COLLECTE ET COMPARAISON DES OPINIONS DES ACTEURS IMPLIQUÉ DANS UN PROJET DE GESTION D'EAUX PLUVIALES URBAINES : EXPÉRIENCE DE CONSULTATION AU ROYAUME UNI

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THE COLLECTION AND COMPARISON OF STAKEHOLDERS' OPINIONS ON URBAN STORMWATER CONTROL MEASURES: CONSULTING EXPERIENCE WITHIN THE UK

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Abstract

Individual interviews were held with nine selected stakeholders in the proposed Clay Farm residential development and Addenbrookes Hospital development, near the city of Cambridge in the east of England, a case study in the EC-funded DayWater sustainable stormwater management *project. The stakeholders included community members, City and County Planners and Engineers and Environment Agency staff. Prior to each interview, the stakeholders were emailed an introduction to DayWater and an outline and instructions for using a simplified version of the Multi-criteria Comparator (MCC) of Best Management Practices (BMPs) or Sustainable Urban Drainage systems (SUDS) available on-line as part of the DayWater Adaptive Decision Support System (ADSS). Each stakeholder was asked to complete and return the comparison matrix with scores and weightings for four alternative drainage options within one week of the interview. Each stakeholder independently developed and allocated their own scores using a combination of the information provided and their own specific needs and requirements. Constructed Wetland received the highest score followed by swale, infiltration trench and conventional drainage system. During and following the interviews, the stakeholders were asked to provide critical comments on the MCC pages on the prototype ADSS website and to highlight issues concerning the promotion and use of BMP(s)/SUDS.*

Résumé

Des consultations individuelles ont été conduites avec 9 représentants des acteurs impliqués

dans des opérations de développement urbain conduites, à l'est de l'Angleterre, à proximité de Cambridge, dans la résidence de Clay Farm et l'Hôpital Addenbrooke. Cette opération constitue d'une des 4 études de cas du programme européen de recherche DayWater, sur la gestion à la source des eaux pluviales urbaines. Les acteurs sélectionnés représentent les résidents, les planificateurs de la ville et du « county » de Cambridge, des ingénieurs et un cadre de « Environment Agency for England and Wales ». Avant chaque rencontre ces 9 personnes ont reçu par courriel une introduction du programme DayWater ainsi que des instructions pour utiliser les matrices de comparaison des 4 techniques envisagées ainsi que le portail disponible par internet. Chaque acteur a ainsi rempli et transmis une matrice de comparaison, dans laquelle il a estimé les valeurs de 6 indicateurs de performance ainsi que leur poids respectif. A l'issue de cette consultation les zones humides artificielles sont apparues comme préférées de tous les personnes consultées, suivies par les noues, fossés filtrants et réseau d'assainissement conventionnel. Ces acteurs ont, en outre, évalué le portail documentaire DayWater et présenté leur opinion sur les questions relatives à la promotion et l'utilisation de techniques alternatives au réseau d'assainissement.

1. Introduction

The Southern Fringe of the City of Cambridge (Figures 1 and 2) is comprised of five development sites including Clay Farm (31.38 ha) with 2300 proposed new homes, Glebe Farm (6.88 ha) with 230 proposed new homes adjacent to the village of Trumpington and the Addenbrooke's Hospital (57.93 ha) with proposed development of clinical and biomedical facilities. Countryside Properties are the developers of the sites and 'end-user' partners in the DayWater project. The County of Cambridgeshire has a relatively low rainfall but is vulnerable to flooding owing to its low elevation. Cambridge City Council published Sustainable Development guidelines (2003) which include 'ensuring sustainable urban drainage systems and watercourses'. The city council have informed and consulted with the community throughout the planning process culminating in the publication of the draft development framework (2005b) for public consultation. The Clay Farm development plan aims to retain the existing 'green corridor', introduce sustainable BMP drainage systems and provide a range of open spaces and community facilities including schools and a medical surgery (Figure 3). Best Management Practices (BMPs) for sustainable urban surface water management include non-structural practices such as street cleaning and structural practices including constructed wetlands. BMPs can provide flow control and pollutant removal complemented by water quality, amenity and ecological improvement (Ellis et al., 2006). These systems can also be cost-effective for construction, operation and management in comparison to conventional drainage systems. The DayWater EC-funded project, Adaptive Decision Support System (ADSS) for Stormwater Pollution Control (contract No. EVK1-CT-2002-00111) has developed a multi-criteria decision making system for the selection of BMPs, including technical, economic, ecological, social and environmental factors, as recommended by ASCE/UNESCO, 1998.

