L W E
Environmental
Impact

Implications of Climate Change for Land Treatment

We are standing in it

Hamish Lowe, Phil Lake, Robyn Chapple

Purpose

Recap on what we know,

Understand legislative action,

Consider responses, and

Look to learn from experiences.

Think piece to build on an issue that is front and centre

LTC 2018

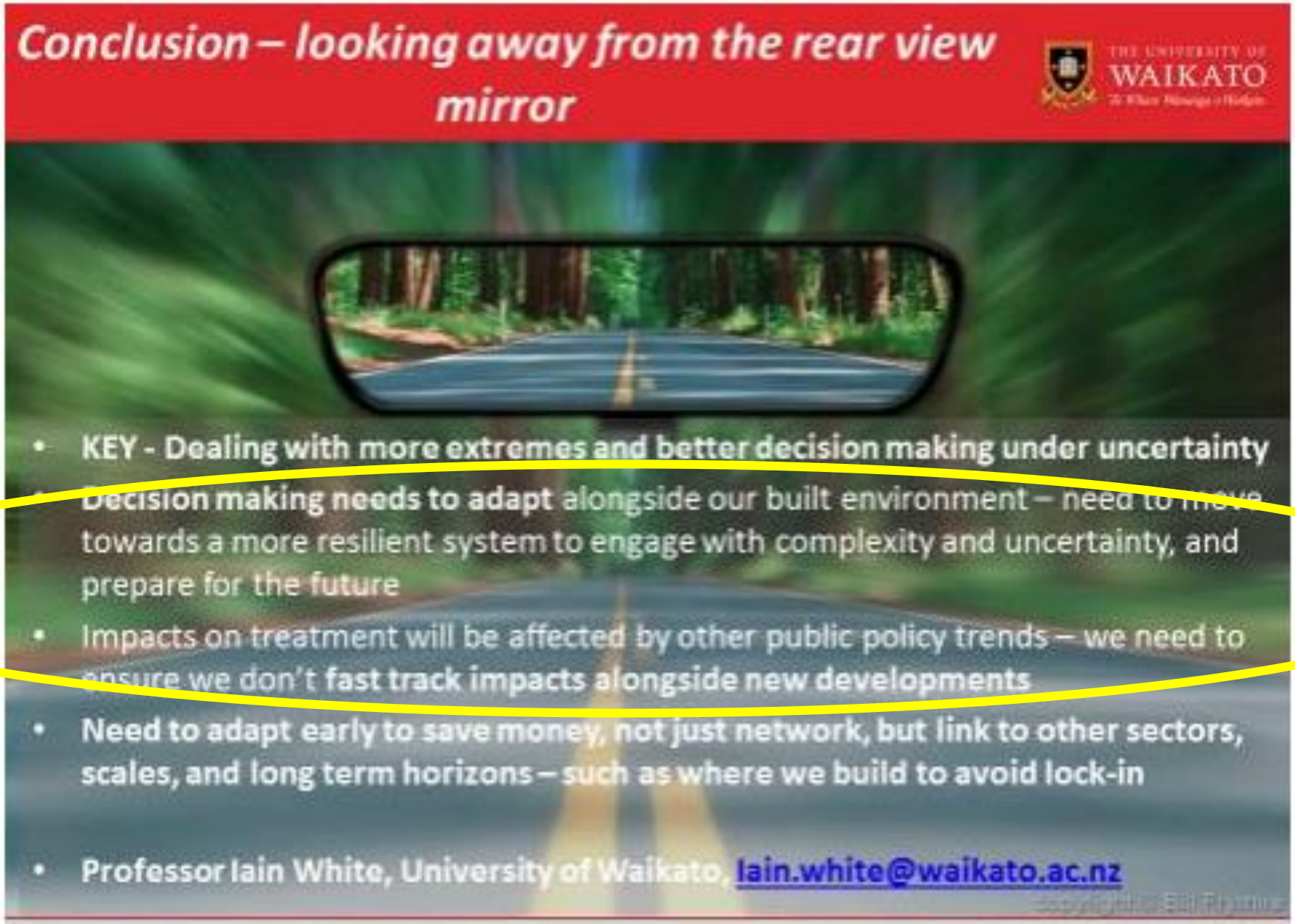
Special session on Climate Change Impacts:

- **What is Climate Change**?
  Prof Ian White, Waikato University
- **How will Climate Change Impact on Land Use?** - Rob Bell, NIWA
- **Climate Change and Land Treatment** – Hamish Lowe, LEI

Idea was to provide international, local and land treatment perspectives.

LTC 2018

Iain's Conclusion



LTC 2018

Rob's Conclusion

Implications: peri-urban and rural wastewater systems/drainage

- Public expectation that the design and maintenance of assets will consider the implications of climate change (CC) *[often raised in aftermath of events]*
- CC will lead to increasing changes to environmental conditions – no longer a static regime with realisable extremes. Historic variability and extremes no longer a useful guide to future performance

- Design and standards will need to be more adaptive to:
  - ✓ deal with scenario uncertainty (multiple possible futures) and deep uncertainty (known unknowns) – but not adapt prematurely (high present value) or too late (adverse risk)
  - ✓ build in signals and triggers (decision points) – more connected to monitoring change
  - ✓ avoid locking in path dependence (eg, a fix for today - but may have a short shelf life)
  - ✓ changing community expectations, values and performance relative to service levels

Some takeaways for relevant for land treatment

- Ongoing change is the new normal – especially for coastal areas
- Need for national/regional stocktake on exposure of OWS's to CC – but need good geospatial info on assets/attributes
- New research initiatives e.g. Deep South Challenge "2-waters"
- Wastewater issues may be one of the gamebreakers for viability for some coastal/lowland river areas e.g. g/w, saltwater flooding
- Adaptive pathways planning - with signals & triggers - provides a way to work around uncertainties (but still give communities a road map)

