NZSSES The New Zealand Society for Sustainability Engineering and Science

MWH

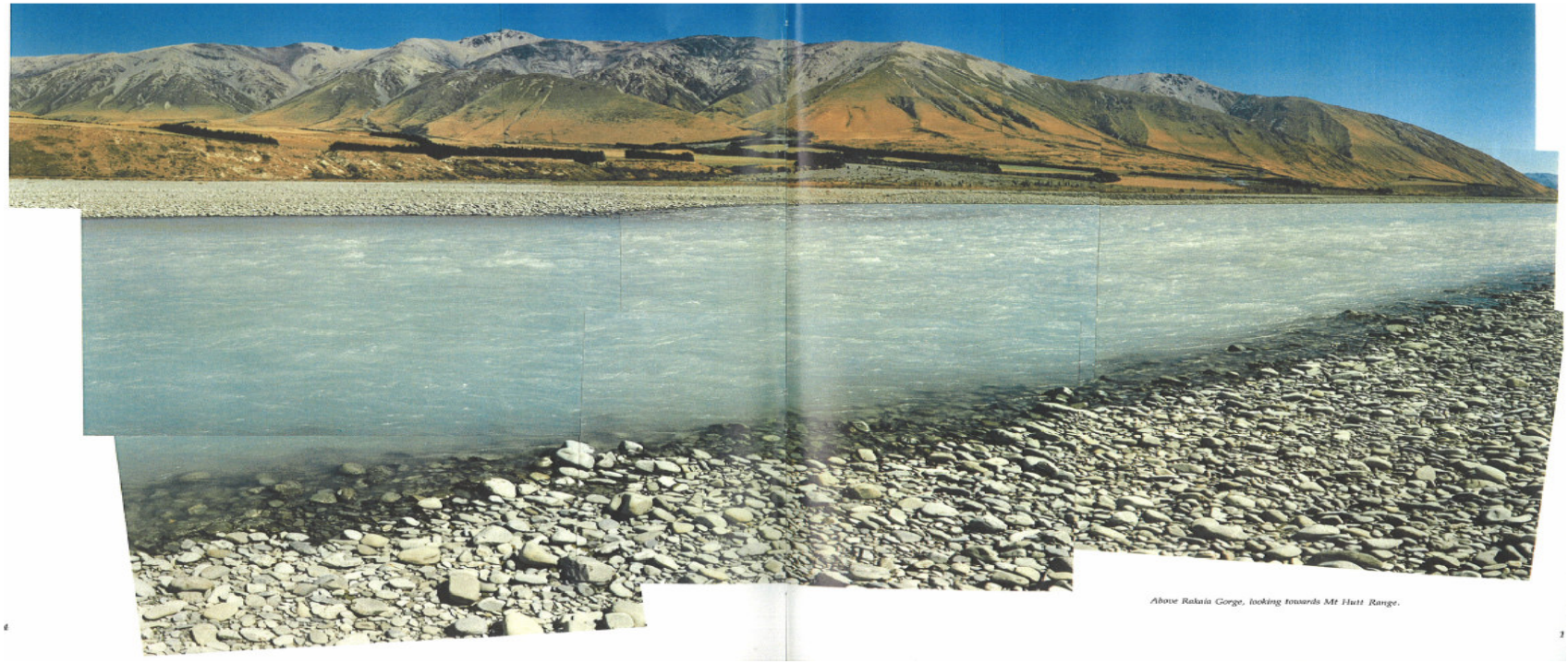
Forum #11 Canterbury Water: The Challenges and Strategies

National and International Trends and Practices in Water Management – Application in a Canterbury Context?

Presented by Jim Bradley - MWH NZ Ltd
jim.w.bradley@nz.mwhglobal.com

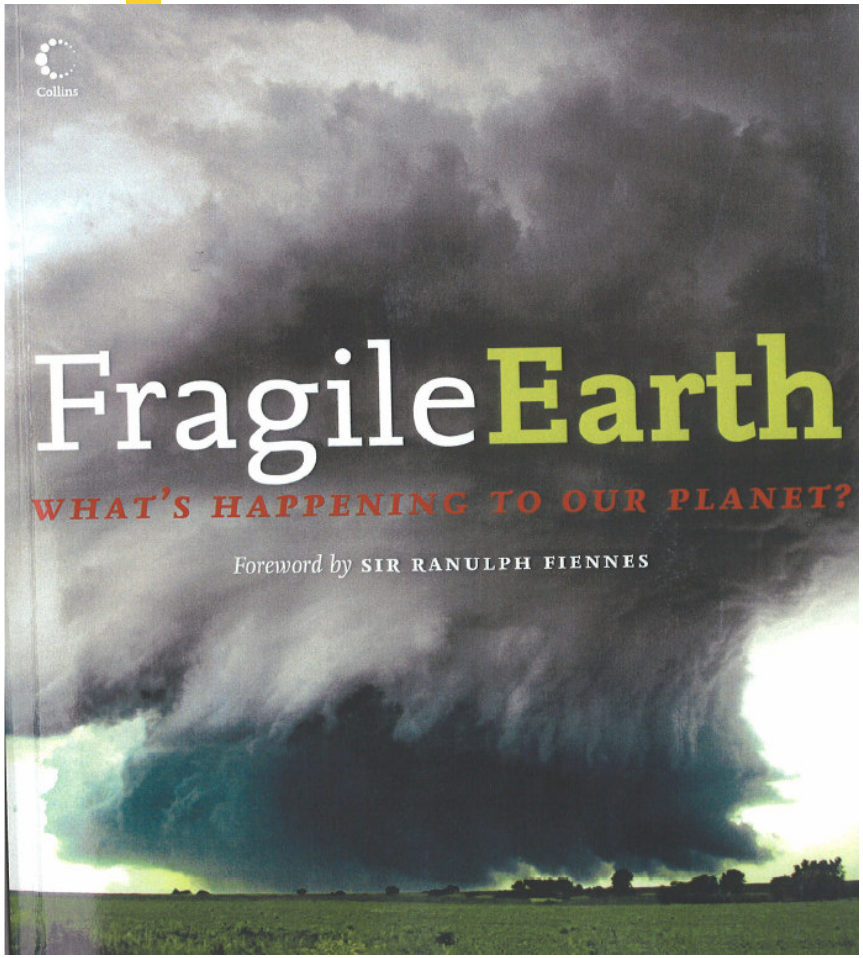
29 August 2008

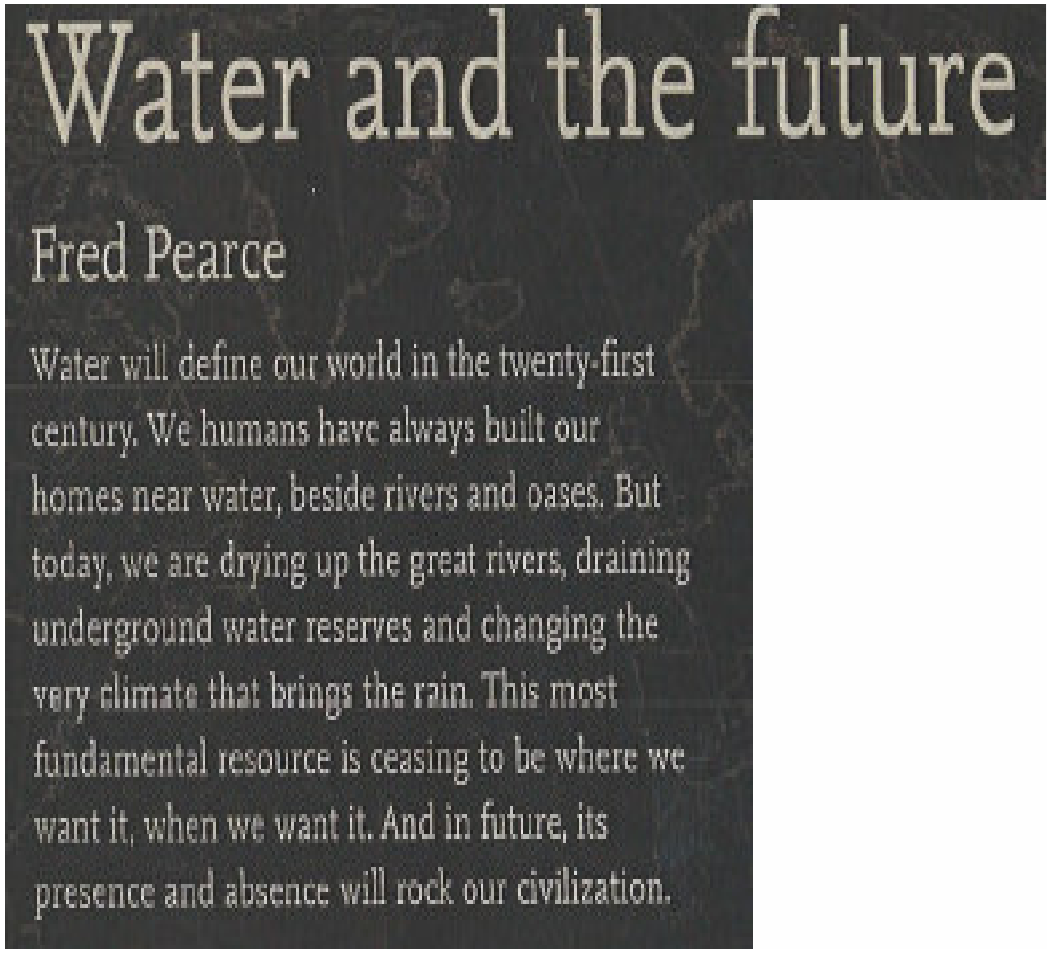
Our Canterbury! Who's Water?



Above Rakaia Gorge, looking towards Mt Hutt Range.

Setting the Scene



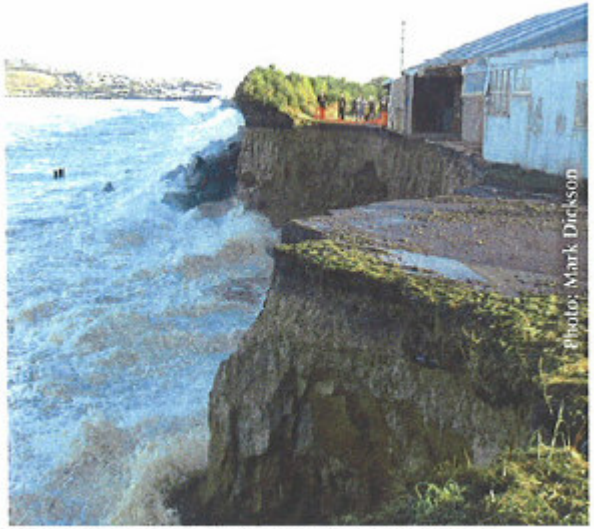


Coastal Erosion: One of Many Issues

The coast around Bawdsey in Suffolk, UK is eroding fast. The *Lines of Defence* flags seen here were part of an art project called *If ever you're in the area*. The complete set of project images beautifully illustrate the problem as they cover a full year. These three images illustrate the erosion from January to August 2005, by which time approximately 14 m (46 feet) of coastline had been lost.

