

Impact Assessment – Permeable Surfaces



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Summary: Intervention & Options

Department : Communities & Local Government	Title: Permitted Development Rights for Permeable¹ Surfacing	
Stage: Interim	Version: 2.0	Date: January 2008
Related Publications: Householder Permitted Development Rights – Consultation and Government Response; Future Water – Government’s new Water Strategy		

Available to view or download at:

What is the problem under consideration? Why is government intervention necessary?

Householders’ use of impermeable materials for converting front gardens to car parking spaces, contributes to flooding and water pollution. The total cost of surface water flooding and water pollution amounts to £270m per year. With climate change, increasing urbanisation, and ‘urban creep’ (increased amounts of hard surfacing in urban areas), are likely to increase flooding and associated water pollution. Currently, householders do not need planning permission to create parking spaces in their front gardens. The expectation is that most people would opt for permeable materials, if these remained permitted development (PD) and impermeable alternatives became subject to planning permission.

What are the policy objectives and the intended effects?

To discourage proliferation of impermeable hard standing in front gardens through changes to householder permitted development rights.

This should slow any increase in the loss of natural drainage storage and the incidence of surface water flooding. Additional benefits from more effective management of surface water runoff include: improved water quality through reduced water pollution (sewage and diffuse), less flood damage to housing and critical infrastructure, less potential loss of life, and fewer outbreaks of infection associated with foul water flooding.

¹ Permeable is used generically to refer to both permeable and porous materials. Porous surfacing is a surface that infiltrates water across the entire surface; Permeable surfacing is formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration through the pattern of voids.

What policy options have been considered? Please justify any preferred option.

This IA compares the costs and benefits of retaining PD rights for hard standing against the option of removing them for impermeable paving (but retaining them for permeable paving).

While the upfront costs of some permeable paving may be higher, available permeable options, such as gravel remain cheaper. Householders may, however, have a preference towards impermeable materials for other reasons such as aesthetics. As permeable paving is used by more households, we envisage that industry could respond by changing prices. Permeable paving also costs less to maintain, so the whole-life costs may be lower. Any additional costs would be more than offset by the benefits of reducing flood risk and improving water quality. Additionally the difference between permeable and impermeable paving are often related to the way it is laid rather than differences in materials.

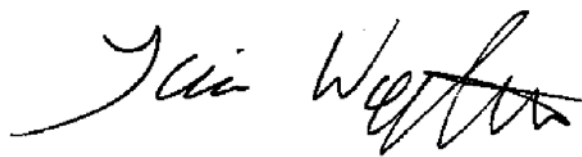
When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

Three years after the implementation date, currently planned for October 2008. At this stage stronger evidence will be needed on relative use of different surfaces and monitoring of prices.

Ministerial Sign-off For final proposal/implementation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister:



Date:

Summary: Analysis & Evidence

Policy Option: Permeable Paving	Description: Permeable paving would remain permitted development, but a householder would require planning permission to lay impermeable hard standing in their front garden.
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COSTS	ANNUAL COSTS	Description and scale of key monetised costs by 'main affected groups'	
	One-off (Transition) Yrs	Based on Assumptions in the Annex	
	£0	Costs to householders through increased materials: £1.7m-£5.1m	
	Average Annual Cost (excluding one-off)	Costs to householders through planning permissions: £0.1m-£1.1m	
	£1.8m-£6.1m	40	Total Cost (PV) £31m-£131m
<p>Other key non-monetised costs by 'main affected groups'</p> <p>Paving industry may need some upskilling in laying permeable paving. Local authorities may experience small increases in planning applications. Compliance would be checked as part of normal local authority enforcement procedures and there would be costs attached to ensuring compliance. Householders may experience disbenefits if they have a preference for non-permeable for other reasons such as aesthetics.</p>			

BENEFITS	ANNUAL BENEFITS	Description and scale of key monetised benefits by 'main affected groups'	
	One-off Yrs	Based on Assumptions in the Annex	
	£0	Benefits from averted floods	
	Average Annual Benefit (excluding one-off)	£6.6m-£6.7m (Impacts on insurers, business and citizens)	
	£6.6m-£6.7m	40	Total Benefit (PV) £112m-£113m
<p>Other key non-monetised benefits by 'main affected groups'</p> <p>Benefits from more effective management of surface water flooding include: improved water quality through reduced water pollution (sewage and diffuse), less potential loss of life, and improved human health. There will be benefits to the local environment and urban biodiversity.</p>			

Key Assumptions/Sensitivities/Risks Assumes that the part of the planning bill restricting compensation rights for the removal of permitted development rights will pass.] See annex for assumptions used in calculations.