Conclusion

Hamish's Conclusion

Long term climate changes

- They area a fact and a reality
- Land treatment systems likely to be able to evolve
- Design can be managed alongside consent terms
- Avoid knee-jerk changes for the sake of it, but plan for longer term

Short term climate events

- Greater potential impact
- Need to consider how we react to wet and dry conditions
- What are exceptional conditions and how do we design for
- Is more management flexibility preferred over regulatory control
- We need to start developing solutions now

LTC 2018 + what do we know

Bit of

- Na na, na na….
- Told you so
- Why has it taken so long

there it is

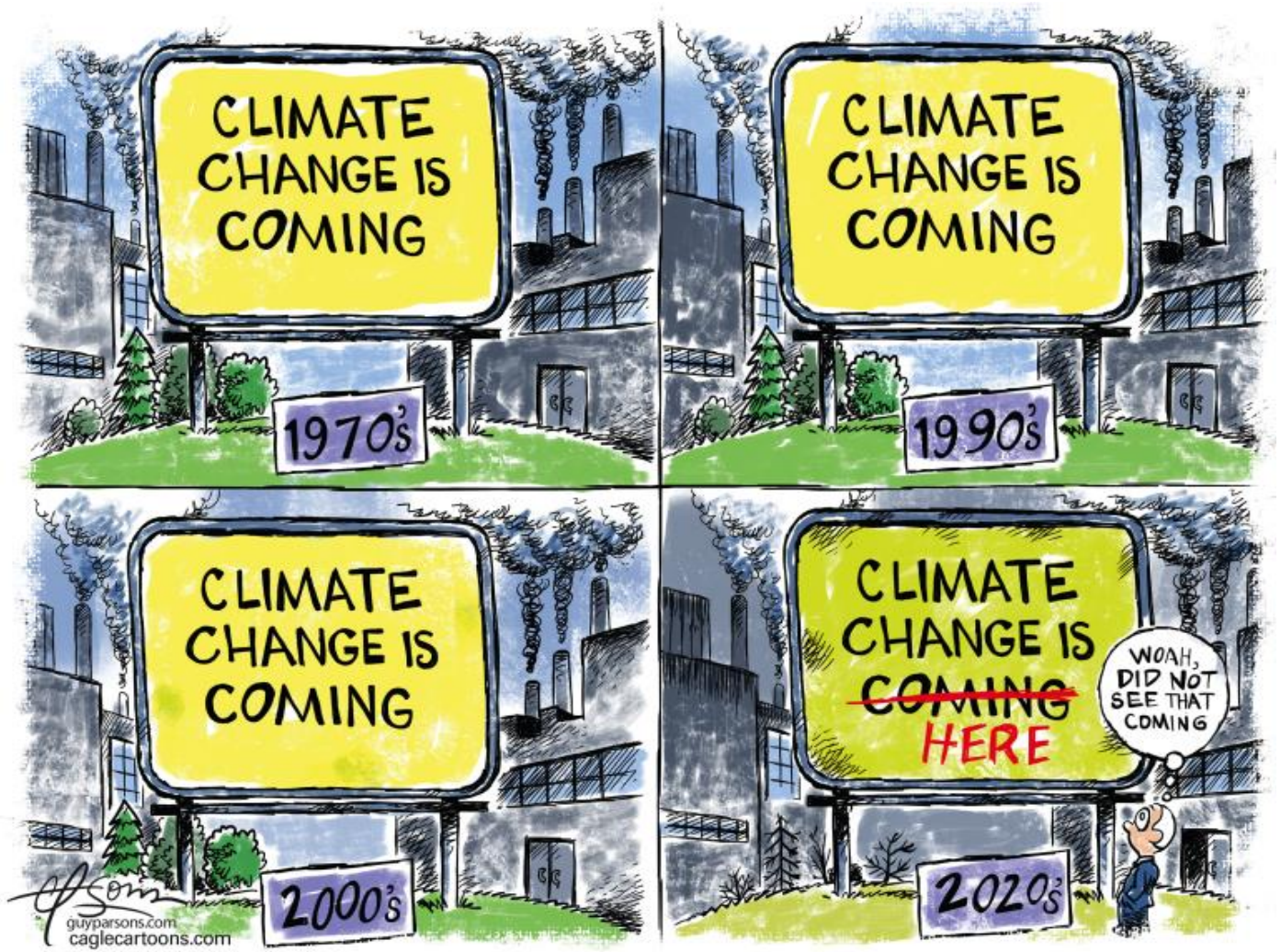
"..we are standing in it, this is a climate change-related event. We need to stop making excuses for inaction, we cannot put our heads in the sand while the beach is flooding."

