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Sustainable Drainage System provisions within the Water and Sewerage Services Bill

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The Water and Sewerage Services Bill seeks to amend the Water and Sewerage Services (Northern Ireland) Order 2006, primarily in order to extend the period for which the Department for Regional Development (DRD) can pay subsidies to NI Water.

This Bill will make a series of other amendments to the 2006 order, including the introduction of measures that are designed to promote the use of sustainable drainage systems. This paper outlines these amendments and provides a detailed discussion on proposals made in respect of SuDS.

Paper 100/15 **10th September 2015**

Executive Summary

The Water and Sewerage Services Bill seeks to amend the Water and Sewerage Services (Northern Ireland) Order 2006, primarily in order to extend the period for which the Department for Regional Development (DRD) can pay subsidies to NI Water. The need to extend this power is a by-product of the one year extension to the current Assembly mandate.

While the primary purpose of the Bill is to extend the period for which the Executive can continue to subsidise NI Water in lieu of domestic water charges, there are a number of other provisions in this Bill:

- Clause one includes a power to make further extensions to the payment of subsidy power, if necessary, by way of subordinate legislation, which would be subject to affirmative resolution;
- Clause two requires NI Water to consolidate the water resource management and drought management requirements into a single plan;
- Clause three removes the requirement for NI Water to install meters at all domestic properties connecting to the main supply for the first time;
- Clause four defines a "Sustainable Drainage System", for the purposes of this order referring to 'Structures'. This clause therefore enables NI Water to adopt 'hard SuDS';
- Clause five will remove the automatic right to connect surface water sewers to the public sewer network without, at least, consideration being given to sustainable alternatives; and
- Clause six will introduce a requirement for developers to enter into a sewer adoption agreement with NI Water.

This bill must, or at the very least clause one, must receive royal assent before the Assembly is scheduled to dissolve in March 2016 in order that the DRD may continue to pay subsidies to NI Water in lieu of domestic water charges.

SuDS Policy Drivers

There is a range of legislation and policy that promotes SuDS in Northern Ireland. However, there is not currently a statutory requirement, nor are there sufficient incentives, to encourage the wider use of SuDS.

The SuDS Strategy

The current uptake of SuDS for new development within Northern Ireland is estimated to be below 5%.[1] According to the Northern Ireland Environment Agency (NIEA) one

[1] DoE (2014) Revised Planning Policy Statement 15 'Planning and Flood Risk' [online] available from: http://nia1.me/2pc

reason for the slow uptake of SuDS in Northern Ireland is the fact that **there is currently an automatic right to connect surface water run-off to a surface or combined public sewer**, granted under Article 163 of the Water and Sewerage Services (Northern Ireland) Order 2006.[2] Other barriers include:

- A lack of knowledge and expertise in SuDS;
- Uncertainty over whole life costs;
- The extent of land take and associated costs; and
- Uncertainty over adoption and future maintenance responsibilities.

To overcome these barriers, the SuDS strategy recommends:

- Specific training for all stakeholders;
- The establishment of a SuDS approving body; and
- NI Water should be required to adopt and maintain 'hard engineered SuDS' in accordance with its sewer adoption policy and procedures.

The latter recommendation has been applied in this Bill. Therefore the provisions of this Bill do have the potential to overcome some of the barriers to SuDS uptake in Northern Ireland identified in the SuDS strategy. However, outstanding issues may persist including a lack of knowledge and expertise in SuDS.

Climate Change

It is widely accepted by the scientific community that climate change is a factor in the increased occurrence of extreme weather events, particularly heavy and prolonged rainfall. Within Northern Ireland, 2010 has been the only year, since 2007, not to experience a serious local flooding incident and there is concern that the frequency of these events will increase in the future.

Properties at risk of flooding

It is estimated that 46,000 of the 83,000 properties in Northern Ireland could be at significant risk of flooding due to their location in coastal or river flood plains – whilst 20,000 properties are sited in an area at risk of flooding from a significant rainfall event.

Combined Sewer System

The problem in Northern Ireland is compounded by the fact that over 70% of the public sewer system is 'combined', [3] meaning it was designed and constructed to collect both foul sewage and storm water. Combined sewer systems transport all of their wastewater to sewage treatment plants, placing unnecessary strain on the capacity of these facilities whilst also increasing the costs to NI Water.

[2] NIEA (2012) A Strategy for Promoting the Use of Sustainable Drainage Systems [online] available from: http://nia1.me/2p0
[3] Water and Sewerage Services Bill: DRD Briefing , Committee for Regional Development, meeting on Wednesday, 3 June 2015 [online] available from: http://nia1.me/2p1

During periods of intense rainfall the capacity of the system can be exceeded causing out of sewer flooding of untreated foul sewage. Combined Sewer Overflows (CSOs) are a necessary part of the system to reduce the risk of overloading during extreme weather events. CSOs discharge the untreated waste directly into nearby streams, rivers, or other water bodies[4] causing pollution that must then be dealt with.

Consultation

There was wide support from technical bodies, environmental groups, and councils for the prohibition of surface water connections to the combined sewer. However, developers were against this proposal highlighting the fact that there are currently no regulations and no regulatory authority in place to approve SuDS. Others raised concerns that preventing surface water connections for non-residential development might restrict the expansion of existing businesses. Other consultees pointed to the need for SuDS expertise within the planning service.

Currently there is an “automatic right to connect” surface drainage systems to the combined sewer meaning there is little incentive for developers to use SuDS. The main concern around the proposal to remove this right was uncertainty over the future maintenance and adoption of SuDS. Consultees disagreed over where ultimate responsibility for this should rest, with some saying NI Water should be responsible for all (soft and hard) SuDS, some saying councils should be responsible for some whilst there was also a suggestion that homeowners should ultimately bear the responsibility.

Legislative position of SuDS in GB

In England and Wales the Flood and Water Management Act (FWMA) 2010 introduced the power to require the inclusion of sustainable drainage of surface water in developments that need planning approval or have drainage implications.

As is proposed in the Water and Sewerage Service Bill the Flood and Water Management Act FWMA removed the automatic right, established by the Water Industry Act 1991, to connect to the public sewer, making the right conditional on meeting the new standards. The FWMA also gave the responsibility for approving SuDS in new developments as well as adopting and maintaining them where they affect more than one property, to a SUDS approving body (SAB), these are generally local authorities’.

The provisions of this Bill had not been enacted following concerns raised by local government and representatives for the house building sector around issues including the conflicting roles of planning and SABs; maintenance requirements for SuDS; and costs. The UK Government has since decided that the development of SuDS in major

[4] DRD (2014) Sustainable Water A Long Term Water Strategy for Northern Ireland Part 3: Flood Risk Management and Drainage [online] available from: http://nia1.me/2p5

developments (10 houses or more, or the equivalent non-residential development) will be managed through Planning Policy, whilst smaller developments (<10 properties) will be excluded from the legal requirement to include SuDS.

Scotland

The Water Environment and Water Services (WEWS) (Scotland) Act 2003 made Scottish Water responsible for SuDS, dealing with run-off from developments. SuDS need to be designed to Scottish Water's specifications as set out in their manual "Sewers for Scotland 3rd Edition".[5]

Maintenance of SuDS within the boundaries or curtilage of a private property, such as a residential driveway or a supermarket car park, is the responsibility of the land owner or occupier. The Scottish Environment Protection Agency's (SEPA's) preference is for SuDS constructed outside the boundaries or curtilage of a private property to be adopted by Scottish Water, the local authority or a public body, and as such SEPA seeks a guarantee for the long term maintenance and sustainability of any SuDS implemented.

Scottish Water's policy is to support the use of SuDS. When the design and construction standards relating to SuDS are met (agreed at planning stage) Scottish Water will finance (up to reasonable cost thresholds) and adopt them.

What are SuDS?

A Sustainable Drainage System (SuDS) is a collective term for a number of approaches to manage surface water that take account of water quantity (flooding), water quality (pollution) and amenity issues. SuDS work by effectively mimicking the natural drainage cycle, which is altered by development.

SuDS Solutions

There are a large number of SuDS solutions; however, these can be grouped into two main categories: soft and hard. Soft SuDS are usually landscaped, vegetated features including swales and detention ponds. Hard SuDS include proprietary engineered precast concrete soakaways, permeable paving and attenuation tanks. Many schemes will feature a combination of hard and soft SuDS solutions and this method is recommended by the construction industry research and information association (CIRIA) as the most appropriate technique for maximising SuDS performance.

[5] Scottish Water (2015) Sewers for Scotland 3rd Edition [online] available from: http://nia1.me/2pm

Costs- SuDS vs. Traditional Drainage

The advantage of SuDS over other drainage standards is site size dependent. Large sites are usually significantly cheaper built with SuDS than other drainage standards

- For virtually all scenarios the use of SuDS ranges from being significantly cheaper to the same cost as traditional drainage for medium and large scale sites;
- SuDS are highly advantageous over other design standards where sites can use infiltration for the disposal of all runoff;
- SuDS are cheaper than traditional drainage systems for all developments where lining of permeable pavements is not required;
- Where small sites require lining of permeable pavements, they are significantly more expensive to construct than traditional drainage schemes. This is not so much to do with the lining itself, but the additional SuDS features that are needed;
- Where ground conditions require protection and permeable pavements have to be lined, SuDS drainage systems require greater attention to design detail and results in more complex arrangements;
- The cost implications of land value where SuDS are not considered to be public open space is very significant and results in a major constraint on SuDS design options;
    - Permeable pavements are a fundamental tool for efficient use of land and for generally meeting the SuDS design standard.
    - Roof runoff management (interception and storm control) is most cost effective by utilising un-lined permeable pavements.
    - If roof run-off interception cannot be provided in the permeable pavement, the most cost effective SuDS are rain-gardens or infiltration trenches in the garden of properties.

If space makes such features difficult to apply, then communal rainwater harvesting is the next best cost option.