Rapid erosion at Oamaru

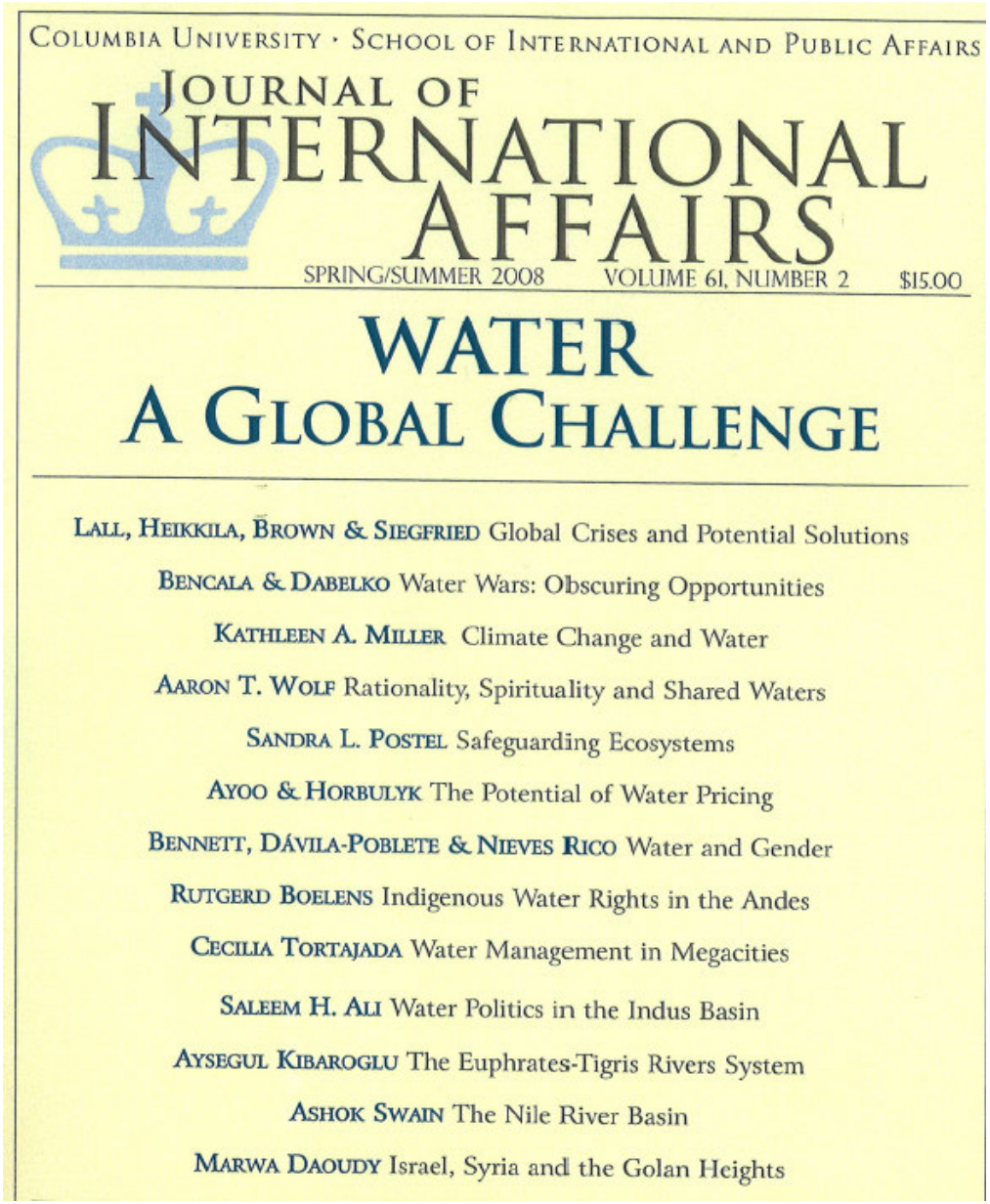
Water & Atmosphere 15(3) 2007



The joinery factory had to be abandoned as the cliff erosion advanced.

Reference:
Fragile Earth/ Coastal Erosion

International Issues



COLUMBIA UNIVERSITY · SCHOOL OF INTERNATIONAL AND PUBLIC AFFAIRS

JOURNAL OF INTERNATIONAL AFFAIRS

SPRING/SUMMER 2008 VOLUME 61, NUMBER 2 $15.00

WATER
A GLOBAL CHALLENGE

LALL, HEIKKILA, BROWN & SIEGFRIED Global Crises and Potential Solutions

BENCALA & DABELKO Water Wars: Obscuring Opportunities

KATHLEEN A. MILLER Climate Change and Water

AARON T. WOLF Rationality, Spirituality and Shared Waters

SANDRA L. POSTEL Safeguarding Ecosystems

AYOO & HORBULYK The Potential of Water Pricing

BENNETT, DÁVILA-POBLETE & NIEVES RICO Water and Gender

RUTGERD BOELENS Indigenous Water Rights in the Andes

CECILIA TORTAJADA Water Management in Megacities

SALEEM H. ALI Water Politics in the Indus Basin

AYSEGUL KIBAROGLU The Euphrates-Tigris Rivers System

ASHOK SWAIN The Nile River Basin

MARWA DAOUDY Israel, Syria and the Golan Heights

Water Environment Federation®
Preserving & Enhancing the Global Water Environment

Sustainability 2008
Green Practices for the Water Environment

MWH
BUILDING A BETTER WORLD

"PRACTICAL PROGRESS IN THE NEW ZEALAND (NZ) JOURNEY TOWARDS MORE SUSTAINABLE WATER AND WASTEWATER MANAGEMENT"

Co-presented by
Paula Hunter and Jim Bradley
MWH New Zealand

Contents

- NZ Context
- Legislation
- Challenges
- NGO Response
- Governance
- Social and Maori Cultural Well-being
- Central Government Response
- Tools and Techniques

These are all very relevant topics in Canterbury

Drivers for Change

- Changing landuse
- Irrigation demands doubling
- Over allocated catchments
- Ecological values threatened
- Growing urban population
- Integrate urban and natural waters
- Low impact urban design
- Managing cumulative effects

Again all very relevant for Canterbury

Some Key Conference Themes

- "The shift is to how can we mainstream green / sustainable infrastructure"
- "We need a whole paradigm shift in our thinking away from hard grey infrastructure"
- "It's a very important time and an exciting time. We cannot continue to manage the waters in the future the way we do in the present"
- "The first approach is to use our infrastructure more efficiently – that's the first step in more sustainability approaches"
- "We need to develop our "Green integrated with Grey tool box of approaches"

Some Key Conference Themes

- "It's Green before Grey Infrastructure. We can reduce the need for and size of the large storage tunnels and stormwater / overflow pipes that we have used in the past"
- "Green Infrastructure is not rocket science, we have been doing this in the past e.g. rain barrels are simple"
- "The challenge is not the technical stuff and devices, its shifting the thinking"
- "Customer based stormwater control, setting policies and pilots"
- "Importance of low impact design and development"

So how do these stack up on the journey in Canterbury?

A Keynote Address

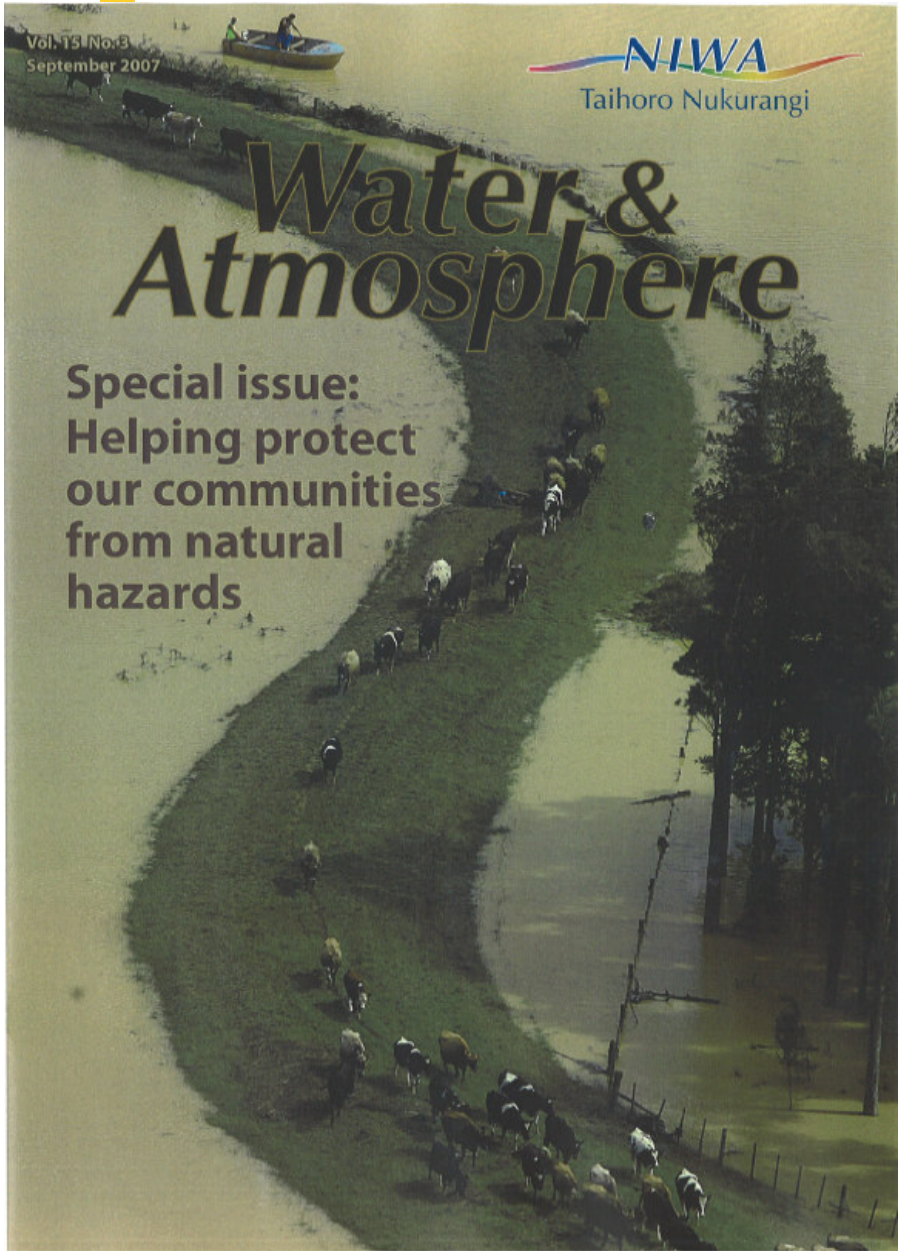
Betty Otto CEO American Rivers (NGO)

Key principles for the future:	Canterbury
• Plan better for climate change impacts	✓
• Protect and restore natural systems	✓
• Fix existing systems first	? (✓)
• Increase ratio of green to hard infrastructure	✓
• Invest in efficiency first	? (✓)
• Full project life cycle planning	✓
• Stop subsidising dumb projects	?

American Planning Association

How Effective are Our Planning Approaches in Canterbury for "Efficient and Sustainable" Water Management?

Natural Hazards



And this weeks reminder for part of Canterbury

American Planning Association

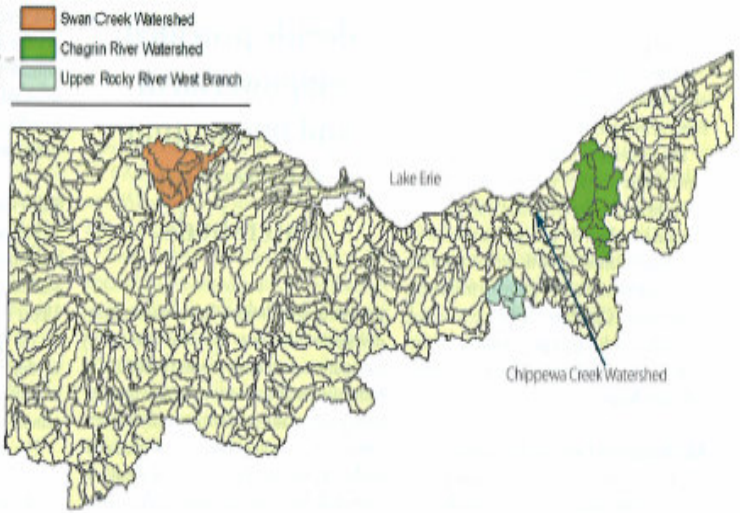
As it is in Christchurch City – A NZ Leader

American Planning Association

In Lake Erie's Chagrin River watershed, pristine cold water streams such as Stebbin's Gulch (left) will be designated as priority conservation areas. Below left: A base map for that watershed was created to jump-start discussions with local communities.