James Shaw

LTC 2018 + what do we know

Climate change creates challenges for all aspects of wastewater infrastructure

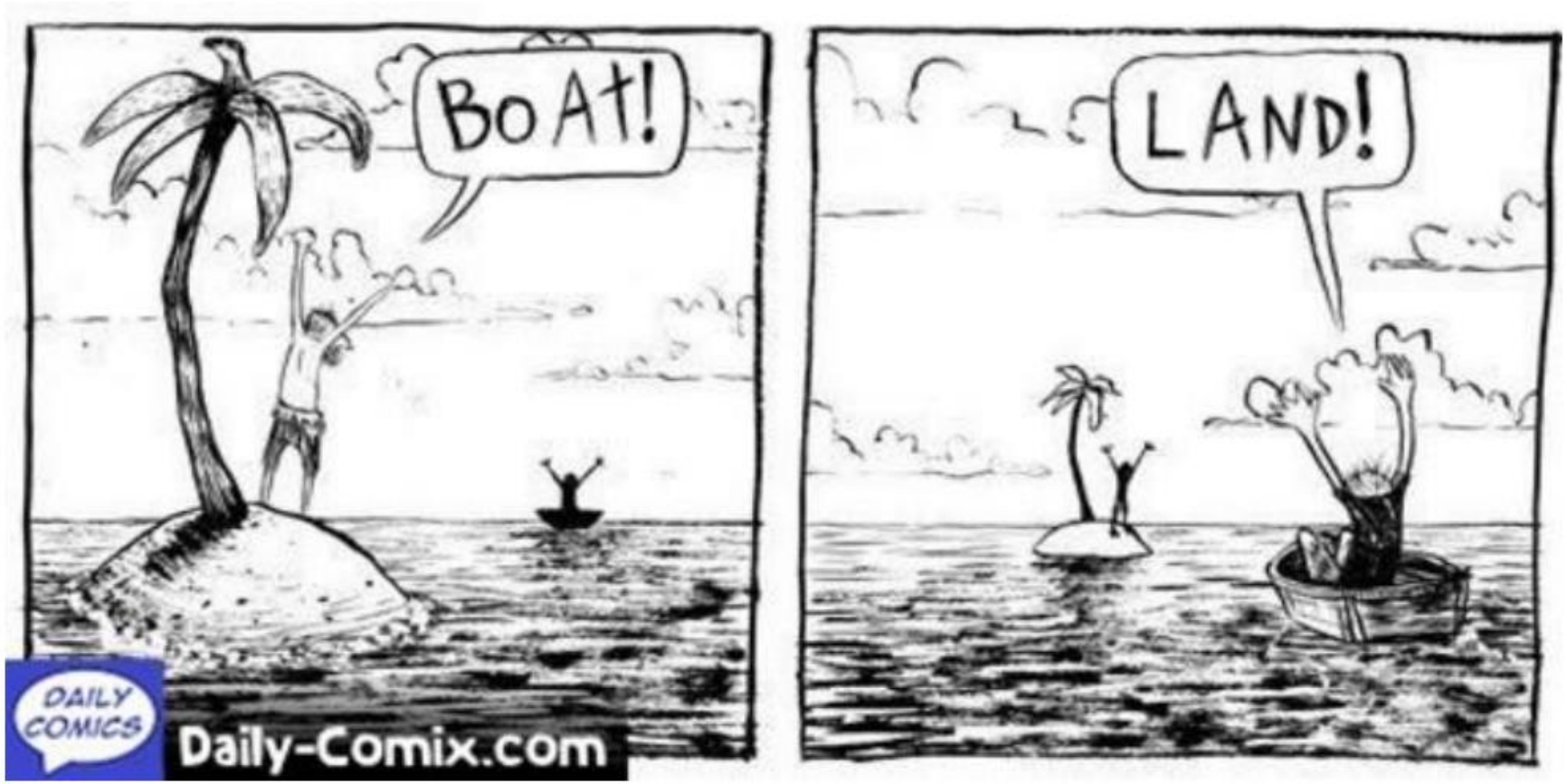
- Increased WW flows and volumes
- Avoiding damage from weather events
- Retreating from coastal areas and riverbanks
- Creating rules and regulations that:
  - Promote climate change responses
  - Help to manage responses
  - Help to manage climate change effects


CLIMATE CHANGE IS COMING
1970's
CLIMATE CHANGE IS COMING
1990's
CLIMATE CHANGE IS COMING
2000's
guyparsons.com
caglecartoons.com
CLIMATE CHANGE IS COMING HERE
WOAH, DID NOT SEE THAT COMING
2020's

Have we been focusing too much on the action to fix

and

not the action to prevent or mitigate?

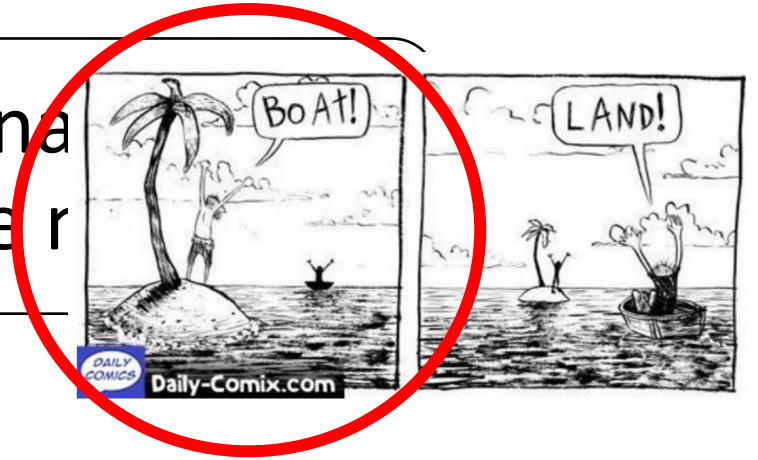

BOAT!
LAND!
DAILY COMICS
Daily-Comix.com

Climate Change Responses

We need to design for climate change resilience:

- Accommodate higher water flow rates (stormwater, rivers, and wastewater).
- Prevent, avoid, and design around erosion risks.

