Manaaki Whenua
Landcare Research

Low Impact Urban Design and Development: making it mainstream

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Manaaki Whenua Landcare Research
and University of Auckland

Urban research for change

Settlement Form and Futures:
- Taxonomy
- Rating
- Futures

Conservation Subdivision

Self-Sufficient Neighborhoods

Urban ecological restoration

Household Dynamics

LIUDD:
- Getting buy in
- Technological and Ecological efficiency
- Economic viability
- Supportive plans and practice

Sustainable Buildings:
- Tamaki Rating and Assessment

Key Issues and Challenges

Issues

- Sprawl and loss of green space
- Contamination of urban and surrounding environments
- Inefficient use of energy, water, and infrastructure
- Conflicting priorities in an adversarial planning environment

LIUDD Challenges

- Enhance liveability
- Protect and incorporate natural systems and technological advances
- Reduce energy demand, waste generation, infrastructure costs
- Align planning processes

Goal: 30% new urban developments take LIUDD approach by 2008

The Way Forward

Four-pronged approach

- **Getting buy-in (1)**
- **Demonstrate technical + ecological efficiency (2,3)**
- **Demonstrate economic viability (4)**
- **Develop supportive plans and codes of practice (5)**

What's the economic problem?

Context

- Demand for enhanced urban drainage is growing
  - New development (infill and green field)
  - Landowners subject to localised flooding
- Receiving environments are deteriorating

Symptom

- Uptake of LIUDD is limited
- No source control
  - Emphasis on engineered drainage solutions
  - Reliance on education and some enforcement

Diagnosis

- Insufficient information
- Inadequate policies and processes

What do we need to know?

A Cost Benefit Approach

- **What level of avoidance, mitigation, or remedy is appropriate?**
  - How do we fairly and efficiently charge for services and benefits?
  - Will price alter consumer use of energy, water, and waste services?

- **What are the costs and benefits of using a low impact approach to urban design and development**?
  - What are the relative costs of conventional and LID approaches?
  - Is a low impact approach economically rational for the private land owner or developer?

What do we need to change?
An Institutional Approach

- **Reduce costs of adopting a low impact approach**
  - Improving understanding: developers, purchasers, Councils
  - Developing technical standards

- **Reduce additional costs of LID options**
  - At establishment (consultation, legal)
  - In operation (maintenance, monitoring)

- **Distribute the costs fairly and efficiently**
  - Equalising marginal abatement costs
  - Targeted rates, charges and contributions

FRST Contract

Target outcome:

- A mix of private and public investment in LIUDD that maximises benefit to the community.

Purpose:

- Determine the private and public benefits and costs of LIUDD at different spatial scales (household, neighbourhood, catchment).
- Evaluate alternative institutional mechanisms to maximise community benefit from urban development.