A Community Participation Workshop, organised by Cambridge City Council and attended by 65 members of the local community, planners and developers, was held in Trumpington village in March 2005 (Cambridge City Council, 2005a). A brief introduction to the DayWater project, BMP(s)/SUDS and the ADSS was given to the Sustainable Development Practices group. Two members of the group responded to the presentation with comments on the value of a constructed wetland in the Clay Farm development and the need for grey water recycling in the residences. The final public consultation document on the Southern fringe Development was issued by Cambridge City Council (2005b) in October 2005. In May 2005,

individual interviews were held with nine stakeholders including committee members of the Trumpington Residents' Association, City and County Planners, Engineers and Environment Agency staff. The stakeholders were selected to represent a range of public and professional input. Their selection was also determined by their availability and acceptance of an agreement not to reveal their names in reports of the interviews.

This paper reports the outcome of a consultation with a range of stakeholders in the Clay Farm development on their preference for and opinions of examples of BMPs, in comparison to conventional drainage systems.

Figure 1: South east England showing the location of Cambridge.

Figure 2: Cambridge Southern Fringe development sites (Cambridge City Council, 2005b. www.cambridge.gov.uk).

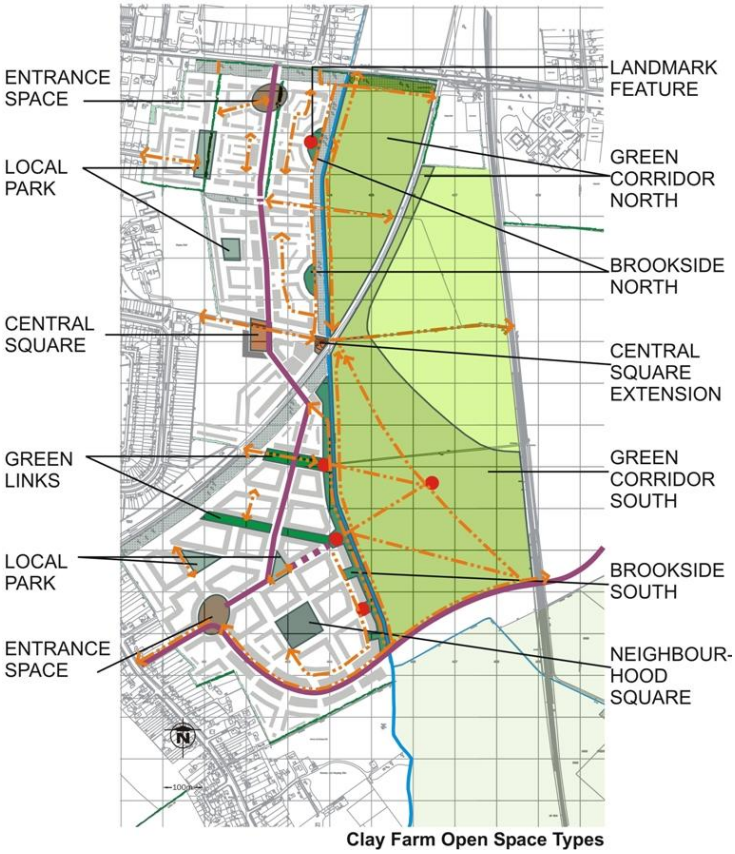

Figure 3: Clay Farm open space types (based on Ordnance Survey map).

(a) Constructed wetland

(b) Infiltration trench

(c) Swale

Figure4: Examples of BMP(s)/SUDS displayed on the DayWater databases.

2. Methods

Prior to each interview, the stakeholders were emailed an introduction to the EU DayWater project, and an outline and instructions for using a simplified version of the ADSS components Multi Criteria Comparator (MCC) and Matrix of Alternatives (MoA). This tool supports end-users in selecting the preferred BMPs/SUDS for a particular location in relation to range of site-specific socio-economic and environmental criteria. Photographs of examples of BMP(s)/SUDS (Figures 4a, b, c) from the prototype DayWater ADSS website (www.daywater.cz ; user name and password: 'guest') and a simplified comparison matrix were shown to the stakeholders. Each stakeholder was asked to comment on the relative advantages and disadvantages of four stormwater drainage options and the problems associated with their implementation and maintenance. Following the interview, each stakeholder was asked to complete and return the completed comparison matrix for four drainage options, based on their experience or perception of each option, within one week of the interview. Each drainage option was evaluated separately as the prototype DayWater system does not enable consideration of combinations of BMPs.