Coastal land will become increasingly untena
communities and their infrastructure so we r

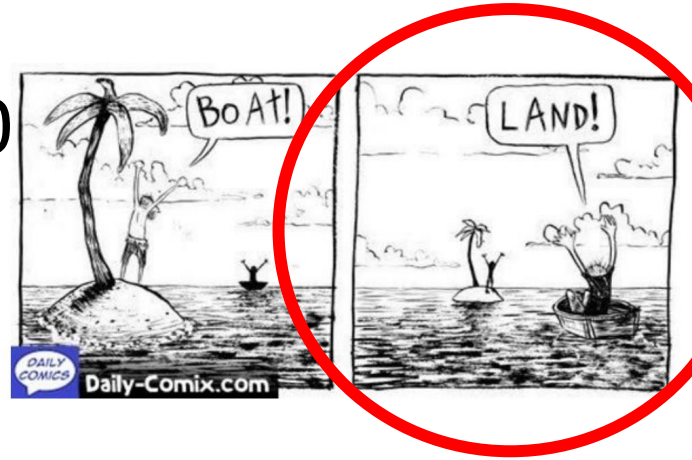


- Actively plan for and manage coastal retreat.
- Adjust depths of buried infrastructure.
- Protect surface features from inundation and erosion.

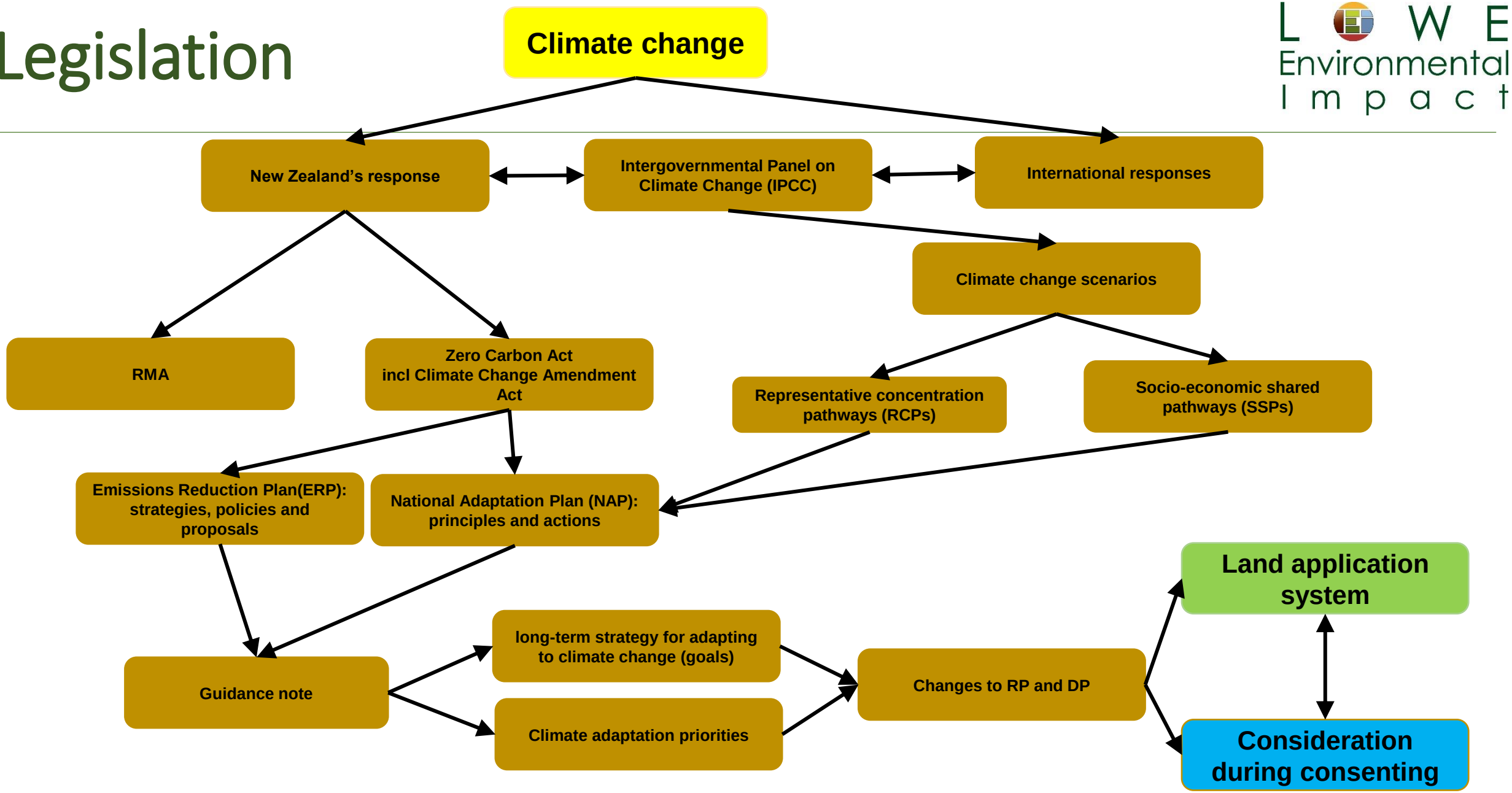
Legislation

Biggie - CCRA requires

- all greenhouse gases, other than biogenic methane, to reach net zero by 2050; and
- to reduce biogenic methane emissions by 10 per cent by 2030, and by 24–47 per cent by 2050, compared with the level of emissions in 2017.



Legislation



Legislation

David Allen has covered:

- What is CCRA – **Climate Change Response Act**
- NAP **National Adaptation Plan**
- ERP **Emissions Reduction Plan**

BPO and consenting

Climate change was focused on extreme weather events –
Now we need to consider events plus aspects of overall GHG emissions.

In consent are we expanding the scope of the discharge consent – CO_2 methane and NO_x – effectively GHG are now considered as specific contaminants discharged to air.

This means not only consider effects in BPO but mitigations in consent (effects assessment)

Where GHG coming from? Retic, treat plant, discharge (water and sludge). If did a pie graph what would it look like?

