

## **Achieving Urban Flood Resilience in an Uncertain Future, EPSRC**

### **Research sub-title: Dynamic assessment of Natural Capital in urban drainage adaptation planning**

#### **Dear participant**

Thank you very much for making time for this survey. This survey is linked to the, “Achieving Urban Flood Resilience in an Uncertain Future” research project, led by Nottingham University and its partner institutions (University of Cambridge, Heriot-watt University, Newcastle University, De Montfort University, Leeds University, University of the West of England, Open University and Exeter University). The overall aim of this project is to conduct research necessary to make urban flood resilience achievable nationally, by making transformative change possible through adoption of a whole systems approach to urban flood and water management.

Specifically, this survey is part of the project focussing on blue/green infrastructure adaptation pathways and the associated natural capital dynamics. Blue/green refers to Infrastructure that aims at restoring the naturally-oriented water cycle while contributing to amenity by bringing water management and green infrastructure together. Natural capital refers to the stock of natural features/assets - e.g. freshwater, soil, habitats, biodiversity and processes which together provide the foundation for the flows of ecosystem services (multiple benefits). Ecosystem services are the benefits which people gain from ecosystems such as food, flood regulation and recreational opportunities etc.

The aim of this survey is to engage you; as key stakeholders in the Borough of Sutton, to identify prioritised multiple benefits in Sutton. Your input will inform subsequent spatio-temporal analysis on how different adaptation pathways can lead to the delivery of multiple benefits profiles.

This is a short survey which is estimated to take about 10 minutes to complete.

We hope to receive your responses by 15/01/2020.

#### **Consent**

Please be assured that all your responses will be held in strict confidence; findings will be presented in aggregate, and no statements will be attributed directly to you. Your participation is voluntary, and you may decline to answer any question or exit the survey at any point. Do you agree to continue?

Yes ☐

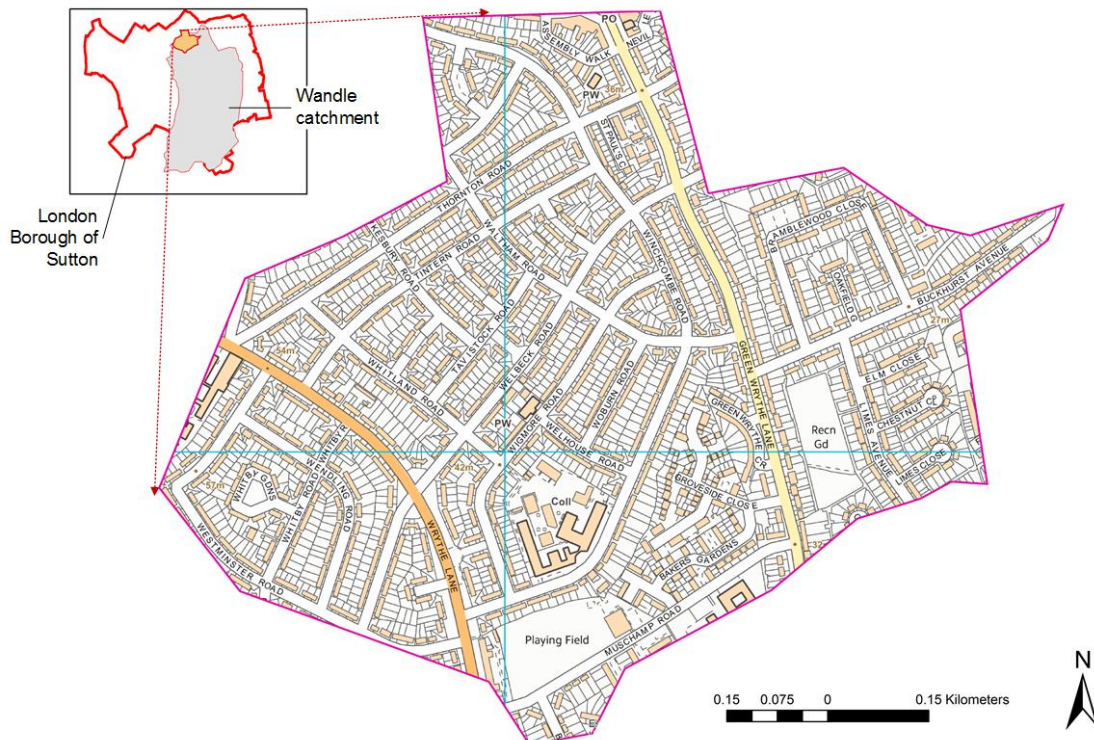
No ☐

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## Basic Information

- a. Which organisation/institution do you work for?  
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- b. What is your position and main role in your organisation/institution?  
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Below is the map of a sub catchment within the Borough of Sutton; showing the study area which this survey is focussed on.