2.1 Consulting Procedure: Instructions for using the simplified DayWater comparison matrix

Five major instructions were given to the 9 consulted stakeholders:

1. Using the information provided, decide how well you think each drainage option performs against each of the indicators on a scale of 0-4. For example, if you think a particular option (e.g. swale) does not contribute anything towards the indicator (e.g. pollution control) award it a score S of '0'. If, however, you think that swales offer the best opportunity for pollution control, award them a score S of '4'. When developing scores, it is often easiest to decide on the 'best' and 'worst' options with respect to a particular indicator, and then agree on how well the 'intermediate' options contribute to meeting the indicators relative to these identified 'best' and 'worst' options. Ensure your scores always have the same direction i.e. that '0' is the lowest value and '4' the highest one.

Note: Two blank rows have been added to the matrix in case you wish to consider the different drainage options in relation to indicators not already listed.

2. Enter the desired weightings percentages W, e.g. complete the final column of the matrix with values that reflect the importance you place on each of the 6 criteria. For example:
    - flood control: 15%;
    - pollution control: 15%;
    - environmental impact: 25%;
    - amenity and aesthetics: 10%;
    - public health and safety: 25%;
    - costs: 10%.

Note: If you do not wish an indicator or criterion to be considered within the MCC, allocate a weighting of 0%. Sum of weightings must add up to 100%.

3. Multiply the score S for each drainage option by the weighting W allotted for that score.
4. Sum the weighted scores S x W for each drainage option to give the overall preference score for that option and place this value in the final row.
5. Rate the 4 drainage options according to their total weighted scores the preferred technique corresponding to the highest S x W value.

3. Results

3.1 Matrices of comparison of techniques

Following the protocol described above, comparison matrices were independently filled by each of the 9 consulted stakeholders, respectively representing:

- Local residents (Table 1),
- Urban planners (Table 2 and 3),
- Environment Agency staff (Table 4).

Illustrative matrices completed by a selection of five of the nine stakeholders representing the three groups listed above, are shown in Tables 1-4. The resulting order of preference for the drainage systems by these representative stakeholders is presented in Figure 5.

	Conventional drainage		**Infiltration trench**		**Swale**		**Constructed wetland d**		**Weightings %**
Indicators	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	
Flood control	3	45	2	30	3	45	3	45	15
Pollution control	1	15	2	30	2	30	3	45	15
Environmental impact	2	50	2	50	3	75	4	100	25
Amenity & aesthetics	0	0	1	20	2	40	4	80	20
Public Hygiene & Security, risks	2	30	2	30	2	30	2	30	15
Cost	2	20	1	10	1	10	1	10	10
TOTAL (sum of score x weight)		160		170		230		310	100
Rating (1 low- 4 high)		1		2		3		4	

Table 1: Stakeholders 1 & 2: Residents. Scores (S) and weightings (W) allowing the rating of the 4 stormwater management techniques.

	Conventional drainage		Infiltration trench		Swale		Constructed wetland		Weightings %
Indicators	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	
Flood control	3	60	2	40	2	40	4	80	20
Pollution control	2	30	3	45	1	15	3	45	15
Environmental impact	1	20	3	60	4	80	3	60	20
Amenity & aesthetics	1	10	4	40	4	40	4	40	10
Public Hygiene & Security, risks	2	50	3	75	3	75	3	75	25
Cost	2	20	3	30	3	30	2	20	10
TOTAL (sum of score x weight)	11	190	18	290	17	280	19	320	100
Rating (1 low- 4 high)	1		3		2		4		

Table 2: Stakeholder 5: Urban planner. Scores (S) and weightings (W) allowing the rating of the 4 stormwater management techniques.