Assessments are not scale dependent….still need to do assessments. Will need to do assessment irrespective of size of plant or its GHG emissions and relative effects

Consenting

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Need an accounting framework

Calculate all of life emissions – land

Needs to be considered in BPO (construct and operational)

BPO relative and subject to opinion

Note data limited – Some on treatment plants, but not discharges

Land application close to farming system – so best source of information (very hard to quantify and variable)

Likely get question in consent – so need answers

Farming systems already there – so only tweaks

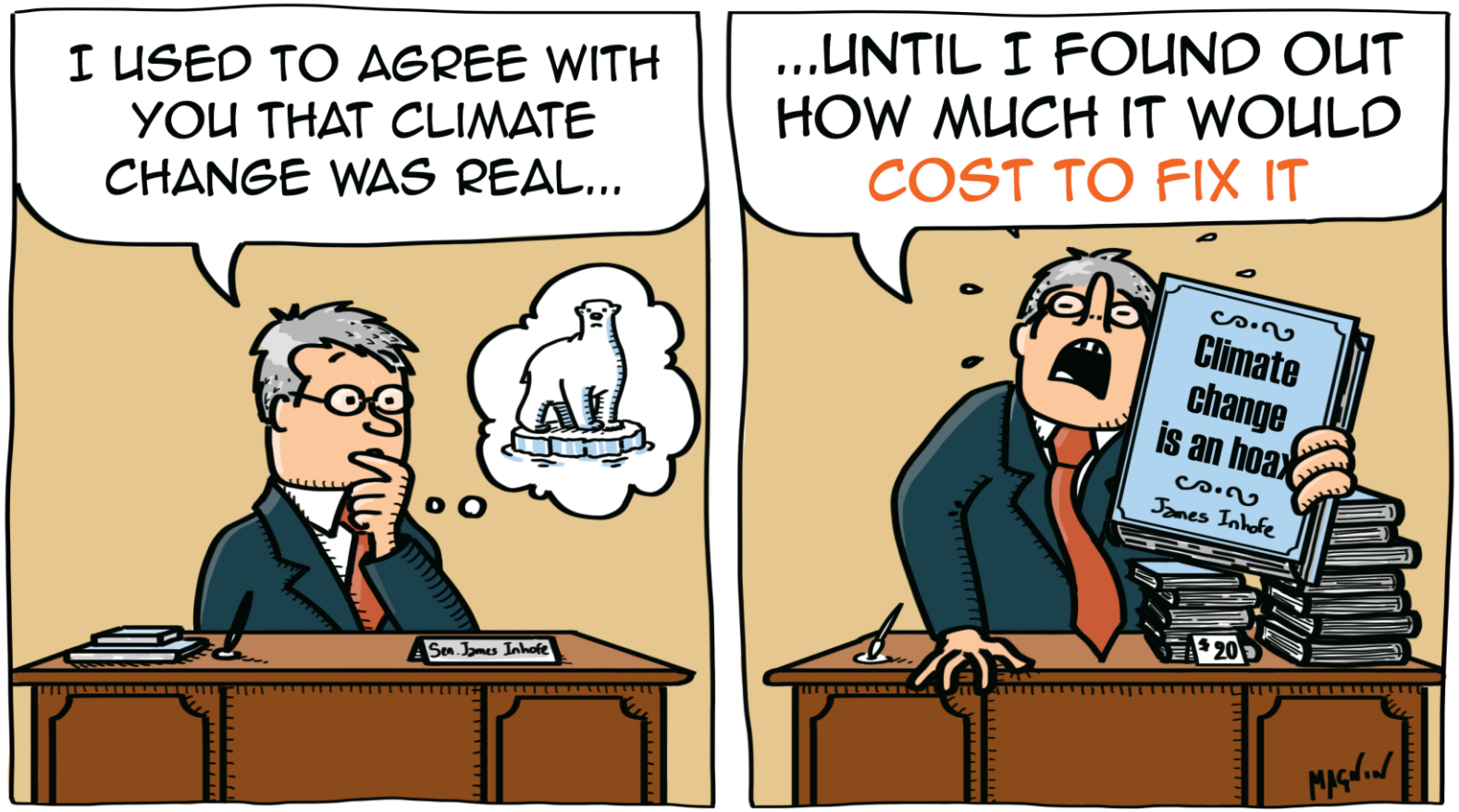
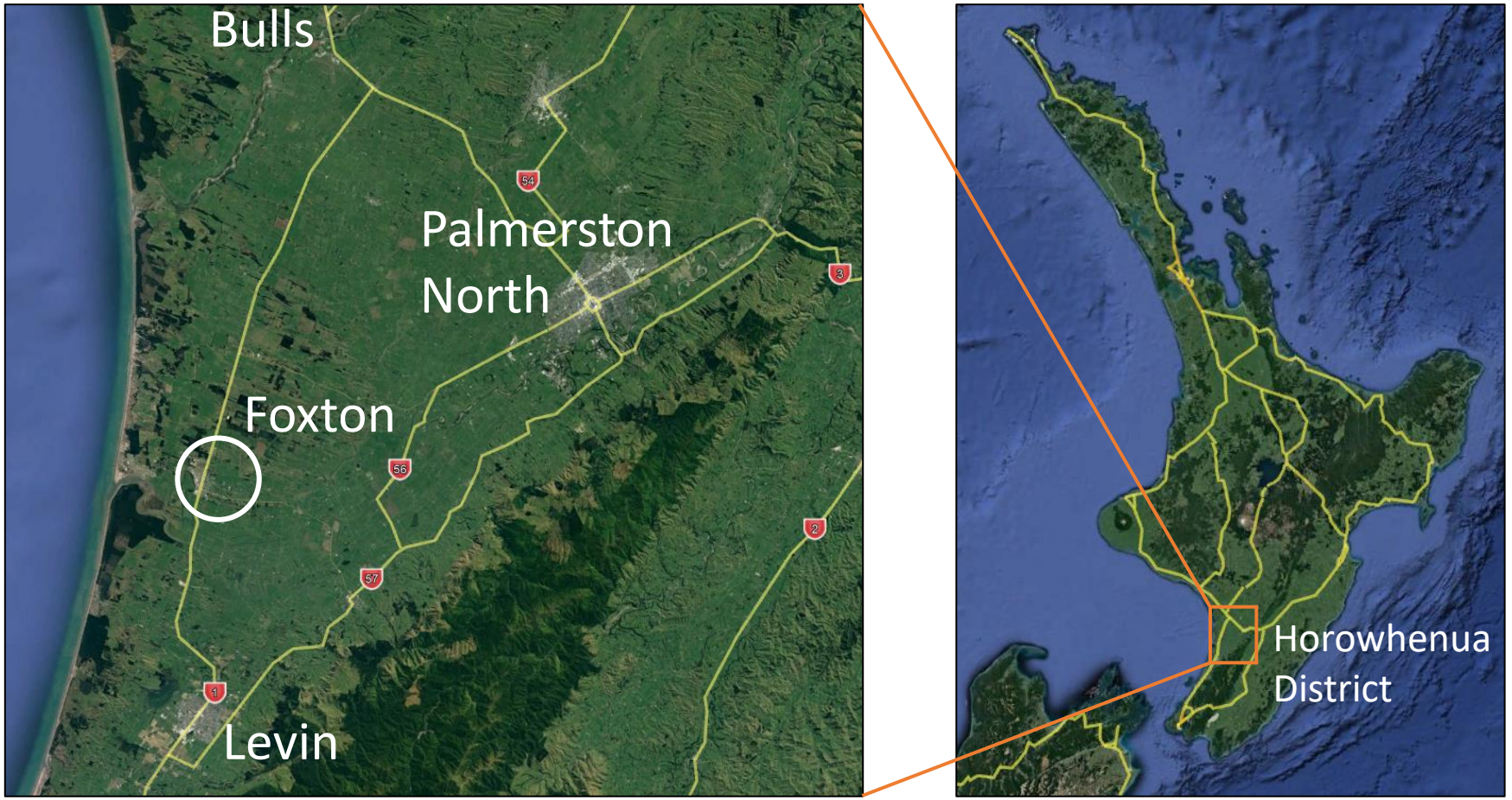