Shared Saving a Asset

By Joseph A. MacDonald, AICP, and David Beach



Ohio communities protect their Great Lake watersheds.

International Issues continued

THE FORGOTTEN INFRASTRUCTURE:
SAFEGURADING FRESHWATER ECOSYSTEMS

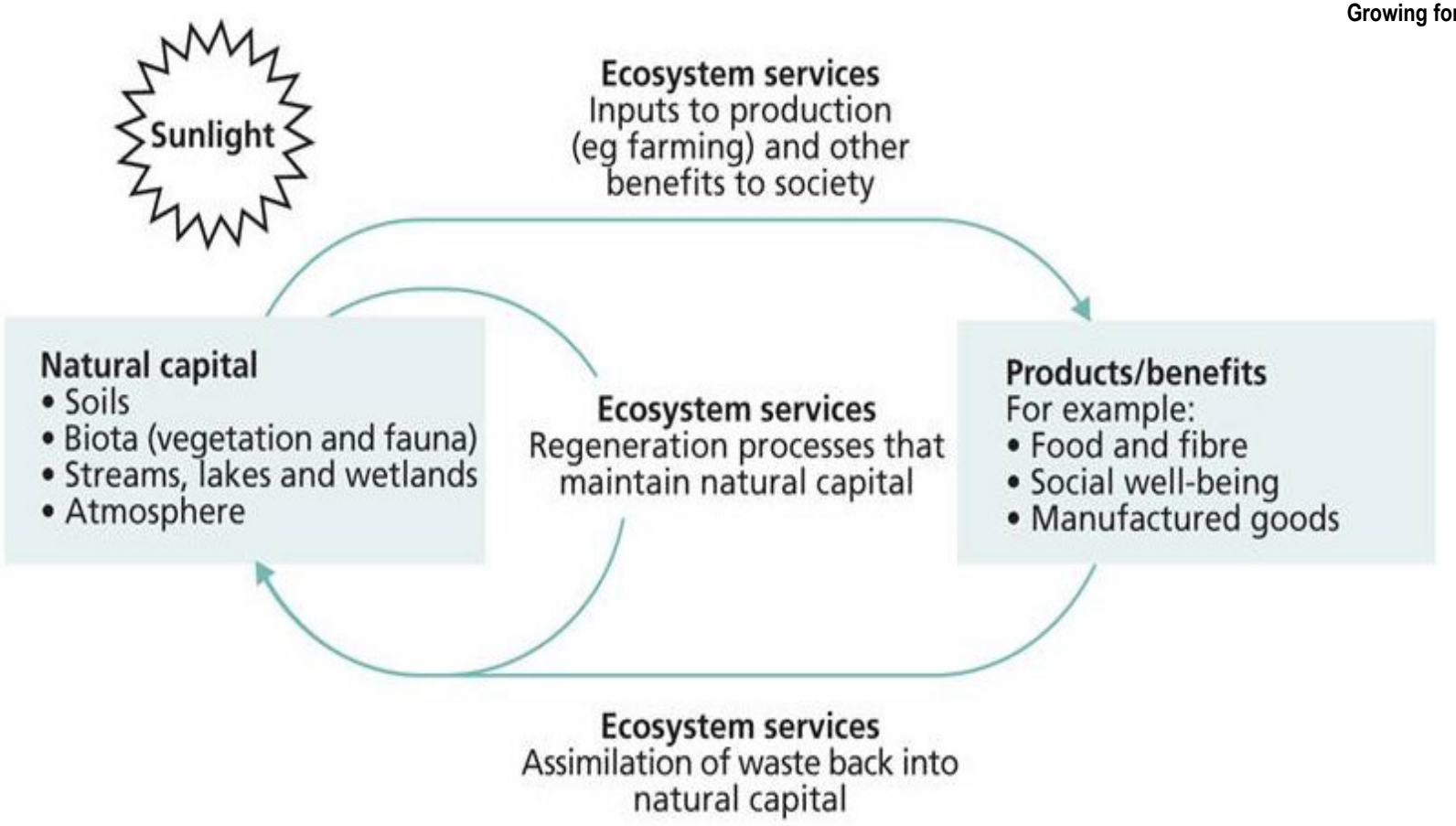
Sandra L. Postel

THE DECLINE OF ECOLOGICAL INFRASTRUCTURE

Water infrastructure typically refers to the collection of dams, levees, canals, pipelines, treatment plants and other engineering works that help provide water services to the human population. There is another class of infrastructure that also delivers valuable services to society: the aquatic ecosystems that perform nature's work, healthy rivers, floodplains, wetlands and forested watersheds supply much more than water and fish.

Ecosystem Services

Reference:
Parliamentary Commissioner for the Environment (PCE)
Growing for Good



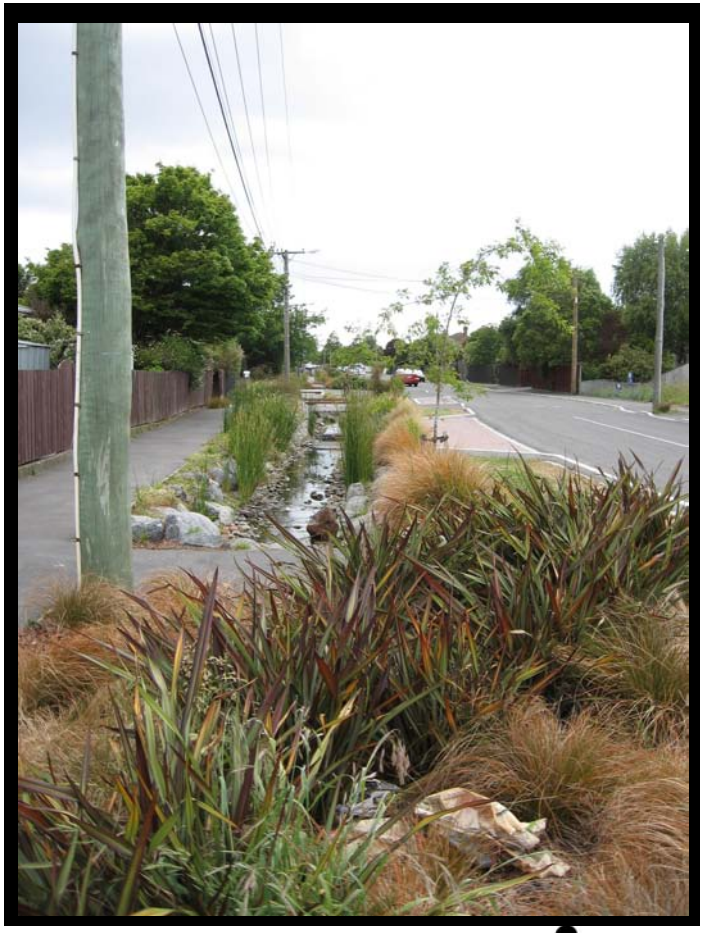
… human societies need to live off the 'interest' of natural capital, instead of using up or degrading the natural resource base

Ecosystem Services / LID

Natural Assets – Christchurch CC

- Council's Green Asset Management
- Piped Stormwater needed replacement
- Daylighting to reform a "living stream"
- Example of using Ecosystem Services

High marks Christchurch City Council!



