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CONCEPTUAL FRAMEWORK TO ENABLE COORDINATED SOLUTIONS FOR CLIMATE CHANGE AND WATER QUALITY

Brian Ellwood, Britt Paton, & Hamish Lowe

February 2020

Outline

- Current approach to managing nutrient reduction
- GHG – requirements
- Individual vs collective nutrient and GHG management
- GIS mapping tools
- Alternative landuse – barriers and options
- System requirements
- Example catchment

Current Approach N-Loss Reduction

- Nutrient reductions required at the catchment level are common requirements of Regional Plans.
- Plans generally require a blanket N loss reduction occurring at a point in time, examples include:
  - Canterbury Land and Water Plan (CLWP) Variation 1 reductions sector specific 0 to 30%
  - CLWP Variation 7 has 5 to 90% reductions
  - Horizon One Plan requires reduction to fixed N loss targets over time kg N/ha/yr.

Farm System	N-Loss %
Dairy	30%
Dairy Support	22%
Pigs	20%
Irrigated sheep, beef or deer	5%
Dryland sheep and beef	2%
Arable	7%
Fruit, viticulture or vegetables	8%
All other sectors.	0%

Source www.ecan.govt.nz

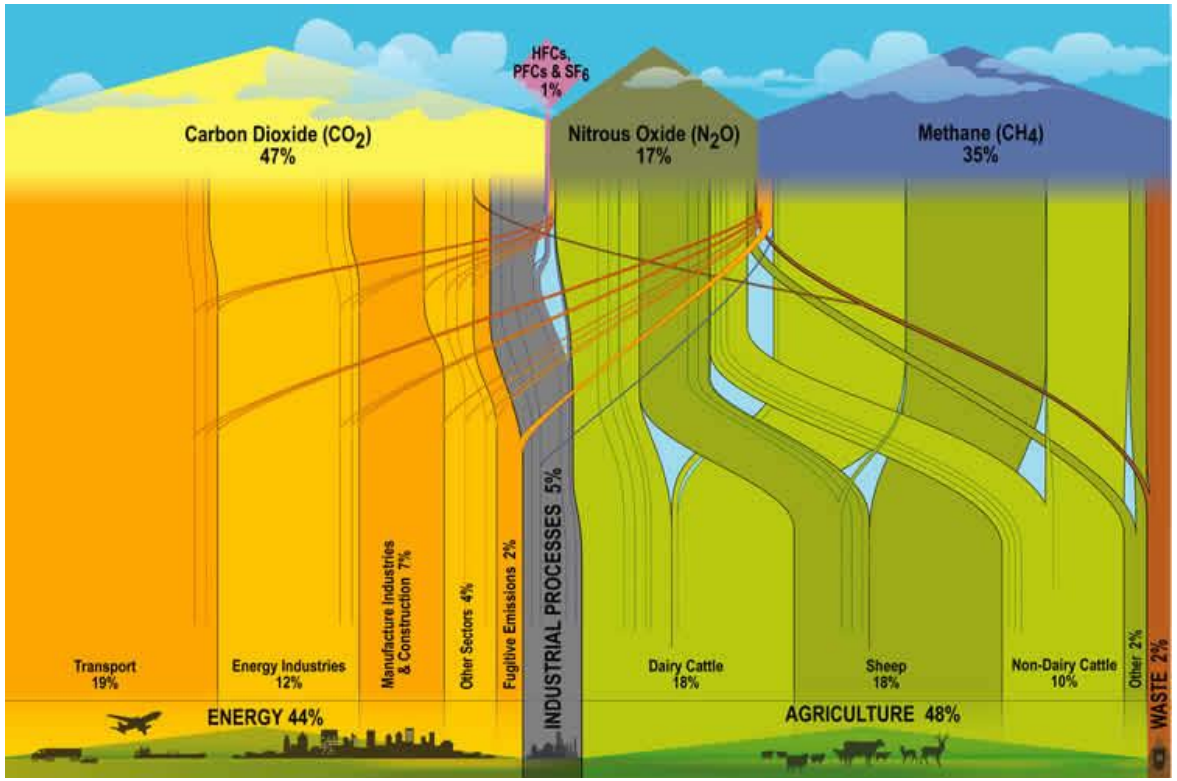
Nitrate Priority Area Sub-area (see planning maps)	Farming type	Cumulative percentage reductions and dates by which these are to be achieved					
		By 1 January 2030	By 1 January 2040	By 1 January 2050	By 1 January 2060	By 1 January 2070	By 1 January 2080
Sub-area A	Dairy	15%	30%	-	-	-	-
	Other	5%	10%	-	-	-	-
Sub-area B	Dairy	15%	30%	45%	-	-	-
	Other	5%	10%	15%	-	-	-
Sub-area C	Dairy	15%	30%	45%	60%	-	-
	Other	5%	10%	15%	20%	-	-
Sub-area D	Dairy	15%	30%	45%	60%	75%	-
	Other	5%	10%	15%	20%	25%	-
Sub-area E	Dairy	15%	30%	45%	60%	75%	90%
	Other	5%	10%	15%	20%	25%	30%