*Contains Ordnance Survey data (2018)*

- c. i. How familiar are you with the sub catchment shown on the map? (*Please tick one box*)

Not at all familiar	Slightly familiar	Somewhat familiar	Moderately familiar	Extremely familiar

- c. ii. If you ticked the first column above (not at all familiar), please answer the following questions based on your general knowledge of Sutton.

## Section 1:

1. On a scale of 1-5, how would you rate the importance of the following multiple benefits to the Sutton residents? *Rate out of 5 (1= not important at all, 5= Absolutely essential)*

Multiple Benefit	1 Not important at all	2 Little importance	3 Average Importance	4 Very Important	5 Absolutely essential	Not applicable
Biodiversity						
Aesthetic values and recreation						
Water quality regulation						
Flood risk regulation						
Air quality regulation						
Local Climate regulation						
Global Climate Regulation						

2. With regards to the area in the map, which multiple benefits would you prioritise? *Rate out of 5 (1= very low priority and 5= Very high priority)*

Multiple Benefit	1 Not a priority	2 Low priority	3 Medium priority	4 High Priority	5 Essential Priority
Biodiversity					
Aesthetic values and recreation					
Water quality regulation					
Flood risk regulation					
Air quality regulation					
Local Climate regulation					
Global Climate Regulation					

3. How would you weight the following multiple benefits to reflect their level of importance/priority over others in the case study area? *(You can score each benefit against each other using values 1-3-5-7-9, e.g. if you consider "aesthetic value and recreation" significantly more important than "biodiversity" then mark B in the third column and score should be 7 or 9).*

A	B	More Important	Score
Biodiversity	Aesthetic values and recreation		
Biodiversity	Water quality regulation		
Biodiversity	Flood risk regulation		
Biodiversity	Air quality regulation		
Biodiversity	Local Climate regulation		
Biodiversity	Global Climate Regulation		
Aesthetic values and recreation	Water quality regulation		
Aesthetic values and recreation	Flood risk regulation		
Aesthetic values and recreation	Air quality regulation		
Aesthetic values and recreation	Local Climate regulation		

Aesthetic values and recreation	Global Climate Regulation		
Water quality regulation	Flood risk regulation		
Water quality regulation	Air quality regulation		
Water quality regulation	Local Climate regulation		
Water quality regulation	Global Climate Regulation		
Flood risk regulation	Air quality regulation		
Flood risk regulation	Local Climate regulation		
Flood risk regulation	Global Climate Regulation		
Air quality regulation	Local Climate regulation		
Air quality regulation	Global Climate Regulation		
Local Climate regulation	Global Climate Regulation		

4. What do you say is the current state/level of delivery (baseline) of each of the following multiple benefits in the study area? *Rate out of 5 (1= very low and 5 = very high)*

Multiple Benefit	1 Poor	2 Fair	3 Good	4 Very Good	5 Excellent	Not Applicable
Biodiversity						
Aesthetic values and recreation						
Water quality regulation						
Flood risk regulation						
Air quality regulation						
Local Climate regulation						
Global Climate Regulation						

## Section 2

5. Which of the following blue/green infrastructure intervention options for run-off control do you know of?

Intervention type	Have no knowledge about it at all	Have little knowledge	Have average knowledge	Have good knowledge	I am very knowledgeable about it
Bioretention cells (these are depressions that contain vegetation grown in an engineered soil mixture placed above a gravel drainage bed. They provide storage, infiltration and evaporation of both direct rainfall and runoff from surrounding areas. Commonly found as linear street features).					
Green roofs					
Road swales					
Rainwater harvesting					
Permeable Pavements					
SUDs retention ponds					
Raingardens (similar to bioretention cells but without the gravel layer. Commonly found within property land)					

6. a. Of the blue/green interventions listed in the previous question, which ones can be implemented in the mapped area?

Intervention type	Impossible to implement	Can Possibly be implemented	Can probably be implemented	Very probably implementable	Definitely possible to implement
Bioretention cells					
Green roofs					
Road swales					
Rainwater harvesting					
Permeable Pavements					
SUDs ponds					
Raingardens					

6.b. If you ticked the first column (impossible to implement) for any of the blue/green interventions listed above, what would be the main hindrance to their implementation? *(please explain briefly)*

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7. Which of the following blue/green intervention options would you like to see implemented in Sutton? *(Rank them in order of priority; 1= High priority and 7=Low priority)*

Intervention type	Rank
Bioretention cells	
Green roofs	
Road swales	
Rainwater harvesting	
Permeable Pavements	
SUDs retention ponds	
Raingardens	

8. Based on your choice of the prioritised blue/green infrastructure interventions, which one do you think can deliver the multiple benefits you prioritised in the previous section?