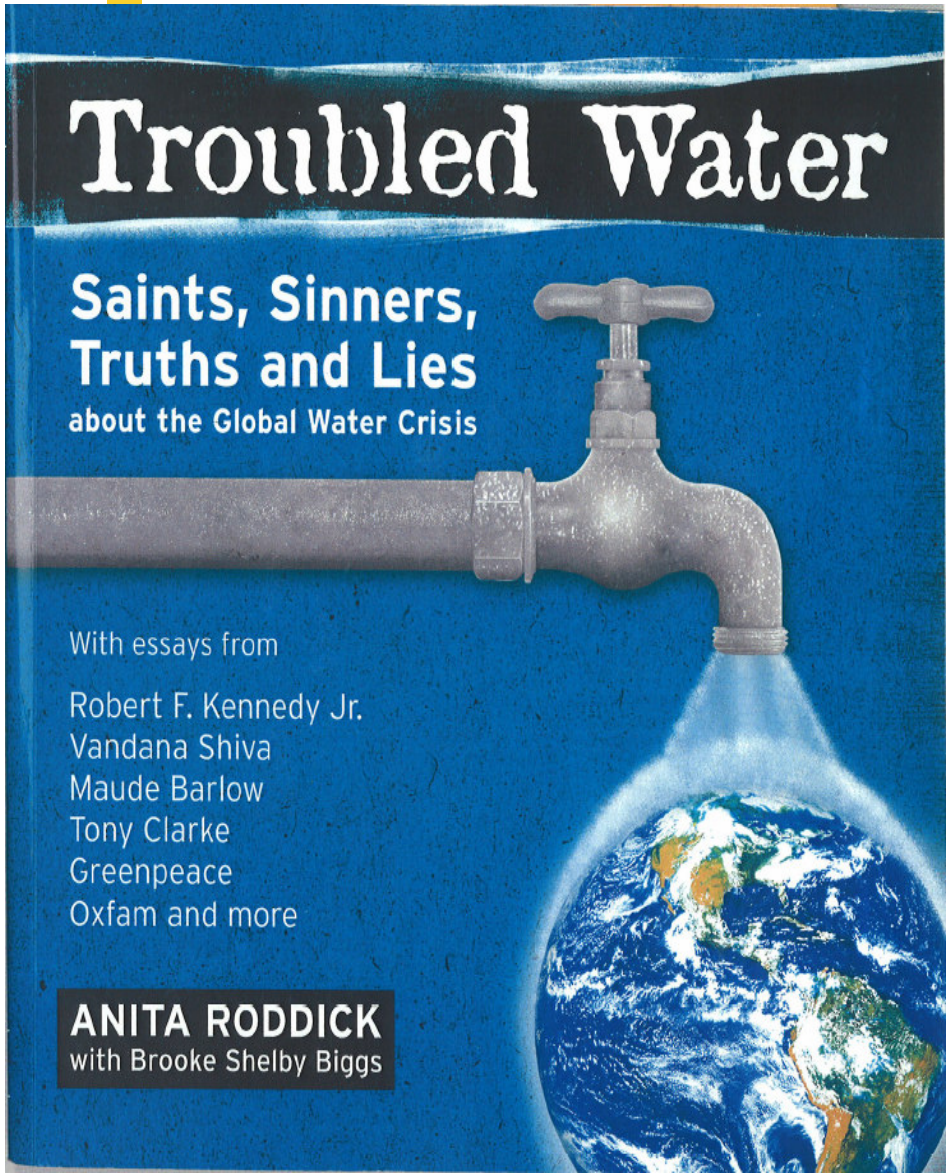
WATER WARS:
OBSCURING OPPORTUNITIES

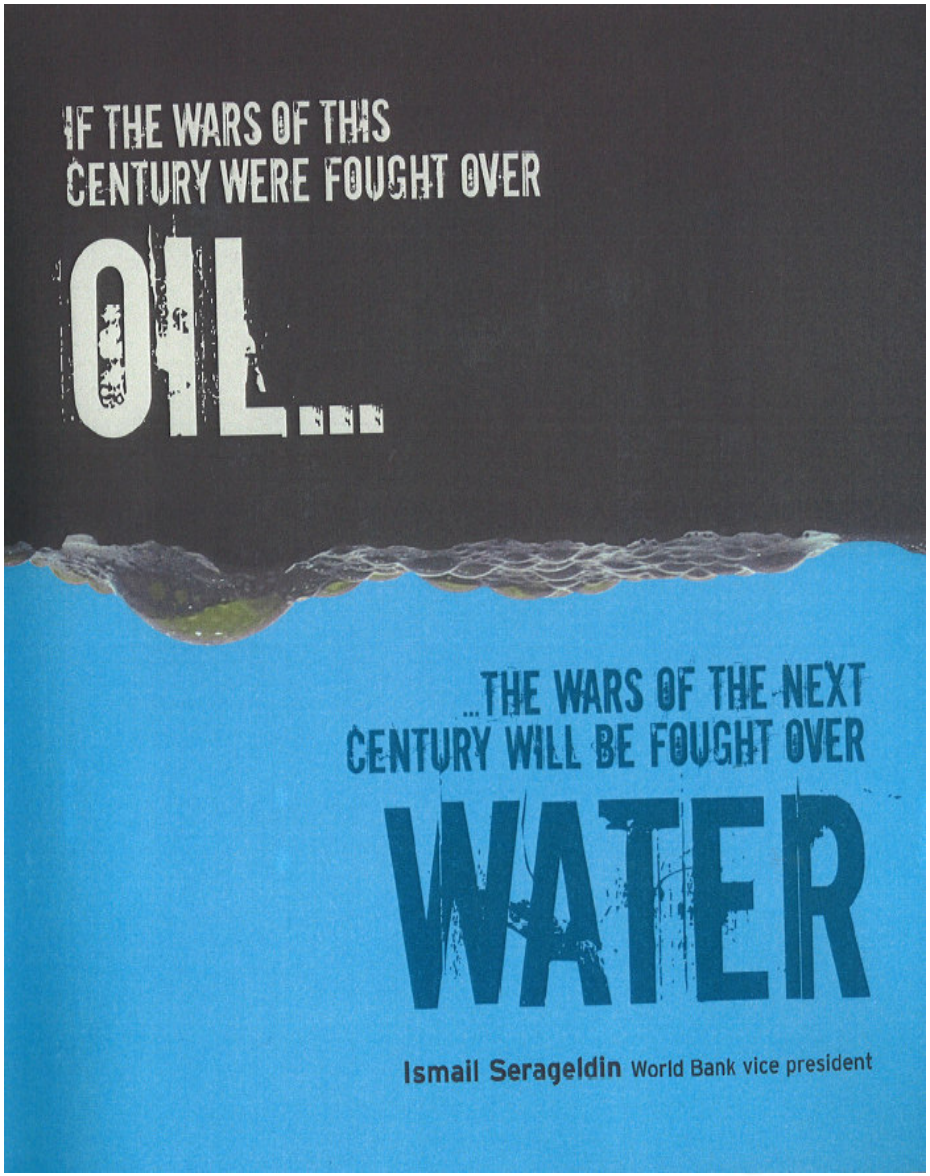
Karin R. Bencala and Geoffrey D. Dabelko

Speaking at the 2008 World Economic Forum in Davos, Switzerland, United Nations Secretary General Ban Ki-moon weighed in on water conflict:

The challenge of securing safe and plentiful water for all is one of the most daunting challenges faced by the world today….Too often, where we need water, we find guns instead. Population growth will make the problem worse. So will climate change. As the global economy grows, so will its thirst. Many more conflicts lie just over the horizon.

Water Wars


Troubled Water
Saints, Sinners, Truths and Lies
about the Global Water Crisis
With essays from
Robert F. Kennedy Jr.
Vandana Shiva
Maude Barlow
Tony Clarke
Greenpeace
Oxfam and more
ANITA RODDICK
with Brooke Shelby Biggs


IF THE WARS OF THIS CENTURY WERE FOUGHT OVER
OIL...
...THE WARS OF THE NEXT CENTURY WILL BE FOUGHT OVER
WATER
Ismail Serageldin World Bank vice president

Canterbury Water Wars!

D MAINLANDER

Mainlander Editor: Ewan Sargent
Contact: mainlander@press.co.nz 03 943 2625

THE PRESS, CHRISTCHURCH Saturday & Sunday, August 23-24, 2008 D1

ALL THINGS BEING EQUAL

Dealing with the gap between rich and poor.

>> MAINLANDER D5

ALBATROSS GRANDEUR

Detailing albatross species while there's still time.

>> MAINLANDER D6

DESTINY SET IN STONE

Volunteers tend

When a fight over water breaks out, the battleground is usually the Resource Management Act. But can the act contain this rush for liquid gold? PAUL GORMAN reports.

WATER WARS

Liquid of life: a centre-pivot irrigator near Oxford, Canterbury. Photo: David Hallett

The big water grab

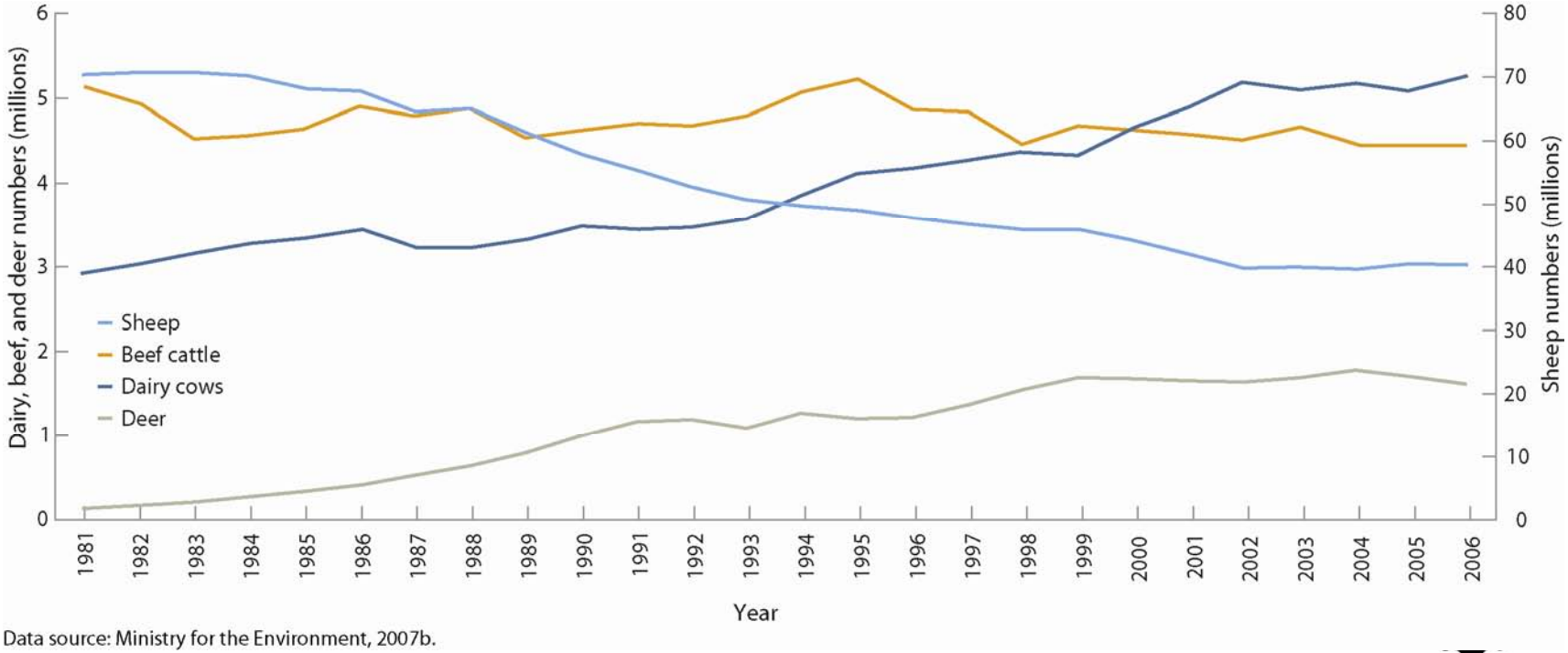
Four Dimensions of Sustainable Development Approach to Four Well-Beings

- NO. 1 ⇨ Take a “Wide View” - broad approach
- NO. 2 ⇨ Take a “Long View” - long term context
- NO. 3 ⇨ Community Engagement – including Maori
- NO. 4 ⇨ “Whole of Government” approach

Land Use

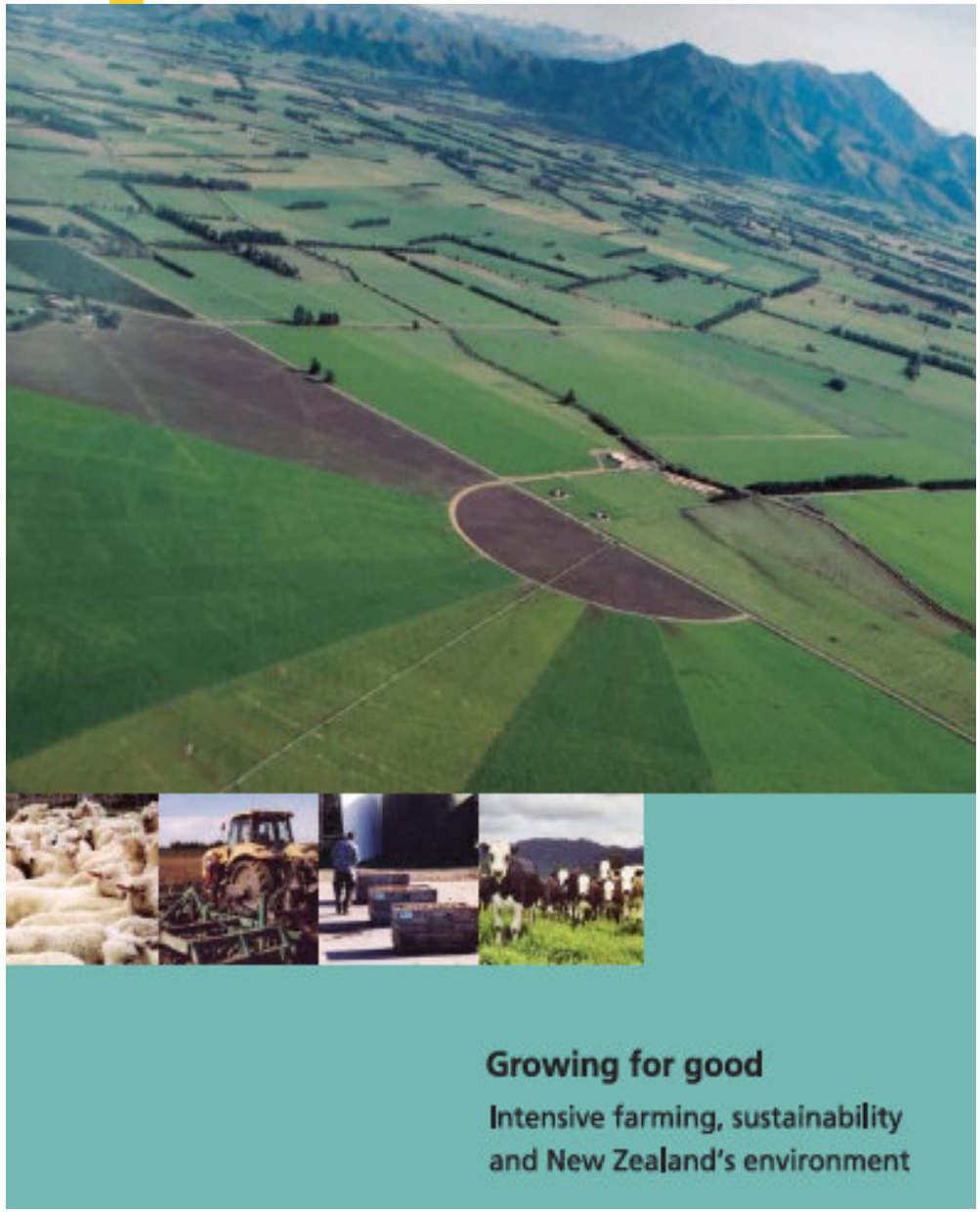
Livestock Numbers in New Zealand 1981-2006

