



low impact urban design and development

concepts

policy

practice

What we can learn from overseas

Policy instruments to promote the uptake
of low impact urban design and development

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Executive Summary

The purpose of this project has been to identify policy instruments that have been used overseas to facilitate the application of Low Impact Urban Design and Development (LIUDD) in land development activities and to initiate thinking on how these may be applied in New Zealand. Councils are looking for innovative ways to encourage LIUDD and are interested in the policy approaches could be used to facilitate the uptake of LIUDD in New Zealand. Particular interest has been paid to examples where LIUDD has been integrated into the wider context of urban design and development and where approaches have facilitated a shift towards more innovative practice.

The research provides an insight into international experience and has identified a suite of techniques which range from enabling design flexibility, providing physical and financial incentives, technical support and capacity building initiatives through to regulation. The type of approaches selected for implementation in a given location are dependent on a number of contextual variables including the regulatory framework and local objectives for environmental management, growth, infrastructure provision and quality urban design. In almost every situation, the overriding approach that has been taken is a mix of policy instruments, supported by a range of tools and capacity building initiatives that enable the successful implementation of an approach and the tangible realisation of policy objectives.

Detailed below is a summary of the policy instruments that have been used overseas to promote the uptake of LIUDD.¹ Specific examples of where these have been applied are provided in the body of the report.

Design Flexibility

Local planning provisions allow for flexibility in the design approach used to meet stormwater management requirements. This can encourage innovative site design and the integration of LIUDD as an approach to development.

LIUDD Stormwater Modelling Credits

Provision of credits in the stormwater model used to determine stormwater management requirements for the development activity in order to recognise the integration of LIUDD in a development proposal. Credits acknowledge the value of sustainable design techniques and can reduce the scale of, or need for, downstream stormwater treatment systems.

Density Bonuses and Development Incentives

Developers can gain approval for building heights or floor areas beyond those permitted in local planning rules by integrating LIUDD principles and techniques into development proposals. A similar incentive can be offered to encourage LIUDD by reducing development requirements such as parking and street improvements.

Technical Advisory Service

The provision of technical advice can be directed at both local government agencies and the development community. Funding and technical support provided for local authorities to enhance planning requirements and supporting tools, such as infrastructure manuals and codes of practice, can promote the uptake of LIUDD. Provision of free technical advice

1. LIUDD is a New Zealand concept that embraces elements of stormwater management, urban development and sustainable design. Internationally there are a range of terms used to describe these approaches, however the term LIUDD has been used in the Executive Summary to present project outcomes in a New Zealand context. A discussion about the definition of LIUDD and international terminology is provided in the body of the report.

to developers from professionals with LIUDD expertise during the design stage of a project can encourage the integration of LIUDD and support the development of quality permit (consent) applications.

Fast Track Permitting and Reduced Permit Fees

Developments incorporating LIUDD principles and techniques can qualify for 'fast track' permitting (consenting) processes and reduced permit (consent) fees. This can provide assurance that permit (consent) processing for LIUDD projects will take no longer than conventional stormwater management permit (consent) applications and can offer reduced costs for this approach.

Reduced User Fees

Discounts in commercial and residential stormwater fees/rates can be offered as an incentive to implement LIUDD techniques on site. The range of acceptable methods can be defined by the local authority and fee/rate reductions can be scaled according to the extent to which LIUDD is implemented.

Stormwater Offsets and Credit Trading

A stormwater offset or trading scheme is a market based approach that provides an economic incentive for developers to meet LIUDD or stormwater management targets. Monetary contributions are required where management standards cannot be met within a development and the funding is directed towards other stormwater management or development objectives to ensure targets are achieved on a catchment scale.

Financial Assistance and Capacity Building

Programmes that providing funding, advice or support can encourage actions that reduce stormwater impacts through the implementation of LIUDD principles and techniques. These programmes often include a significant community outreach and education component and are aimed at improving skills, knowledge and expertise, as well as providing localised stormwater improvements. Examples include downspout disconnection and rain garden implementation projects, provision of funding for research and demonstration projects, interpretation signs and outreach initiatives.

Regulations

Mandatory stormwater management regulations have been adopted by some government agencies, which set minimum standards that must be met by all developments. The establishment of regulations appears to follow many years of voluntary approaches to encourage the application of LID principles and techniques.

Enabling factors that have supported the development and implementation of these policy instruments are outlined below.

- Knowledge of LIUDD philosophies and techniques by both the development community and regulatory agencies.
- Adequate staff and resources to support new approaches and to actively seek opportunities to promote LIUDD in development.
- Passionate and visionary leaders who have made a commitment to support sustainable urban water management solutions, and who advocate and empower people to take this approach.

- Interdisciplinary teams and organisational processes that enable integrated decision making in developing policies and tools, and providing advice and assessment services for innovative development applications. An integrated process can assist in achieving buy-in to an approach across a range of disciplines and audiences, avoid the development of contradictory policy objectives and support the delivery of multiple urban outcomes.
- A clear understanding of the problem that identifies LIUDD as a solution and an organisational vision and set of values that can guide decision making.
- Quality data, information and clear management objectives to provide the justification of LIUDD as a policy approach.
- Community outreach and consultation during the development of a policy approach to upskill the community about the problem, seek their input to the proposed solutions and gain support for the adopted policy approach.
- Criteria and guidance material that provides certainty to both regulatory agencies and the development community about acceptable approaches and how these will be assessed.
- The use of clear and meaningful language that facilitates shared understanding and levels of understanding across disciplines and audiences.
- Introduction of voluntary policies with incentives for innovative performance for the private sector and mandatory requirements for the public sector to demonstrate leadership, build capacity and recognise best practice. Regulations are introduced much further down the track (5–20 years) and are likely to be better supported by an informed community and improved levels of practice.

All of the policy instruments described in this report that have been used to promote the uptake of LIUDD overseas are potentially transferable to New Zealand. The policy mix that will be most appropriate in a given location will depend on the local context, policy objectives and the capacity of government and industry to implement LIUDD.

There is significant potential for LIUDD to enhance the sustainability of the built environment through an integrated approach to urban design and land development in New Zealand. Many local, district and regional councils are seeking more innovative ways to deliver a range of outcomes as a part of the urban development process and to better utilise their policy framework to enable this. Some have already taken steps to promote the uptake of LIUDD and provide an opportunity for national learning.

The next step in building on the understanding provided in this project is to work with councils seeking to integrate LIUDD into their approach to urban development and to design tools and processes to support this transition.

1. Introduction

Councils are looking for innovative ways to encourage LIUDD and are interested in the policy approaches that could be used to facilitate the uptake of LIUDD in New Zealand. Increasing pressure is continuously being felt by government agencies responsible for establishing a clear policy direction to guide urban development and to provide tools to support policy implementation. The challenge comes in trying to achieve multiple urban outcomes, in an efficient manner and across a range of objectives including the accommodation of a growing population, the provision of infrastructure, environmental integrity, good urban design and quality of life.