Source www.ecan.govt.nz

GHG – Zero Carbon Act 2019

The Act sets new domestic greenhouse gas emissions reduction targets:

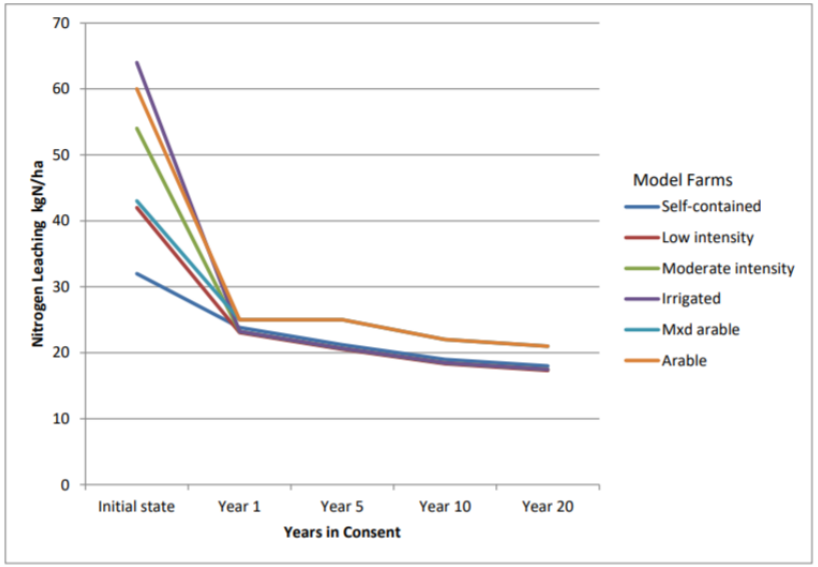
- Reduce net emissions of all greenhouse gases (except biogenic methane) to **zero** by 2050
- Reduce emissions of biogenic methane to **24–47** per cent below 2017 levels by 2050, including to **10** per cent below 2017 levels by 2030



Source www.mfe.govt.nz

Individual property approach N or GHG

- There is no differential between scale of loss when % reductions are applied
- % approach shares the pain but doesn't maximise the benefits
- Different properties have different natural potential
- Providing a differentiated approach based on mass of emission maybe more beneficial as individuals on-farm have limited toolbox of options



