

By: [REDACTED]

a member of the

Lismore and Richmond River Flood Mitigation Scheme Committee

THE CITY OF LISMORE NSW, population approximately 40,000, is the regional commercial, industrial, educational and administrative centre of the Far North Coast and caters for the needs of over one hundred thousand people living within a radius of 50 kms. At the centre of one of the most rapidly growing and densely populated rural areas in Australia, with sub-tropical climate and proximity to the Pacific Coast and unspoiled rainforests of unique beauty, Lismore attracts an increasing number of tourists and new residents. But recurrent floods are seriously hampering the social, economic, commercial and industrial development.

### WHAT FLOODS MEAN TO LISMORE AND THE LOWER RIVER

- Heavy financial losses to the business and general community of the City Centre, North Lismore and South Lismore (valued at over \$5 million per year);
- Depressed value of all properties, particularly in flood-prone areas;
- Loss of investments, developments, employment opportunities, etc. (over an extended period of time could be estimated in the region of billions of Dollars); such loss is also translated into a continuous revenue loss for the three tiers of Government (Council Rates, Land Tax, Income Tax etc.);
- Stress and anxiety for the general community;
- Loss of tourist activities;
- A high welfare expenditure on flood relief - \$2.8 million in the 1988 flood;
- A degenerative effect on the agricultural sector.

### WHY IS IT HAPPENING?

Because the Leycester Creek is allowed to merge with the Wilson River right in the centre of the City, causing a bottleneck effect in periods of exceptional heavy rain.

The Leycester Creek carries approximately two thirds of the total catchment area waters and is allowed to revert back to Lismore from the area of Caniaba, instead of flowing straight down stream on the western side of South Lismore.

The flow in such a direction is being blocked by man-made artificial levee banks such as roads and the Railway Line.

### WHAT CAN BE DONE

#### First Stage

1. By building a levee bank on the City side of the Wilson River from the Police Station to Bernstein Street, the City centre would be flood-free. (Such levee bank could be constructed very economically and in a short period of time).

Because the amount of flood-water entering the city centre is negligible, compared with the total amount, no aggravating effect would be felt in North Lismore, South Lismore or further downstream, particularly keeping in mind that the bulk of flood-waters would be diverted beyond North and South Lismore with the proposed measures in item 1;

2. By facilitating the flow of flood-waters of the Leycester Creek downstream before they revert back to the City, excavating an opening under the road and railway line and constructing a levee bank on the western side of South Lismore, the bulk of flood-waters would not reach the City, North Lismore and South Lismore.

*(Please see Appendix No. 2)*

### Stage Two

- A canal of suitable dimension can be excavated *as* a continuation of the works proposed in item 1. of the First Stage and extended, between the western side of the Airport and the hills, to reach a bend of the Wilson River downstream past the Bruxner Highway.
- After that the Leycester Creek can be blocked completely on the eastern side of the Boorie Creek junction where the levee bank proposed in item 1 of First Stage starts. At the junction of the new canal with the Wilson River downstream a sluice gate can be built to regulate the level of the water of the new canal.
- Lower River hydraulic measures to facilitate discharge to the Ocean downstream.
  - Specially 1. The Tuckean Diversion Canal
  - 2. The Boundary Creek-Ocean Canal.

The Diversion Canal from the Wilsons River to the Broadwater.

1. A preliminary examination indicates that a diversion canal from the Wilsons River near South Ruthven to The Broadwater to mitigate damaging flooding on the middle Richmond River, would be justified on economic grounds alone and more so on economic and social grounds.
2. The principal bases for this conclusion are:
  - 2.1 The value of agricultural production in the areas affected by a canal was \$7.00 in 1986-87 with a total direct and indirect production value of \$14.0s, applying a multiplier of 2.
  - 2.2 The average persisting detrimental effect of flooding is 33%, that is the additional income from existing enterprises with the canal in place would be of the order of \$4.6m p.a.
  - 2.3 Additions to the industrial base (agricultural and other) with the canal in place in the medium term, and increasing, would generate new incomes of the order of \$3.04 p.a.
  - 2.4 The total additional income in the affected area of \$7.6m p.a. would cull at least 40% of additional direct and indirect taxes, say, \$3.0m p.q.
  - 2.5 These taxes, applying a long-term interest rate of 12% would service the interest on \$25.0m.
- 3 No attempt has been made to quantify the costs of repairing damage to roads and other services that would be avoided. The heavy social toll in damaged morale and the effects of stress due to lost income, wasted efforts and sheer frustration wrecks

its own kind of damage, mostly incalculable, although much would show up in a proportion of health and social service costs that could be avoided.