A 2009 DEFRA study confirms that the costs associated with SuDS decrease with development size as economies of scale are realised while costs reduce for higher density developments. Case studies considered indicate that SuDS systems are cheaper to install than the equivalent traditional drainage solution.

Contents

1 Overview

The Water and Sewerage Services Bill seeks to amend the Water and Sewerage Services (Northern Ireland) Order 2006, primarily in order to extend the period for which the Department for Regional Development (DRD) can pay subsidies to NI Water.

This Bill will make a series of other amendments to the 2006 order, including the introduction of measures that are designed to promote the use of sustainable drainage systems in future developments by extending the powers NI Water has in relation to the adoption, management and maintenance of public sewers to include SuDS.

A sustainable drainage system collects surface water run-off and releases it slowly, rather than discharging it all straight into the public sewer system or water course, reducing the risk of flooding. The common acronym for sustainable drainage systems is SuDS (Sustainable Drainage System). They are also known as "sustainable urban drainage systems", although SuDS can be used in both urban and more rural developments.

This paper will outline each of these amendments and provide a detailed discussion on proposals made in respect of SuDS.

2 Background

The water and sewerage industry in Northern Ireland is governed, principally, by the Water and Sewerage Services (Northern Ireland) Order 2006, as amended[6] (see RaISe publication 105/14 for a detailed discussion of the water and sewerage industry structure and governance[7]).

Article 213(4) of the 2006 Order empowered the DRD to make a subsidy payment to Northern Ireland Water (NIW) in lieu of household water charges, up until March 31st 2013.[8] This power was extended by a further three years (until 31st March 2016) via the Water and Sewerage Services (Amendment) Act, 2013.[9] The need to extend this further is a by-product of the one year extension to the current Assembly mandate.[10]

2.1 The Water and Sewerage Service Amendment Bill

Clause one of the Water and Sewerage Service Amendment Bill (2015) seeks to extend this power by a further year, until the 31st March 2017. Clause one also enables the 2006 Order to be further amended by order, with the approval of the Assembly, so

[6] The Water and Sewerage Services (Northern Ireland) Order 2006 [online] available from: http://nia1.me/2oi
[7] McKibbin, D. (2014) An examination of business models within the Water and Sewerage Industry in the UK and Republic of Ireland. NI Assembly RaISe [online] available from: http://nia1.me/2oh
[8] Chapter II: Financial Assistance for Undertakers [online] available from: http://nia1.me/2oj
[9] Water and Sewerage Services (Amendment) Act (Northern Ireland) 2013 [online] available from: http://nia1.me/2ok
[10] Danny Kennedy MLA [online] Water and Sewerage Services Bill: Second Stage. Available from: http://nia1.me/2oq

that the subsidy can be paid until such other date as the Department decides without the need to take a future Bill through the Assembly.[11] During the Second Stage debate of the Water and Sewerage Services Bill, the Minister stated:

> *"The Bill includes a power to make further extensions to the payment of the subsidy power, if necessary, by way of subordinate legislation,* ***which would be subject to affirmative resolution.*** *Members may recall that two Acts, passed in 2010 and 2013, have already been required to extend the subsidy-paying power. The new power to make further extensions by subordinate legislation would* ***provide some flexibility and enable any future extensions to be made more quickly and efficiently.****"*[12]

The DRD has described the need to extend the power to pay subsidies to Northern Ireland Water as *"the most important part of the Bill."*[13] However, this Bill includes a number of other amendments to the 2006 order which seek to address various aspects of water policy:

- Clause two requires NIW to consolidate the water resource management and drought management requirements into a single plan. It is anticipated that this will remove much of the administrative burden involved with producing two plans and reduce costs[14];
- Clause three enables the DRD to make regulations to remove or amend the requirement within Article 81 of the 2006 Order (conditions of connection concerning metering) for NI Water to install water meters at domestic properties connecting for the first time to the public water supply;
- Clause four defines a *"sustainable drainage system"* for the purposes of the Order and extends NI Water's power to adopt infrastructure to include SuDS. It also includes the necessary amendments to Article 161 agreements (agreements to adopt sewer, drain or waste water treatment works at a future date) so as to include SuDS.

> *"(3A) In this Order "sustainable drainage system" means any structure or part of a structure that is designed to receive surface water from premises and—*
>
> *(a) to discharge that water at a rate which is (whether in all circumstances or only in some circumstances) less than the rate at which the water enters the structure, or*
>
> *(b) to reduce the volume of surface water entering public sewers or watercourses.*

[11] Water and Sewerage Services Bill, Explanatory and Financial Memorandum.
[12] NI Assembly Official Report: Monday 29 June 2015 [online] available from: http://nia1.me/2p7
[13] Water and Sewerage Services Bill: DRD Briefing 3 June 2015
[14] Danny Kennedy MLA [online] Water and Sewerage Services Bill: Second Stage. Available from: http://nia1.me/2oq

Scrutiny Point

The Department has indicated that under the provisions of the Bill, NI Water will only be empowered to adopt 'hard' SuDS. However, this is not made clear by the SuDS definition applied in the Bill.

Is the word 'structure' used to differentiate between 'soft' and 'hard' SuDS and if so could certain 'soft' SuDS (ponds, for example) be considered 'structures'?

Under section 163 of the 2006 Order there is an automatic right to connect surface water run-off to a surface or combined public sewer. However, whilst there is acknowledgement that in some instances there may be no alternative to connecting to a public sewer, this automatic right to connect may also be one of the reasons why there has been such a slow uptake of SuDS in Northern Ireland.[15] Therefore,

- Clause five seeks to **restrict the right to connect** surface water sewers to the public sewer network if NIW determines a connection compromises the public infrastructure, if construction standards are not met or if there are sustainable alternatives (SuDS solutions) to dealing with the surface water or that such a means could reasonably be provided; and
- Clause 6 limits the right, conferred by Article 163 of the 2006 Order, to connect to a sewer. The clause introduces a **requirement to enter into a sewer adoption agreement** within the meaning of Article 161 of the 2006 Order (agreements to adopt sewer, drain or waste water treatment works at a future date) as a condition of that right.

2.2 Time constraints

The need for this bill to receive Royal Assent before the Assembly is scheduled to dissolve in March 2016 has meant, according to DRD officials, that it is *"not possible to progress all policy proposals, particularly those related to private supply pipes and broad enabling powers in respect of sustainable drainage."* In practice this means that the Department will not be taking forward the proposals made to take wider enabling powers in respect of SuDS; this would mean that the Department's ability to adopt wider 'soft' SuDS solutions, such as trenches and retention ponds, is restricted.

Scrutiny Point

As will become clear in this paper there is a significant need to increase the uptake of SuDS in Northern Ireland as a result of various legal and environmental drivers. That said, at the Department's own admission "there are important questions still to be answered regarding the introduction of SuDS schemes in Northern Ireland." The committee may therefore wish to assure itself that it has sufficient time in which to fully consider any legislative provisions or indeed omissions relating to SuDS.

[15] NIEA (2012) A Strategy for Promoting the Use of Sustainable Drainage Systems [online] available from: http://nia1.me/2p0

3 Policy Drivers

There is a range of legislation and policy that promotes the use of SuDS in Northern Ireland, including:

- EU Water Framework Directive 2000/60/EC (WFD);
- EU Habitats Directive 92/43/EEC;
- EU Freshwater Fish Directive 78/659/EEC;
- EU Urban Waste Water Treatment Directive 91/271/EEC;
- The European Directive on the Assessment and Management of Flood Risks (2007/60/EC) (The Floods Directive);
- Northern Ireland Sustainable Development Strategy 2006;
- Planning Policy Statement 15 (PPS 15) – Planning and Flood Risk;
- Planning Policy Statement 7 (PPS 7) – Safeguarding the Character of Established Residential Areas;
- Managing Stormwater: A strategy for promoting the use of sustainable drainage systems (SuDS) within Northern Ireland (2011); and
- Sustainable Water: A long-term water strategy for Northern Ireland (2014).

These policies recognise the benefits of SuDS and the contribution they can make to, for example, reducing pollution to support compliance with the Water Framework Directive (WFD). However, there is not currently a statutory requirement, nor are there sufficient incentives, to make developers adapt existing practices and consider installing SuDS.

3.1 Managing Stormwater: The SuDS Strategy

The current uptake of sustainable drainage solutions for new development within Northern Ireland is estimated to be below 5%.[16] According to the Northern Ireland Environment Agency (NIEA) one reason for the slow uptake of SuDS in Northern Ireland is the fact that there is an automatic right to connect surface water run-off to a surface or combined public sewer, granted under Article 163 of the Water and Sewerage Services (Northern Ireland) Order 2006.[17] The NIEA SuDS Strategy recommends, therefore, that:

> *"Developers should be **required to include sustainable drainage**, where practicable, in new developments, built to standards which reduce flood damage and improve water quality. Section 163 of the Water and Sewerage Services (Northern Ireland) Order 2006 **should be amended** to make the right to connect surface water run-off to public sewers **conditional on meeting new standards**."*

[16] DoE (2014) Revised Planning Policy Statement 15 'Planning and Flood Risk' [online] available from: http://nia1.me/2pc
[17] NIEA (2012) A Strategy for Promoting the Use of Sustainable Drainage Systems [online] available from: http://nia1.me/2p0

Other barriers include the lack of knowledge and expertise in SuDS with uncertainty over whole life costs, the extent of land-take required in new developments, future maintenance responsibilities and adoption.[18] [19] To overcome these barriers the SuDS Strategy recommends a number of actions:

- Specific training for the organisations involved (NIW, DRD, Planning NI, NIEA etc.) to provide an understanding of the applicability, limitations and benefits of SuDS;
- Responsibility for approving SuDS in new developments should rest with a SuDS approving body; and
- NIW should adopt and maintain approved 'hard engineered SuDS' within new developments in accordance with its sewer adoption policy and procedures.