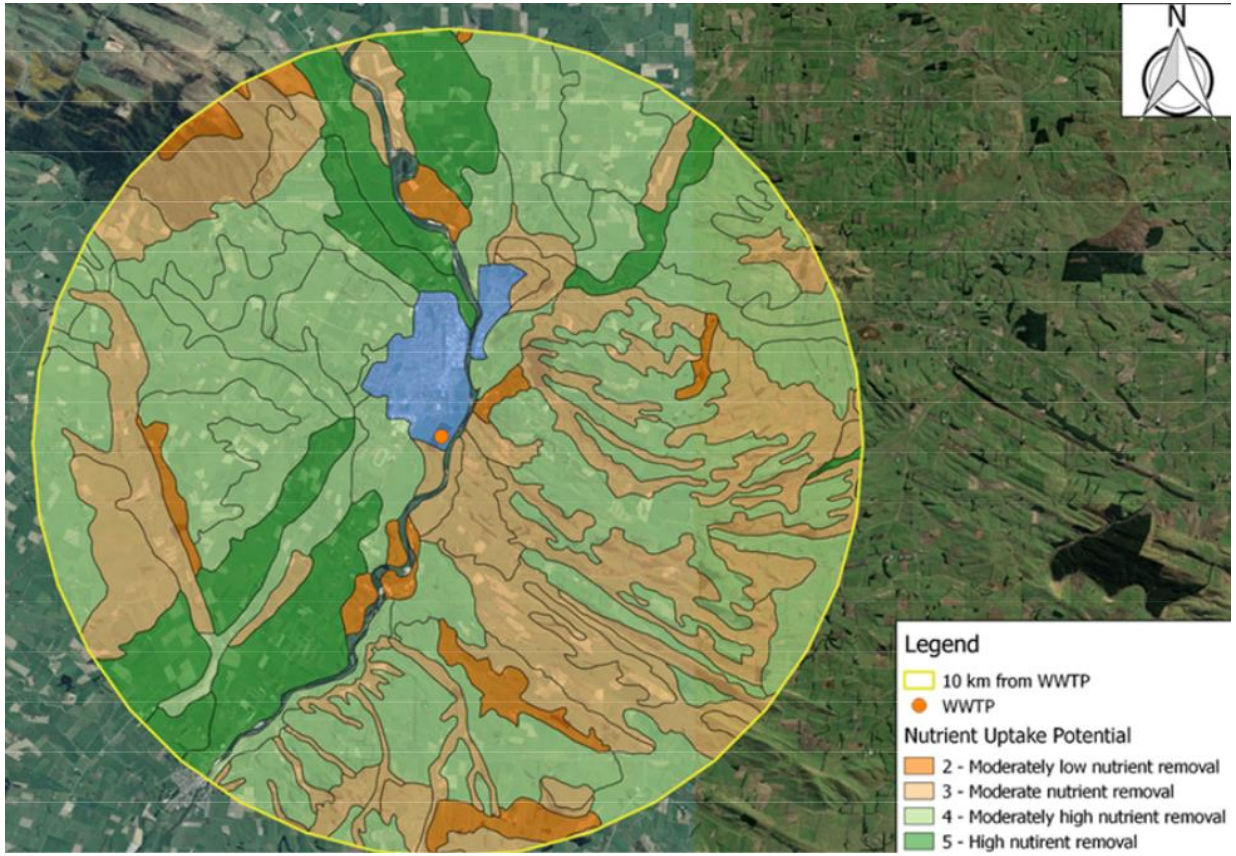
Source www.horizons.govt.nz

Catchment Cooperative Approach

- An alternative to individual loss reductions
- Expanding to a catchment approach allows a greater number of options
  - Farm practices
  - Wetlands existing and new
  - Favorable topography
  - Alternative landuse
- Targets catchment hots spots
- Focus mitigation on areas where greatest reductions are likely
- Pooled investment to achieve greater results