4. There is nothing new in this proposal—it was planned to be carried out in 1968 twenty years ago, to complete the necessary works in the middle Richmond area. Its non-completion has meant that large areas, particularly off the right bank, have been steadily degenerating, in every sense. This is iniquitous and should be redressed with the proposed works. Such a canal, properly conceived, would be an enhancement to the area industrially and aesthetically as rural areas are confidently redeveloped. Properly handled, it should also be an enhancement environmentally. Imagination and a positive approach will quickly demonstrate its worth. It has to be done and is justified now. A major consequence would be an increased production base providing greater income and more work for the increasing regional population.

*(Please see Appendices Nos. 3 & 4)*

### **THE COST**

The total cost for Stage One is difficult to assess because it varies with the method adopted to allow the flow of waters under the railway line (raising it or excavating under it) and the extent of the area. At present it is estimated that the total cost of the measures proposed for the First Stage should not exceed \$6 million.

### **COMPLETION OF THE FIRST STAGE**

The First Stage could be completed within a period of two years.

### **THE BENEFITS**

1. Elimination of all financial losses for the business and general community;
  2. Elimination of the 'Flood Stigma' with consequent increase in value of all properties;
  3. With new developments, investments and job opportunities a new era of prosperity will be generated;
  4. Substantial increased revenue for the Local Government (Council Rates), State Government (Land Tax), Federal Government (Income Tax, Employment etc);
  5. Creation of a great amount of new wealth by turning worthless flood-prone land into valuable residential, commercial and industrial land;
  6. Elimination of social stress and anxiety for the general community.
- The benefits will extend indefinitely into the future and repay thousand times over the cost.

After completion of Stage One and Two a new horizon of development and progress will open up for the whole Region.

The local government and private enterprise could combine in new developments to foster tourism and attract new residents by the creation of thousands of reasonably priced residential, commercial, industrial blocks of land and sporting and tourist facilities. The canal could be turned into an attractive lake with numerous marinas.

The rivers, that now are an ugly menace, could become the best asset of the City by landscaping them with suitable tropical vegetation and making them suitable for spectator water sports.

The rich agricultural land of the flood plain would be able to carry higher stock levels, develop a range of economically viable other crops and provide a more stable agricultural sector for the region.