Although the uptake of SuDS has been slow in Northern Ireland it is worth noting that SuDS have been included in 16 of Transport NI's major works schemes during the past 12 years.

SuDS schemes are also included in new developments with NI Water having adopted 59 schemes as part of the sewerage network since 2011. NI Water expects that it will adopt a further 31 schemes in new housing developments during 2015/16.

Source: DRD

Scrutiny Point

With the potential for developers to now be required to consider/incorporate SuDS the committee may wish to content itself that measures have been put in place to ensure stakeholders (officials etc.) are suitably qualified to oversee/implement the necessary changes.

The strategy acknowledges the issues with regards to whole life costs suggesting a significant barrier to SuDS implementation will be associated with the adoption, costs and maintenance arrangements for SuDS schemes. The strategy therefore calls for greater clarity on the issues of long term maintenance, ownership and liability associated for SuDS and proposes an analysis of ownership, funding and maintenance arrangements elsewhere in the UK. This is provided in section four of this paper. [20]

The result of having no statutory basis from which to require, at least, consideration of SuDS in new developments is that the natural drainage cycle will continue to be altered by the proliferation of impermeable surfaces such as roads, pavements, roofs, car parks and other manmade structures, placing evermore pressure on our drainage systems and significantly increasing the likelihood of flooding.

[18] Bastien, N.R.P., Arthur, S., Wallis, S.G. and Sholz, M. (2007) Towards the best management of SuDS treatment trains[online] available from: http://nia1.me/2p6
[19] DRD (2015) Draft Consultation Report Sustainable Water Draft Long-Term Water Strategy for Northern Ireland (2014 – 39). DRD: Belfast
[20] Doyle, P., Hennelly, B. and McEntee, D. (2003) SUDS in the Greater Dublin Area. National Hydrology Seminar 2003 [online] available from: http://nia1.me/2p3

Scrutiny Point

The provisions in the Bill have the potential to overcome some of the barriers to SuDS uptake in Northern Ireland identified in the SuDS strategy and the recommendation for NI Water to be empowered to adopt hard SuDS is included in the Bill

The committee may wish to satisfy itself that the training needs identified in the SuDS strategy in order to overcome the lack of SuDS expertise have been addressed and may also inquire as to the status of any plans for a SuDS approving body.

3.2 Climate change

The traditional method of managing surface water is to funnel it away quickly into the sewer system from where it is released in local water courses. However, this approach often means the problem is simply transferred to another part of the catchment and during periods of intense rainfall flooding can and does occur.[21] The type of weather events (heavy/prolonged rainfall) that cause flooding are expected to become more common as a result of climate change[22]. This will significantly increase both the volume and flow rate of storm water produced and conveyed directly to watercourses. Indeed, these events are already commonplace; since 2007, only 2010 did not have a serious local flooding incident:[23]

- July 2015 Heavy rain caused flooding in parts of County Londonderry affects the Bogside, Creggan, Foyle Road and Strand Road areas of Derry as well as several towns and villages, including Limavady and Claudy;[24]
- November 2014 heavy rain led to flash flooding across Counties Down, Armagh and Antrim. Bridge Street in Newry was under three feet of water at one point, closing a number of businesses and severely restricting traffic flow through the city centre;[25]
- July 2013 – Roads flood in County Antrim during period of prolonged and heavy rainfall;
- June 2012 – flash flooding across Greater Belfast cause considerable damage to residential and commercial property, led to About 1,000 homes in south Belfast being left without electricity for a time, whilst motorists were forced to abandon vehicles on some of the city's main thoroughfares;
- October 2011 – widespread flooding across eastern and western regions of Northern Ireland damaged property and led to road closures. The worst-hit areas included Ballyclare, Cushendall and north and west Belfast. While there were localised flooding events in Banbridge, Carnlough, Lurgan and Moira;

[21] NIEA (2012) A Strategy for Promoting the Use of Sustainable Drainage Systems [online] available from: http://nia1.me/2p0
[22] DEFRA (2012) UK Climate Change Risk Assessment: Climate Change Risk Assessment for Northern Ireland [online] available from: http://nia1.me/25n PAGE 38
[23] PEDU (2012) PEDU Review of Response to Flooding on 27th and 28th June 2012 [online] available from: http://nia1.me/1ab
[24] BBC NEWS [online] Roads flooded after heavy rain in Londonderry. Available from: http://nia1.me/2pr
[25] UTV NEWS [online] Homes flooded in Newry. Available from: http://nia1.me/2ps

- November 2009 – protracted flooding across County Fermanagh posed considerable challenges to the local population including difficulties in accessing homes, shops, schools, farmland and businesses; problems in caring for the vulnerable; public health concerns; animal welfare issues; and wider economic impacts were all reported;[26]
- August 2009 – street and out-of sewer flooding in Belfast;
- August 2008 – Greater Belfast affected by flooding, including closure of the M2 motorway because of landslides

3.2.1 Properties at significant risk of flooding

The Department for Agriculture and Rural Development's (DARD) flood risk assessment for Northern Ireland demonstrates the significant risk of flooding faced by many households in Northern Ireland:

- It is estimated that 46,000 (5%) of the 830,000 properties in Northern Ireland could be at significant risk from flooding due to their location in coastal or river flood plains;
- The surface water flood map for Northern Ireland indicates that around 20,000 (2.5%) of properties are sited in an area that is shown to be at risk of flooding from a significant rainfall event;

The estimated number of properties at flood risk in Northern Ireland (approximately 1 in 18) is, however, lower than in England and Wales where 1 in 6 properties are claimed to be at flood risk but higher than in Scotland where 1 in 22 homes and 1 in 13 businesses are at risk.[27]

3.3 Combined Sewer System

The problem in Northern Ireland is compounded by the fact that over 70% of the public sewer system is 'combined', [28] meaning it was designed and constructed to collect both foul sewage and storm water. Combined sewer systems transport all of their wastewater to sewage treatment plants, placing unnecessary strain on the capacity of these facilities whilst also increasing the costs to NI Water:

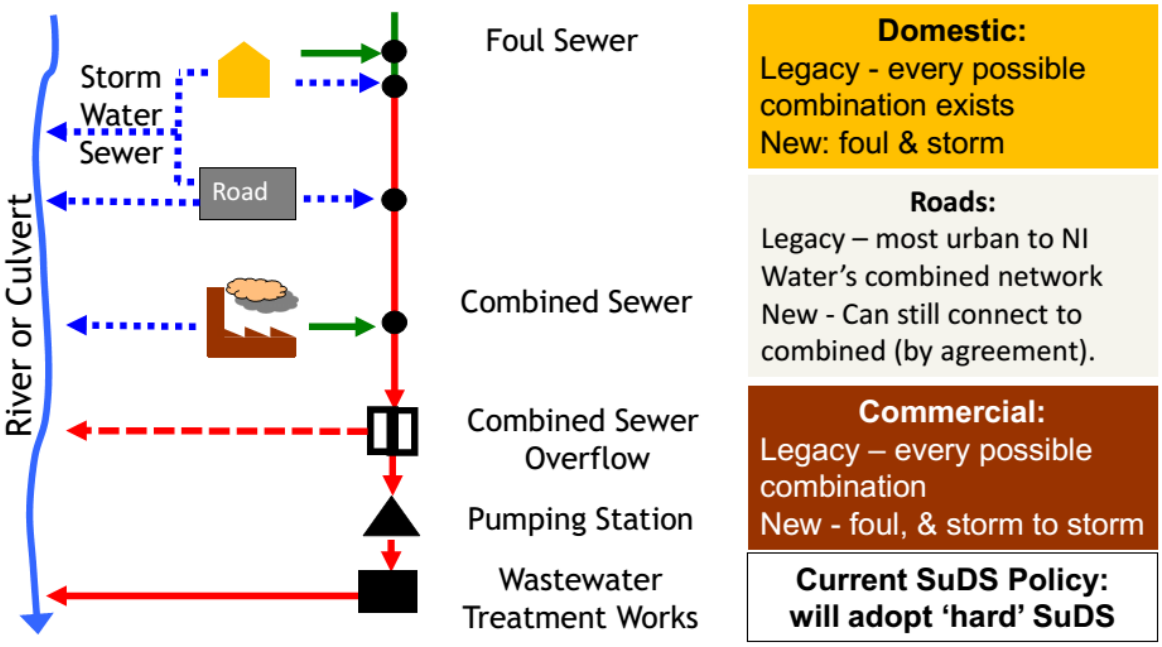
> *"NI Water estimates an annual cost of approximately £34 million to collect, treat and dispose of surface water, with some 200 million cubic metres of surface water drainage entering the sewer network and around 130 million cubic metres of that surface water drainage entering waste water treatment works. Sewage treatment operating costs in 2012/13 were estimated in the region of £47.5 million. With more than 800,000 households and*

[26] OFMDFM (2010) Report of the Flooding Taskforce on the Fermanagh Flooding of November 2009 [online] available from: http://nia1.me/2ow
[27] DRD (2014) Sustainable Water A Long Term Water Strategy for Northern Ireland Part 3: Flood Risk Management and Drainage [online] available from: http://nia1.me/2p5
[28] Water and Sewerage Services Bill: DRD Briefing , Committee for Regional Development, meeting on Wednesday, 3 June 2015 [online] available from: http://nia1.me/2p1

businesses across Northern Ireland and a projected additional 122,000 homes here by 2023 (beyond the 2008 level of approximately 689,000 households), this demonstrates the cost and scale of the issue and the need to act urgently to reduce surface water entering the sewerage system".[29]

An additional problem with combined sewer systems is that during periods of intense rainfall the capacity of the system can be exceeded causing out of sewer flooding of untreated foul sewage. Combined Sewer Overflows (CSOs) are a necessary part of the system to reduce the risk of overloading during extreme weather events. CSOs discharge the untreated waste directly into nearby streams, rivers, or other water bodies[30] causing pollution that must then be dealt with.[31] A graphic representation of NI Water's sewerage system is laid out in figure one.