The legislative framework that guides urban development in New Zealand promotes a sustainable approach to natural resource management and community wellbeing. The challenge in delivering sustainable solutions requires innovative approaches to problem definition and identification of opportunities to integrate outcomes for efficient implementation. Low Impact Urban Design and Development (LIUDD) is an approach to urban development and stormwater management that provides a process that can guide integrated decision making and facilitate the delivery of multiple sustainable urban outcomes.

This purpose of this project is to investigate a range of policy instruments that have been used overseas to facilitate the uptake of LIUDD and discuss how transferable these approaches could be to New Zealand. There is a particular interest in examples that have been successful in changing practice from conventional to more innovative approaches to urban development and stormwater management.

1.1 Background

The evolution of LIUDD and the current challenges around its implementation are briefly described below. This draws on the significant amount of research currently being undertaken by the LIUDD research programme and aims to provide a context within which to discuss the range of policy instruments that could be applied in New Zealand to promote the uptake of LIUDD.

1.1.1 Low Impact Urban Design and Development

In New Zealand, the term LIUDD has been coined to embrace elements of water sensitive urban design (WSUD), sustainable urban drainage systems (SUDS), low impact design² (USA and New Zealand), environmentally sensitive design (ESD) and conservation subdivision design (CSD) and to deliberately extend and strengthen connections with the fields of urban design and sustainable design (Dixon and Sharp, 2007). The need to enhance sustainability of the built environment through an integrated approach to urban design and development strongly underpins the research programme (van Roon, 2005).

LIUDD is both a design approach and a range of structural techniques that can be applied to urban development and stormwater management. As a design approach, LIUDD acknowledges the value of natural landforms and environmental resources and can facilitate integrated decision making processes to maximise the potential for multiple urban

2. Low Impact Design (LID) is an approach to land development and stormwater management that recognises the value of natural systems and utilises these as a stormwater management technique. LID is both a design approach that aims to minimise land disturbance and the generation of contaminants and a suite of structural techniques that use natural systems to manage stormwater quality and quantity.

outcomes. Given that land development often results in modifications to the lands surface, LIUDD structural techniques aim to utilise natural processes such as vegetation and soil media to provide stormwater management solutions and add value to urban environments through enhancing habitat, biodiversity, landscaping, amenity, recreational opportunities and cultural identity.

Because LIUDD is both a design approach and a suite of structural techniques, LIUDD can be applied to a range of spatial scales, geographical locations and both Greenfield and brownfield scenarios. The design approach is universal as it aims to understand the local context and work with natural resources. Structural techniques are then designed to local conditions in a way that meets the specified design objectives.

For the purposes of this project, the term LIUDD has been used when providing a general description of a policy instrument and when discussing the application of the approach to a New Zealand context. International terms such as WSUD and LID have only been used where specific international examples are discussed.

1.1.2 Value of LIUDD

Many conventional approaches to land development and stormwater management tend to focus on singular outcomes and treat natural processes as secondary to development objectives. This conventional approach, which has shaped much of the existing infrastructure and urban form that we currently experience, is not necessarily delivering the environmental or urban outcomes that were intended.

LIUDD provides another way of thinking about how we accommodate growth, develop land, provide infrastructure and manage the interaction between the built and natural environments. In contrast to the conventional approach described above, LIUDD provides an integrating framework for site design that recognises the value of natural processes and the role they can play in providing multiple outcomes for urban development.

As a design approach, LIUDD provides an opportunity to identify and recognise natural features and integrate these into the design of development layouts in order to minimise environmental impacts or enhance natural features. The integration of natural processes in the design stage of a development can result in more attractive, multifunctional landscapes with greater value across a range of outcomes. LIUDD supports an integrated approach to design that recognises the range of professional expertise is required to inform an efficient development process and deliver sustainable urban solutions.

1.1.3 Barriers to Implementation of LIUDD

The principles and practices of LIUDD are not new and have been evolving over the past 25 years. Research and experience have refined the principles and techniques which have facilitated the evolution of the approach. The understanding of the benefits that LIUDD can provide in adding value to the urban development process has also evolved along with practice.

Despite this understanding, LIUDD has only received limited consideration in mainstream planning and implementation of land development activities in New Zealand. This is similar to the evolution of WSUD in Australia and LID in the USA where an increasing awareness of the need for alternative approaches to urban development has driven the evolution of WSUD and LID over time. This awareness has also grown in New Zealand along with an improved understanding of the impacts of urban development on environmental systems and the increasing need to accommodate growing populations and provide supporting infrastructure.

While there have been some positive actions and intentions to pursue LIUDD as an approach to land development and stormwater management in New Zealand, research and experience shows that widespread implementation of LIUDD is hindered by a range of impediments (Dempsey and Dixon 2005). These include limited experience or confidence in the approach, limited technical understanding, little or no encouragement in regulatory and policy frameworks and insufficient capacity in government and industry to support implementation. Similar challenges have faced the uptake of WSUD in Australia (Brown and Clarke, 2007; Chandler 2005).

1.1.4 Opportunities to Promote the Uptake of LIUDD

Given that there are a number of barriers across a range of issues that currently limit the uptake of LIUDD, a suite of solutions that address these issues will be required to promote wider uptake. Both government and industry are seeking ways to improve their outcomes through innovative processes and solutions.

Enabling policies and processes provide one opportunity to improve the uptake of LIUDD and support the delivery of improved urban outcomes. The capacity building framework currently being developed as part of the LIUDD research programme provides a context in which to consider the role of policy mechanisms in facilitating changes in the approach to land development. The capacity building framework describes the need for an integrated approach to human resource, organisational and institutional development in order to establish an enabling context for a change in practice (Heslop and Hunter 2007).

Recognising that policy is just one element that can support change, it must be supported by knowledge, skills, resources, leadership, an enabling organisational culture and legislative environment to be truly effective. A clear understanding of policy objectives and the framework within which they can be achieved can inform the development of interventions to support implementation.

The purpose of this project is to identify opportunities for facilitating the uptake of LIUDD through policy instruments and processes. There are two important aspects to exploring policy opportunities in this manner and these are:

- (i) Developing new policy mechanisms to promote the uptake of LIUDD; and
- (ii) Removing barriers in existing policy instruments and processes that are impediments to the uptake of LIUDD.

Both of these processes are interdependent and an integrated approach to policy development and implementation is critical to achieving the desired objectives.

1.1.5 Policy Instruments

The term 'policy instrument' is open to a range of interpretations. For the purposes of this project 'policy instruments' is used in a broad sense to describe a range of policy tools (e.g. rules, education, economic incentives) and the processes that support their development and implementation (e.g. organisational processes and programmes combining more than one tool).

In considering the type of policy instrument that may be the most appropriate to achieve an objective and to understand why a certain approach may have been adopted, it is important to consider the role of the broader regulatory framework in influencing its development and the degree to which it directs or encourages action.

The regulatory context in which a policy instrument is developed will have a significant influence on the approach that is taken. For example, in the USA a number of federal

regulations, including the Clean Water Act and the Endangered Species Act require management techniques that address stormwater quality and protect or enhance aquatic species habitat. This has influenced the evolution of LID in the USA by encouraging on-site management techniques that reduce contaminants and stormwater volumes and rates of discharge.