*(Reproduced from the original document)*

**CITY OF LISMORE  
SCHEDULE OF FLOOD MITIGATION OPTIONS  
SINCLAIR KNIGHT CIRCA 1991**

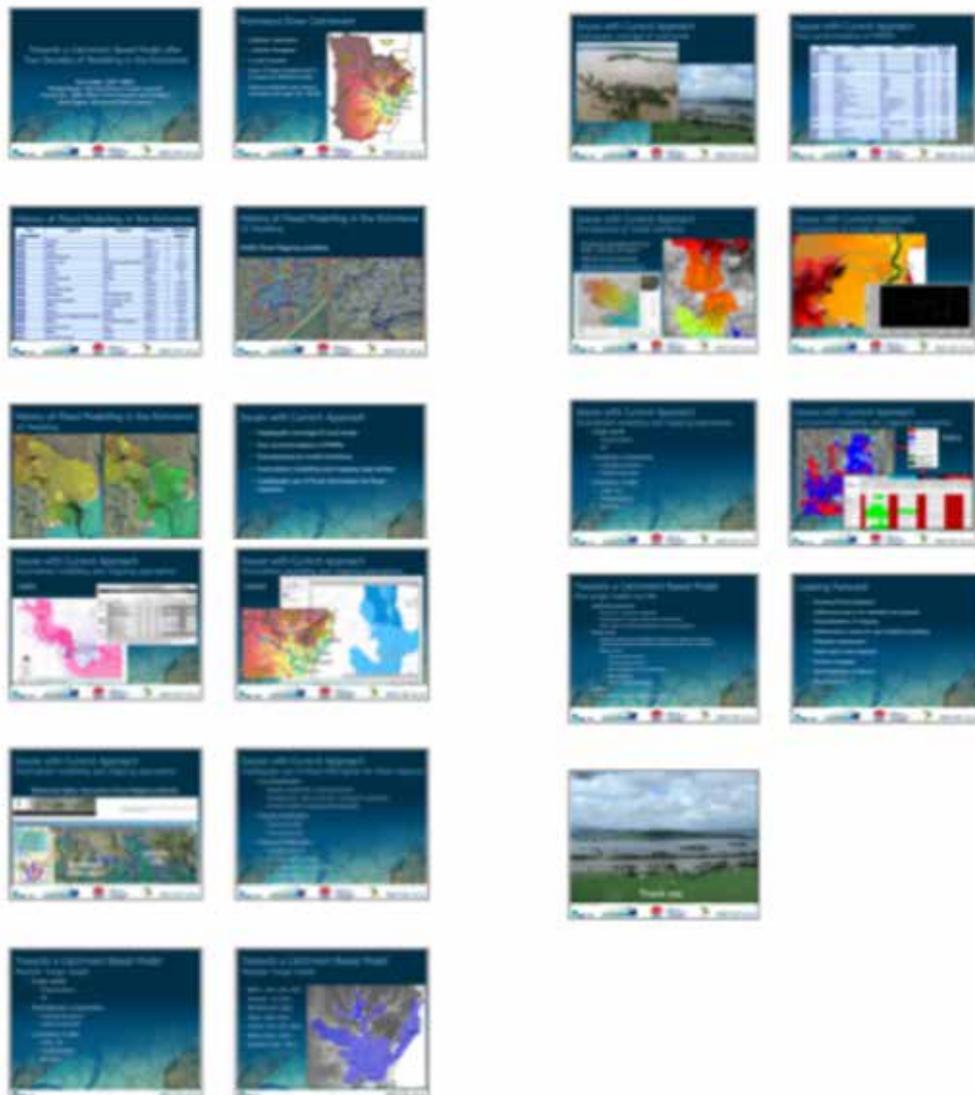
OPTION DESCRIPTION	SUMMARY OF COMMENTS RELATING TO CHANGES IN LEVELS FOR 1% FLOOD
Option 1: C.B.D. Levee	Increase in levels: North Lismore (0.08-0.14,); South Lismore (0.06-0.10m) No increase at Wyrallah
Option 2: C.B.D. Levee + Raise South Lismore Levee + New Levee at Wilson St.	Generally produces flood levels which are higher than C.B.D. levee on its own.
Option 3: C.B.D. Levee + Realignment of South Lismore Levee + Remove old rubbish dump + Extend railway culverts	Reduces the water level increases in North Lisore caused by C.B.D. levee back to 0.10m but increases levels in Hollingsworth Creek area by 0.15. Note: Further exploration as to why this happens may be required.
Option 4: Combination of Options (2) and (3)	Increases generally higher than for C.B.D. levee on its own due to Hollingsworth floodway being blocked bu raising of levee south of railway
Option 5: Large diversion Channel in Airport Floodway	}
Option 6: Large Diversion Channel in Airport Floodway +Airport Levee.	} } Major decreases in flood levels up to } 1.2m at Tuncester and 0.65m at Railway } Bridge and 0.4m to 0.65m upstream of } } Ballina Street Bridge.
Option 7: Large Diversion Channel in Airport Floodway +Airport Levee +Large Bridge over Loftville Creek	} } } } }
OPTION 8: C.B.D. Levee +Small diversion Channel in Airport Floodway	Compensates for increases caused by Option (1)
Option 9: C.B.D. Levee +Small Diversion Channel from Leycester Creek to Three Chain Road	Generally slight increase in levels but not to same extend as Option (1).

## Towards a Catchment-Based Model After Two Decades of Modelling in the Richmond

### Issues with Current Approach

- Inadequate coverage of rural areas
- Poor synchronisation of FRMPs
- Discrepancies at model interfaces
- Inconsistent modelling and mapping approaches
- Inadequate use of flood information for flood response

<https://www.floodplainconference.com/presentations2012/Ben%20Caddis.pdf>





Our ref: [REDACTED]  
[REDACTED]

Hon Thomas George, MP  
Member for Lismore  
PO Box 52  
LISMORE NSW 2480

Dear Thomas

**Joint grant funding submission to improve Lismore's flood resilience**

Given your strong advocacy for flood mitigation initiatives across the Northern Rivers region, Lismore City and Rous County Councils are pleased to present the enclosed submission for Federal and State government grant funding to help build greater flood resilience in Lismore.