Price Base Year 2007	Time Period Years 40	Net Benefit Range (NPV) £-19m to £74m	NET BENEFIT (NPV Best estimate) £ See Range	
What is the geographic coverage of the policy/option?		England		
On what date will the policy be implemented?		October 2008		
Which organisation(s) will enforce the policy?		Local authorities		
What is the total annual cost of enforcement for these organisations?		£		
Does enforcement comply with Hampton principles?		Yes		
Will implementation go beyond minimum EU requirements?		Yes		
What is the value of the proposed offsetting measure per year?		£N/A		
What is the value of changes in greenhouse gas emissions?		£N/A		
Will the proposal have a significant impact on competition?		No		
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	N/A	N/A	N/A	N/A
Impact on Admin Burdens Baseline (2005 Prices)		(Increase)		
Increase of £0.1m-£0.9m Decrease of £0		Net Impact £0.1m-£0.9m		
Key:	Annual costs and benefits: Constant Prices		(Net) Present Value	

1. What is the problem?

Surface water flooding occurs wherever high rainfall events exceed the drainage capacity in an area. Such events can lead to serious flooding of property and possessions where surface water flows and collects. The Foresight Future Flooding report estimated that currently 80,000 properties are at very significant risk from surface water flooding (10% annual probability or greater), causing on average £270 million of damage each year.² These problems were exemplified during the floods of summer 2007, when extreme rainfall over the Midlands and the north of England led to large-scale flooding, causing around £3 billion of damage. It is estimated that around two thirds of the 55,000 homes affected by the 2007 floods were flooded from surface water run-off.

Climate change scientists predict that while winters will generally be wetter and summers drier, the number and intensity of extreme storms will increase. By the 2080s winter rainfall could increase by 10–30% and rainfall intensity by up to 20%.³ The Government's Foresight report calculated that damages from surface water drainage flooding could increase from £270 million to £1–10 billion by the 2080s.⁴

Trends that are increasing surface water run-off include increasing urbanisation and, urban creep (see above). It is partly caused by more extensions and outbuildings and an increased tendency for the creation of hard standing (under Class F of the General Permitted Development Order) – usually for off-street car parking. A report by the London Assembly Environment Committee stated that in London alone, around two-thirds of front gardens – equivalent to an area 22 times the size of Hyde Park – are already at least partially paved over, primarily to provide parking bays.⁵ A Royal Horticultural Society (RHS) study found that the NE and SW regions had the highest proportion of front gardens paved, each with more than 75% paved.⁶

² Foresight (2004) *Future flooding*, www.foresight.gov.uk/Previous_Projects/Flood_and_Coastal_Defence; at least half of these costs are borne through insurance.

³ UK Climate Impact Programme (2002) *Climate change scenarios in the United Kingdom*, www.ukcip.org.uk/scenarios/ukcip02/documentation/ukcip02_scientific_report.asp

⁴ Foresight (2004) *Future Flooding*, www.foresight.gov.uk/Previous_Projects/Flood_and_Coastal_Defence/index.html

⁵ This is a total area to date; London Assembly (2005) *Crazy paving: the environmental importance of London's front gardens*, www.london.gov.uk/assembly/reports/environment/frontgardens.pdf

⁶ Research by MORI, reported in Royal Horticultural Society, *Gardening Matters. Front Gardens: Are we Parking on our Driveways? Do Driveways cause Flooding?* www.rhs.org.uk/learning/research/gardeningmatters/documents/frontgardens.pdf

When these pressures are combined, the impacts and costs of severe rainfall could rise sharply. The Foresight report estimated that the number of properties at very significant risk from surface water flooding could rise to 300,000–400,000 per year by the 2080s, potentially leading to billions of pounds in economic damages on average each year.⁷ Water companies could potentially have to spend around £1 billion per year to stop sewer flooding getting worse given increasingly intense rainfall events and increasing urbanisation.⁸

3. Why does it need Government intervention?

3.1 Market Failure

At present there is little incentive to mitigate possible water run off effects by using permeable materials. Currently, those who contribute to surface water runoff by increasing the amount of impermeable surface do not bear the full cost or consequences of their actions, because the impacts on flood risk and water pollution are felt further down the drainage catchment. Only four water companies charge for surface water drainage from commercial premises on an area basis. The existing system does not encourage developers, property owners or highway authorities to control surface water runoff at source, with the result that much surface water is routed into public sewers, which themselves have limited drainage capacity.