Policy approaches can be described as cooperative or coercive (Morison and Brown, 2007) in the way they promote the uptake of LIUDD. Cooperative approaches are supportive and aim to provide opportunities for building capacity and can offer incentives to those willing to apply innovative thinking and test new techniques. Coercive approaches are directive and aim to establish prescribed rules that set a baseline for performance and bring poor performers up to a minimum standard. Both approaches have value for promoting the uptake of LIUDD depending on the policy objective and the capacity of government and industry to implement them.

An understanding of broader organisational policy objectives across a range of issues is an important part of the process in determining a policy approach to promote the uptake of LIUDD. Local authorities are seeking a wide range of outcomes that are often competing for priority and there are a finite number of policy instruments available to encourage changes in practice. Careful investigation of desired outcomes is necessary to inform the selection of an appropriate policy instrument. For example, density bonus provisions could be introduced to influence a number of potentially competing outcomes in the design of a development such as (a) integrating LIUDD (b) incorporating affordable housing or (c) providing public art. Without careful consideration, the density incentive scheme may fail to deliver the desired outcomes. On the other hand, synergies through policy approaches could be sought. For example, the introduction of a technical advisory service for both (a) integrating LIUDD and (b) incorporating green building elements into a development project. An integrated approach to policy development can help to avoid these conflicts or create synergies and is important in delivering a clear and consistent message to the development industry.

2. Methodology

The project has been undertaken in two phases. These are described as follows.

Phase One – An international review of policy instruments, programmes and process that have been used to promote LIUDD.

Research into a range of approaches used to promote the uptake of LIUDD overseas was undertaken. The primary focus of the investigation was on Australia and the USA given the history in pursuing similar approaches to LIUDD. Research included liaison with an international network of LIUDD professionals, Internet research and discussions with national practitioners. An assessment of information was undertaken in order to characterise the nature of policy instruments and to capture lessons and experience where available.

Phase Two – Transferability of approaches to the New Zealand context.

A review of the approaches identified in Phase One was undertaken by number of professionals with expertise in stormwater management, the New Zealand legislative framework (Resource Management Act and the Local Government Act) and the operating environment of local government. The potential transferability of these policy instruments to New Zealand was discussed and documented. The review focussed on opportunities for innovation and was not limited by current practice.

3. Context and Enabling Factors

The selection and adoption of a policy instrument to promote the uptake of LIUDD is dependent on the drivers behind its adoption and the local context in which it will be applied. Key drivers are often linked to high level legislative requirements, which have been developed in response to an increased understanding of the impacts of land development activities and the need to address specific environmental, social, cultural and economic issues.

In researching international examples of policy instruments to facilitate the uptake of LIUDD, the significance of the local context and factors that supported policy development and implementation became evident. In order to gain an appreciation for the policy instruments that will be described in this report, it is important to have an understanding of the background to their evolution and implementation.

3.1 Context

The local context will have an influence on the type of policy instrument, or mix of approaches, that will be most effective in meeting management objectives and therefore how a local authority may promote LIUDD principles and techniques.

Significant drivers and contextual factors that have influenced the development and adoption of the types of policy instruments described in this report include:

- Federal and state legislation, including LIUDD as a method for achieving federal and state permit (consent) compliance.
- Reducing stormwater impacts on stream channels, including physical integrity and hydrology.
- Protection and enhancement of aquatic and terrestrial species habitat.
- Promotion and protection of biodiversity.
- Provision of open space or green space.
- Water quality and contaminant management.
- Infrastructure capacity limitations, including LIUDD as a method to reduce pressure on existing infrastructure and defer investment in large scale capital works.
- Contribution to urban design and growth objectives.
- Improving energy efficiency of buildings and to reduce the urban heat island effect.

3.2 Enabling Factors

A policy instrument by itself is not enough to facilitate a change in approach and promote the uptake of LIUDD. The capacity of the system within which the instrument is applied has significant influence on how successful development and implementation of the approach will be.

Through investigating international examples of policy approaches to LIUDD, the research has identified a range of 'enabling' factors that have supported the development and implementation of LIUDD policy. The enabling factors are fundamentally about the provision of leadership, knowledge, skills, resources, technical advice, funding and integrated processes that provide an enabling context within which new practices can evolve.

An overview of the enabling factors that have supported the development and implementation of policy approaches described in this report are outlined as follows:

- **Knowledge and understanding** of LIUDD philosophies and techniques by both the development community and regulatory agencies.
- Adequate **staff and resources** to support new approaches and to actively seek opportunities to promote LIUDD in development.
- Passionate and visionary **leaders** who have made a commitment to support sustainable urban water management solutions and who advocate and empower people to take this approach.
- **Interdisciplinary teams and organisational processes** that enable integrated decision making in developing policies and tools, and providing advice and assessment services for innovative development applications. An integrated process can assist in achieving buy-in to an approach across a range of disciplines and audiences, avoid the development of contradictory policy objectives and support the delivery of multiple urban outcomes.
- A clear **understanding** of the problem that identifies LIUDD as a solution and an organisational **vision** and set of **values** that can guide decision making.
- **Quality data, information and clear management objectives** to provide the justification of LIUDD as a policy approach.
- **Community outreach** and consultation during the development of a policy approach to upskill the community on the problem, seek their input to the proposed solutions and gain support for the adopted policy approach.
- **Criteria and guidance material** that provides certainty to both regulatory agencies and the development community about acceptable approaches and how these will be assessed.
- The use of clear and meaningful **language** that facilitates shared understanding and levels of understanding across disciplines and audiences.
- Introduction of **voluntary** policies with incentives for innovative performance for the private sector and **mandatory** requirements for the public sector to demonstrate leadership, build capacity and recognise best practice. Regulations are introduced much further down the track (5-20 years) and are likely to be better supported by an informed community and improved levels of practice.

4. International Policy Instruments

The research has identified a range of policy instruments that have been used overseas to promote the uptake of LIUDD. These can be viewed on a scale of voluntary mechanisms such as enabling design flexibility, providing physical and financial incentives, technical support and capacity building initiatives through to mandated legislative requirements described in regulation. In many cases, LIUDD approaches have been voluntary for private developments and mandatory for public agencies, recognising the role the public sector can play in demonstrating leadership, making a commitment to new initiatives and supporting the development of LIUDD capacity for government, the development industry and the community.

As outlined earlier, the term LIUDD has been used when providing a general description of a policy instrument or when discussing the application of the approach in a New Zealand. International terms such as WSUD and LID have only been used where specific international examples are discussed.

Detailed below is an overview of a range of policy instruments that have been applied overseas to facilitate the uptake of LIUDD. Examples are provided and the approaches include both greenfield and brownfield development scenarios and residential and commercial applications.

4.1 Design Flexibility

Local planning provisions allow for flexibility in the design approach used to meet stormwater management requirements. This can encourage innovative site design and the integration of LIUDD as an approach to development.