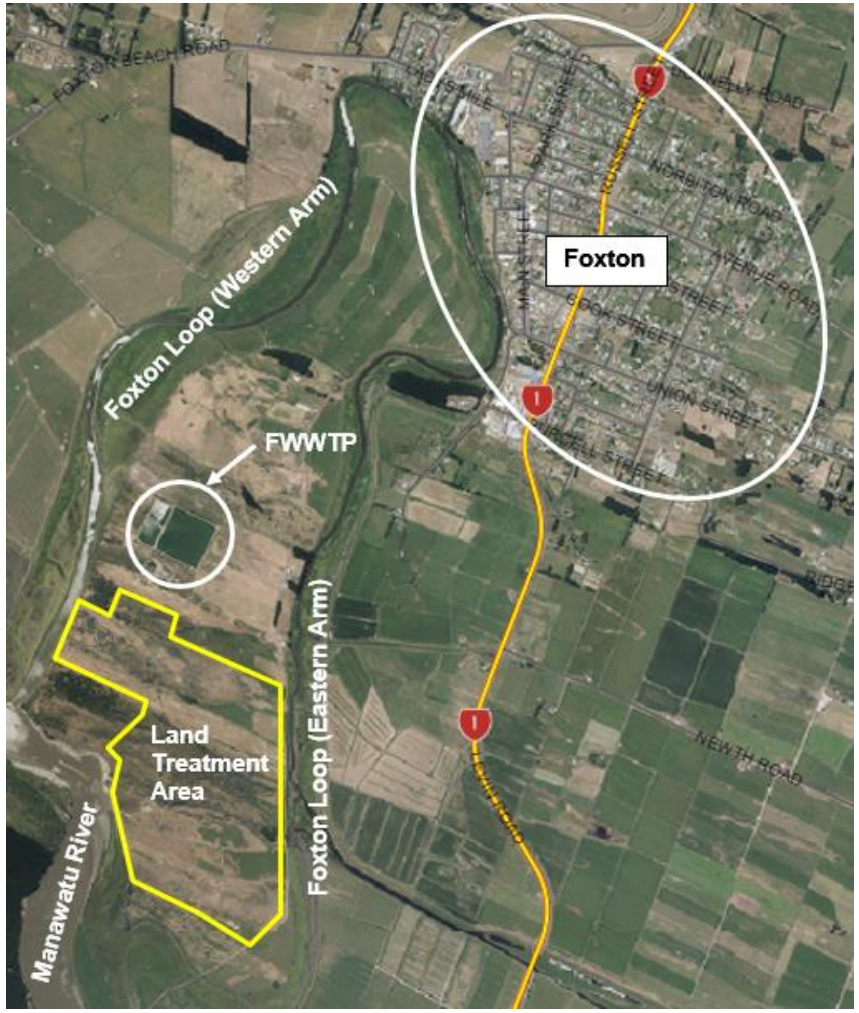
Illustration by Alexandre Magnin - Sustainabilityillustrated.com