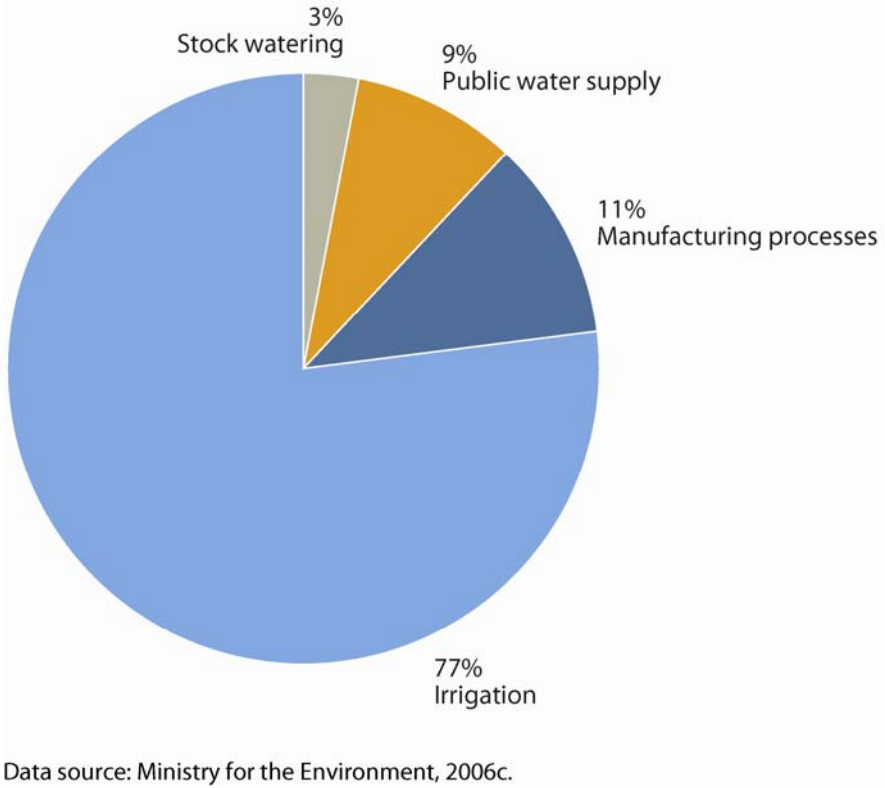
- Dairy cows major increase
- Sheep major decrease



Data source: Ministry for the Environment, 2007b.

Water Abstraction and Land Use



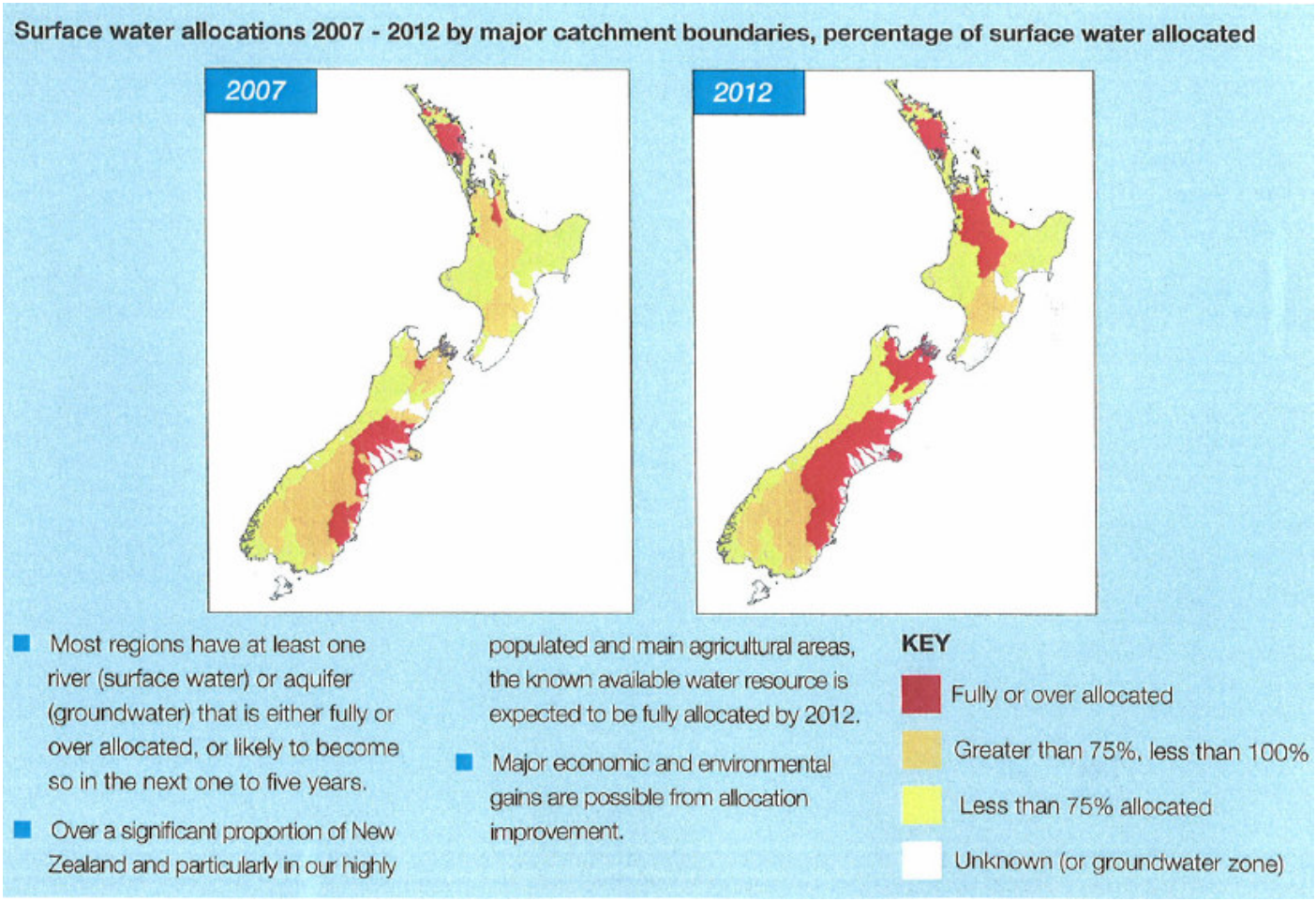


Data source: Ministry for the Environment, 2006c.

National Established Approaches

- Planning Instruments (RPS, RP, DP, COPs etc)
- Long Term Council Community Plan (LTCCP) 10 year forecast – community involvement
- Education – case history information and site visits
- Working Party and Liaison Groups
- Multi-criteria analysis decision conferencing – relative sustainability etc
- Resource Consents (licenses) having proactive conditions
- Effective and defensible monitoring – long term trends

Surface Water Allocation



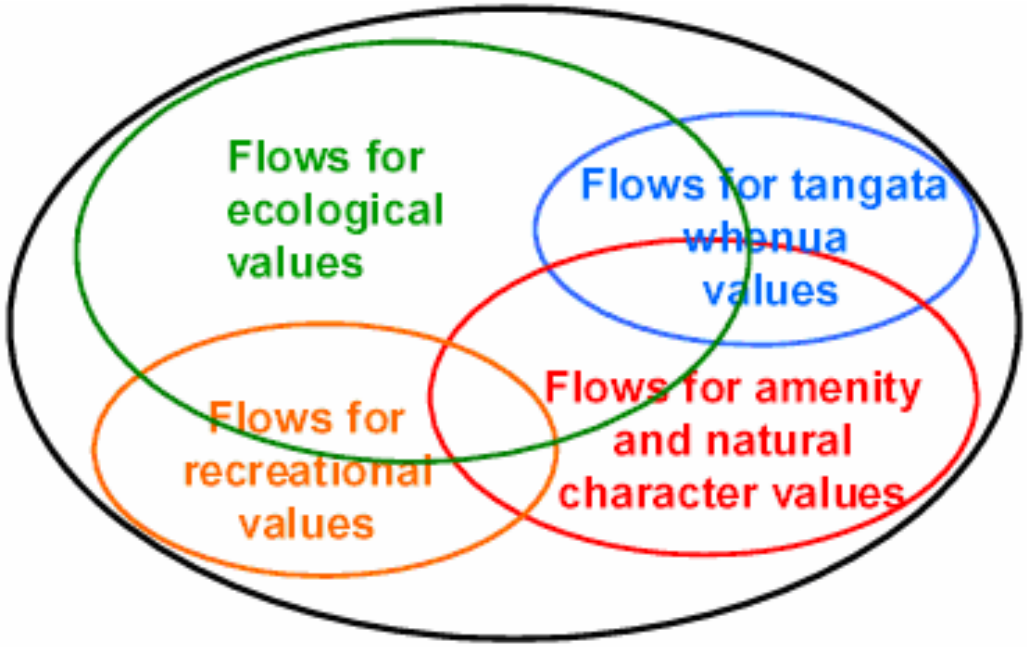
Reference
NZBCSD

A Best Solution for NZ's Water Problems 2008

Fresh Water Management

Proposed National Environmental Standard Ecological Flows and Water Levels

- Our new National Environmenta Standard (NES)
- Provides for flows and water levels for ecological function
- How does it stack up?
- Submissions close – date?
- Supported by NES for Water Measuring Devices



Water Allocation

Municipal Water Demand Management

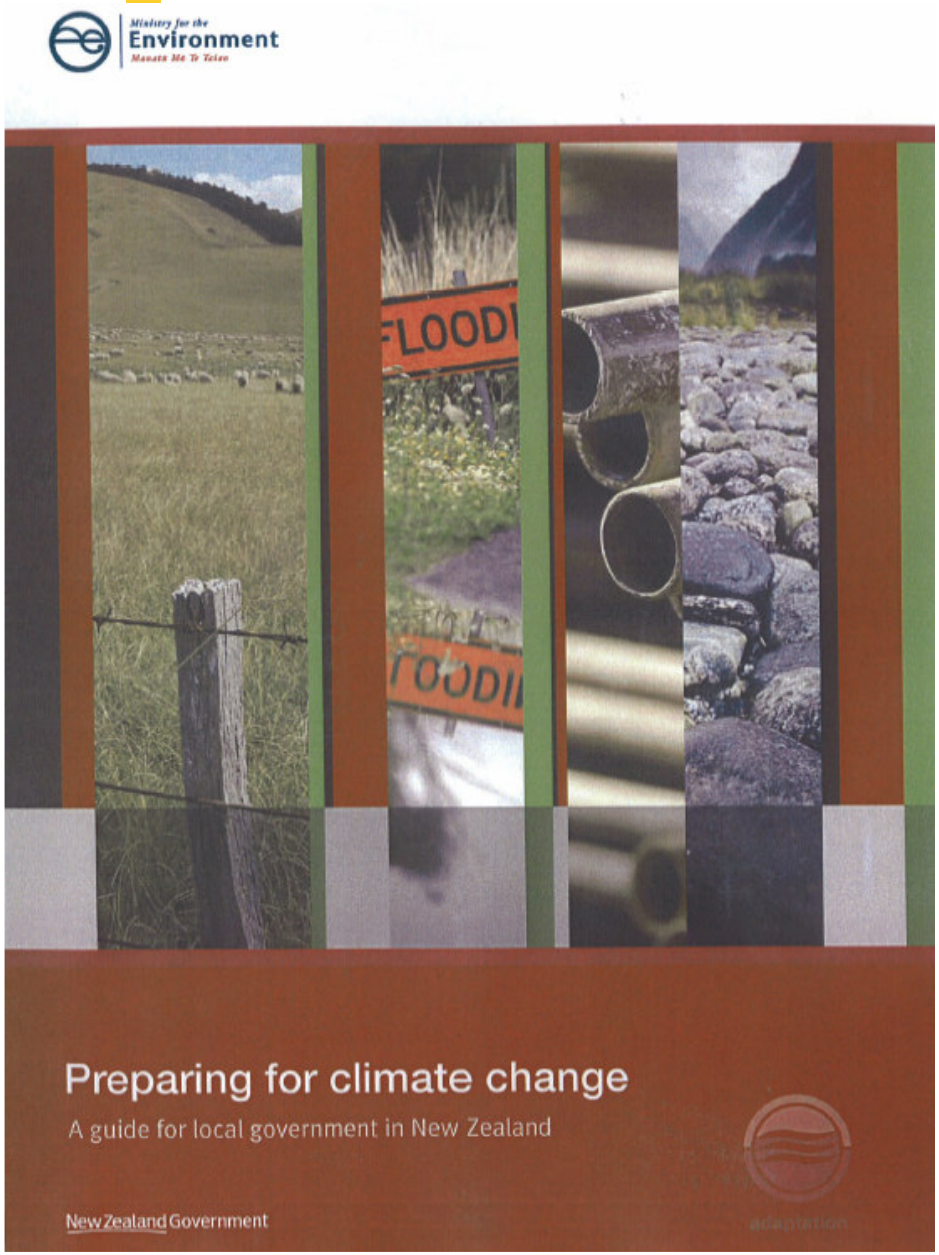
Problem

- Competing demands for freshwater resources

New Planning Approach – based on:

- Protection, allocation and use of freshwater
- Prioritisation of municipal supply
- Supported by Water Conservation and Demand Management Plans
- Environment Waikato Proposed Regional Plan Variation 6 - Water Allocation

Preparing for Climate Change

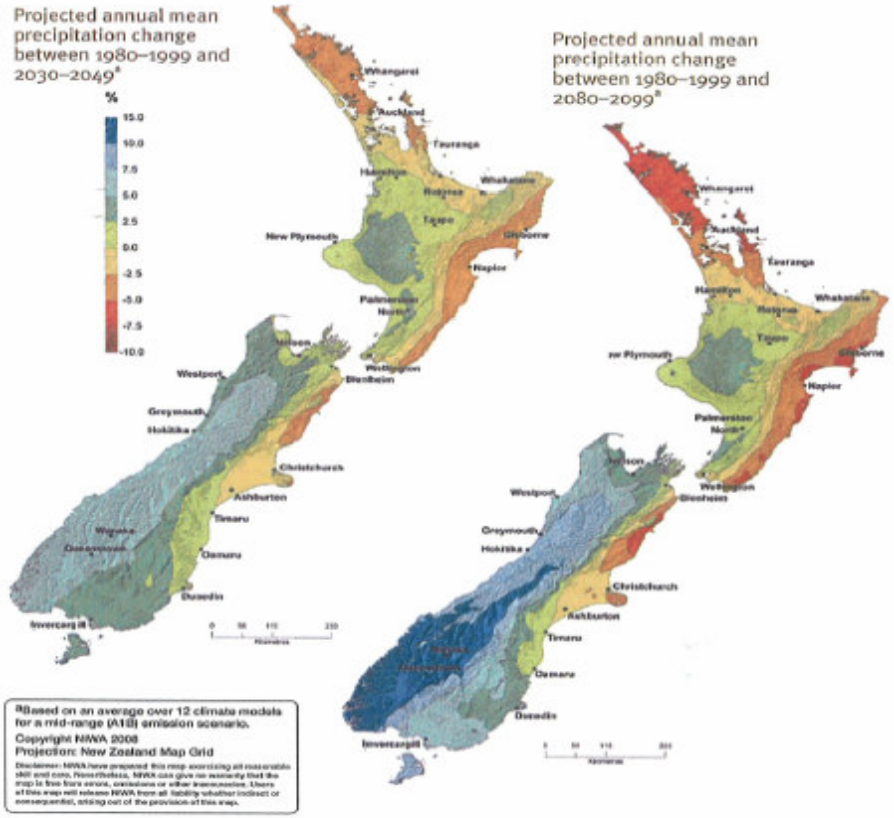


Projected changes in rainfall

Figure 2 shows that the projected mid-range change in the average annual rainfall has a pattern of increases in the west (up to 5 per cent by 2040 and 10 per cent by 2090) and decreases in the east and north (exceeding 5 per cent in places by 2090). This annual pattern of 'wetter in the west and drier in the east' results from the changes in the dominant seasons of winter and spring.

Figure 2: **Projected mid-range changes in annual mean rainfall (in %) relative to 1990.**

The changes shown are an average of the results of 12 climate models for a mid-range IPCC emissions scenario.

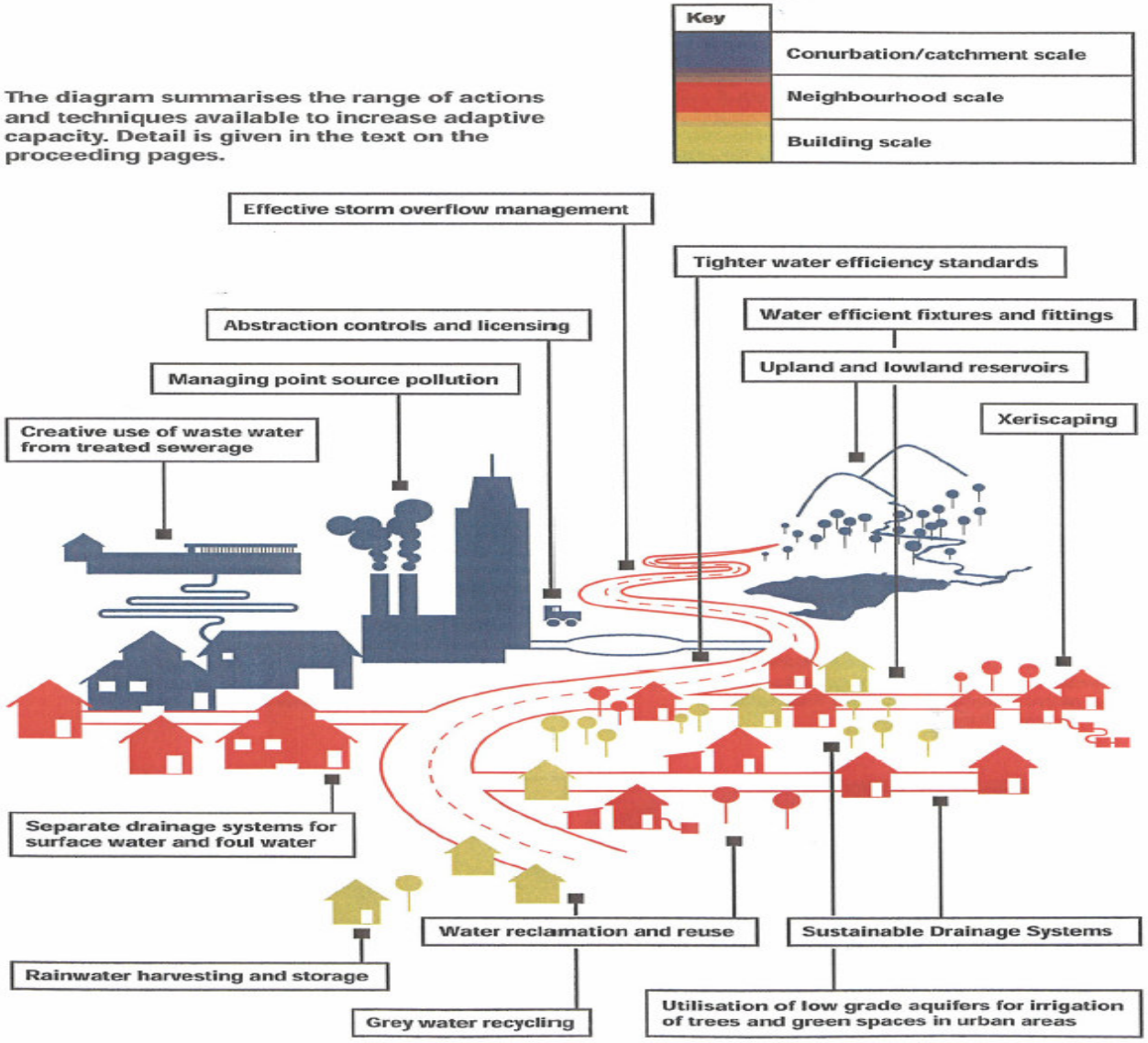


Newly projected changes in seasonal mean rainfall (Figure 3) show a different and more marked seasonality than was evident in earlier projections used in the previous edition of this guide. The latest mid-range model results suggest that increased westerlies in winter and spring will bring more rainfall in the west of both islands and drier conditions in the east and north. Conversely, there will be a decreased frequency of westerly conditions in summer and autumn, with drier conditions in the west of the North Island and possible rainfall increases in Gisborne and Hawke's Bay.

Integrated Water Management

menu of strategies for managing water resources and quality risks

The diagram summarises the range of actions and techniques available to increase adaptive capacity. Detail is given in the text on the proceeding pages.



Reference:
Climate Change Adaption by Design - A Guide for Sustainable Communities

Adapting to Climate Change

Reference:

Adapting to climate change impacts on water management: A Guide for Planners

prepared for the South East England Regional Assembly

by AEA Technology

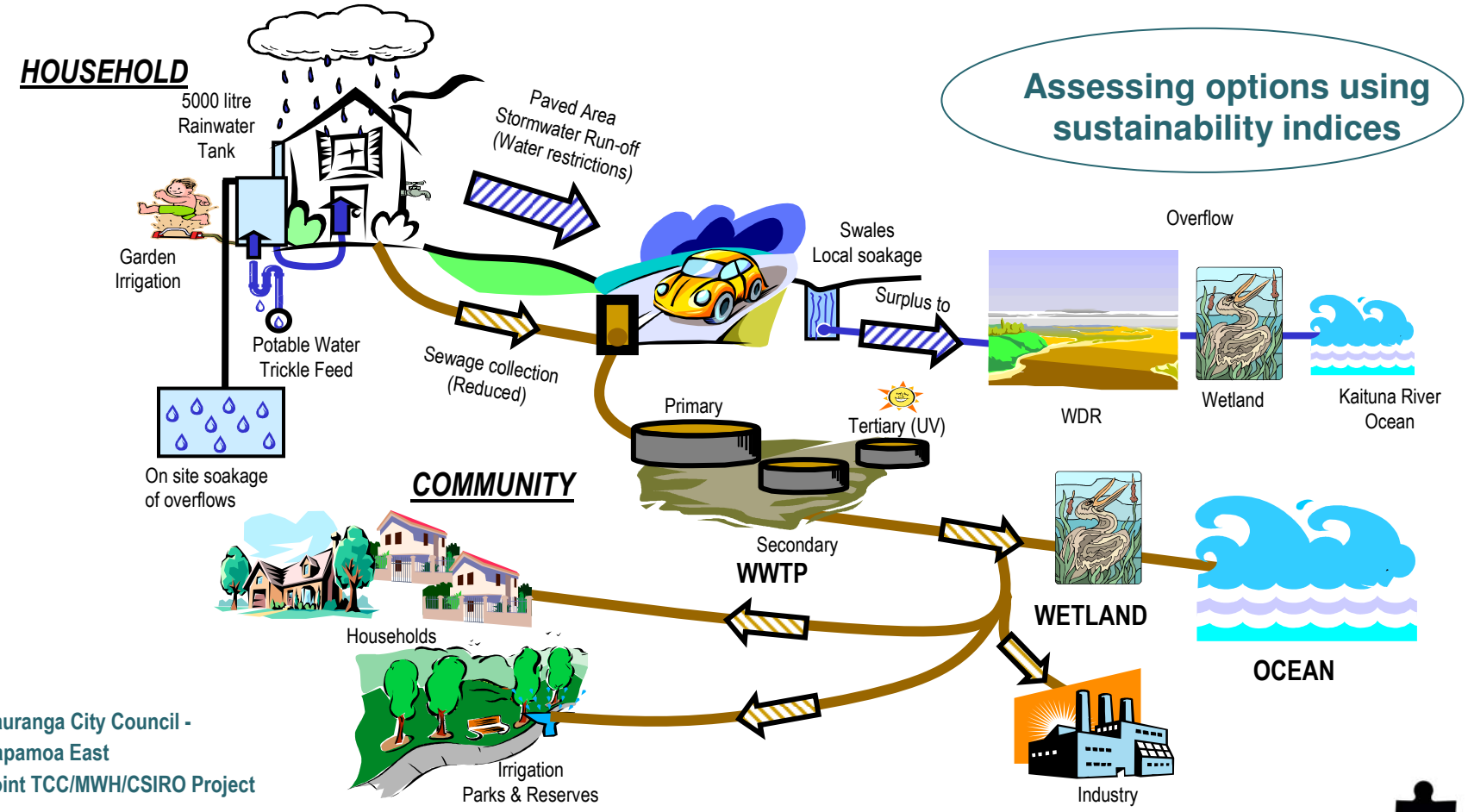
May 2006

Menu of adaptation options

The Guide provides suggestions of water-management measures you could consider to ensure your development, proposal, or policy is adapted to the impacts of climate change. These are summarised in a menu.

Risk	Adaptation measures to consider in new development:	Principle
Pressures on water resources	Water efficient fixtures and equipment within developments	Water reduction
	Water meters to encourage demand management	
	Water efficiency in gardens/communal greenspace through choice of species as part of landscaping schemes	
	Rainwater use systems	Water reuse
	Greywater use systems	Water recycling
Addressing flood risk	Development zoning	
	Provision of safe access	
	Land raising and raising floor levels	
	Flood warning	
	Flood proofing walls (internal and external) and floors	Flood proofing
	Flood proofing fixtures and fittings e.g. raising circuitry levels	
	Temporary barriers (require developers to provide information packs)	
	Flood proofing gardens	
	Design of channel and hydraulic structures	
	Developer contributions to strategic flood risk management	
	Compensatory flood storage	
	Filter strips, soakaways, swales, filter drains, infiltration basins, detention basins, retention ponds, permeable and porous paving surfaces, infiltration trenches	Management of development runoff (SUDS type measures)
	Minimisation of directly connected areas	
	Reed beds and wetlands	
	Green roofs	
	Use of flood defences and pumping to drain the low-lying area behind defences	
Resilience to other water-related climate change impacts	Under-pinning buildings (cost depends on access, depth of soil, severity)	Subsidence
	Construct new buildings with deep foundations (in some cases may require the use of pile-and-ground-beam foundations)	
	Rendering brickwork (protection to the building structure; reduces surface weathering)	Responding to increased rain and damp
	Damp courses (chemical damp-proof course to minimise dampness rising above the physical damp-proof course)	

Integrated Urban (three) Water Systems



Tauranga City Council - Papamoa East Joint TCC/MWH/CSIRO Project

How is the progress on Three Waters in Urban Canterbury?

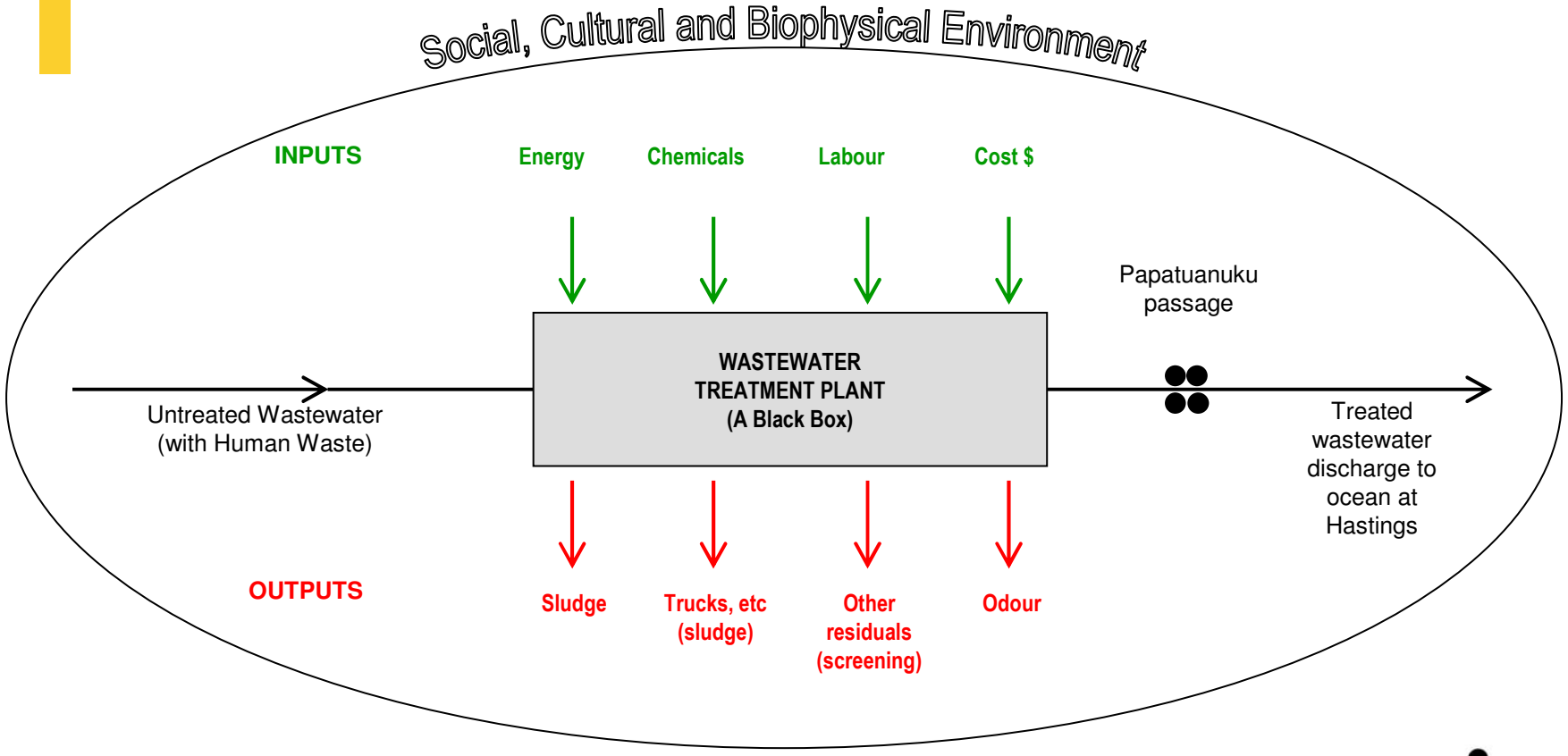
Low Impact Design (LID)

Sustainable Urban Stormwater Management – Kapiti DC

Low Impact Design (LID)

Tools and Techniques

Holistic Approach to Wastewater Management



Need for a holistic approach in 'effects' assessment

Tools and Techniques

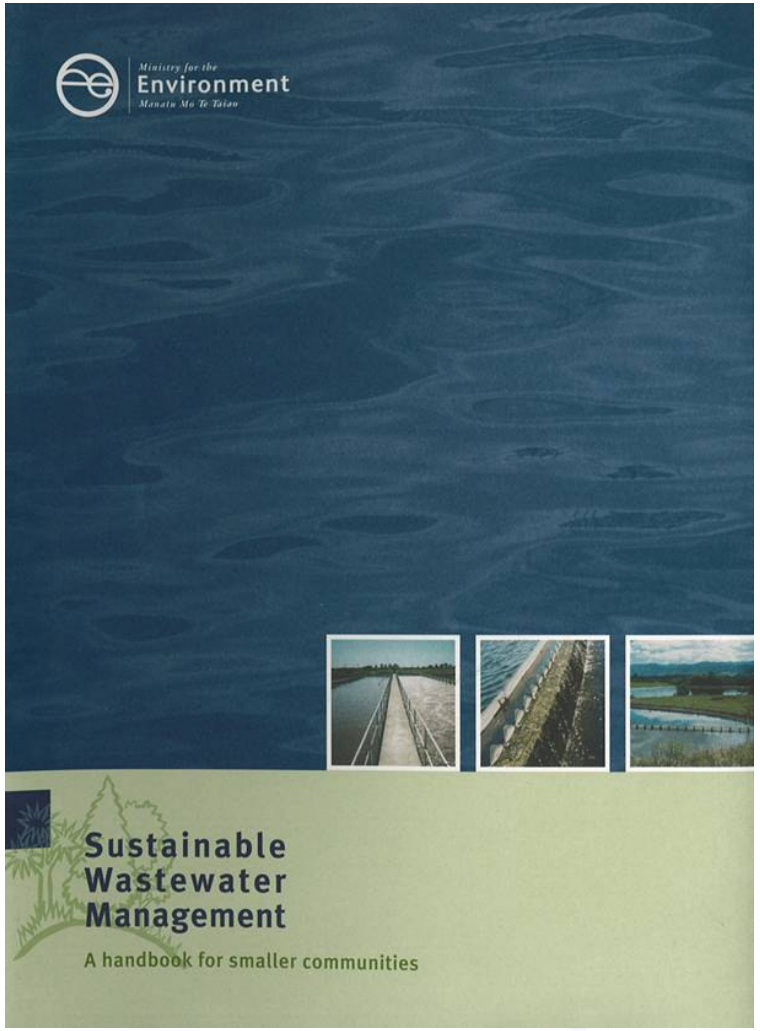
Sustainable Wastewater Management

- Reflects a Sustainable Development framework
- Systems thinking
- Consultation
- Recognition of Maori perspective
- Integrated urban (three) waters approach
- Water conservation / Waste reduction
- Using ecosystem services
- Subsidy scheme allocation criteria

A useful handbook with a new term

"Eco-system Re-entry"

How are Canterbury TLA's progressing with sustainability in wastewater schemes?



Tools and Techniques

Cumulative Adverse Effects
A Biggie in My Book!

- RMA Meaning of Effect
  - *d) any cumulative effect which arises over time or in combination with other effects"*
- The difficult one as highlighted by a number of commentators
- A key water quantity and quality issue one for intensification of dairying and other rural uses – especially in Canterbury
- "When is Enough, Enough? Dealing with Cumulative Effects under the Resource Management Act". Paper by Philip Milne
  - Enough tools under the RMA
  - Need to more effectively use these tools
  - Need to play catch-up with cumulative effects

Flashback 1978: Templeton Sewage

SURFACE IRRIGATION WITH SEWAGE EFFLUENT IN NEW ZEALAND - A CASE STUDY

Bert F. Quin

Winchmore Irrigation Research Station, Ministry of Agriculture and Fisheries, Ashburton, New Zealand

New Zealand's oldest existing sewage effluent irrigation scheme, situated at Templeton, Christchurch, was commenced in 1958 and now serves a population of 2000.