Figure 1: NI Water's sewerage system and duties[32]



Since the 1970s new developments have had to provide separate drainage systems for sewerage and surface water. However, due to a lack of suitable river or drains to discharge the surface water, the two often are merged together in combined sewers. These problems enhance the need for SuDS in NI as it is both environmentally and socially desirable to limit instances of flash flooding to both prevent pollution problems and protect homes and businesses.

[29] DRD (2014) Proposals for a Water Bill Consultation. DRD: Belfast PAGE 35
[30] DRD (2014) Sustainable Water A Long Term Water Strategy for Northern Ireland Part 3: Flood Risk Management and Drainage [online] available from: http://nia1.me/2p5
[31] Ibid.
[32] NI Water (2013) NI Water's Approach to Urban Drainage and Key Challenges [online] available from: http://nia1.me/2p4

3.4 Consultation responses to policy proposals

The draft proposals for a Water Bill to amend the 2006 Order were published on 5 June 2014 for a 12-week public consultation period. The consultation closed on 29 August. As indicated earlier not all proposals relating to SuDS have been included in this Bill However, those that have are considered below with a short summary of the relevant responses to the consultation.

Proposal **Prohibit new surface water connections to the combined system for non-residential development**:

Sewerage connections would continue to be permitted. However, industrial or commercial developers would be **required to manage surface water on site using appropriate SuDS.** This is because development on a non-residential scale can involve significant hard surfaces (car parks, roofs etc.) which do not allow surface water to dispel naturally.

Response There was wide support from technical bodies, environmental groups, and councils for the prohibition of surface water connections to the combined sewer. However, developers were against this proposal highlighting the fact that there are currently no regulations and no regulatory authority in place to approve SuDS. Others raised concerns that preventing surface water connections for non-residential development might restrict the expansion of existing businesses. Other consultees pointed to the need for SuDS expertise within the planning service.

Proposal **Encourage sustainable drainage systems in the new residential development by restricting surface water connections to the combined sewerage system:**

Currently there is an “automatic right to connect” surface drainage systems to the combined sewer meaning there is little incentive for developers to use SuDS.

The main concern with this proposal is **uncertainty over the future maintenance and adoption of SuDS.** Consultees disagreed over where ultimate responsibility for this should rest, with some saying NI Water should be responsible for all (soft and hard) SuDS, some saying councils should be responsible for some whilst there was also a suggestion that homeowners should ultimately bear the responsibility.

Scrutiny point

It is established that (in GB) sewerage undertakers adopt and maintain hard SuDS as part of a sewer system, especially in new developments where SuDS may need to connect to surface water or combined sewers. Soft SuDS (that don’t connect to

sewerage network) particularly those in the public realm can be adopted by water companies but may be adopted by a range of stakeholders including local authorities.[33]

The committee may want to clarify with the Department the types of circumstances in which NI Water would adopt 'soft' SuDS and whether this will require future legislation. Although it is largely outside the remit of this Bill the committee may wish to consider the wider arrangements for adoption of SuDS in Northern Ireland as a means of identifying future barriers to take up.

In the consultation report the Department highlighted:

> *"…a common thread throughout the consultation responses was the lack of skills and knowledge regarding SuDS within the construction industry and stakeholders."*[34]

Indeed the Department acknowledged that:

> *"there are important questions still to be answered regarding the introduction of SuDS schemes in Northern Ireland. However, given issues with climate change, flood risk and the power costs of conventional drainage solutions, action is required to separate the existing combined sewer network and reduce the volume of surface water presently being carried in it."*

The Department concluded that **it is necessary to bring legislation** in order to *"drive forward the introduction of SuDS."* This Bill therefore seeks to:

- Reverse the current presumption in favour of the right to make surface water connections to the combined public sewerage network and to ensure that developers for both residential and non-residential sites consider SuDS.

It is anticipated that this measure will *"…reduce, or at least attenuate, the volume of surface water that enters the combined sewer network during adverse weather conditions […] greatly reducing the need to use CSOs."*

4 Legislative position of SuDS in GB

In October 2012, Schedule 3 of the Flood and Water Management Act (FWMA) 2010 came into force in England and Wales. This legislation created the power to require the inclusion of sustainable drainage of surface water in developments that need planning approval or have drainage implications.

As is proposed in the Water and Sewerage Service Bill **the FWMA removed the automatic right**, established by the Water Industry Act 1991, to connect to the public sewer, making the right conditional on meeting the new standards. The FWMA also

[33] Susdrain [online]
[34] DRD (2014) Consultation Report: Proposals for New Water Legislation [online] available from: http://nia1.me/2p2

gave the responsibility for approving SuDS in new developments as well as adopting and maintaining them where they affect more than one property, to a SUDS approving body (SAB), these are generally local authorities'.

4.1 Adoption

The FWMA (when enacted) would have required SABs to adopt SuDS which meet three specified conditions (the drainage system was constructed in pursuance of approval; the drainage system was constructed and functions in accordance with approval; the drainage system is a Sustainable Drainage System). The maintenance of approved SuDS was also to be the responsibility of the SAB and in the short term, the maintenance of adopted SuDS would have been funded by the Government.[35]

4.2 National Standards

It was intended that sustainable drainage systems would be assessed relative to a new national standard that would address the way drainage systems are designed, constructed, maintained and operated, considering run-off destination, peak flow rates, volume and water quality. The requirements of Schedule 3 were intended to be phased in over 3 years. Initially only major developments had to submit sustainable drainage proposals for approval, but from October 2015 it was the intention that all developments of more than one house would need to seek approval.

4.3 A new direction for SuDS in England

In September 2014, the UK government released a consultation document seeking views an alternative approach to the one envisaged in the FWMA (England and Wales). This stemmed from concerns raised local government and representatives for the house building sector. These included:

- The impact on development of approving sustainable drainage systems under a separate consenting regime from that used to approve planning applications;
- The fact that these regimes were to have been run by two different parts of local government, rather than just the one;
- The risk of delay if local authorities were not fully prepared to take on their new duties, including a new duty to maintain sustainable drainage systems that had been approved;
- concerns were also raised by local government about the mechanism for charging householders to pay for sustainable drainage systems maintenance.

[35] TCPA (2012) tcpa briefing SuDS – the flood and water management act and draft national standards [online] available from: http://nia1.me/2om

The UK Government announced the changes to the policy were to proceed in December 2014, and came into force in April 2015.[36] They have been summarised as follows:

- The development of SuDS in major developments (10 houses or more, or the equivalent non-residential development) will be managed through Planning Policy;
- Smaller developments will be excluded from the legal requirement, though the Government says that local planning authorities should ensure that flood risk is not increased by any new development and that sustainable drainage systems are considered for all new developments;
- Planning Policy guidance has been revised to define why and when SuDS should be considered appropriate, accepting that not all development will require SuDS or it may not be practical to provide;
- Local planning authorities will be required to ensure appropriate SuDS are provided for the management of run-off, unless it is demonstrated as being inappropriate;
- From 15 April 2015, Lead Local Flood Authorities (LLFA) became statutory consultees on planning applications for surface water management, replacing the Environment Agency;
- Planning authorities must ensure there are clear arrangements in place for the ongoing maintenance of SuDS for the lifetime of the development through planning conditions or obligations;
- Developers will need to secure adoption of the system by the Water and Sewerage Company (WaSC) or the Local Authority, through payment of a commuted sum, or potentially establishing a suitable management company.[37]

In lieu of the National Standards, the Department for Environment, Food and Rural Affairs (DEFRA) has published a set of non-statutory technical standards.[38] These standards are effectively a series of design and construction requirements, taken from current best practice, without replicating or re-writing detailed technical design criteria.

4.3.1 Response to policy change

The proposal to exclude minor developments (less than 10 homes) was unpopular among most respondents to the consultation, with 62% (of 402 respondents) in disagreement. However, a similar number thought that some threshold was necessary in order to avoid a burden on resources.

On maintenance, most of the respondents agreed with the Government's proposal that a suite of options was the best solution for maintaining sustainable drainage systems "for the lifetime of the development." However, the new policy means **it is now up to developers to propose a suitable mechanism for maintenance of SuDS over the**

[36] Parliament [online] Sustainable drainage systems: Written statement - HCWS161. Available from: http://nia1.me/2pl
[37] Hayes, D. (2014) U-Turn for the SuDS campaign bus? [online] available from:
[38] DEFRA (2015) Non-statutory technical standards for sustainable drainage systems [online] available from: http://nia1.me/2pk

lifetime of the scheme. The cost of this cannot be passed on to the homeowner therefore, this could *"ultimately become the main influence in design solutions rather than proposals on the best SuDS options for a site."*[39] This will place greater emphasis on the role of the LLFA who will have a vital role in assessing the appropriateness of SuDS requirements/solutions on individual planning applications.

4.4 Wales

The FWMA applies equally in Wales. However, as schedule three of the FWMA has not been commenced, the Welsh Government has published draft interim national standards, on an advisory basis, until such time as it determines the most effective way of embedding SuDS principles in new developments in the longer term.[40] This guidance is intended to provide developers and other stakeholders with an opportunity to take account of the standards in advance of a statutory framework which has yet to be developed.

According to the Welsh Government, having standards in place is vital to ensure the adoption and management arrangements for SuDS infrastructure are agreed with the local authority or sewerage undertaker at the planning stage. In its view, failure to do this is poor practice due to the risk of the drainage system not being adopted, and the consequent risk of poor performance or drainage failure due to inadequate maintenance.