Case Study: Foxton



Case Study: Foxton

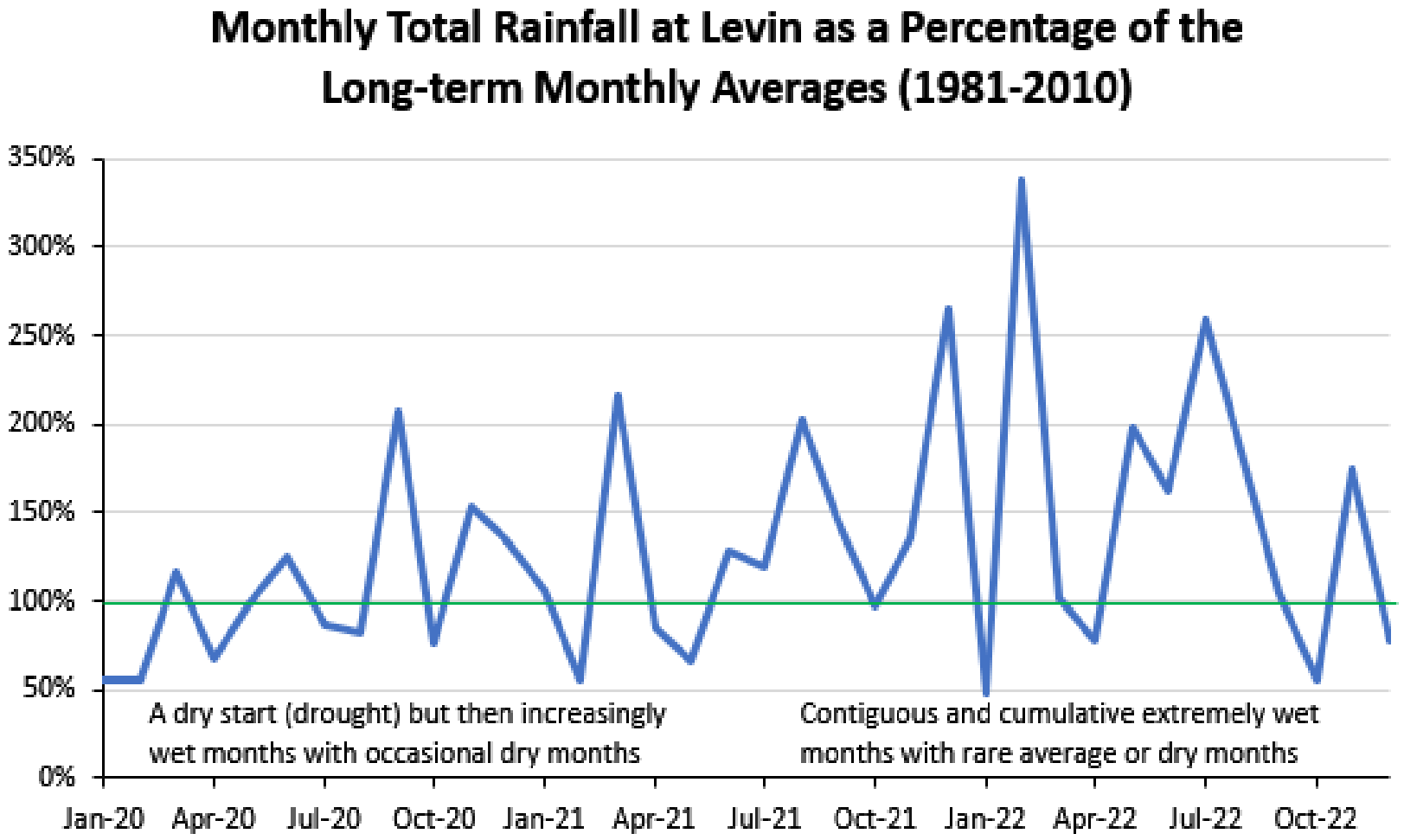
- Treated wastewater is irrigated to 63 ha
- Deficit irrigation along eastern flats
- Non-deficit along western dune plains
- Bull beef farm, no feed import/export



Case Study: Foxton

Rainfall during 2020-22 was extremely and persistently high.

Occasional intense storms are easier to cope with than such persistently wet and lengthy periods.



Case Study: Foxton

Extreme rainfall during 2021-22 kept soils wet and generated high volumes of wastewater which resulted in:

- Challenges for wastewater reticulation to cope with.
- Challenges for wastewater treatment to perform consistently well.
- Limitations on wastewater irrigation locations, durations, and volumes.
- Difficulties with managing stock grazing and pasture management due to rain and irrigation.
- Extremely high storage water levels over long periods of time.
- High stress levels for managing storage capacity for future storm inflows and irrigated farm operations.