3.2 Current policy

Existing policies perpetuate these market failures. Increasing paved areas and curtilage developments such as the erection of outbuildings often do not require planning permission or Building Regulations approvals. There is therefore little incentive for householders to consider sustainable drainage systems for 'curtilage' developments or paved surfaces. Householders face few barriers to increasing the amount of hard standing in their property. Paving front gardens is a permitted development right and therefore can generally proceed without planning permission.

⁷ Foresight (2004) *Future flooding*, www.foresight.gov.uk/Previous_Projects/Flood_and_Coastal_Defence.

⁸ ICF International (2007) *The potential costs of climate change adaptation for the water industry*, Report for the Environment Agency, www.environment-agency.gov.uk/commondata/acrobat/icf2007_cc_report_1920959.pdf

3.3 Local control – Article 4 directions and local development orders

Local authorities can apply to the Secretary of State for an Article 4 direction to restrict permitted development rights. This means that they can determine locally for example that impermeable surfacing should no longer be permitted development but subject to planning approval. However, evidence from the Environment Agency suggests that local authorities have been reluctant to use this measure, probably because of the risk of liability for compensation, which could be costly and time-consuming. To address this issue and make it easier for local authorities to exert local control, there is a proposal in the new planning reform bill to remove the right to compensation for any changes made under Article 4 as long as 12 months notice is given. A further measure will allow local authorities to make Article 4 directions without the approval of the Secretary of State.

Assuming that permitted development rights are removed nationally for impermeable surfacing (the proposal being assessed) there would still be local powers in the form of local development orders (LDOs) available to local authorities. LDOs allow local authorities to specify what is permitted development locally, according to local circumstances. In areas where flooding was not considered a risk, local planning authorities could create LDOs to grant planning permission for impermeable surfaces.

4. What are the policy objectives and intended effects?

As part of its wider review of permitted development, Communities and Local Government consulted stakeholders for views on whether laying paving in front gardens should continue to be permitted development⁹. The General Permitted Development Order currently provides no restriction on a householder's ability to pave over front, side or rear gardens. At present, therefore, significant changes can occur where hard surfaces are installed in an uncontrolled manner to provide off-street parking in front gardens. Hard surfaces lead to accelerated runoff of surface water, which can overload sewerage systems in more urban areas. In most cases, it would not be economically or logistically feasible to expand the existing below-ground sewerage network to accommodate an increase in surface water run-off at reasonable cost. To the extent that any existing surplus capacity in sewerage systems is taken up by increased drainage from paving over front gardens, it will reduce the capacity available in those systems to accommodate other forms of development, e.g. foul water from urban infill developments. Even if expansion of existing sewerage systems were undertaken, there would also be implications for expenditure further downstream in increasing the capacity

⁹ Changes to Permitted Development: Consultation Paper 2 – Permitted Development Rights for Householders
www.communities.gov.uk/publications/planningandbuilding/changesdevelopmentconsultation

of sewage treatment works (for those areas served by combined surface and foul water sewerage systems). Such expansion measures would increase the Water Industry carbon footprint (already large) further (construction and lifetime operating requirements). This problem is likely to intensify as climate change produces more torrential downpours of rain. Another effect of hard surfaces is to reduce street-scene and urban biodiversity. 68% of respondents to the Communities and Local Government consultation felt that there needed to be a national restriction on hard surfaces, predominantly because of its impact on surface water runoff, drainage and flooding.

As a result, the Government is proposing to change householders' permitted development rights to allow them to pave over their front garden without planning permission only if the surface is porous, such as by using permeable paving or gravel. Planning permission would be required for laying impermeable surfaces in front gardens.