This is a voluntary mechanism which enables developers to take a traditional or low impact approach to stormwater management, or a combination of both. In order to be effective, this type of approach must be consistent with other planning requirements, provide an indication about the level of deviation from conventional design that is acceptable and be supported by an efficient regulatory process.

Examples

Zero Effect Drainage Discharge Ordinance – Cities of Lacey & Tumwater, Washington, USA
Stormwater Management Policy – City of Issaquah, Washington, USA

These are voluntary ordinances that make it easier for developers to deviate from traditional design and building regulations if they use LID design practices. Ordinances require a development to demonstrate ‘near zero effective imperviousness’ which shifts the design of stormwater management away from traditional techniques such as paved driveways, curb and channel (effective impervious) towards low impact practices such as on-site techniques including reduced impervious surfaces, rain gardens and swales (near zero effective impervious).

4.2 LIUDD Stormwater Modelling Credits

Provision of credits in the hydrological model used to determine stormwater treatment and flow control requirements can be provided as an incentive for implementing LIUDD techniques. Lower site runoff estimates are calculated where LIUDD techniques have been implemented to manage stormwater on site. LIUDD credits acknowledge the reduction in site runoff through site design and the use of on-site stormwater management techniques and allow for reduced inputs into the hydrological model. Stormwater modelling calculations should then result in smaller treatment and flow control requirements downstream, and in some cases, the elimination of these facilities altogether.

This is a voluntary mechanism that provides an incentive for developers to implement on-site stormwater management principles and techniques. In turn, this can reduce the scale or even need for costly stormwater management facilities downstream of a development.

Examples

Flow Control Reduction Credits – Washington State Department of Ecology, Washington, USA

The Washington State Department of Ecology provides a voluntary incentive for implementing LID in developments by providing flow credits in the hydrological model. The method for calculating LID benefits and adjusting the model are provided in the Stormwater Management Manual for Eastern/Western Washington (2005).

LID Credit System – Virginia State Department of Conservation and Recreation, Virginia, USA

The Virginia Department of Conservation and Recreation has proposed a voluntary incentive for the implementation of LID through Virginia's Stormwater Regulations, similar to that provided by the Washington State Department of Ecology. The proposed LID credit system enables 'LID credits' to be achieved based on the use of LID practices (rain garden, rainwater harvesting, pervious paving) and their ability to reduce the overall volume of stormwater runoff from a site.

A spreadsheet model is used to calculate the reduction in runoff volume achieved through implementing LID practices, creating a value called 'adjusted impervious cover'. This 'adjusted' runoff volume is then used to determine the nature and scale of stormwater management practices (ponds, wetlands) required to manage the remaining runoff. In essence, the 'adjusted impervious cover' uses the documented volume reduction associated with LID practices to 'discount' impervious cover treated by LID.

LID Credits – County of Sacramento, California, USA

Sacramento County encourages the use of LID approaches to residential development and redevelopment projects in a similar manner to the Washington and Virginia State examples above. The Sacramento County Stormwater Quality Design manual provides guidance on quantifying the stormwater runoff volume and rate benefits of on-site stormwater management techniques, thus reducing the amount of runoff that must be treated to comply with permit (consent) requirements and managed to protect streams from erosion.

4.3 Density Bonuses and Development Incentives

Developers can gain approval for building height or floor areas beyond that permitted in local planning rules by implementing LIUDD principles and techniques. Other development incentives including reduced parking provisions, play area and street improvement requirements can also be used to encourage LIUDD approaches to development.

This is a voluntary incentive which is usually well defined in terms of the LIUDD requirements (e.g. provision of 30% open space or the relationship between building footprint and green roof coverage) and the maximum increase in height or floor area that can be achieved (e.g. an increase of up to 25% in residential lot density).

Examples

Floor Area Ratio Bonus – City of Portland, Oregon, USA

The City of Portland offers a zoning bonus allowing additional floor area for buildings incorporating eco-roofs (green roofs). The 'Floor Area Ratio Bonus' has three levels of incentive based on the relationship between the eco-roof and the building footprint.

Green Roof Policy – City of Chicago, Illinois, USA

The City of Chicago offers a density bonus option to developers whose buildings have a minimum vegetative cover on the roof of 50% or 2000 square feet (whichever is greater).

LID Credit System – City of Sammamish, Washington, USA

The City of Sammamish has developed a draft LID credit system to provide an incentive for developers to incorporate LID techniques into new residential site and subdivision design. The draft LID Municipal Code Amendment describes a range of acceptable LID techniques

and assigns each of these techniques 'incentive points'. LID points can be used to obtain development incentives including increased density and height, reduced parking provisions, play area, and street improvement requirements and flexibility for signage and attached housing.

Open Space Subdivisions – Brevard County, Florida, USA

Brevard County has a voluntary ordinance that provides an incentive for developers to cluster residential development in order to preserve open space. Developers are offered an increase of up to 25% in residential lot density for preserving at least 35–50% open space within a subdivision.

4.4 Technical Advisory Service

The provision of technical advice can be directed at both developers and local government agencies.

Technical advice for developers can be provided by a specific multi-disciplinary team within a permitting (consenting) authority or provided externally through funding from the permitting authority. Developers can receive free technical advice from professionals with LIUDD expertise and knowledge of the local planning regulations. This is most often provided during the design phase of a project to enable the broadest application of LIUDD principles and techniques and to support the development of quality permit (consent) applications.

Funding and technical support for local authorities to enhance planning requirements and supporting tools, such as infrastructure manuals and codes of practice, can promote the uptake of LIUDD. National or regional agencies can provide funding and resources for LIUDD professionals to work alongside local agencies to modify their infrastructure design manuals and planning documents to incorporate LIUDD opportunities. This allows LIUDD policies and guidelines to be developed in a way that fits within the local context, meets local objectives and identifies constructive opportunities to modify existing development guides where conflicts with LIUDD may exist.

Examples

LID Technical Assistance and Grant Programme – King County Department of Natural Resources, Washington, USA

The King County Department of Natural Resources provides a free LID technical assistance programme which is linked to its green building programme. LID elements are promoted and assessed through green building performance criteria (using the Leadership in Energy and Environmental Design (LEED) rating system for commercial buildings and the local King-Snohomish Built Green rating system for residential properties).

King County provides green building grants to cover the cost of the green building certification. Grants are based on applicants meeting a range of criteria including reductions in landscape irrigation and water use and compliance with the 2005 Surface Water Design Manual (which requires LID best management practices on most projects) and Post Construction Soil Standards (requiring disturbed soils be modified to enhance permeability characteristics). King County also provides a wide range of green building and LID training and technical assistance through the 'Green Tools' website.

LID Local Regulation Assistance Project – Puget Sound Partnership, Washington, USA

The LID Local Regulation Assistance Project is a technical assistance programme for local government agencies to prepare or revise existing regulations and development standards to increase the implementation of LID within their local jurisdiction.

The LID Local Regulation Assistance Project was offered in both 2005 and 2006, in response to the recognition that many local regulations discourage or prohibit the use of LID principles and techniques, such as requiring the installation of curbs and gutters. The programme was supported by federal and state funding which enabled the Puget Sound Partnership, a state agency promoting collaboration in environmental management, to design and administer the delivery of the project.