4.5 Scotland

The Water Environment and Water Services (WEWS) (Scotland) Act 2003 made Scottish Water responsible for SuDS dealing with run-off from developments. SuDS need to be designed to Scottish Water's specifications as set out in their manual "Sewers for Scotland 3rd Edition".[41] The Water Environment Controlled Activities Scotland Regulations 2005 (CAR), which transposed the EU Water Framework Directive (2002), requires all surface water from new development to be treated by a sustainable drainage system (SUDS) before it is discharged into the water environment.

The Scottish Environmental Protection Agency (SEPA) planning advice on Sustainable Urban Drainage Systems (2010) points out that while SUDs is a legal requirement, as outlined above, the location, design and type of SUDs is largely controlled through planning.

[39] Hayes, D. (2015) The watered down 'SuDS renaissance'. Peter Brett Associates [online] available from: http://nia1.me/2q0
[40] Welsh Government (2015) Interim non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems [online] available from: http://nia1.me/2pz
[41] Scottish Water (2015) Sewers for Scotland 3rd Edition [online] available from: http://nia1.me/2pm

4.5.1 Drainage Assessment

The Sustainable Urban Drainage Scottish Working Party (SUDSWP) document 'Drainage Assessment: A Guide for Scotland' requires that a developer undertakes and submits a drainage assessment (DA) to the local Planning Authority with their planning applications.

For all developments and at an early stage before a drainage assessment (DA) is submitted, the developer must consult with Scottish Water on appropriate SUD system design and the practical aspects of servicing the development. However, the developer must agree the drainage assessment (DA) with the local Planning Authority and stakeholder organisations prior to submitting a formal application of their design to Scottish Water.

4.5.2 Adoption

Maintenance of SuDS within the boundaries or curtilage of a private property, such as a residential driveway or a supermarket car park, is the responsibility of the land owner or occupier. The Scottish Environment Protection Agency's (SEPA's) preference is for SuDS constructed outside the boundaries or curtilage of a private property to be adopted by Scottish Water, the local authority or a public body, and as such SEPA seeks a guarantee for the long term maintenance and sustainability of any SuDS implemented.

Scottish Water's policy is to support the use of SuDS. When the design and construction standards relating to SuDS are met (agreed at planning stage) Scottish Water will finance (up to reasonable cost thresholds) and adopt them.

Scrutiny Point

Given each of the jurisdictions have established SuDS standards, what plans are in place for the Department/NIEA to publish statutory/non-statutory standards for SuDS in Northern Ireland?

5 What are SuDS?

Sustainable drainage is defined as: *"a means of managing rainwater (including snow and other precipitation) with the aim of:*

a) Reducing damage from flooding;
b) Improving water quality;
c) Protecting and improving the environment;
d) Protecting health and safety; and
e) Ensuring the stability and durability of drainage systems".[42]

[42] Flood and Water Management Act 2010, Schedule 3(2)

A Sustainable Drainage System (SuDS) is a collective term for a number of approaches to manage surface water that take account of water quantity (flooding), water quality (pollution) and amenity issues. SuDS work by effectively mimicking the natural drainage cycle, which is altered by development. It does this by:

- Storing runoff and releasing it slowly (attenuation);
- Allowing water to soak into the ground (infiltration);
- Slowly transporting (conveying) water on the surface;
- Filtering out pollutants;
- Allowing sediments to settle out by controlling the flow of the water.[43]

The two primary benefits of SuDS are that they:

1. Reduce the risk of surface water flooding, which causes considerable damage, disruption to homes and business, and cost (in repairs, lost profits and finding alternative accommodation); and

2. They offer an opportunity to improve water quality (because impurities are deposited in the soil during infiltration, rather than reaching the aquifer) and can provide sites for biodiversity initiatives and public amenity.

There are other benefits of SuDS over traditional drainage systems, for example, in housing developments soft SuDS solutions have been shown to improve amenity with the introduction of trees and shrubs and fewer hard surfaces. It has been suggested that the use of SuDS and subsequent improved visual attractiveness has increased house values by 10% to 20%.[44]

5.1 SuDS Solutions

There are a large number of SuDS solutions; however, these can be grouped into two main categories: soft and hard. Soft SuDS are usually landscaped, vegetated features including swales and detention ponds. Hard SuDS include proprietary engineered precast concrete soakaways, permeable paving and attenuation tanks. Many schemes will feature a combination of hard and soft SuDS solutions. Examples of different SUDS and how each of them work are shown in table one.

[43] Susdrain [online] SuDS Principles. Available from: http://nia1.me/2p8
[44] Susdrain [online] Benefits for developers. Available from: http://nia1.me/2p9

Table 1: Examples of Sustainable urban Drainage Systems (SuDS)

SUDS	Description of SUDS
'Soft Engineered' SuDS features	
Infiltration trenches	An infiltration trench is a shallow, excavated trench that has been backfilled with stone to create an underground reservoir. Storm water runoff diverted into the trench gradually infiltrates into subsoil. An emergency overflow may be provided for extreme rainfalls which exceed the capacity of the reservoir.
Infiltration basin	Infiltration basins are shallow, surface impoundments where storm water runoff is stored until it gradually infiltrates through the soil of the basin floor. An emergency overflow may be provided for extreme rainfall events which exceed the capacity of the reservoir.
Filter drain	The gravel in the filter drain provides some filtering of the runoff, trapping organic matter and oil residues which can be broken down by bacterial action through time. Runoff velocity is slowed, and storage of runoff is also provided. Infiltration of stored water through the membrane can also occur and some filter drains need not lead to a watercourse at all.
Retention pond	Retention ponds retain a certain volume of water at all times. This can avoid possibly unsightly exposure of banks of collected sediment and enhance performance in removing nutrients, trace metals, coliforms and organic matter. Allowance for a considerable variation in water level during storms should be incorporated in the design, so that a significant storage volume can still be provided.
Detention basin	In contrast to retention, a detention, or dry, basin has an orifice level with the bottom of the basin so that all of the water eventually drains out and it remains dry between storms – hence, a dry basin.
Swales	Swales are grassed depressions which lead surface water overland from the drained surface to a storage or discharge system, typically using the green space of roadside margins. When compared to a conventional ditch a swale is shallow and relatively wide, providing temporary storage for storm water and reducing peak flows. They are appropriate close to source and can form a network within a development scheme, linking storage ponds and wetlands
'Hard Engineered' solutions	
Porous pavement	Porous pavement is a permeable pavement surface with a stone reservoir underneath. The reservoir temporarily stores surface runoff before infiltrating it into the subsoil. Runoff is thereby infiltrated directly into the soil and receives some water quality treatment. Porous pavement often appears the same as traditional asphalt or concrete but is manufactured without "fine" materials, and instead incorporates void spaces that allow for infiltration.
Geocellular systems	Geocellular systems can be used to control and manage rainwater surface water runoff either as a soakaway or as a storage tank. The modular/honeycomb nature of geocellular systems means that they can be tailored to suit the specific requirements of any site. This type of component is lightweight, easy to install and robust, can be installed beneath trafficked or non-trafficked areas and has a Long-term physical and chemical stability.
Detention/Retention Tank	Detention/Retention tanks are an effective means of stormwater management which provide a means of flow reduction and treatment prior to discharge from a developed site. Whether used to store and slowly release stormwater to the sewer system (detention) or dispose of stormwater onsite (retention) through infiltration to soils below or recycling onsite, these systems provide additional capacity to an existing sewer system, thereby improving its performance.

5.1.1 Soft SuDS vs. hard SuDS

SuDS are most useful when a combination of hard and soft techniques are employed. But while this is a best case scenario, this Bill as presented to the committee will only allow the adoption of hard SuDS, which are generally more difficult to install and maintain but are also more suitable for retrofitting and rainwater harvesting. The following table provides a brief comparison of the pros and cons of hard vs. soft suds.

Table 2: Pros and Cons of Soft vs Hard SuDS

Soft SuDS		Hard SuDS	
Pros	Cons	Pros	Cons
Ease of construction	High land take	Minimises space required	Water treatment for discharge into water courses requires ancillary components
		Conducive to rainwater reuse	
Ease of access for maintenance	Potential eyesore and health & safety risk if not maintained or abused	Can use land above	Greater maintenance expertise required as they are confined spaces
Can create a landscaped visual feature	Site topography and conditions can limit functionality	Protected against misuse or vandalism	Site conditions can limit functionality (e.g. high water table level)
Natural treatment	Lack of designer and contractor expertise.	Can retrofit	Higher initial cost
Lower upfront cost	Not conducive for water reuse	Recognised design standards	

Source: New Civil Engineer (2008)

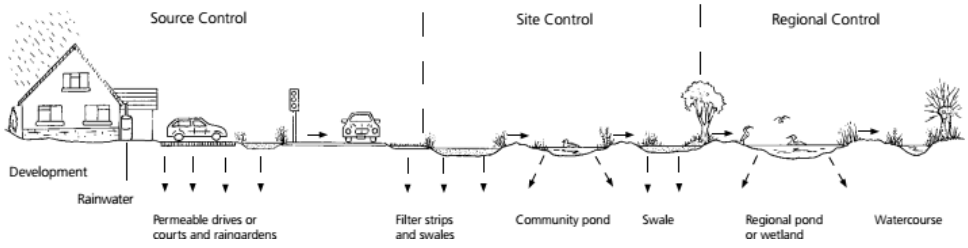
5.1.2 SuDS 'Treatment Train'

The above table is only a small sample of the wide range of SuDS solutions available to developers. In practice, it is suggested that a combination of techniques will deliver the best results -

> *"For example, a housing development where downpipes are fitted with water butts, the driveways use permeable paving, all connecting to conveyance swales, which in turn are linked to a pond or wetland area. This combination of drainage techniques is known as a 'treatment train'."*

Figure three shows how the treatment train works within the context of a typical development.