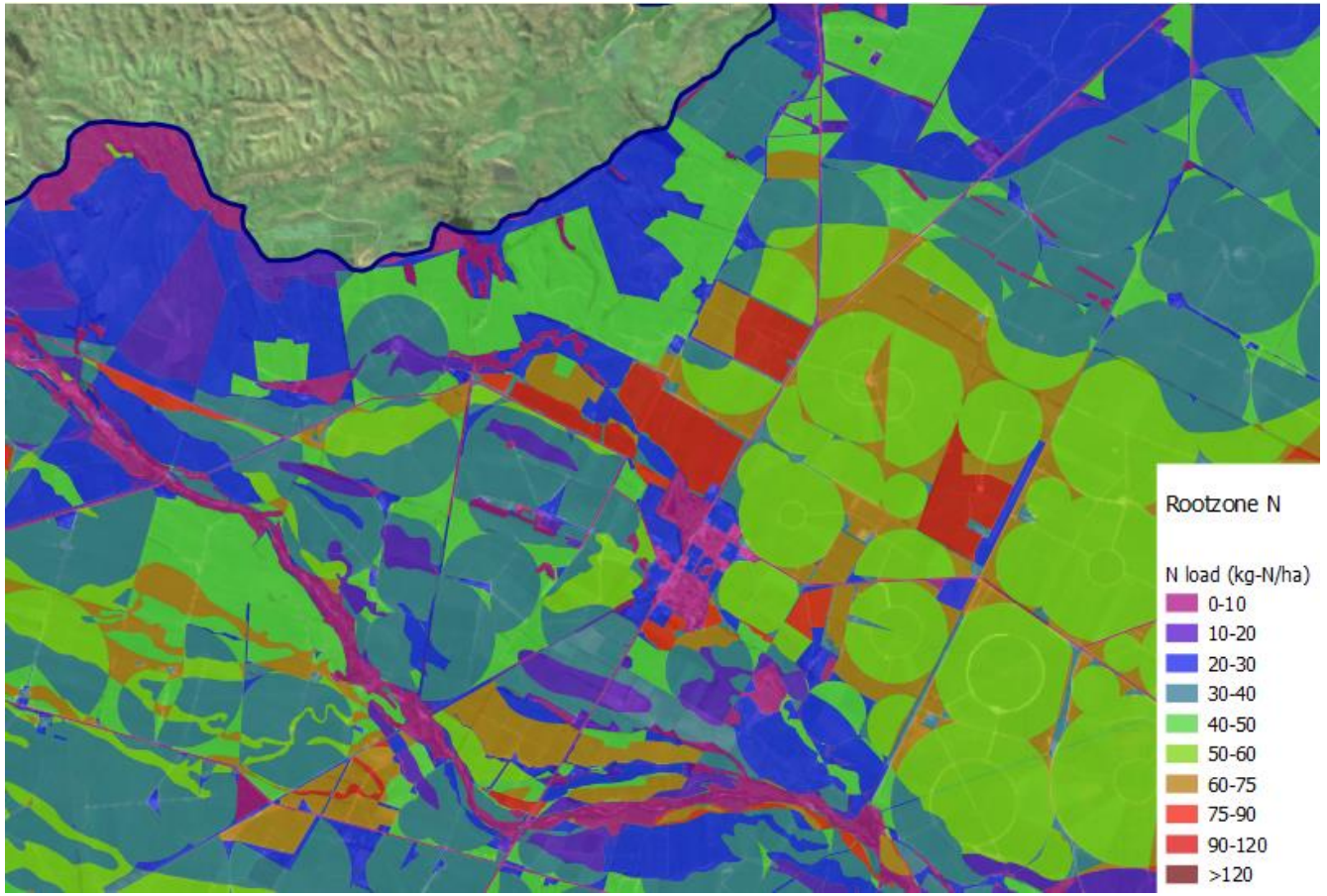
Tools -Nutrinet Loss GIS mapping

- The GIS modelling incorporates layers for climate change impacts, water resource requirements, soil type and leaching potential
- Nutrinet loss potential factors can be overlaid to identify target areas
- Multiple layers can be combined using scales and weighting to produce an overall matrix, which can be used to target effort



Tools - Spatial Distribution of Losses

- Mapping of N- Loss by
  - Farm system
  - Soil type
  - Climate
  - Irrigation system
- Red and orange area for targeted reductions
  - Irrigation system change
  - Farm intensity reductions