	Conventional drainage		Infiltration trench		Swale		Constructed wetland		Weightings %
Indicators	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	
Flood control	2	30	3	45	3	45	4	60	15
Pollution control	1	15	3	45	3	45	3	45	15
Environmental impact	4	100	2	50	2	50	2	50	25
Amenity & aesthetics	0	0	2	20	3	30	4	40	10
Public H&S risks	2	50	2	50	2	50	3	75	25
Cost	3	50	1	10	1	10	2	20	10
TOTAL (sum of score x weight)	12	225	13	220	14	230	18	290	100
Rating (1 low-4 high)	2		1		3		4		

Table 3: Stakeholder 7: Planner. Scores (S) and weightings (W) allowing the rating of the 4 stormwater management techniques.

	Conventional drainage		Infiltration trench		Swale		Constructed wetland		Weightings %
Indicators	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	**S**	**S x W**	
Flood control	4	180	3	135	4	180	4	180	45
Pollution control	2	70	3	105	3	105	4	140	35
Environmental impact	2	40	2	40	3	60	4	80	20
Amenity & aesthetics	0		0		0		0		0
Public H&S risks	0		0		0		0		0
Cost	0		0		0		0		0
TOTAL (sum of score x weight)		290		280		345		400	100
Rating (1 low- 4 high)		2		1		3		4	

Table 4: Stakeholder 9: Environment Agency staff. Scores (S) and weightings (W) allowing the rating of the 4 stormwater management techniques.

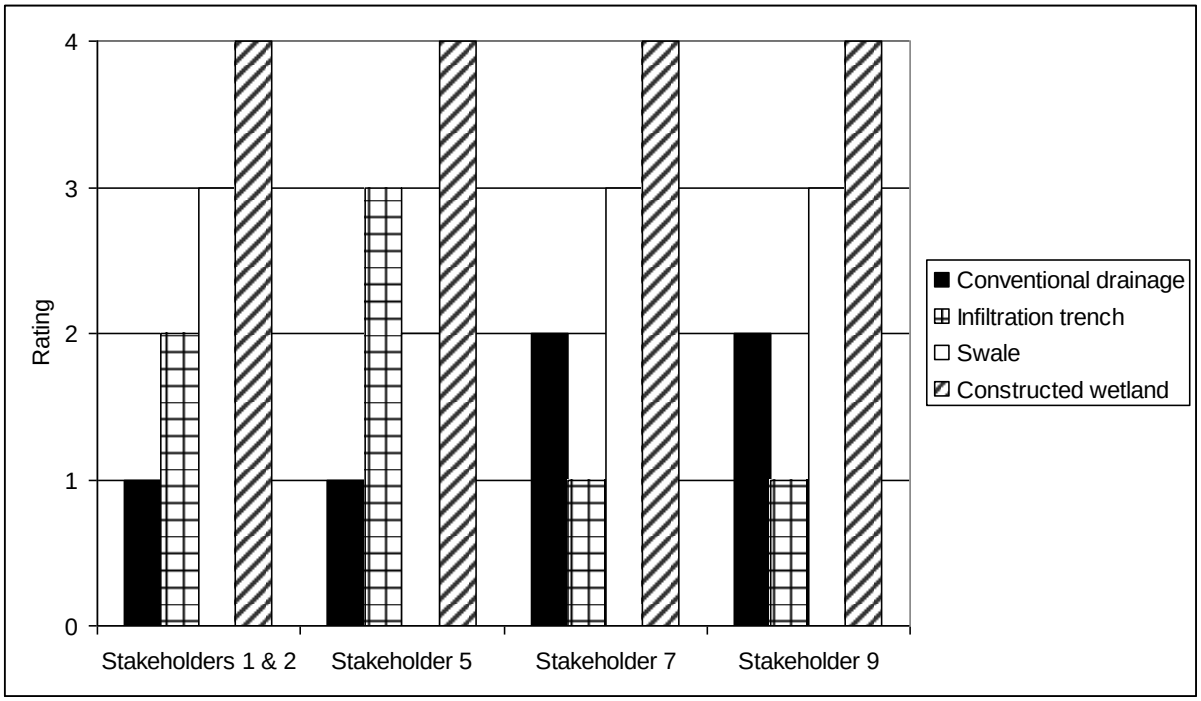

Figure 5: Rated order of preference (4 corresponds to the preferred measure) by stakeholders of three selected BMP(s)/SUDS and conventional drainage system.