As you are aware, over a year has passed since a major flood devastated Lismore. There has never been a more critical time than now for effective and decisive action to safeguard this community from the future impacts of severe flooding.

In close collaboration with the Lismore City Council Floodplain Management Committee and Lismore Citizens Review Group, we have recently finished investigating several potential flood mitigation options.

As a result, a series of strong, cost-effective initiatives have been identified to undertake flooding issues now and into the future.

Most importantly, with funding support from both the Federal Government and NSW Government, three key actions could be completed within a 12 to 15-month period that would result in a significant reduction to peak flood levels.

Our highest priority at this stage is the excavation of the airport floodway in South Lismore, which already has the necessary approvals and is 'shovel ready'.

To implement these vital, short-term actions as soon as possible, we are seeking up to \$12.4 million in funding assistance from both levels of government.

Further details (including estimated costs) about these three projects as well as a number of complementary medium-term and long-term actions are provided in the enclosed joint submission.

On behalf of Lismore City and Rous County Councils, we sincerely thank you for your tireless efforts to provide improved flood relief for the community and look forward to working closely with you to deliver more beneficial flood mitigation outcomes for the people of Lismore.

Rous County Council  
[REDACTED]

Lismore City Council  
[REDACTED]

We would also like to take this opportunity to recognise the tremendous dedication of all the Lismore City Council Floodplain Management Committee and Lismore Citizens Review Group members to protecting the area against major floods.

Yours faithfully

[Redacted signature]

*Rous County Council*

[Redacted signature]

*Lismore City Council*

Attachment: Submission

[Redacted attachment name]

Rous County Council

[Redacted contact information]

Lismore City Council

[Redacted contact information]



Lismore shops and businesses under water during the 2017 flood

## Submission to improve Lismore's flood resilience

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### Background

Rous County Council (RCC) and Lismore City Council (LCC) has been investigating the Leycester floodway proposal and the removal of the railway embankment as proposed by the Citizens Review recommendations. The initial modelling shows that this floodway has hydraulic benefit in Leycester Creek dominated floods. However, it is clear that a diversion of the Leycester Creek will not prevent flooding to Lismore as the City Centre levee is still overtopped during a 5% annual exceedance probability equivalent flooding event. This is potentially due to a tailwater / backwater effect from the Wilsons River downstream at a pinch point in the floodplain near Wyrallah.

RCC has completed a flood assessment for a number of potential flood mitigation options for the South Lismore and Airport Area. The preferred flood mitigation options, as determined by the Lismore Flood Management Committee, are; summarised below

These works, if funded, have a common goal of greater flood resilience for the Lismore area.

### Lismore Flood Management Committee Agreed Priority Actions

#### Commence excavation of the airport floodway South Lismore

These works have development consent for the removal of 410,000 cubic metres of excavated material from the airport floodway. This area is located within the Leycester floodway proposal and these works would be required if this option was undertaken at a future date.

LCC owns all of the land associated with this proposal. LCC also has obtained development consent for the filling of adjacent Council land inside the levee. This will provide much needed flood free industrial land in South Lismore.

It is proposed that any increase in the developed lands value will be reinvested into future mitigation works. These potential flood mitigation works are list in following sections of the submission. (eg Other priority projects)

**Approximate total cost: \$8.2M** (can be completed in stages if needed).

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### Removal of railway viaducts and embankment adjacent to Kyogle Road.

#### Part 1 Removal of Railway viaducts

Historically, floodwaters overflowed in a southerly direction towards Hollingsworth Creek and the Lismore Regional Airport.

In the 1860s a three-metre rail embankment was constructed that stopped water flowing south and directed all the overland flow paths through South Lismore.

The railway ceased operations in the 2000s and after the recent flood the contractor working for the rail authority commenced the removal of the rail viaduct, however, these works have now stopped apparently due to a lack of further funding commitments.

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Meeting notes in preparation for Citizens' Review Lismore March 2017 Flood

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This proposal is to continue the removal of viaducts as soon as an agreement can be reached with the railway authority/corridor manager.