<b>Intervention type</b>	<b>Very low potential</b>	<b>Low potential</b>	<b>Average potential</b>	<b>High potential</b>	<b>Very high potential</b>	<b>No idea</b>
Bioretention cells						
Green roofs						
Road swales						
Rainwater harvesting						
Permeable Pavements						
SUDs ponds						
Raingardens						

9. Any other comments?

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End of the survey. Thank you!

## Telephone interviews summary notes

### Question 1: Can you please comment on the following findings on ecosystem services from the online survey you completed?

1. Flood risk regulation, aesthetic values and recreation are **very important** ecosystem services while water quality regulation is of **little importance** to local residents in the study area.
2. Flood risk regulation is an **essential priority** ecosystem service in the study area while other ecosystem services i.e. local climate regulation, air quality regulation, water quality regulation, aesthetics values and recreation are of **high priority**.
3. The current state/baseline of all the above-mentioned ecosystem services in the study area can be rated as **fair**.

**Expert stakeholder 1:** Prioritised ecosystem services reflect good priorities in the study area.

**Expert stakeholder 2:** Very important and prioritized ecosystem services are a true reflection of the study area as people appreciate and see/visualise them while water quality regulation is less tangible. Recreation and aesthetic values can be easily explained and understood while water quality regulation and its benefit to people is difficult to explain.

**Expert stakeholder 3:** This reflects an awareness of what people are worried about such as flooding. Water quality is not prioritized as people don't understand where water comes from and the direct importance of water quality directly to them.

**Expert Stakeholder 4:** Ecosystem Service priorities in the study area are influenced by their applicability to their daily lives like flooding, recreation and aesthetic values and these can be easily explained to residents. Ecosystem services like water quality regulation were regarded as of little importance because they are less tangible, some residents don't understand where water for their domestic uses comes from and hence the direct importance of water quality to them is less understood.

### Question 2: Can you please comment on the following findings on blue-green options from the online survey you completed?

4. Among the different blue/green options there is **good knowledge** on raingardens and rainwater harvesting in the study area.
5. Raingardens and permeable pavements blue/green options are **definitely possible** to implement in the study area.
6. In terms of ranking - Bioretention cells can be **ranked** as the 1<sup>st</sup> choice and raingardens as 2<sup>nd</sup> choice blue/green options to be implemented in the study area while Permeable Pavements can be ranked last.

**Expert Stakeholder 1:** Raingardens are popular as they have multiple benefits, some of which are visible to the public e.g. aesthetic values. Rain gardens are cheap in terms of costs and benefits compared to large scale blue/green intervention options. The amount of spoil from raingardens is less and they are common in schools and they have been used to attract more schools to join the SUDs program. Raingardens require limited skills to implement them, their impact in terms of flood risk regulation is small compared to large scale interventions like bioretention cells. The council will take on large scale measures and 1<sup>st</sup> choice ranked options like Bioretention cells have a large storage potential and water quality improvement. Bioretention cells need to be included in upcoming new developments e.g. new homes as they would be difficult to implement in a retrofit set up while raingardens are suitable in such set ups.

**Expert Stakeholder 2:** SUDs ponds not obvious to people compared to raingardens. Flood risk regulation of PP and raingardens is significant though this is expensive in individual households and a challenge in retrofit settings. Bioretention cells are easier to implement along the roads especially in the upcoming new housing developments. Bioretention cells are easy for the councils and developers as they mostly have limited time/resources to put green infrastructure during construction but bioretentions cells are easier for them though they are large scale works with lots of spoil.

**Expert Stakeholder 3:** Bioretention cells offer more value in terms of multiple ecosystem services provision while Permeable Pavements are primarily focused on one benefit/addressing one challenge. The magnitude of benefits and higher water storage potential of Bioretention cells makes them a 1<sup>st</sup> choice compared to Permeable Pavements which don't even have an aesthetic or recreational value. Raingardens are popular as people can understand and have confidence in what such interventions can deliver.

**Expert Stakeholder 4:** Raingardens are popular as they have multiple benefits some of which are visible to the public such as aesthetic values and they can also attract more people to implement them. They are cheap, require limited skills to implement and have less spoil. Their flood risk regulation potential is low compared to large scale interventions like bioretention cells. Raingardens are suitable in retrofit set ups and people have confidence on what they can deliver.

Bioretention cells have been ranked as the first choice as they have a large storage potential and flood risk regulation and water quality regulation compared to small scale interventions like raingardens. They are easily implementable in new developments and along roads. Bioretention cells are much easier for the local authorities and developers to be included in their plans and even though these are large scale works, they have such machinery and equipment to implement them. Bioretention cells like raingardens offer more value in terms of multiple benefits provision while options such permeable pavements are primarily focused on flood risk regulation with no aesthetic or recreational value.