The project was delivered by an engineering firm, engaged by the Puget Sound Partnership, to work alongside local government agencies to develop locally relevant proposed amendments to development standards and regulations. The approach was adapted to fit each agency and generally included the identification of barriers to implementing LID, identification of specific regulations and standards to target in the review or that required development, amending existing and drafting new regulations and standards that promote LID and supporting local agency staff in presenting proposed changes to elected officials.

The project was well received by local government agencies as it acknowledged their existing regulations, identified and targeted deficiencies in basic standards while optimising what they already had. The delivery of tailored regulations and standards rather than generic forms of technical advice that is often provided was greatly supported especially given the time and resource limitations of many local agencies. The project has developed a significant amount of material that is publicly available, including summaries of targeted assistance, details of regulations reviewed, recommendations for revised language, new regulations, engineering drawings, maintenance considerations and other relevant LID information.

4.5 Fast Track Permitting and Reduced Permit Fees

Developments incorporating LIUDD principles and techniques can qualify for 'fast track' permitting (consenting) processes and reduced permit (consent) fees. This is a voluntary incentive that offers shortened permitting times or provides assurance that permit processing for LIUDD projects will take no longer than conventional stormwater management permit applications and may offer reduced costs for this process.

Permit applicants may be required to undertake third party verification of their designs. Experience has shown that reduced permit fees can approximately cover the cost of external verification. Independent verification and has been acknowledged by developers to have a positive effect on property marketing.

Examples

Green Track – King County Department of Natural Resources, Washington, USA

Green Track is a fast track permitting (consenting) process for development projects that incorporate green building and LID principles. Green building and LID proposals are assigned to a green team, comprising of King County staff with expertise in green building and LID. This team offers, at no extra cost, technical assistance and manages a customised permit (consent) review process to ensure it is efficient, predictable and co-ordinated.

Gainesville Green Building Ordinance – Gainesville, Florida, USA

While this is an energy efficiency policy mechanism, the approach has significant potential as a LID incentive. It is voluntary for private developers and mandatory for city owned facilities.

The ordinance offers fast-track building permit (consent) processes and a 50% reduction in the building permit fee for developments that incorporate energy efficiency elements into their building design. To receive these benefits however, an independent third party audit must certify the building. In addition to fast-track permitting and reduced permit fees, the council also provides marketing incentives for green buildings including installing green building signs on site, placing case studies on a web site, press releases and running an awards programme.

4.6 Reduced User Fees

Discounts in commercial and residential stormwater fees/rates can be offered as an incentive to implement on-site stormwater management techniques that reduce the volume and rate of stormwater runoff. The range of appropriate methods for stormwater management can be defined by the local authority and fee/rate reductions can be scaled according to the extent to which stormwater is managed on-site.

Examples

Clean River Rewards Programme – City of Portland, Oregon, USA

The Clean River Rewards programme offers residential and commercial ratepayers discounts of up to 35% on their stormwater utility fee for controlling stormwater runoff on their property. Fee reductions can be achieved for partial or complete site stormwater management. Property owners must register to receive the discount. The Clean River Rewards programme is supported by a range of technical assistance including workshops, on-line guides and calculators and a trained professionals referral list.

The Clean River Rewards programme was established to reward ratepayers who prevent stormwater from leaving their property thereby reducing pressure on the reticulated network and aquatic receiving environments. The programme was approved in 2000 but not adopted until 2006 due to complications with the utility billing system.

Surface Water Fee Discount – King County Department of Natural Resources, Washington, USA

The King County Department of Natural Resources offers a discount in surface water fees for properties that retain at least 65% forest cover or convert impervious surface to pervious surface.

Stormwater Fee Discount – Berlin, Germany

Berlin provides an incentive for on-site stormwater management to reduce the volume of stormwater runoff. Property owners in Berlin are charged for stormwater runoff by water companies, with the fee based on impervious surface coverage of a site. Through implementing on-site stormwater management practices, such as permeable paving, downspout disconnection and infiltration techniques, property owners are eligible for stormwater fee discounts based on the ability of on site techniques to reduce runoff volumes.

Water Smart Gardens and Homes Rebate Scheme – Department of Sustainability and the Environment, Victoria, Australia

Private property owners and not-for-profit organisation can be eligible for rebates covering a proportion of the purchase and installation costs for a range of products that provide for smarter use of water. An example of products and practices that are provided for in the rebate scheme include rain water tanks, dual flush toilets, installation of grey water systems and new plumbing connections, water audits, water efficient shower heads and 'a basket of garden products'. Rebates are funded by the Victorian State Government and paid through local water companies as a credit on the property owner's water bill. The Government is currently investigating opportunities for schools and hospitals to participate in a water audit and retrofitting programme.

4.7 Stormwater Offsets and Credit Trading

A stormwater offset or trading scheme is a market based approach that provides an economic incentive for developers to meet targets cannot be met within a development and the funding is directed towards achieving objectives in an alternative manner.

An offset or credit trading scheme will often require that stormwater solutions, such as LIUDD principles and techniques, be implemented to the maximum extent possible on a development site in order to achieve local or regional management targets. Where these targets cannot be met on site, an offset or credit trading scheme provides options for how the remainder of the target might be met, usually through monetary contributions. Monetary contributions from the offsets or credit trading scheme can then be used for stormwater management activities undertaken elsewhere within the catchment to offset water quality or quantity impacts not managed within the development.

Examples

Stormwater Quality Offsets Program – Melbourne Water, Melbourne, Australia

Melbourne Water operates a Stormwater Quality Offset programme for the Port Phillip and Western Port catchments in Melbourne. Developers are required to meet best practice stormwater quality objectives by either implementing best practice treatment measures on-site (which include WSUD) or by contributing an offset payment to Melbourne Water for regional water quality works undertaken elsewhere in the catchment. The offset program is targeted at both greenfield and brownfield development activities for residential and industrial/commercial developments.

This programme was established following a number of regional research and planning initiatives that aimed to establish partnerships, develop stormwater management strategies and investigate policy approaches that promoted the implementation of WSUD into development projects and manage the impact of urban development and growth on Port Phillip Bay.

Stormwater Credit Trading System – City of Portland, Oregon, USA

In 2005, the City of Portland received a grant from the United States Environmental Protection Agency to study the feasibility of developing a stormwater credit trading system in Portland. The study will determine if a marketplace for stormwater credits that property owners can exchange will increase the implementation of stormwater management on private property. The three-phase study is scheduled for completion by the end of 2008.

Currently, developers in Portland are encouraged to implement LID techniques to manage stormwater on site. When developers are unable to satisfy on-site stormwater management

requirements, a credit trading system offers an option to privately finance or buy credits for stormwater mitigation elsewhere within the city, providing the purchased credit meets water quality and discharge volume requirements.

4.8 Financial Assistance and Capacity Building Programmes

A range of programmes that provide financial incentives for actions that reduce stormwater impacts through the implementation of LIUDD principles and techniques have been implemented overseas. These programmes often include a significant community outreach and education component and are aimed at improving skills, knowledge and expertise, as well as providing localised stormwater improvements.