Such a change would help mitigate the effects and reduce the possibility of serious flooding events, relative to the projected increase with climate change, as surface water runoff is not exacerbated by an increase in hard standing. There will also be less surface water runoff contaminated with diffuse urban pollution, and fewer incidences of Combined Sewer Overflows, when untreated sewage enters watercourses. It will therefore be an incremental measure, of a portfolio of measures, of the type needed to help reduce flood risk.

A further, unquantified benefit of the policy would be to preserve ground water resources. Parts of the country (such as Sussex and Hampshire) are dependent, to varying degrees, on ground water resources such as aquifers for water supplies. These are replenished from rainwater infiltrating into the ground. A consequence of the increased coverage of the country's surface area by impermeable surfaces is that such replenishment is impeded. The use of permeable surfaces, as against impermeable paving, would support replenishment of water resources via ground water recharge. Greater permeability should also increase soil moisture levels which would benefit street trees and it is likely to reduce the risk of trees drying out soils and increasing the risk of subsidence.

5. Policy Options considered

Option 1 – Do nothing

Under this option, laying impermeable hard standing would continue to be permitted development. There would be no incentive for householders to lay permeable rather than impermeable surfaces in their front gardens and the problems of flooding, pollution, and danger to public health would, with climate change and development pressures, continue to increase.

Option 2 – Permeable paving would remain permitted development, but using impermeable hard standing to pave over front gardens would require planning permission

This option should significantly reduce the further proliferation of impermeable hard surfacing and encourage the use of permeable materials such as paving or gravel. This would happen in two ways:

- Householders would be deterred from applying for planning permission, because of its associated costs and need to await approval, and would therefore pursue permeable paving solutions;
- As permeable paving becomes dominant in the market for conversion of front gardens, it would naturally become dominant for use by those households who are re-surfacing previously surfaced front gardens (and who would not need planning permission). This fits in with the Environment Agency's report "A review of the cost benefit of undertaking SUDS retrofit in urban areas"¹⁰ which describes the life cycle of permeable surfacing to be 20 to 40 years.

The effect would be to reduce surface water run off and make an important contribution to offsetting the risks of serious flooding, water pollution and danger to public health.

8. Detailed costs and benefits

There are a range of material costs for permeable and impermeable paving depending on the product used. At the low end, the costs are already comparable – gravel (permeable) at £4 per square metre, compared with asphalt (impermeable) at £6–£12 per square metre. At the higher end, the upfront costs of permeable paving are currently slightly higher – £15–£17 per square metre for material costs of permeable concrete blocks compared with £8–£17 for impermeable blocks. The costs of the material for any sub-base could also be slightly higher, and there may also be a small premium on labour costs. However, permeable materials are not inherently more expensive, nor are labour costs (once the workforce is trained), and it is very likely that the market price would drop as they are used routinely for paving projects. Furthermore, any increase in material and labour costs are likely to be offset over the lifecycle of the product because: (1) property owners do not need to lay any drainage infrastructure with permeable paving and (2) new research by the Environment Agency, supporting findings of Interpave, suggests that whole life costs should be lower because of reduced maintenance costs. There are no insurmountable monitoring, enforcement or other costs. Providing clear guidance on permeable

¹⁰ The forthcoming report from the Environment Agency describes the relative costs and benefits of retrofitting sustainable drainage systems (SUDS).

solutions (based on existing advice such as that issued by the Royal Horticultural Society) and education should encourage compliance with the new permitted development rights.

As regards a possible increase in planning applications, it is unlikely that many people would pursue the planning application route rather than the permitted development route. A planning application would incur costs and payment of a fee (currently £135 but due to increase to £150 in April) and would require a wait of up to 8 weeks for approval. Permitted Development would allow for immediate development.

Option 1 – Do Nothing

If no action is taken householder will continue to pave over their front gardens with impermeable hard standing. This will result in increased flooding and sewage as described in section 1.

It is possible however that this could be mitigated by local authorities proscribing these permitted development rights through article 4 directions. This could become more prevalent if government legislation removing compensation rights is successful.

Option 2 – Permeable paving would remain permitted development, but using impermeable hard standing to pave over front gardens would require planning permission

Impact of Bill Clause

The analysis of this assumption has been undertaken on the assumption that the clause of the planning bill removing compensation rights when sufficient notice has been given for restricting development rights has passed.