The chief cause of concern is the considerable loss of nutrients (particularly nitrogen) in the drainage, which contained 15-20 mg/l of NO_3-N. The chemical composition of the drainage was clearly reflected in the shallow groundwater immediately downstream of the effluent irrigation scheme. If a limit of 10 mg/l of NO_3-N for potable waters is enforced,

Cumulative Effects

Rural subdivision and development – cumulative impact on groundwater quality

by Chris Nokes[1], Hilary Michie and Liping Pang, Water Management Group, Institute of Environmental Science and Research Ltd, Christchurch

Impact of clustered septic tanks on groundwater quality

Nitrate

The field survey carried out by Sinton (1982) demonstrated elevated Nitrate levels in groundwater, with a clear trend of increasing nitrate concentrations in the down-gradient groundwater as the number of up-gradient septic tank systems increased.

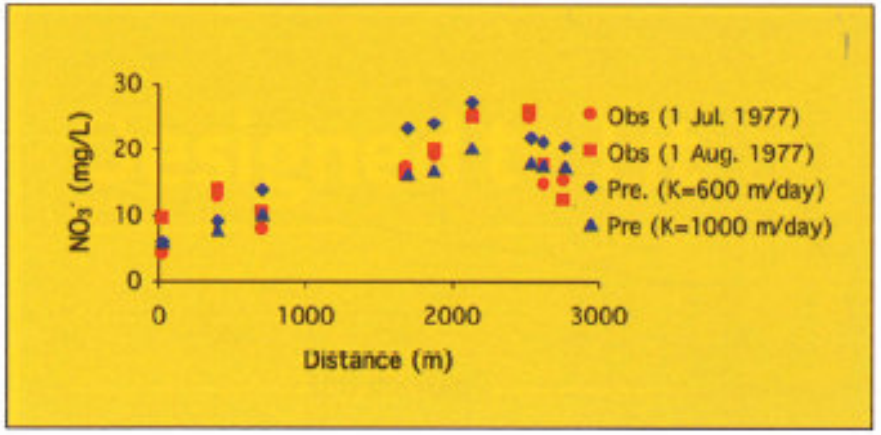
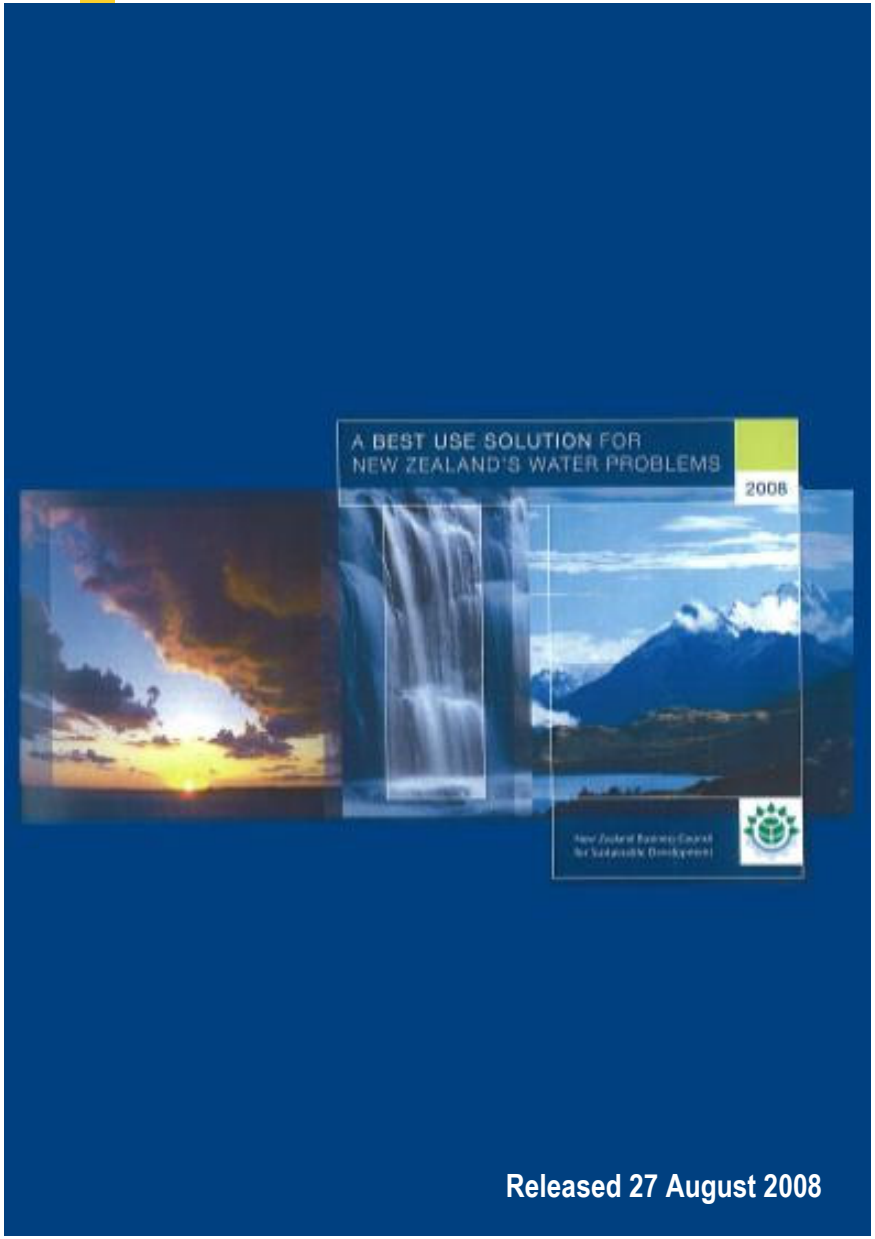


Fig. 1. Comparison of nitrate concentrations in groundwater simulated by Pang et al. (2006) and observed in 1977 by Sinton (1982) for the nine wells that were sampled on the same dates (1 July 1977 and 1 August 1977).

Proposed National Policy Statement for Freshwater Management

- **How do the nine Objectives stack up?**
  - Objective 1 – Enabling well-being of people and communities
  - Objective 2 – Ensuring integrated management of effects on fresh water
  - Objective 3 – Improving the quality of fresh water
  - Objective 4 – Recognising and protecting life supporting capacity and ecological values
  - Objective 5 – Addressing fresh water degradation
  - Objective 6 – Managing demand for fresh water
  - Objective 7 – Efficient use of fresh water
  - Objective 8 – Iwi and hapu roles and tangata whenua values and interests
  - Objective 9 – Ensuring effective monitoring and reporting
- **The test will be in the implementation!**

NZBCSD "Best Solution for NZ's Water Problems" Report



Released 27 August 2008

CONTENTS

Contents

The Elusive Sustainable Development – Putting it in a 'Middle New Zealander' language

- *"It is about health, pleasure, freedom and fulfilling peoples potential within environmental limits. And this is about quality of life and quality of place".*

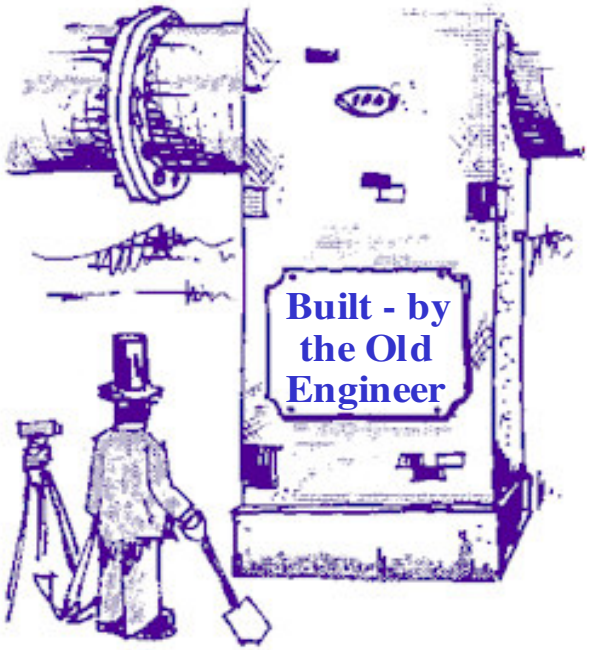
  Jonathan Smales, www.beyondgreen.co.uk

- *Futureproofing – NZ Business Council Sustainable Development (NZBCSD)*

Getting it Right

Our NZ Sustainable Development Journey

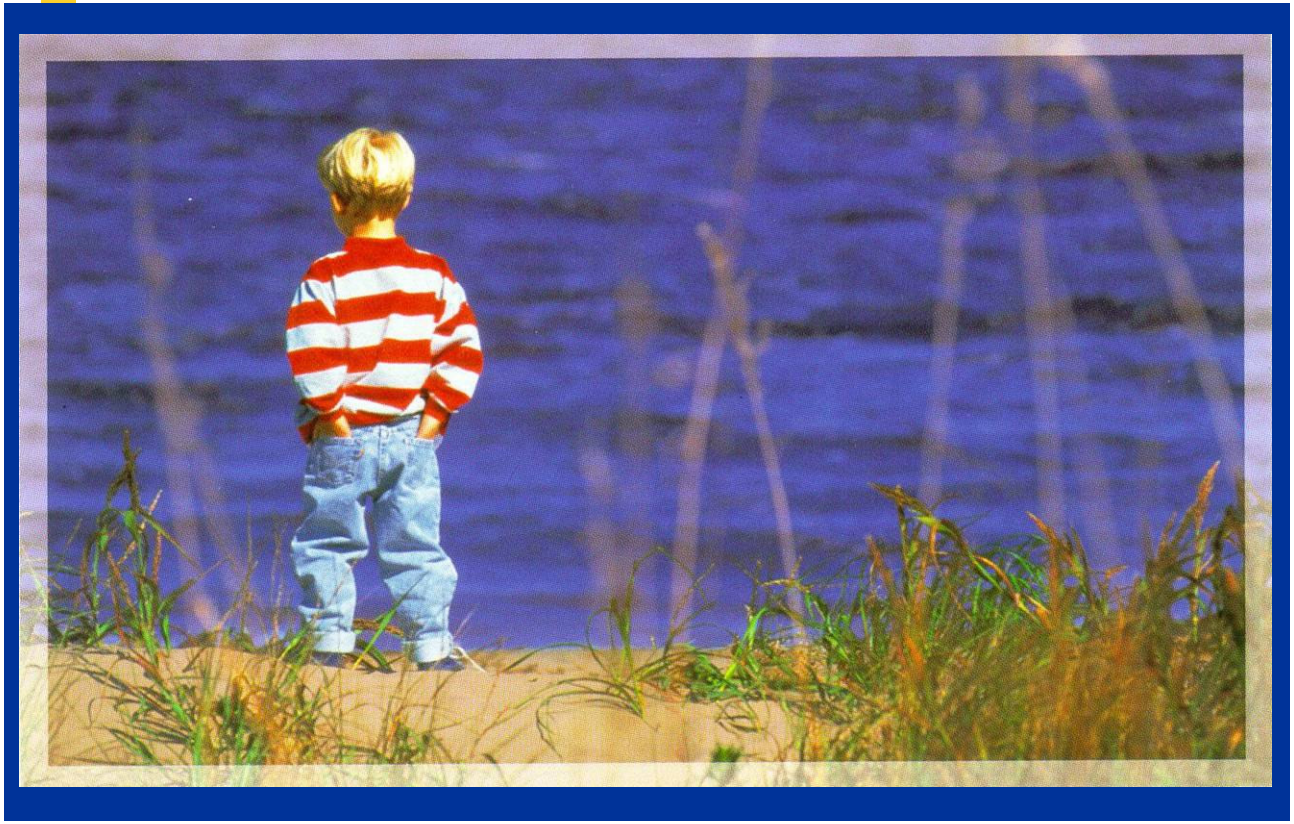
Efficiency means build less, or nothing - hard for engineers!



Visible construction to meet society's *wants*

Refurbishing the minimum to meet society's *needs*

The Sustainable Development Journey



"A hundred years from now it will not matter what my bank account was, the sort of house I lived in or the kind of car I drive…But the world may be different because I was important in the life of a child".