LIUD Device Database and Models

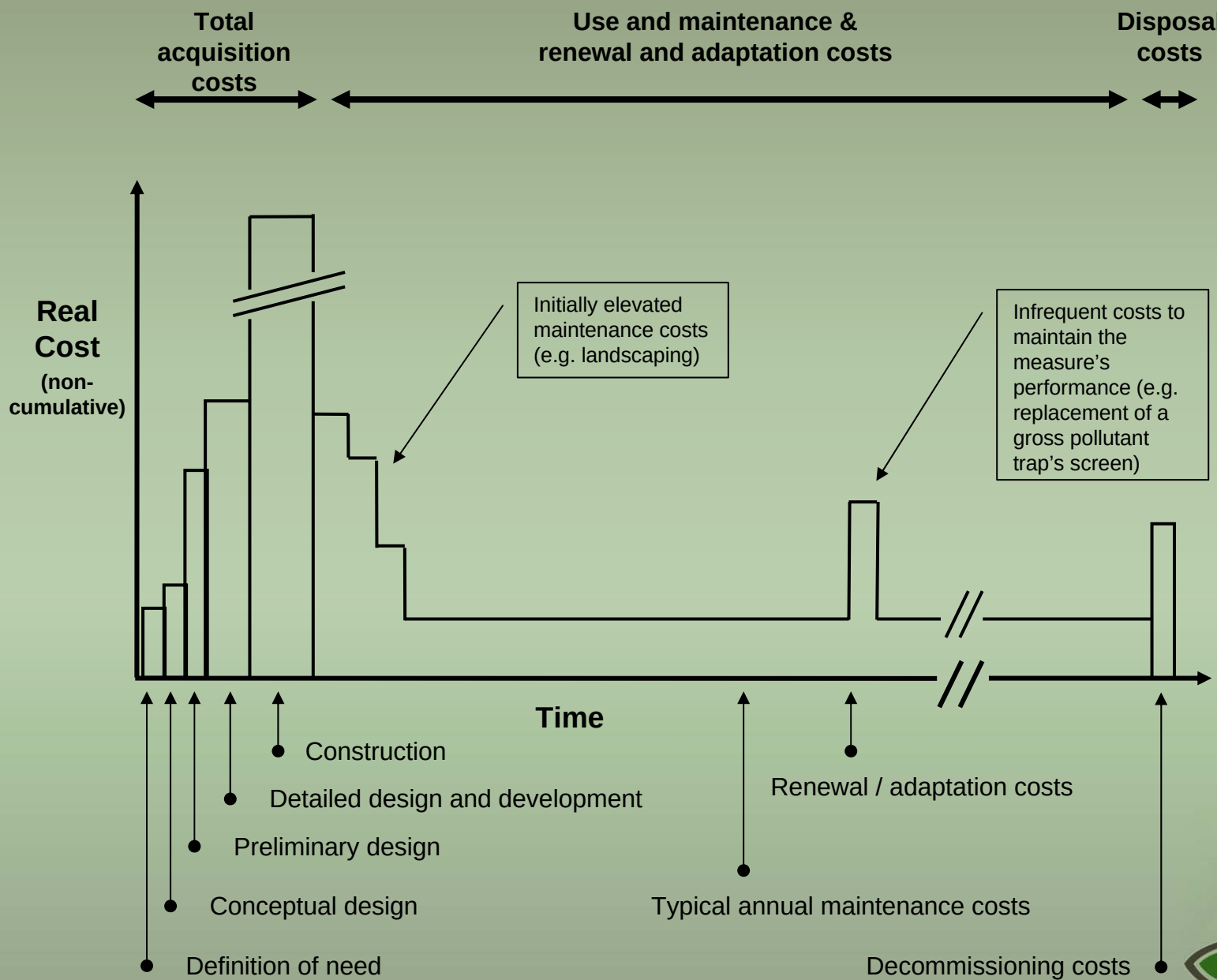
(Eva Vesely, Michael Krausse, ARC, Monash)

Issue and objective:

- What are the relative costs and performance of conventional and LID approaches in New Zealand?
- Develop an “open-access” living database of cost and performance data for LID devices in New Zealand.

Progress to date:

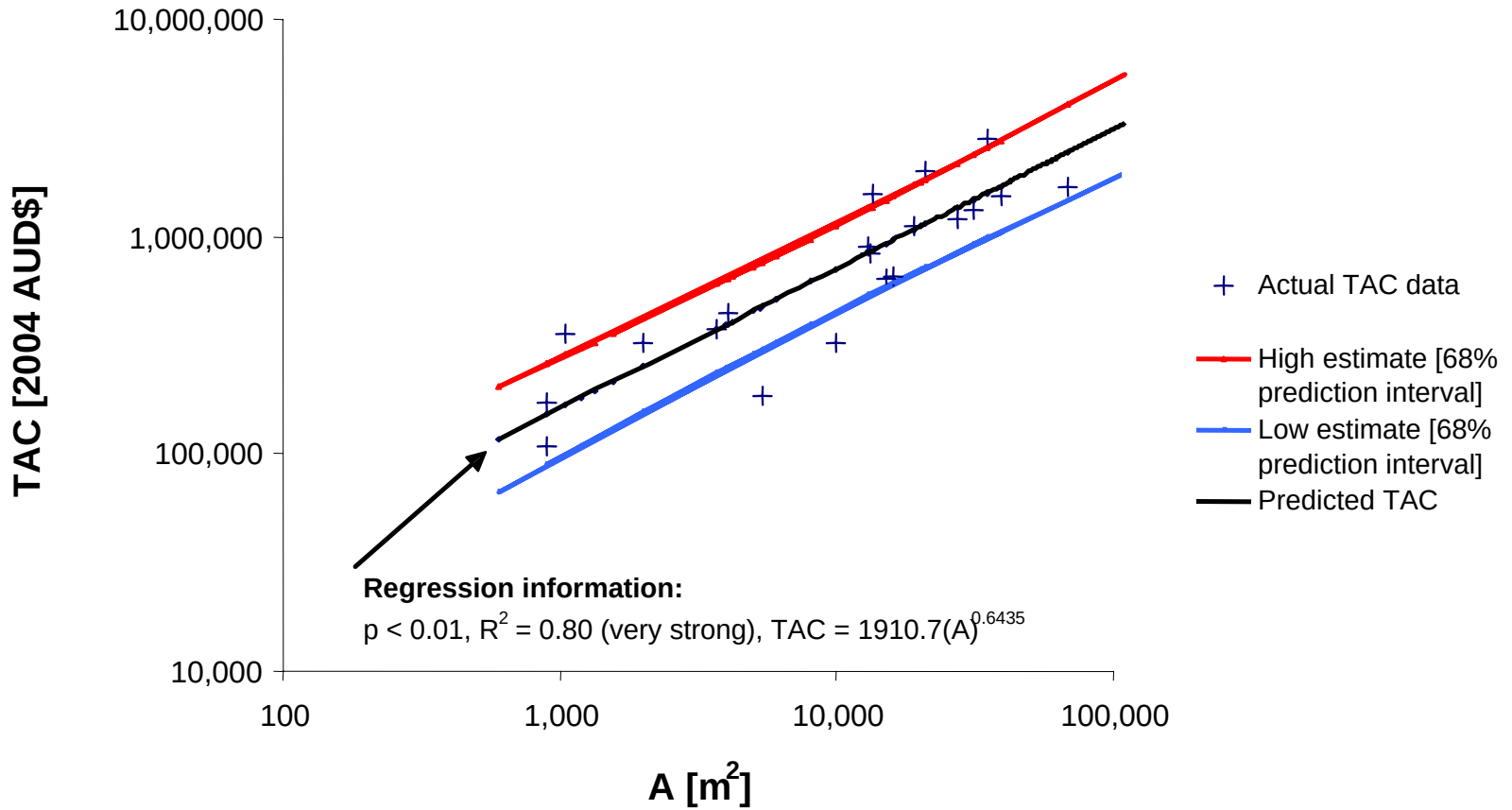
- Survey of TAs nation wide for available data.
- Partnership with the ARC and Monash University
- Developed a New Zealand data protocol for collecting construction and operating cost data for stormwater devices.
- Collected data from 7 Auckland TAs



Source: Andre Taylor, CRC Catchment Hydrology

Greenfield Constructed Wetlands:

Total acquisition cost [TAC] vs. Treatment zone area [A]



Source: Andre Taylor, CRC Catchment Hydrology

Auckland LCC Device Database

Sediment basins and ponds	Online wet	33
	Offline wet	10
	Dry	14
Constructed wetlands		8
Gross Pollutant Traps	Proprietary devices	29
	Litter traps	20
Bioretention devices	Swales, Filter strips	11
	Rain gardens	9
Infiltration systems		17
Sand filters		11
Sediment traps		4
Rainwater tanks		1

LIUD Device Database and Models

Plans for the next 12 months:

- Establish and deliver a New Zealand life cycle cost database.

Challenges:

- How do we encourage uptake of the data protocol?
- How do we overcome the barriers to data gathering and sharing?

Life-cycle Analysis

(Robbie Andrew, Eva Vesely)

Issue and Objective:

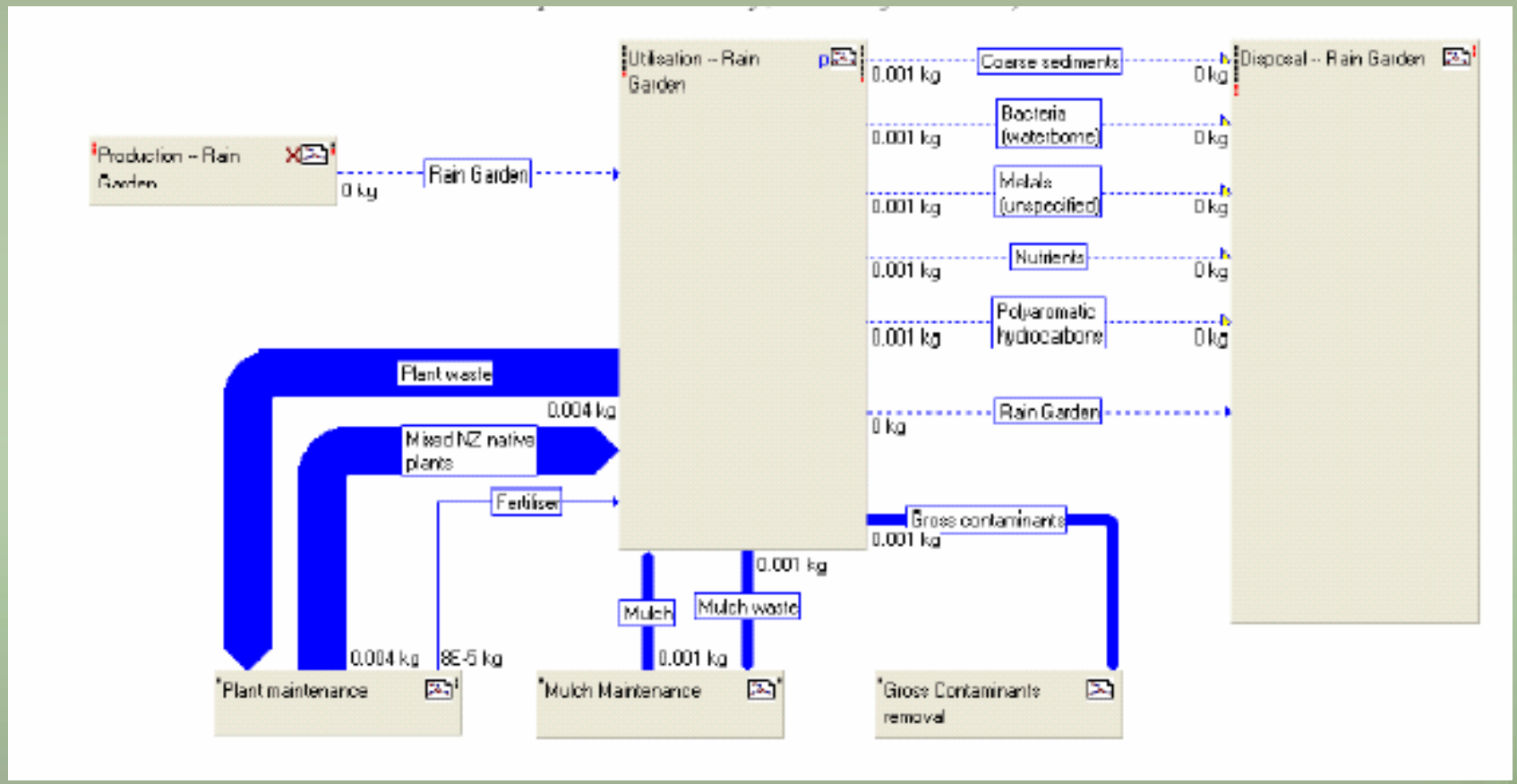
- Are low impact devices really all that environmentally friendly?
- Assess the “cradle to grave” environmental impacts of a low impact stormwater management device and its conventional alternative.

Progress to date:

- Developed data collection and analysis procedures and experience.
- Identified a case study rain garden (under construction)

Life-cycle Analysis

(Robbie Andrew, Eva Vesely)



Life-cycle Analysis

Plans for the next 12 months:

- Complete LCA of the Paul Matthews Road rain garden and an equivalent (detention pond).

Challenges:

- What will the LCA results reveal c.f. whole life costing?
- Will LCA prove to be a cost effective analytical tool for TAs?

LIUDD Case Studies

(Eva Vesely & Michael Krausse)

Issue and Objective:

- The theory is fine, what happens in practice?
- Evaluate the economic costs and benefits of LIUDD implemented at the subdivision or development scale.

Progress to date:

- Completed a review of the introduction of on-site stormwater management to Glencourt Place, North Shore City.