Monetised Impacts

The primary benefits will be reduced flooding and the primary costs will be the increased cost of materials. It is not possible to accurately calculate monetised impacts as it is not known how many householders will wish to apply for permission to use impermeable paving after the removal of permitted development rights. Information on the current relative use of asphalt and other paving is not readily available. Our cost data is also limited and incomplete.

The annual monetised impacts that have been calculated therefore depend on assumptions which are set out in the annex. These assumptions will be revisited and refined at the final impact assessment.

The methodology is based on calculations of the surface area which will be paved over with permeable rather than impermeable material as a result of this proposal. This can then be converted into an estimate of how many floods that will be averted per year based on an assumption in the Environment Agency report 'A review of the cost benefit of undertaking SUDS retrofit in urban areas'. This assumption is that for every 1% decrease in run of surface area there will be a 9% decrease in the incidents of sewage floods. See the annex for more details.

The benefits for reducing flooding are calculated at an average of £6.6m–£6.7m per year over a 40 year period. The costs in terms of increased materials are calculated at an average of £1.7m–£5.1m per year over a 40 year period. The costs in terms of increased planning permissions (including fees and administrative burdens) are calculated at an average of £0.1m–£1.1m over a 40 year period. The benefits are based on current estimates of flood damage and do not take account of the increased flooding that is expected over time as a consequence of climate change.

The above costs do not include the impact of the possible reduction in cost of impermeable materials as their use is made more common as a result of this proposal. Such an affect will depend on how industry responds to the changed incentives it will face as the demand for materials changes.

In addition to the above analysis an alternative way of presenting costs and benefits has been used in order to consider them at the level of impact on a typical garden. This does not form part of the analysis at an annual level and therefore does not relate to the summary sheets. This uses the same methodology as the calculation of annual costs and benefits is used but fewer assumptions are needed. The three scenarios that are considered are:

1. A household that would choose to use gravel rather than asphalt to surface their front garden as a result of the proposal.
2. A household that would choose to use permeable paving blocks rather than impermeable paving blocks to surface their front garden as a result of the proposal.
3. A household that decides that they still wish to use impermeable paving successfully applies for planning permission.

The relative costs and benefits of the scenarios are therefore:

Scenario	Benefits (In terms of reduced flooding risk discounted over 40 year life of paving)	Costs	Net Benefit
Scenario 1 Gravel used instead of Asphalt when paving over front gardens	£57.69	£0.00	£57.69
Scenario 2 ¹¹ permeable blocks used instead of impermeable blocks	low	£57.69	£57.69
	medium	£57.69	£1.69
	high	£57.69	-£86.52
Scenario 3 decide to apply for planning permission	£0.00	£875.00	-£875.00

Again the above costs do not include the impact of the possible reduction in cost of impermeable materials as their use is made more common as a result of this proposal.

Aside from these monetised costs and benefits there will be a number of non-monetised costs and benefits that are described below.

Non Monetised Costs

- Local Authorities will have to monitor compliance to ensure front gardens are not surfaced with impermeable material without planning permission.
- Local Authorities will also incur costs enforcing this policy.
- Local Authorities may need to train their planning officials in the new rules.
- There will be disutility from consumer’s using gravel instead of asphalt.
- Firms that specialise in impermeable surfaces and paving could lose business in the short term and may have stock that they will not be able to sell (or will take longer to sell). However their will be opportunities for them to change to selling permeable surfaces and paving.

¹¹ The low medium and high cases for this scenario relate to different assumptions about the relative costs of impermeable and permeable paving blocks that relate to the price ranges provided by industry.

Non Monetised Benefits

- Improved water quality through reduced water pollution.
- Health benefits from the improved water quality.
- Benefits to the local environment and biodiversity.
- Reduction in the urban heat island effect. thus reducing the potential impact of climate change (where gravel rather than asphalt is used).
- Enhanced water resources via ground water recharge.

9. Impact Tests

Competition Assessment

It is possible that at present firms that specialise in impermeable paving and surfaces are competing against firms that specialise in permeable paving and surfaces. It is therefore possible that reducing the demand for impermeable paving and surfaces through this measure will restrict competition. This will be mitigated by firms switching their business to permeable paving. As the difference between permeable paving and impermeable paving often depends on the way that it is laid the only constraint for such as switch should be skills. The extent of any restriction in competition will depend on the characteristics of local markets and our understanding of these is at present limited. We will revisit this competition assessment for the final IA.