It is understood that both rail authority/contractors want to remove the viaducts for both maintenance and public safety reasons.

The removal of the viaducts would be a win-win for both the Lismore community and the NSW Rail Authority as these works would be required for any rail trail project to proceed.

**Cost to remove viaducts: \$800,000.**

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## **Part 2 Removal of rail embankment**

The removal of this embankment will be carried out at the same time as the proposed excavation in the airport floodway. The embankment will need to be assessed for contaminated material given its historical use. These waste materials will require disposal at a licenced and approved waste facility.

It is recommended that 1.5 km of embankment be removed.

Excavated material can be used to raise the nearby industrial land subject to material assessments or re-profile the existing South Lismore levee.

**Approximate total cost: \$1.4M.**

**Total cost to remove railway viaducts and embankment: \$2.2M.**

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## **Upgrade the Brown's Creek floodway**

The proposal is to remove the current obstacles to the clean overland flow path through Brown Creek's floodway. This will ensure that flood waters will no longer be diverted down Woodlark Street where significant damage was sustained in 2017.

The proposal will require the relocation of businesses affected and converting the floodway into additional car parking, which is greatly needed adjacent to the CBD.

**Approximate total cost: \$2M.**

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## **Other priority projects**

As previously mentioned, at meetings with the representatives of the Lismore Citizens Review, the Lismore floodplain is considerably complex and detail investigations are required to progress other options that have been identified by either the community, Councils or key stakeholders.

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### **Flood modelling and EIS**

The modelling of the Wilson River and Leycester Creek where they converge at Lismore has been a significant technical challenge. Attempts have been made over many years, but funding is a major impediment for these works. Various experts have all had varying issues in getting models to accurately reflect the known floods and likely future floods. It is vital that an accurate flood model be created that truly reflects flood behaviour.

Any significant floodplain modification proposed will require a model which reflects flood behaviour for both historical and design flood scenarios. Any option that has hydraulic merit and meets funding objectives (eg cost/benefit) will require an EIS.

### **Enhanced modelling and cost/benefit analysis approximately \$900,000.**

The EIS will assess the following major projects:

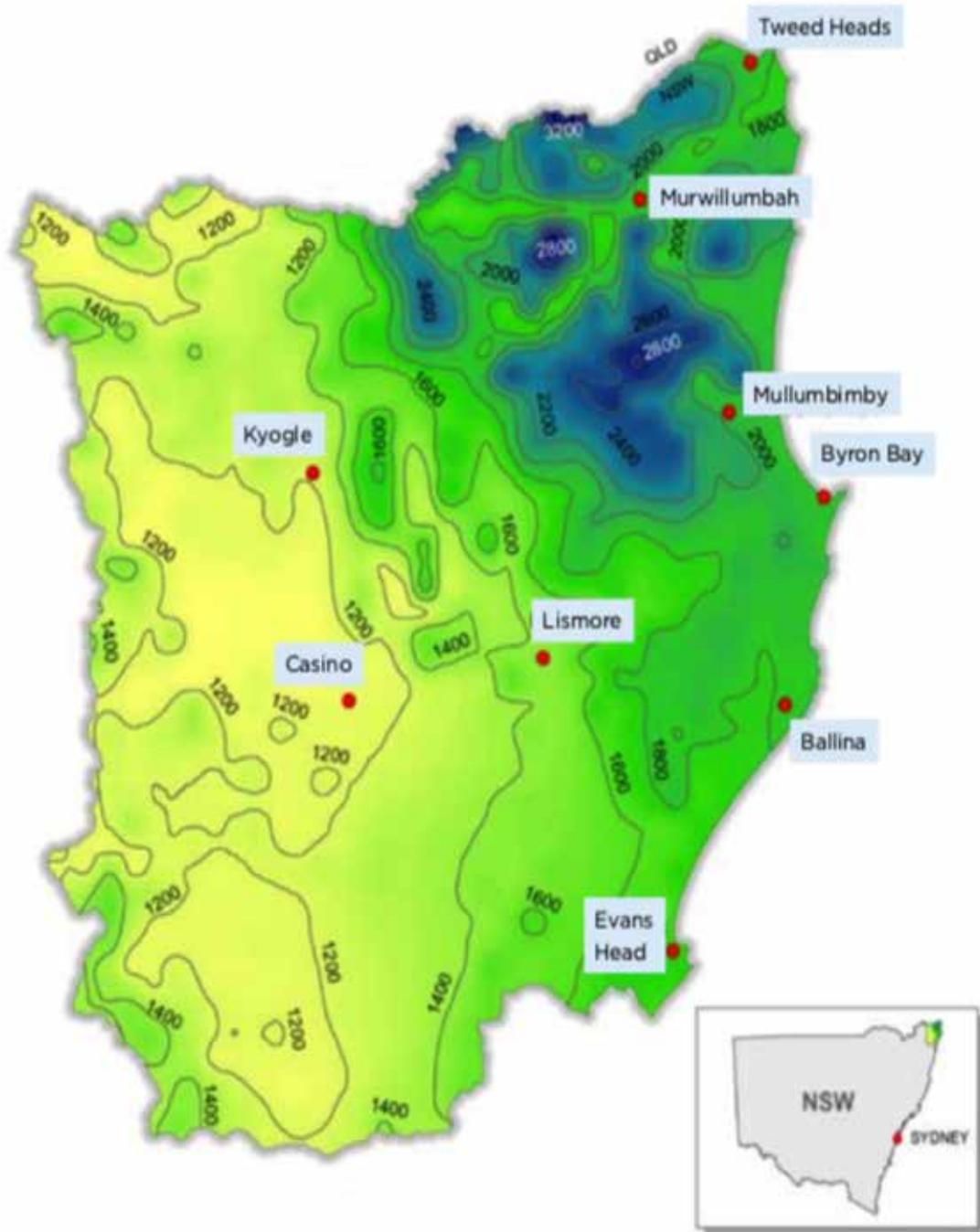
1. Further improvements/refinements to the Airport Floodway.
2. Floodplain modifications to the Wilsons River downstream at a pinch point in the floodplain near Wyrallah.
3. Raising of the CBD levee by minimum of 600mm.
4. Raising of the South Lismore Levee western side by 0.6m to 1m and have a broad controlling inflow structure.