Glencourt Place Case Study

NPV Comparison ($000)	50 years		100 years	
	3.5%	10%	3.5%	10%
Conventional	619	612	621	612
Low impact	703	639	732	640
Difference	+14%	+4%	+18%	+5%
Low impact with water savings	643	612	661	612
Difference	+4%	-	+6%	-

LIUDD Case Studies

Plans for the next 12 months:

- Initiate a comparative evaluation of a green-fields LIUDD case study.

Challenges:

- Majority of case studies are rural residential.
- What are the implications of the distribution of costs and benefits between stakeholders?
- How do we link device and treatment train performance data with environmental benefits valued by the community?

Market acceptance of LIUDD

(Basil Sharp & Michael Krausse)

Issue and Objective:

- Does LIUDD affect the market value of properties?
- Complete a hedonic price survey of residential sales in Auckland to determine the impact of environmental variables.
- Identify and evaluate the impact of LIUDD elements on property value and sale price.

Progress to date:

- Preliminary hedonic analysis complete.

Market acceptance of LIUDD

Plans for the next 12 months:

- Complete and present results of the hedonic survey.
- Complete a qualitative comparative survey of residential property owners with and without LIUDD elements.

Challenges:

- How do we draw lessons from low impact rural residential development for medium/high density urban development?

Public benefits of LIUDD
(Basil Sharp)

Issue and Objective:

- What value does the community place on the ecological health of receiving environments (urban streams, estuaries, harbours, beaches)?
- Complete choice modelling surveys of values placed on changes in environmental condition of receiving environments.
- Evaluate the impact of LIUDD elements on environmental outcomes.

Progress to date:

- Completed contract report on values associated with urban stream health for ARC.

Public benefits of LIUDD

Part Worths ($/hhld/ann)	Natural Stream		Degraded Stream	
	North Shore	South Auckland	North Shore	South Auckland
Water clarity	66	67	48	73
Native fish spp.	11	5	4	0
Fish habitat	-1	-3	13	5
Moderate native vegn.	28	16	21	36
Plentiful native vegn.	21	41	20	55

Source: Kerr and Sharp 2003, AERU Research Report 256, Lincoln University

Public benefits of LIUDD

Plans for the next 12 months:

- Complete a choice modeling survey of values associated with coastal receiving environments for ARC.

Challenges:

- How do we incorporate these values in decision making about policy, service provision, rating and charges?

Efficient institutions and funding

(Michael Krausse, Geoff Hunter, Basil Sharp)

Issue and Objective:

- Do the present structures (industry, local government) and funding mechanisms facilitate low impact development?
- Evaluate potential stormwater management options and organisational and funding arrangements to implement these.

Progress to date:

- Discussion papers in preparation:
  - The influence of the current land development process on adoption of LIUDD
  - Funding options for sustainable stormwater management

Efficient funding options

Efficient mitigation

- Appropriate levels of service
- Effective targeting of effort

Efficient charging

- Targeted rates
- Road user contributions
- Efficient development and financial contribution mechanisms

Efficient institutions and funding

Plans for the next 12 months:

- Identify and prioritise opportunities and constraints for alternative models under the LGA
- Further develop high priority models.

Challenges:

- How do we distribute and incentivise abatement efficiently?
- What should be the balance between fixed discharge limits, targeted rates, development charges and contributions, incentives etc?
- What are the implications for monitoring and enforcement costs?

Water pricing and sustainable water use

(Karen Kviberg & John Craig)

Issue and Objective:

- What would sustainable water use look like?
- What determines public acceptance of water pricing proposals?
- Develop policy recommendations to achieve sustainable water use.

Progress to date:

- Successful University of Auckland Doctoral scholarship application.
- Project proposal complete, literature review and method development complete.

Water pricing and sustainable water use

Plans for the next 12 months:

- Collection of water consumption data from TAs in Auckland, Wellington and Christchurch
- Complete willingness to pay survey of 500 households in Auckland, Wellington and Christchurch.

What's next

Challenges

- How do we ensure effective use of economic information when infrastructural alternatives are being considered?
- Changing property rights requires community acceptance, political will, or compensation.
  How do we facilitate the development of the conditions for change?

Accessing Information and Contact Details

www.landcareresearch.co.nz/research/urban/