A simple example is a local downspout disconnection and rain garden implementation programme which aims to reduce the volume and rate of stormwater runoff from individual properties and educate property owners about the impacts of stormwater discharges. Government agencies offer technical and physical assistance and direct financial payments to residents that disconnect their down spouts, install rain barrels and construct of rain gardens on their properties. This improves local understanding of stormwater management issues and can alleviate local stormwater impacts.

Federal and state or regional government agencies have provided funding for a range of activities that have improved the understanding of urban development and stormwater impacts on the environment, facilitated the development of innovative stormwater management techniques and supported the implementation of demonstration projects. This investment has been instrumental in fostering an experimental, evolving environment and enabling the development of skills, knowledge and technologies to support the effective implementation of LIUDD.

Examples

Green Roof, Rain Barrel and Rain Garden Programmes – City of Chicago, Illinois

Between 2005 and 2006, the City of Chicago provided twenty grants of US\$5000 for green roof installations on small scale commercial and residential properties. The City is also committed to implementing these practices and has established a number of municipal demonstration projects which support the development of professional expertise in the city.

In 2004, the City of Chicago implemented a rain barrel and rain garden programme, providing subsidised rain barrels and rain garden installation to residents in areas with a high frequency of basement flooding. This was primarily designed as a public outreach programme for raising awareness about stormwater management and water conservation with a secondary benefit of reducing stormwater flows.

Downspout Disconnection Program – City of Portland, Oregon, USA

This programme is a partnership between the Portland Bureau of Environmental Services and the Office of Neighbourhood Involvement. Homeowners in areas of the city with geology that supports stormwater infiltration are encouraged to disconnect their downspouts by an offer of a financial return or having the work undertaken at no cost. Home owners can call the council office and arrange to have their downspouts disconnected for them free of charge or disconnect their own downspouts and receive US\$53 for each downspout disconnected.

Downspout Disconnection, Rain Garden and Green Roof Programmes – Milwaukee Metropolitan Sewerage District, Wisconsin, USA

In an attempt to decrease the volume of stormwater entering the combined sewerage system and causing overflows, the Milwaukee Metropolitan Sewerage District initiated a number of co-operative and cost sharing programmes including:

- A downspout disconnection programme aimed at redirecting building downspouts from the municipal drainage system to rain barrels and directing overflows from rain barrels to pervious areas.
- Cost sharing initiatives with public agencies and private businesses to install rain gardens and green roofs.

Green Alley Program – City of Chicago, Illinois, USA

The Chicago Department of Transportation introduced the Green Alleys Program to utilise the city's many alleyways to conserve natural resources and improve the environment. With over 1900 miles of paved public alleys, there is significant potential to improve stormwater management, reduce the urban heat island effect, recycle construction materials, introduce energy efficient lighting and improve the quality of public spaces through urban redevelopment.

The City has made a commitment to creating a greener, more sustainable environment by using best management practices in alley improvement and construction. The Chicago Green Alley Handbook is an illustrated action guide that provides design tips, illustrations and case studies to support this initiative.

Victoria Stormwater Action Program – Environment Protection Authority, Victoria, Australia

The \$22.4 million Victorian Stormwater Action Program was launched in 2000 by the newly elected State Labor Government to improve stormwater management in Victoria over the following three years. The program was designed to build on technical work already undertaken on water pollution and to support initiatives that would promote the uptake of innovative stormwater solutions, particularly by local government.

The fund was administered by the Environment Protection Authority (EPA) who established a Stormwater Advisory Committee to develop a multi-faceted strategy that would direct the allocation of funds and build awareness, improve knowledge and maximise local government involvement and ongoing commitment to water quality improvement. This included the provision of a subsidy for the development of stormwater action plans by local government organisations and the establishment of the Victorian Clearwater Program. Clearwater is an industry capacity building program that was jointly funded by a number of agencies with an interest in water quality management and which delivered a range of services including education, training, networking activities and dissemination of resources.

Yarra River Action Plan (2006) – Melbourne, Australia

The Yarra River Action Plan was launched 2006 and outlines \$600 million of initiatives aimed at improving the water quality of the Yarra River. Approximately \$20 million of the funding has been allocated to further building the capacity of local government in Melbourne to implement sustainable urban water management solutions. \$10 million has been allocated to support the implementation of WSUD projects in the lower Yarra region and enhance the relationship between key agencies responsible for water management in Melbourne.

Stormwater and Urban Water Conservation Fund – Department of Sustainability and the Environment, Victoria, Australia

The Victorian State Government allocated \$10 million to a three year Stormwater and Urban Water Conservation Fund to enhance stormwater management and encourage water conservation. The purpose of the fund is to support local scale innovative WSUD projects, stormwater conservation and water recycling initiatives across Victoria. Funding is available to local government, water authorities, open space and recreational management facilities and industry.

Road Reconstruction Program – City of Kingston, Melbourne Australia

Kingston City Council has a road reconstruction program that recognises the opportunity that road maintenance activities provide for integrating WSUD into streetscapes to deliver stormwater quality benefits (Trower, Moore & Francey, 2006). While WSUD is not implemented in all street reconstruction projects, it is considered as part of the design brief and there are an increasing number of case studies that provide real examples of WSUD streetscape applications across the municipality.

As a result of this approach Kingston City has over seven years experience of integrating WSUD into road construction activities (West 2007) and can offer significant insight into the practical considerations and process requirements for the delivery of successful council projects.

Sustainable Water Management Strategy – City of Stonnington, Melbourne, Australia

In 2005, Stonnington Council adopted a Sustainable Water Management Strategy, which states that the Council will *‘investigate the incorporation of WSUD elements into all Council buildings and facilities to achieve potable water consumption reduction and stormwater quality improvement.’* Through its involvement in the Melbourne Water WSUD program, the Council is currently undertaking a variety of WSUD projects around the city. This has included the design and implementation of functional landscaping including street tree pits and rain gardens within the streetscape.

Maroochy Shire Council, Queensland, Australia

Maroochy Shire Council has developed an innovative approach to the long term strategic planning and budgeting for water quality infrastructure (McGarry 2007) that is based on the preservation and enhancement of the environmental values of local waterways and coastlines.

The approach brings together consideration of land use types, the associated pollution generating potential of that land use type, stormwater treatment methods including WSUD techniques and their efficiencies, and cost estimates for capital and maintenance expenditure on the stormwater management methods. These elements are combined to prepare a conceptual schedule of works and associated cost for implementation. This can be used to inform the development of an infrastructure charges schedule, and potentially the design of monetary contributions required from development activities, to support the delivery of the long term water quality strategy and WSUD solutions.

4.9 Regulations

Mandatory LIUDD regulations have been adopted by some government agencies in the USA, which set minimum standards for LIUDD that must be met by all developments. Regulations can be stormwater specific, such as the Maryland Stormwater Management

Act (2007) or take a broader approach to sustainable urban development by establishing multiple criteria for development projects that incorporate LIUDD principles and techniques, such as the Seattle Green Factor.