Figure 3: The SuDS Treatment Train within a typical development

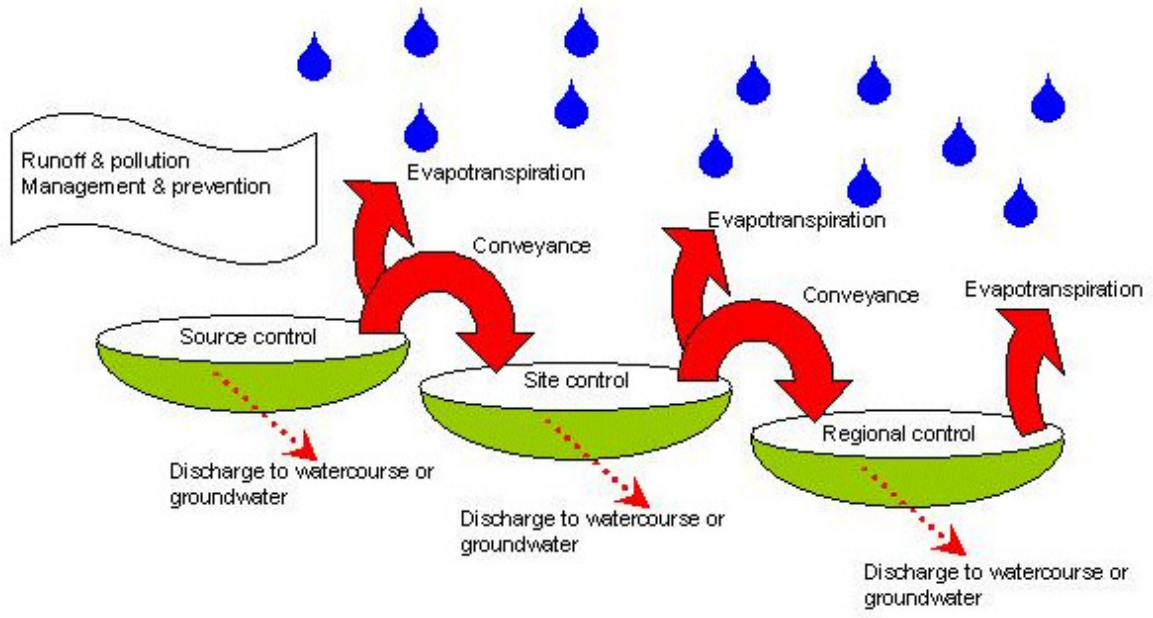


Source: Anglian Water[45]

[45] Anglian Water (2015) Sustainable drainage systems (SUDS) adoption manual [online] available from:

The SuDS treatment train uses a logical sequence of SuDS solutions. This allows run-off to pass through several different SuDS before reaching the receiving watercourse or water bodies. By using the treatment train, run-off will encounter different passive treatment processes that are active in different types of facilities.[46]

Figure 2: The SuDS Treatment Train



Source: SUDS Wales

The management of runoff using a treatment train is recommended by the construction industry research and information association (CIRIA) as the most appropriate technique for maximising SuDS performance.[47] It is also the preferred method of the environmental regulators in GB (see SEPA, 2014[48]; Environment Agency, 2013[49]). This reflects *"the partial effectiveness of SUD systems at removing pollutants,* [meaning] *successive stages achieving further reductions, greatly increasing overall performance".*[50] This approach has the following advantages:

- it provides better risk management for accidents that could produce shock loads of pollutants;
- using different and complementary removal techniques can achieve enhanced pollutant removal;

[46] SUDS Wales [online] The SuDS Treatment Train. Available from: http://nia1.me/2pd
[47] DTI (2004) The Operation and Maintenance of Sustainable Drainage Systems (and Associated Cost) [online] available from: http://nia1.me/2pn
[48] SEPA (2014) Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems (SUDS or SUD Systems) [online] available from: http://nia1.me/2pg
[49] Environment Agency (2013) Rainfall runoff management for developments Report – SC030219 [online] available from: http://nia1.me/2ph
[50] SEPA (2014)

- pollutant spills can be detected and managed in a more efficient manner by making the drainage infrastructure visible; and
- a better level of treatment is achieved by treating pollutants closer to their source.[51]

5.2 SUDS in Action

Lamb Drove Cambridgeshire is a residential development completed in 2006 whilst Rednock School in Gloucestershire was completed in 2009. These developments employ a range of hard and soft SuDS features including permeable paving, swales, green roofs and detention basins. Since completion these developments have been closely monitored to assess the impacts these SuDS features have had. According to Susdrain the inclusion of SuDS in the Lamb Drove site has:

- Reduced heavy metal pollution in runoff by between 30% and 90% and very small sediments (which collect other pollutants) by nearly 90%;
- Reduces flow rates and volumes of surface water runoff and improves quality of the runoff;
- 11% saving on construction costs when compared to traditional drainage and a 4% saving on maintenance costs;
- Proven environmental benefits through increased biodiversity and amenity spaces;

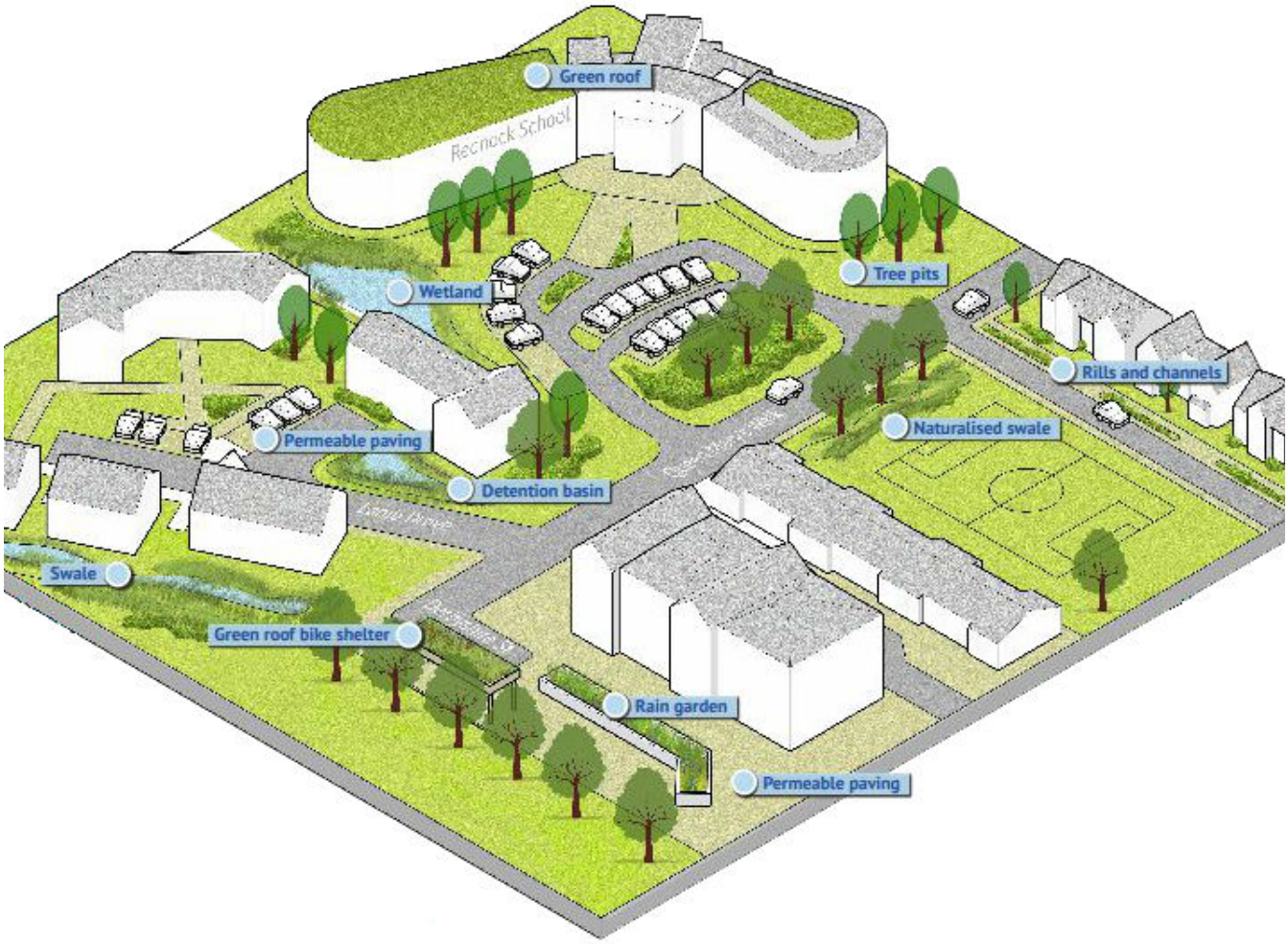
In Rednock School the use of SuDS:

- Prevented surface water runoff entering the combined sewer system and impacting the river;
- Effectively manages surface water flood risk; and
- Provides an attractive learning environment for the school children.

Created by CIRIA, www.susdrain.org is an independent platform containing a plethora of resources for those involved in delivering sustainable drainage. It has published an infographic that provides a simple overview of the drivers and benefits of sustainable urban drainage systems (SuDS). The 'Going with the flow' infographic describes some of the key objectives and outcomes of SuDS. Based on four case studies, two of which have been summarised above, it highlights how SuDS can enable savings in construction costs, manage local flood risk and deliver community space. Figure three is an extract of this infographic which shows a representation of the two schemes discussed above.