AS LONG AS OUR ACTIVITY CAN GO ON, IT'S NOT SO BAD
CHAPPATTE

Case Study: Cyclone Gabrielle

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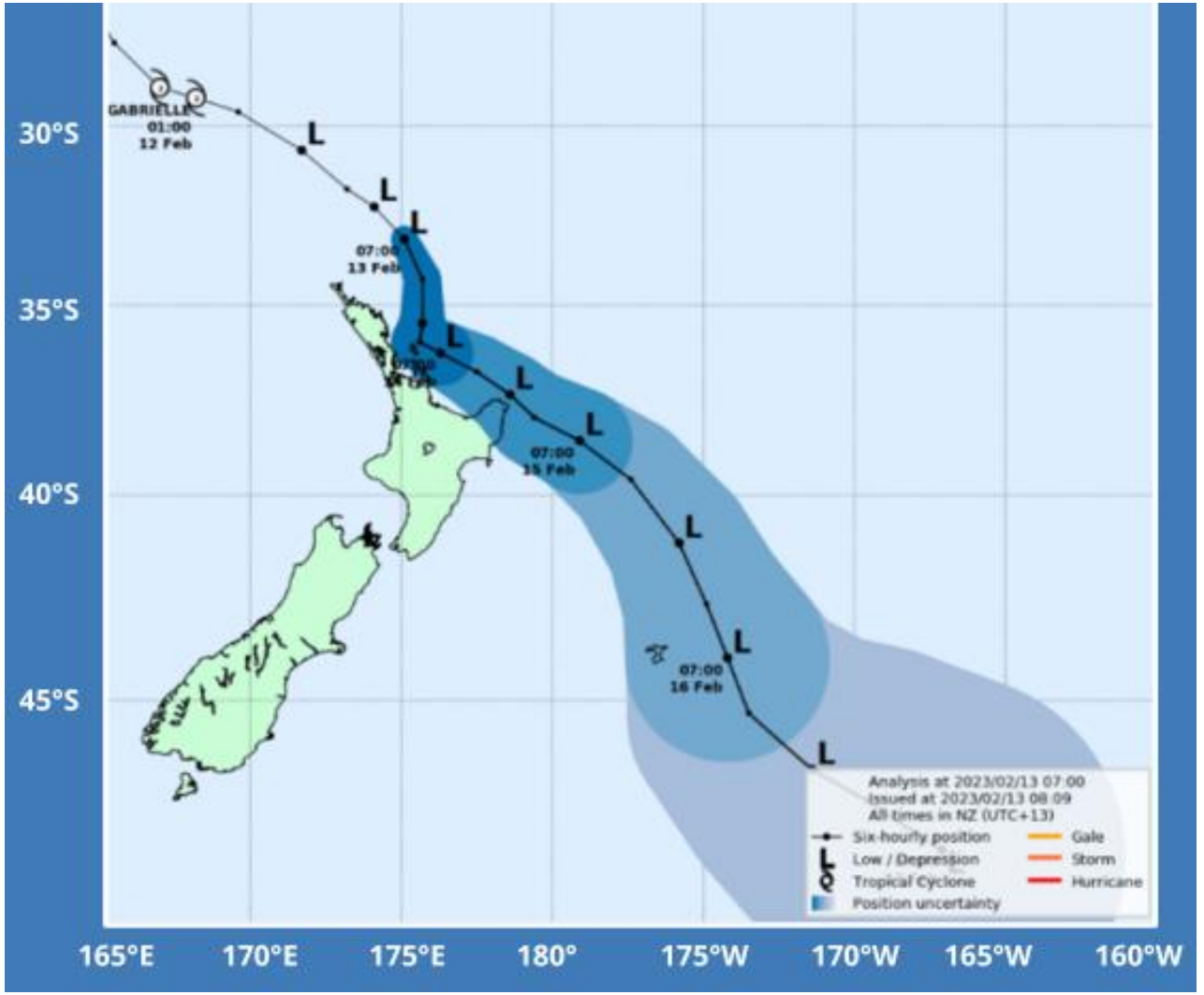
- 12-14 February 2023
- Worst or second worst on record for rain - 500mm (and up to 1,000 mm) and floods
- Extreme winds in many areas
- Storm surge exceeded 2.5 m
- Waves up to 11 m high!
- Impacted Northland to North Canterbury



Case Study: Cyclone Gabrielle

LWE Environmental Impact

Case Study: Cyclone Gabrielle

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- Inundation by stormwater and silt.
- Power and communications outages (for days in some cases).
- Pumps blocked with silt and/or stopped working and/or irreparable.
- Pipes filled with silt and washed away by erosion.
- Treatment plants overwhelmed with inflows, silt, and, in some cases, flooded by rivers breaching pond bunds.
- Discharge systems struggled with flow rates and erosion of structures.
- Septic tank and discharge field inundation
- Portable toilet wastes killing treatment pond biology

What do we do? – The Challenge

LWE Environmental Impact

Task 1: Develop resilient infrastructure

(old and still current focus)

Task 2: Consider consequential impacts on GHG when developing

(new(?) and additional focus)

What do we do? – The Challenge

Buy a b
enoug
everything

Understand things are changing and ask how is this going to modify my design

Appreciate different questions are going to be aske
th

Add a desalinisation plant to your boat

Accept there will be unknowns – that's ok

Develop r
management solutions – may have series of options

And the rain, rain, rain came down, down, down
And the rain, rain, rain came down, down, down
And the Hundred Acre Wood got floodier and floodier

Advice AEE Agricultural Analysis Application Approachable Assessments Assimilation Assistance Biosolids Capability Client Communications Communities Compliance Compost Consents Consultation Contamination Coordinate Council Cultural Current Data Degradation Design Detention Developments Discharges Documentation Drafting E. coli Ecosystems Effects Engagement Environment Equipment Evidence Excellence Experienced Expert Facilitating Farming Feasibility Fieldwork First-flush Fit-for-purpose Flooding Fun Geology Graphs Greywater Groundwater Guidelines Handbag Hazardous Hydraulics Innovation Interpretation Investigation Irrigation Land Landfills Landscape Land-treatment Leaching Lodge Management Metals Microbiology Modelling Monitoring NES Nitrogen Nutrients Onsite Optimisation Organics Overseer Papers Pathogens Phosphorus Plain-english Plans Preparation Presentations Project Quality Relevant Remediation Reports Research Review Sampling Scientific Septage Sludge Soil Solutions Spreadsheets Standpipes Stormwater Strategy Support Surface Water Sustainability Systems Team Testing Timely Treatment Validation Wastewater Water Water-balance Waterways