The establishment of regulations appears to follow many years of voluntary approaches to encourage the application of LIUDD principles and techniques. The evolution from voluntary incentives to mandatory requirements has enabled regulatory authorities to refine their approach, develop support tools, structures and partnerships and facilitate the development of knowledge, skills and technology within the development and stormwater management industries. As an interim step, some localities introduce mandatory LIUDD requirements for public development projects and voluntary requirements for private development projects, taking the opportunity to demonstrate public leadership and build capacity.

Examples

Stormwater Management Act (2007) – Maryland Department of the Environment, Maryland, USA

In April 2007, the Stormwater Management Act was introduced in Maryland. The Maryland Department of the Environment is charged with implementing the Act which requires that environmentally sensitive design (ESD), through the use of non structural best management practices and other better site design techniques, be implemented to the 'maximum extent practicable' and other stormwater best management practices are used only where absolutely necessary to control stormwater volume.

The Maryland Department of the Environment is currently working to develop technical guidance and enabling policy to support the Act, including developing a definition of 'maximum extent practicable', updating the Maryland Stormwater Design Manual and working with local authorities to review and modify planning, zoning and public works ordinances to remove impediments to LID.

Maryland has led the way in advocating LID as a stormwater management approach. Their stormwater management programme has evolved over 25 years and is underpinned by the aim to 'maintain after development, as near as possible, the predevelopment runoff characteristics'. Up until the establishment of the Stormwater Management Act in early 2007, implementation of LID has been encouraged through LID credits. These credits could be obtained through implementing LID approaches to reduce runoff volumes and stormwater contaminants, thus reducing the size and need for more conventional stormwater management techniques downstream.

The Maryland Department of the Environment has developed a 'model stormwater management ordinance' which is a template for local government to use in developing stormwater ordinances. The model stormwater ordinance provides the minimum content required for compliance with state regulations. It has been updated in 2007 to provide content for promoting the implementation of LID.

Seattle Green Factor – City of Seattle, Washington, USA

The Seattle Green Factor is a regulatory requirement for all new construction projects above a minimum size threshold in commercial areas of Seattle, to provide landscaping equivalent to 30% of the parcel size. Credits towards meeting the required target are achieved through a range of practices including deep soils, planting in layers, rain gardens, permeable paving, vegetated roofs and walls and rainwater harvesting.

The Green Factor was developed as part of a review of the 'Neighborhood Business District Strategy', which involved revising commercial zoning requirements to meet city growth objectives, deliver vibrant, pedestrian oriented streets and achieve stormwater outcomes

including reduced runoff and infrastructure costs. The Seattle Green Factor came into effect in January 2007 and is supported by a range of education initiatives targeted at the design community and involved explaining techniques that could be used to meet the new requirements. The City of Seattle is planning to extend this requirement to areas of the city zoned multi-family in 2008 with a landscaping target of either 60% or 75%.

Green Area Factor – Berlin, Germany

The Green Area Factor is a regulatory requirement for all urban sites undergoing development or redevelopment to incorporate green elements into their design. Land use and zoning determine the greening target which is based on a ratio of vegetated elements to impervious surface. The goal of the Green Area Factor is to combat ‘creeping impermeability’ by promoting the implementation of green infrastructure to protect (or even create new) ecosystems, habitat and landscape character while allowing high density, high quality urban development. The approach is non-prescriptive, allowing property owners to select the type of vegetation from an approved list and weighting the selection according to its effectiveness in achieving environmental goals.

Subdivision Regulations for Landscape Requirements – City of New London, New Hampshire, USA

The City of New London draft subdivision regulations includes requirements for landscape design that integrates stormwater functionality through landscape design elements including LID. The draft regulations require ‘landscape design for stormwater treatment’ including categories for styles of planting and plant specifications, soil preparation, mulching, site layout and parking.

Stormwater Management Rule – New Jersey Department of Environmental Protection, New Jersey, USA

The New Jersey Department of Environmental Protection proposed Stormwater Management Rule N.J.A.C. 7.8 requires that any development that disturbs at least one acre of land or increases its impervious cover by at least 1/4 acre, must incorporate non-structural stormwater management strategies to the ‘maximum extent practicable’. In these circumstances, LID techniques are given preference over structural stormwater management practices.

The New Jersey Stormwater Best Management Practice Manual includes a chapter on LID techniques and has a LID checklist to assist in assessing the incorporation of LID strategies into proposed land development projects.

Sustainable Neighbourhoods – Clause 56, Victorian Planning Provisions – Department of Planning and Community Development, Victoria, Australia

Clause 56 is the Residential Subdivision component of the Victorian Planning Provisions (VPP) which sets the standard for all local planning schemes in Victoria. The VPP are statutory mechanisms designed to ensure consistent provisions across the state of Victoria.

Clause 56 has been revised to apply the Neighbourhood Principles set out in ‘Melbourne 2030 Planning for Sustainable Growth’. The aim of these principles is to achieve residential subdivision design that provides attractive, safe, liveable and sustainable neighbourhoods. The revised Clause 56 sets out clear objectives to support and promote integrated water management, and provides a new and more sustainable basis for managing water in residential subdivisions. This includes a requirement to use best practice WSUD techniques to conserve, reuse and recycle water and manage the quality of stormwater runoff.

5. Transferability of International Approaches to New Zealand

5.1 New Zealand Policy Context

The paper entitled 'Legislative and Institutional Policy Framework for Influencing the Adoption of LIUDD' (Hunter and Winefield, 2006) provides a concise and informative overview of the legislative framework and key strategic influences for stormwater management in New Zealand.

The key pieces of legislation that set the framework for environmental management and local governance in New Zealand are the Resource Management Act 1991 (RMA) and the Local Government Act 2002 (LGA). While both Acts are based on the concept of sustainability, the way in which the concept is applied is different. The purpose of the RMA is to promote *sustainable management* of natural and physical resources and in the context of stormwater management is substantially about setting the policy framework for and controlling the development process. In contrast, the LGA is underpinned by the principle of *sustainable development* of communities and in a stormwater context is largely about the planning, management and delivery of public stormwater services.

The RMA and LGA provide for a range of policy instruments that support their implementation, allowing significant opportunity to influence stormwater management and therefore facilitate the uptake of LIUDD in New Zealand. Policy instruments include statutory tools such as regional policy statements, regional / district plans and long term council community plans and non non-statutory mechanisms such as growth strategies, structure plans, integrated catchment management plans, guidelines and codes of practice.

Research and experience indicate that the non-statutory mechanisms are increasingly being seen as significant opportunities to influence urban development and encourage alternative methods of development (Heslop & Hunter 2007). These tools can be developed outside the formal public policy process and provide the opportunity to be responsive to needs and build capacity. Non-statutory tools can then be given effect through regional and district plans and allow for the development of human resource and organisational capacity.

In the broader context of New Zealand governance, central government is committed to a sustainable future for New Zealand and is currently supporting and developing a range of national initiatives to promote this. This further supports LIUDD as a potential approach to urban development.