Small Firms Impact Test

Small firms that specialise in impermeable paving and surface will be adversely affected by this measure. They will have a reduction in their demand for their product and could be left with excess or slow-moving stock. The extent of these effects will depend on these firms ability to convert their business to the supply of permeable paving and surfaces. This again will often only depend on skills. Sufficient notice of this change should also allow firms to adjust their stocks. This measure will be beneficial to smaller firms that specialise in permeable paving and surfaces. We will review this test for the final IA, once we have a better understanding of the market.

Legal Aid

No impact is envisaged.

Sustainable Development

Permeable paving is classified as a sustainable drainage technique. Sustainable drainage aims to mimic natural drainage systems and uses less energy and other resources than are used by conventional techniques of transporting, treating and disposing of surface water via the sub-surface sewerage systems. It is therefore more sympathetic to the principle of living within environmental limits that underpins sustainable development.

Carbon Assessment

Greater permeability through permeable surfacing should increase soil moisture levels, benefiting street trees and carbon absorption levels.

Other Environmental impacts

Control of storm run off and serious flooding, water pollution, ground water depletion and soil moisture levels.

Enforcement, Sanctions and Monitoring

Local Planning Authorities would be responsible for monitoring and enforcement as part of their normal responsibilities.

Health Impact Assessment

The risk of injury, illness or death (potentially on a large scale) through serious flooding and/or water pollution would be reduced.

Race Equality

There would be no discernable impact on race equality.

Disability Equality

There would be no discernable impact on disability equality.

Gender Equality

There would be no discernable impact on gender equality.

Human Rights

There would be no discernable impact on human rights.

Rural proofing

Except for the fact that rural areas are more sparsely populated, with less area likely to be made hard surface, there would be no particular impact on rural areas. The benefits calculated above are averaged across the country as a whole, but the benefits of averting surface water flooding will be greater in urban areas and less in rural areas. Additionally, rural homes may have larger front drives to pave over than urban settings. These scenarios will be explored in the final IA.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	Results in Evidence Base?	Results annexed?
Competition Assessment	Yes	No
Small Firms Impact Test	Yes	No
Legal Aid	Yes	No
Sustainable Development	Yes	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	Yes	No
Race Equality	Yes	No
Disability Equality	Yes	No
Gender Equality	Yes	No
Human Rights	Yes	No
Rural Proofing	Yes	No

Annexes

Assumptions used to calculate annual impacts and scenarios

The following assumptions are preliminary and will be revisited and revised at the time of the final IA.

- A 40 year assessment period has been chosen in line with the expected life of paving blocks as taken from the Environment Agency report: “A review of the cost benefit of undertaking SUDS retrofit in urban areas”.
- The relative costs of permeable and impermeable paving blocks have been provided by a firm within the industry. (This does not account for the likelihood that the price of permeable paving will fall as result of its increased use as a result of this proposal).
- The cost of gravel and asphalt is assumed to be equal. This is based on information supplied by industry which suggests that gravel is actually cheaper than but the difference is made up with the higher maintenance costs of gravel.
- Consumers are assumed to face choices between gravel and asphalt and between permeable and impermeable paving blocks. In reality the measure could move some consumers from using asphalt to using permeable paving blocks or from using impermeable paving to using gravel.
Little information is known about current consumption and the relative substitutability of the materials.
- The benefit is measured in terms of the assumption used in the EA report that for every 1% decrease in run off surfaces there will be a 9% decrease in sewer related floods.
- The average cost of each sewer flood is assumed to be £39,000 inline with the EA report.
- There are assumed to be 2062 sewer related floods in England in line with OFWAT figures quoted in the EA report.
- The number of front garden conversions happening each year is taken from information available from Ealing which has been scaled up for the whole of England.
- The average size of the garden which will be paved over is assumed to be the area of two cars or 16m². (Based on looking up measurements for a typical car.) This could well be an underestimate as some households pave over their entire front garden.

- The proportion of consumer who will still wish to use impermeable materials and will therefore apply for planning permission is assumed to be very small as the costs of applying for planning permission will outweigh the higher costs of using permeable material. For the purpose of the calculation they are assumed to range from 0.1% to 1%.
- The proportion of the changes in material that relate to using gravel instead of asphalt as opposed to permeable blocks rather than impermeable blocks is assumed to range from 25% to 75%.