It is difficult to predict what options will ultimately be approved based on sound cost/benefit and environmental considerations. However, it would be reasonable at this stage to include both South and the CBD Levees and further refinements to the airport floodway in the Environmental Impact Assessment.

**Environmental Impact Assessment approximately \$1.1M.**

**Total costs to assessing long-term options = \$2.0M.**

### Observed Average Annual Rainfall in the Far North Coast



Average Annual Rainfall (mm) (1961-1990)



Source: Department of Planning, Industry and Environment—Water 2020, regional rainfall data

### Twenty Wettest Places in NSW

Ranking	Place Name	Annual Mean Rainfall (mm)	
1	<a href="#">Mullumbimby</a> , NSW	2330 mm	★
2	<a href="#">Nimbin</a> , NSW	2330 mm	★
3	<a href="#">Dunoon</a> , NSW	2330 mm	★
4	<a href="#">Modanville</a> , NSW	2330 mm	★
5	<a href="#">Perisher Village</a> , NSW	1950 mm	
6	<a href="#">Jindabyne</a> , NSW	1950 mm	
7	<a href="#">Lakewood Estate</a> , NSW	1950 mm	
8	<a href="#">Clunes</a> , NSW	1860 mm	★
9	<a href="#">Lismore</a> , NSW	1860 mm	★
10	<a href="#">Wollongbar</a> , NSW	1860 mm	★
11	<a href="#">Alstonville</a> , NSW	1860 mm	★
12	<a href="#">Wardell</a> , NSW	1860 mm	★
13	<a href="#">Coraki</a> , NSW	1860 mm	★
14	<a href="#">Broadwater</a> , NSW	1860 mm	★
15	<a href="#">Woodburn</a> , NSW	1860 mm	★
16	<a href="#">Evans Head</a> , NSW	1860 mm	★
17	<a href="#">Thredbo Village</a> , NSW	1790 mm	
18	<a href="#">Ocean Shores</a> , NSW	1710 mm	★
19	<a href="#">Brunswick Heads</a> , NSW	1710 mm	★
20	<a href="#">Byron Bay</a> , NSW	1710 mm	★

16/20 in this catchment area

Lismore Flood, 2017