[51] Bastien, N., Arthur, S., Wallis, S. and Scholz, M. (2010) Towards the best management of SuDS treatment trains. Institute for Infrastructure and Environment, School of Engineering, The University of Edinburgh [online] available from: http://nia1.me/2p6

Figure 3: Managing rainfall with Sustainable Drainage Systems in a residential and educational development



Source: Susdrain see: http://nia1.me/2pa

6 Barriers to SuDS

The uptake of SuDS in Northern Ireland has been slow. Barriers preventing the uptake of SuDS, include:

- The lack of clear, strategic responsibility for flooding and a lack of information and data sharing between stakeholders;
- The current legislative context is restrictive with, for example, SuDS not falling within the current definition of a 'sewer' meaning they cannot be adopted, maintained and funded by NI Water;
- There is an automatic right to connect to a public sewerage system – at present authorities cannot compel developers to consider/install SuDS;
- Maintenance of SUDS devices may be carried out by some of the regulatory authorities, contractors or developers/owners. There is reluctance for adoption of

SUDS due to a lack of information on whole life costs of schemes together with a general lack of knowledge and experience in maintaining these systems;[52]

- Resistance to change and a lack of knowledge can also form barriers to implementation.

6.1 Costs

In 2013 the Department of the Environment, Food and Rural Affairs (DEFRA) published a report on the comparative costs associated with the construction and operation of both SuDS and traditional drainage systems for three typical residential developments. The selected developments comprise:

- 8 dwellings (small site);
- 32 dwellings (medium site); and
- 210 dwellings (large site).

Table three lists the SuDS features which were used in this study; maximum variation of use of SuDS features was made to illustrate the possibilities that are available, their relative merits and their effect on costs.

Table 3: SuDS features used in each study site

Design Criteria	Size of Site		
	Small	Medium	Large
SuDS elements	Permeable Pavements	Permeable Pavements	Swales
	Rain Gardens	Rainwater Harvesting	Permeable Pavements
	Green Roofs	Communal Rainwater Harvesting	Communal Rainwater Harvesting
	Rainwater Harvesting		Attenuation Storage

Source: DEFRA (2013)

6.1.1 Capital Costs

According to the report, differences in the costs are dependent on a number of factors and are often unique to that particular scheme:

- **Scale:** The greatest benefit for SuDS is at large sites but there is a reduced cost benefit for small sites;
- **Site characteristics:** Cost differences associated with site conditions (contaminated land, soil strength, high groundwater level etc.) can be considerable. For example, SuDS have advantages for developments on permeable catchments where rainfall runoff can be infiltrated. Impermeable sites will require solutions such as permeable paving, which are necessary to reduce land take, but cost more than other SuDS;

[52] NIEA (2012) A Strategy for Promoting the Use of Sustainable Drainage Systems [online] available from: http://nia1.me/2p0

- **Previously developed land** facilitates more generous discharge rates and the ground is more likely to be contaminated. Therefore the use of SuDS is likely to be less cost effective, but this will be very site specific;
- **Flat sites:** There is a significant cost advantage in using SuDS for flat sites, but in contrast their use on steep sites tends to constrain site layout and may cost more;
- **Design:** The study found that the approach of the design team in developing a development layout and the SuDS strategy will have a large impact on the capital costs and only small changes in the approach will have a large impact on the cost and affordability of the SuDS scheme.[53]

6.1.2 Maintenance Costs

According to the report, the annual costs of maintenance of SuDS in the public realm are of the order of 0.5% of capital costs of drainage construction. This indicates that a whole life cost (WLC) approach to SuDS would focus on capital costs.

That said, this report found that there is a limited benefit in doing WLC (irrespective of the dominant effect of the capital costs), as there are 3 different sets of stakeholders – each with their own cost interest;

- The capital cost is incurred by the developer,
- The SuDS in the public realm will be publically owned, and
- The SuDS in private property will be owned by these individuals.

The report concludes that there is generally little difference in maintenance costs between traditional drainage and the use of SuDS, though this is dependent on the type of SuDS used.

The report authors indicated that de-silting costs dominated their maintenance calculations. However, the fact that, in practice, maintenance tends to be reactive means it is difficult to attach a precise estimate. There is less uncertainty around the maintenance of permeable paving. While routine maintenance such as suction sweeping, jet washing and weed treatment is recommended twice a year, in Spring and in late Autumn, the evidence gathered suggests the chance of any blockage is minimal and SuDS is assumed to operate without the need for major works for up to 25 years.[54]

Vegetative systems have much less uncertainty associated with their maintenance, although frequency of attention can vary greatly based on aesthetic requirements:

- There is a need to deal with grass growth and accretion of sediment, or reed growth in ponds;
- In terms of equipment and effort required, pond vegetation, particular reeds in shallow waters or in poorly drained basins, require a high degree of maintenance;

[53] WSP Consultants (2013) DEFRA WT1505: Final Surface Water Drainage Report [online] available from: http://nia1.me/2pf
[54] Dublin Drainage [online] Greater Dublin Strategic Drainage Study: Permeable Pavement. Available from: http://nia1.me/2pi

- Where maintenance schedules are not kept to, trees can rapidly germinate and develop in basins and the banks of ponds leading to higher costs later in rectifying unmanaged growth;
- Roof related SuDS unit maintenance is an area of significant uncertainty, both in terms of the frequency and time needed and the risk of non-maintenance of home owners. This applies to rainwater harvesting tanks, green roofs, rain-gardens and infiltration units. Certain components, such as the pumps in rainwater harvesting systems, have a design life and they normally need replacing every 10 to 15 years;
- Communal rainwater harvesting units have reduced risk in terms of planned maintenance and competence, but require specific management provision to address ownership and long term maintenance requirements.[55]

There is a lot of guidance available that provides information on the maintenance of SuDS and it is clear from this that the level of inspection and maintenance will vary depending on the type of SuDS component and scheme, the land use, types of plants as well as biodiversity and amenity requirements. Table three provides a brief overview of the types of maintenance tasks and how often these should take place.[56]

Table 4 - Typical inspection and maintenance activities

Activity	Indicative frequency	Typical Tasks
Routine/regular maintenance	Monthly (for normal care of SuDS)	Litter picking Grass Cutting Inspection of inlets, outlets and control structures
Occasional maintenance	Annually (Dependent on design)	Silt control and components Vegetation management around components Suction sweeping of permeable pavement Silt removal from catch pits, soakaways and cellular storage
Remedial maintenance	As required (tasks to repair problems due to damage or vandalism)	Inlet/outlet repairs Erosion repairs Reinstatement of edgings Reinstatement following pollution Removal of silt build up

www.susdrain.org

[55] WSP Consultants (2013) DEFRA WT1505: Final Surface Water Drainage Report [online] available from: http://nia1.me/2pf
[56] Susdrain (2012) Maintenance of SuDS [online] available from: http://nia1.me/2px

6.1.3 Whole Life Costs (WLC)

It is considered good practice to carry out whole life cost (WLC) analysis for systems to ensure that the minimum cost solution has been selected. This avoids choosing low cost schemes at the expense of long term high levels of operating costs and vice versa. However, in the case of drainage systems for housing developments, those building the drainage systems will not own them, so each stakeholder has a specific interest in only their elements of cost.

According to the DEFRA report, it is due to:

- The high levels of uncertainty of key elements of the costs;
- The relatively small costs of maintenance relative to the capital costs; and
- The different stakeholder interests;

That there is limited value in carrying out a WLC exercise as outturn values will be dominated by the capital costs.[57]

6.1.4 Land take

A major aspect of concern levelled at SuDS is the land take needed – land that, in the case of a new housing development, could be used for additional dwellings. In all developments there is a requirement to provide a certain amount of open space. Open space can take many forms, from formal sports pitches to open areas within a development to footpaths and roads and is intended to provide health and recreation benefits to people living and working nearby, have an ecological value and contribute to green infrastructure.[58]

According to DEFRA some local authorities in GB are happy for SuDS to be considered as public open space as they have significant aesthetic value, while others do not. This is an area that would need to be clarified in the Northern Ireland context.

6.1.5 Cost Conclusions

The following are the principal conclusions from this estimated cost information:

- The advantage of SuDS over other drainage standards is site size dependent. Large sites are usually significantly cheaper built with SuDS than other drainage standards;
- For virtually all scenarios the use of SuDS ranges from being significantly cheaper to the same cost as traditional drainage for medium and large scale sites;
- SuDS are highly advantageous over other design standards where sites can use infiltration for the disposal of all runoff;

[57] WSP Consultants (2013) DEFRA WT1505: Final Surface Water Drainage Report [online] available from: http://nia1.me/2pf
[58] National Planning Policy Framework [online] Guidance: Open space, sports and recreation facilities, public rights of way and local green space. Available from: http://nia1.me/2pb

- SuDS are cheaper than traditional drainage systems for all developments where lining of permeable pavements is not required;
- Where small sites require lining of permeable pavements, they are significantly more expensive to construct than traditional drainage schemes. This is not so much to do with the lining itself, but the additional SuDS features that are needed;
- Where ground conditions require protection and permeable pavements have to be lined, SuDS drainage systems require greater attention to design detail and results in more complex arrangements;
- The cost implications of land value where SuDS are not considered to be public open space is very significant and results in a major constraint on SuDS design options;
    - Permeable pavements are a fundamental tool for efficient use of land and for generally meeting the SuDS design standard.
    - Roof runoff management (interception and storm control) is most cost effective by utilising un-lined permeable pavements.
    - If roof run-off interception cannot be provided in the permeable pavement, the most cost effective SuDS are rain-gardens or infiltration trenches in the garden of properties.
    - if space makes such features difficult to apply, then communal rainwater harvesting is the next best cost option.

6.2 Committee on Climate Change Study

A review of the available case study information on the costs of SuDS schemes was undertaken by the Committee on Climate Change. The purpose of this study was to assess typical total costs of schemes for different development densities and sizes. The available capital cost data is limited. However, it does give some indication of costs for typical new residential development.

6.2.1 Capital Costs

Table three presents capital costs of six different residential developments ranging in size from 35 to 387 properties and also ranging in property density from 24 to 500 properties per hectare.