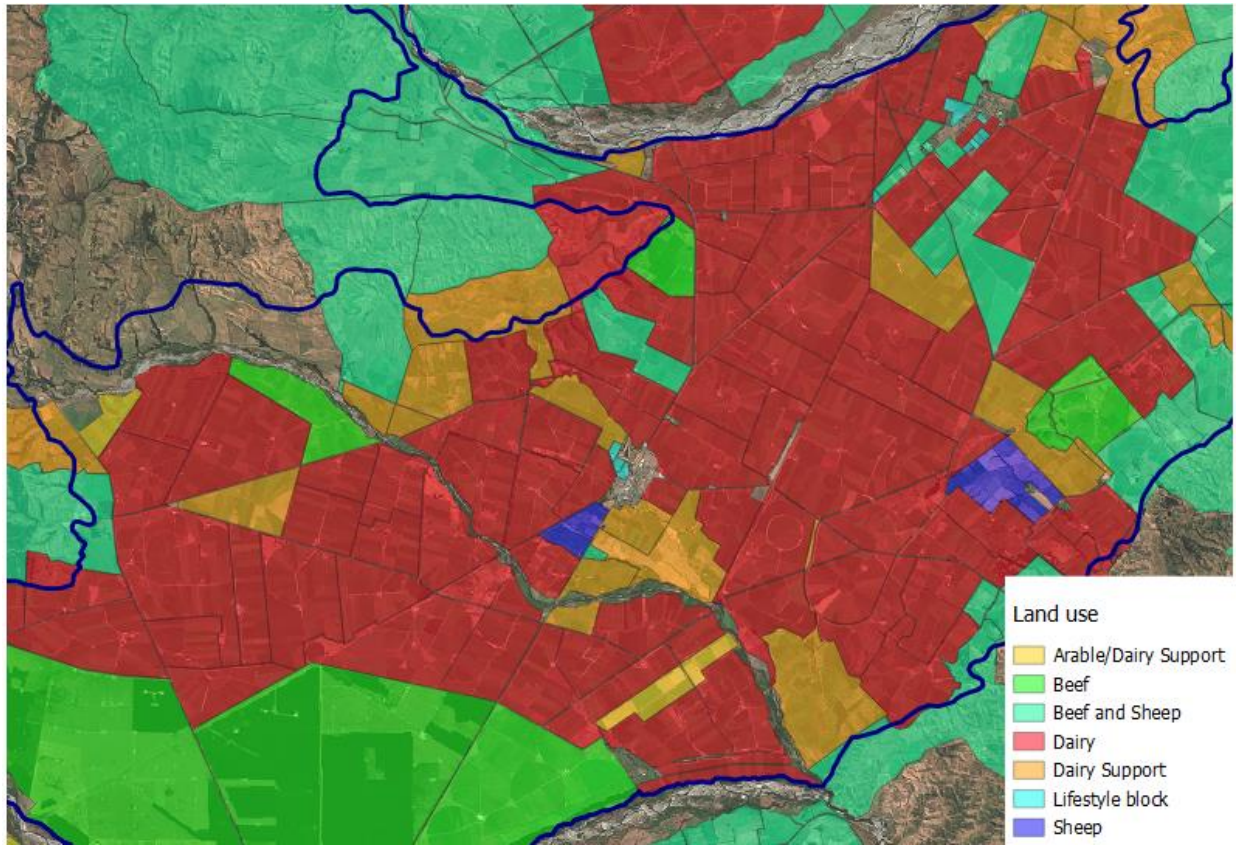


Alternative Landuse – Low N and GHG

- Changing landuse effective for N and GHG reduction
- Hard to achieve for individuals with many barriers to change
  - Risk in establishing viable alternatives for area
  - Skills in new landuse
  - Markets and scale of production
  - Supporting infrastructure (pack houses, harvesters etc)
  - Access to technology
- These barrier restrict changes to new markets like
  - Sheep milking
  - Horticulture
  - Viticulture

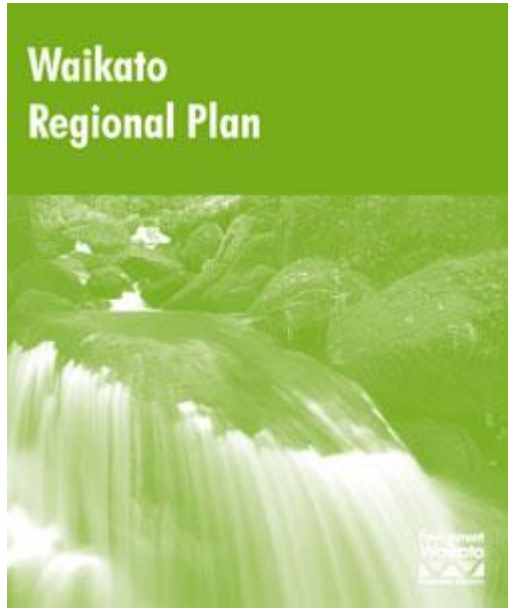
Alternative Landuse – Low N and GHG To overcome the barriers

- If a collective of landowners all convert 10% of their farm to an alternative crop/system
  - It spreads the investment risk for that business
  - Creates scale in the new industry to allow downstream infrastructure to be supported like powder dryer, pack houses
  - Reduces emissions but not land productivity
  - Diversifies farms creating more resilient/antifragile communities



System Requirements

- Flexible –Planning regime to require management at individual or collective level
- Organized group or collective
  - Industry co-op
  - Collective supply company
  - Collective membership/ownership – Irrigation company
- Methods for managing free loaders
  - Default reductions apply to individual if outside of a group
- Data
  - Lots and lots
  - System losses - Nutrient or GHG
  - Mitigation reductions



Example in Development

- Current Nitrate level is 3.6 g/m^3
- Desire for expansion of irrigated land
- No head room for expansion, exist landuse at risk
- Proposed solution
  - Irrigation scheme coordinating (co-op)
  - Catchment intensive monitoring to id hot spots
  - Tiered mitigation measures
    - Tier 1 – Reduce nitrate losses at source
    - Tier 2 – Self-sustaining natural treatment (e.g. wetlands)
    - Tier 3 – Dilution (stream augmentation, MAR)
  - Targets reduction to 1.8 g/m^3 to enable current landuse plus expanded irrigation area

LOWE Environmental Impact

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