5.2 Transferability to New Zealand

All of the policy instruments described in this report that have been used to promote the uptake of LIUDD overseas are potentially transferable to New Zealand. The policy mix that will be most appropriate in a given location will depend on the local context, policy objectives and the capacity of government and industry to implement LIUDD.

A policy instrument alone will not be enough to facilitate the uptake of LIUDD. An enabling context that supports a policy approach will be critical to achieving buy-in and effective implementation. The LIUDD capacity building framework provides a useful reference to inform the analysis of capacity needs and how these may be addressed in an integrated manner.

A number of local, district and regional councils in New Zealand have already initiated changes to their policy processes to promote the uptake of LIUDD. Examples of New Zealand initiatives can be found on the LIUDD case study website <http://cs.synergine.com>.

A number of comments about the transferability of policy approaches from one location to another were raised during the review of international policy instruments. These were largely observations about differences between international contexts and the New Zealand context along with considerations about the potential impacts of specific instruments on broader policy objectives. These comments have been summarised as points to inform further discussion on how to facilitate the uptake of LIUDD and encourage innovative approaches to urban development.

- A **mix of policy instruments and processes** appears to be the most effective approach to facilitate the uptake of LIUDD. Community education and public outreach initiatives are important to improve understanding and develop support for new initiatives. Policy interventions that recognise best practice and discourage bad behaviour can be developed by providing both incentives and penalties.
- There is significant potential to increase **public awareness and understanding** about the impacts of urban development and stormwater discharges on the environment in New Zealand. Education and outreach initiatives have played a fundamental role in raising awareness about LIUDD, informing policy development and facilitating implementation overseas. Increased support and buy-in could be facilitated through enhancing the profile of stormwater issues and LIUDD solutions in New Zealand.
- A **risk averse culture** in local government can limit the potential for innovation and implementing approaches to promote the uptake of LIUDD. An improved understanding of LIUDD and the enabling factors that support policy development and implementation can build confidence and potentially empower local government to pursue new approaches to urban development.
- It takes **time** to develop understanding and expertise about LIUDD, including principles, techniques and processes for implementation. Organisations and communities need to acknowledge the time required to build capacity and take steps to meet their development needs. This in turn can help to build confidence in LIUDD.
- In many instances, New Zealand tends to **use legislation as a first step** towards influencing behaviour change. In contrast, many of the international examples of policy instruments presented in this paper take a voluntary approach to embedding new practices such as LIUDD and provide incentives to encourage best practice. The voluntary approach is underpinned by clear policy objectives and can be followed up by regulation in the longer term to formalise best practice when there are appropriate skills, knowledge and processes to support implementation.
- The availability of national or regional **funding** for LIUDD initiatives in New Zealand is clearly different from that which is available overseas. Innovative approaches to utilising policy tools, funding mechanisms and resources that are available will be critical in progressing LIUDD in New Zealand. Given the responsibilities of local government to provide for sustainable management of natural resources and the sustainable development of communities, LIUDD provides an opportunity to facilitate integrated processes, enhance efficiencies and deliver multiple urban outcomes.
- An important consideration in designing a **density incentive scheme** to encourage the uptake of LIUDD is the impact the approach may have on other urban outcomes such as local character and infrastructure capacity. Also important are community expectations and how a potential increase in density might be perceived.

- An understanding of the impact that **financial incentives** will have on the revenue of a local authority is important when investigating these as a policy instrument. It is likely that baseline costs for a local authority will stay the same or increase over time and by introducing financial incentives there is a potential to shift more cost onto some people as a result of providing discounts for others. There is a need to consider the fairness and equity of this approach.
- Some local authorities already have consenting agreements with high frequency consent applicants that offer agreed levels of service. This is seen as a significant advantage by the applicants and there is potential to build on this service to promote the uptake of LIUDD. Challenges around the provision of **technical advice and fast track consenting processes** largely relate to the availability of skills and resourcing. It is important to recognise that development is a process with components that often requires a number of consents and inspections. There is a need to consider how you might design a technical advisory service and enhanced consenting process that recognises this complexity while still achieving specific management objectives such as the uptake of LIUDD.
- While **strategies, policies and plans** are largely enabling of LIUDD, the way in which these are **interpreted and compliance** with them determined, can be a significant barrier to the uptake of LIUDD. Innovative approaches to land development are often discouraged by a system that relies on conventional design standards and does not have processes or tools to support alternative approaches. This could be seen as a self-imposed barrier and there is significant potential for government and industry to identify opportunities to overcome this. One potential solution provided in this paper is the concept of a technical advisory service supported by educational resources and a targeted consenting system. This approach could facilitate the establishment of an integrated government process to encourage innovative design.
- Some investigation into the potential use of '**stormwater user fees**' in New Zealand has been undertaken. The primary focus of this work has been to look at how stormwater is addressed in local rates and the potential for modifying this to introduce a financial incentive for on-site stormwater management. While this approach has not been implemented to date, the concept of linking rate discounts to impervious surface coverage has been considered along with the practical, financial, administrative and political implications that could be associated with such an approach.

6. Next Steps

In theory, all of the policy instruments described in this report are potentially transferable to New Zealand. It is the practicality of their development and implementation that poses the real challenge. Opportunities to build on the understanding provided in this report and further progress policy initiatives that have already been taken to promote the uptake of LIUDD in New Zealand include:

Working directly with councils seeking to integrate LIUDD into their approach to urban development. This will enable the design and development of tools and processes that acknowledge the local context, recognise local management objectives and facilitate the establishment and delivery of supportive processes for implementation of LIUDD.

Co-operative policy approaches that reward innovation and provide the opportunity to build capacity for LIUDD appear to be the most constructive approach to promote the uptake of LIUDD. This requires careful consideration about how proposed initiatives may fit with the current policy framework and provides the opportunity to consider how longer term change could be achieved.

There is significant potential for **government agencies to demonstrate leadership** by integrating LIUDD into their own activities such as road construction and maintenance works, public buildings and other public developments. By doing this, public agencies can demonstrate their commitment and willingness to promote the implementation of LIUDD, enhance the quality of urban outcomes and inform the development of policy and supporting tools and processes. This also provides an opportunity to test and refine potential policy approaches for promoting the wider uptake of LIUDD.

7. Conclusion

There is significant potential for LIUDD to enhance the sustainability of the natural built environments through an integrated approach to urban design and land development in New Zealand. Many city, district and regional councils are seeking more innovative ways to deliver a range of outcomes as a part of the urban development process and to better utilise their policy framework to enable this. Some councils have already steps to integrate LIUDD into their policies and processes.

This project has provided an overview of the range of policy instruments that have been used internationally to promote the uptake of LIUDD. The role that local context plays in determining an appropriate mix of policy instruments and the importance of enabling factors in supporting the development and implementation of these has been highlighted.

All of the policy instruments identified in this report are potentially transferable to New Zealand. This provides an opportunity to further investigate how these policy instruments could be applied and to test the development and implementation of options. This will require a clear understanding of management objectives and a detailed understanding of the context in which LIUDD will be applied.

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