As is to be expected the capital cost per property is directly related to the number of properties – due to the economies of scale which are realisable. In the case of Caledonia Road, Islington, it is clear that property density is also a factor (500p/ha). This is a major residential development which provides around 50 residential units including apartments, while there are also a number of ground floor commercial units, around a small central courtyard space. There are three surfaces that intercept rainfall

at Caledonian Road: the roof, the courtyard space and car parking.[59] The total capital cost for a traditional drainage system in this scheme would have been £75,100 – this represents a saving of £27,600 or 37%.[60]

Table 3: Case study evidence of capital costs of new residential development SuDS schemes

Scheme Name	Site Size		Property Density (per Hectare)	Capital Cost (£) SuDS		
	Area (ha)	Properties		Total	Per Property	Per Hectare
Lamb Drove, Cambridgeshire	1	35	35	197,600	5,646	197,600
Elvetham Heath, Hampshire	62	1868	30	2,140,000	1,146	34,516
Caledonia Road,Islington	0.3	150	500	47,500	317	158,333
Daniel's Cross, Newport	7	171	24	780,800	4,566	111,543
Ramshill	Unknown	287	Unknown	350,000	1,220	Unknown
Marlborough Road, Newport	11	387	35	966,100	2,496	87,827

6.2.3 Maintenance costs

This study points to the limited information available regarding the maintenance cost for SuDS. However, there is some data. For example, the Lamb Drove Scheme (discussed in section 4.2 of this paper) reportedly costs £1,340 per year or £38 per property to maintain – this is slightly less than the cost of traditional drainage suggested by the impacts assessments for SuDS produced by DEFRA.[61]

This study has developed a unit cost database from a synthesis of the available data, which can be used as the basis for generalised costing of SuDS solutions for new developments. Costs have been updated to 2011 prices using the consumer price index; they are available in Annex 1.

6.2.4 Summary

This study confirms the findings of the DEFRA study with regards to capital costs. The unit costs of SuDS decreases with development size as economies of scale are realised while costs reduce for higher density developments. Several of the case studies considered also developed theoretical costs for an equivalent traditional piped drainage system. These indicate that SuDS systems are cheaper to install than the equivalent traditional drainage solution.

[59] Islington Council [online] Promoting Sustainable Drainage. Available from: http://nia1.me/2po
[60] DEFRA [online] Presentation: Update and Progress on the Flood and Water Management Act 2010 - Sustainable Drainage Systems (SuDS) [online] available from: http://nia1.me/2pp
[61] DEFRA (2009) Impact Assessment - Local Flood Risk Management and the increased use of Sustainable Drainage Systems. London: Defra.

Table 4: Capital Cost of SuDS and Traditional Drainage Systems per property

Development Density	Capital Cost per Property (£)					
	Small (<100 properties)		Medium (100-500 properties)		Large (>500 properties)	
	SuDS	Traditional	SuDS	Traditional	SuDS	Traditional
Dense (urban) 100 properties/ha	No data	No data	500	1000	No data	No data
Moderate (urban) 40 properties/ha	5,500	6,000	1,000-5,000	3,000-5,000	1,000	No data

7 Summary

The main purpose of this Bill is to extend the power to pay subsidies to Northern Ireland Water, which has arisen due to the one year extension of the current NI Assembly mandate for which the Executive made a commitment not to introduce domestic water charges. The Bill also includes two clauses that will in effect reduce future administrative burdens:

- Clause one removes the need for primary legislation to extend the NI Water subsidy;
- Clause two requires NI Water to consolidate the water resource management and drought management requirements into a single plan; and

Clause three will facilitate the removal of requirements on NI Water to install water meters at domestic properties connecting for the first time to the public water supply.

7.1 Time Constraints

The Department has made it clear that this bill must receive Royal Assent before the Assembly is scheduled to be dissolved in March 2016. Already this has meant that it was *"not possible to progress all policy proposals, particularly those related to private supply pipes and broad enabling powers in respect of sustainable drainage."* Whilst the Department also admits to *there being "important questions still to be answered regarding the introduction of SuDS schemes in Northern Ireland."*

It may therefore be appropriate for the committee to consider if it has sufficient time in which to fully consider any legislative provisions or indeed omissions relating to SuDS.

7.2 SuDS

The remainder of the Bill deals with a number of measures designed to promote the use of (primarily 'hard' structural) SuDS, including:

- Removal of the automatic right to connect surface water run-off to a surface or combined public sewer unless prescribed standards are met and (where appropriate) SuDS are considered/employed;

- Provisions which would enable NI Water to adopt SuDS in line with its duties around the adoption and maintenance of sewers.

As it stands the public sewer network in Northern Ireland is not fit for purpose with over 70% of it combined. Extreme weather events have led to numerous examples of these sewers exceeding capacity and the result of this is devastation to peoples home, business and the wider environment.

While SuDS are viewed as a means of reducing the strain on the public sewer network there has been a slow uptake to date. Some of the barriers to SuDS will be addressed by the provisions in this Bill. However, both the Northern Ireland SuDS strategy and the consultation carried out by the DRD on these policy proposals highlighted a number of other barriers including a lack of knowledge and expertise.

It has therefore been recommended within this Bill paper that the committee seeks to content itself that measures have been put in place to address this deficiency.

The proposals in this Bill will bring the legislation which governs the water and sewerage industry in Northern Ireland in line with equivalent legislation in Great Britain where the automatic right to connect surface water runoff to the public sewer has been removed and sewerage undertakers have been empowered to adopt SuDS. That said the role of planning authorities in England, Wales and Scotland is enhanced.

7.2.1 Adoption

This Bill will enable NI Water to adopt hard structural SuDS. However, nothing has been done to address the issue of soft SuDS which in GB can be adopted by water companies but may be adopted by a range of stakeholders including local authorities.

The committee may want to clarify with the Department the types of circumstances in which NI Water would adopt ‘soft’ SuDS and whether this will require future legislation. Although it is largely outside the remit of this Bill the committee may wish to consider the wider arrangements for adoption of SuDS in Northern Ireland as a means of identifying future barriers to take up.

7.3 Costs

The question will ultimately arise as to what is more expensive; traditional vs sustainable systems. The evidence considered in this paper shows that this is very much case dependent and issues such as development size, topography, water table level, site use , SuDS solution etc., will all be factors.

Annex 1

Unit costs for SuDS

Table 1: Capital Unit Costs Database for SuDS [62]

SuDS Feature	2011 Unit Cost (£)			Unit	Data Source
	Low	Medium	High		
Filter drain	125	150	175	/ m^3 stored volume	HR Wallingford (2004)
Infiltration trench	70	75	80	/ m^3 stored volume	HR Wallingford (2004)
Soakaway	125	125	125	/ m^3 stored volume	HR Wallingford (2004)
Permeable pavement	275	337.5	400	/ m^3 stored volume	Average of HR Wallingford (2004), Interpave (2006), Environment Agency (2007) and Lamb Drove Scheme (Royal Haskoning)
Infiltration basin	15	18	20	/ m^3 storage volume	HR Wallingford (2004)
Detention basin	20	23	25	/ m^3 storage volume	HR Wallingford (2004)
Wetland	30	35	40	/ m^3 treatment volume	HR Wallingford (2004)
Retention pond	30	40	50	/ m^3 treatment volume	Average of HR Wallingford (2004) and Stovin and Swan (2007)
Swale	15	15	15	/ m^2 swale area	Average of CIRIA (2007), Environment Agency (2007) and Stovin and Swan (2007)
Filter strip	5	5	5	/ m^2 filter strip area	HR Wallingford (2004)
Exposed green roof	55	55	55	/ m^2 surface area	Solution Organisation (2005)
Green roof covered with sedum mat	110	110	110	/m^2 surface area	Solution Organisation (2005)
Biodiverse green roof	115	115	115	/m^2 surface area	Solution Organisation (2005)
WaterbButt	380	652.5	925	/ m^3 stored volume	Stovin and Swan (2007)
Rainwater harvesting	1140	1140	1140	/property	Roebuck (2008)
Storage tanks	515	553	590	/ m^3 stored volume	Stovin and Swan (2007)

Table 2: Annual Maintenance Unit Costs Database for SuDS[63]

[62] Committee for Climate Change (2012) Costs and Benefits of Sustainable Drainage Systems[online] available from: http://nia1.me/2py

[63] Committee for Climate Change (2012) Costs and Benefits of Sustainable Drainage Systems[online] available from: http://nia1.me/2py

SuDS Feature	2011 Unit Cost (£)			Unit	Data Source
	Low	Medium	High		
Filter drain	0.3	0.8	1.3	/ m3 stored volume	HR Wallingford (2004)
Infiltration trench	0.3	0.8	1.3	/ m3 stored volume	HR Wallingford (2004)
Soakaway	0.1	0.1	0.1	/ m2 treated area	HR Wallingford (2004)
Permeable pavement	0.6	1.0	1.3	/ m3 stored volume	HR Wallingford (2004)
Infiltration basin	0.1	0.3	0.4	/ m2 infiltration basin area	HR Wallingford (2004)
Detention basin	0.1	0.3	0.4	/ m2 detention basin area	HR Wallingford (2004)
Wetland	0.1	0.1	0.1	/ m2 wetland surface area	HR Wallingford (2004)
Retention pond	0.6	1.3	1.9	/ m2 pond surface area	HR Wallingford (2004)
Swale	0.1	0.1	0.1	/ m2 swale area	Average of CIRIA (2007), Environment Agency (2007) and Stovin and Swan (2007)
Filter strip	0.1	0.1	0.1	/ m2 filter strip area	HR Wallingford (2004)
Exposed green roof	0.2	0.2	0.2	/m2 surface area	Solution Organisation (2005)
Green roof covered with sedum mat	0.7	0.7	0.7	/m2 surface area	Solution Organisation (2005)
Biodiverse green roof	0.2	0.2	0.2	/m2 surface area	Solution Organisation (2005)
Water butt	N/A	N/A	N/A	N/A	N/A
Rainwater harvesting	120	120	120	/property	Roebuck (2008)
Storage tanks	Unknown	Unknown	Unknown	Unknown	Unknown