3.2 Stakeholders comments

During and following the interviews, the stakeholders were asked to provide critical comments on the MCC pages on the prototype ADSS website and highlight issues concerning the promotion and use of BMP(s)/SUDS. The following comments summarise the response of the stakeholders.

3.2.1 Stakeholders 1, 2 & 4: residents of Trumpington village, near proposed Clay Farm development site

BMP(s)/SUDS systems would be appropriate within the proposed 'Green Wedge' in the Clay Farm residential development for their environmental, educational and amenity value. BMP(s)/SUDS systems should be integrated into a stormwater drainage strategy for Clay Farm. A booklet produced by the Trumpington Residents' Association on development options at Clay Farm of value to the community and the environment, had proposed a constructed wetland. The stakeholders recognised the value of BMP(s)/SUDS systems to local flood prevention and alleviation but expressed concern about responsibility for long term operation and management of BMP(s)/SUDS systems.

3.2.2 Stakeholders 5, 6 & 7: urban planners

There is a need to show/emphasise feasibility of BMP(s)/SUDS to engineers and establish BMP(s)/SUDS designs at an early stage in a development and be flexible.Guidance on the relative costs of BMP(s)/ SUDS and conventional systems should be provided and the issue of liability and cost of BMP(s)/SUDS failure be addressed. BMPs/SUDS should be combined with river restoration, where appropriate. Problems of construction of BMP(s)/SUDS (eg. siltation of wetlands during construction and uneven surface) Should be addressed and guidelines on construction and monitoring of construction of BMP(s)/SUDS systems be provided. The long term management of BMP(s)/SUDS including maintaining performance should be considered and BMPs/SUDS management training programmes provided for maintenance staff

3.2.3 Stakeholder 9: Environment Agency staff

The management of BMP(s)/SUDS systems is as important as the choice of system. Accessible advice should be provided to engineers on BMP(s)/SUDS design. BMP(s)/SUDS adoption and maintenance issues should be addressed. Phased development of BMP(s)/SUDS should be linked to the stages of housing construction. The recycling of grey water and water conservation should be addressed

3.3 Results for consultation

The weightings W assigned by the stakeholders to each performance indicator differed. Stakeholders 1 & 2, members of the Residents' Association, gave the highest weighting (20%) to amenity and aesthetics (Table 1). The weightings of Stakeholders 5 & 7, urban planners, differed by a maximum of 5% and were identical for pollution control 15%, amenity and aesthetics and cost 10%, respectively (Tables 2 and 3). Stakeholder 9 gave weightings only to flood control (45%), pollution control (35%) and environmental impact (20%), reflecting the main responsibilities of the government agency.

All stakeholders preferred constructed wetland (Tables 1-4 and Figure 5). The ranking of preferred options by the Residents' Association members are to be expected,with the conventional drainage option being considered as the worst measure as also assigned by stakeholder 5, the city planner. For stakeholder 7, a county planner, and stakeholder 9, an Environment Agency staff member, the infiltration trench was considered as the worst measure even after the conventional drainage.

4. Conclusion

The interviews conducted with the various stakeholders and their subsequent completion of a simplified MCC, provides a useful insight into the differing perceptions, views and opinions of stakeholders involved within the same development scheme. Stakeholders who participated within this procedure are representative of a range of individuals who may typically be consulted within the context of a major new development i.e. urban planners, regulators (Environment Agency) and local residents. It is therefore particularly interesting to note areas where views expressed and results generated on completion of the same procedure coincide or differ. All stakeholders exhibited a clear preference for constructed wetlands, supporting the results of a survey in Scotland of public attitudes towards wetlands and wet retention basins (Apostaki *et al.*, 2001) and the earlier work of Mungur, 1997. Of particular interest is the fact that stakeholders 5 and 6 are both urban planners (although working at different municipal levels) but rated the four options differently, most notably infiltration trench which was ranked 2nd by stakeholder 5 and 4th by stakeholder 7. This may indicate that the preferences expressed by stakeholders are not solely determined by either their specific role within a project or their professional training (as if this were the case presumably the results of these stakeholders would have more closely overlapped). It would be useful to interview these stakeholders further to gain a fuller understanding of their perceptions and reasons behind their preferences; however, this was not within the scope of this pilot study.

The outcome of this consultation process was fed-back into the DayWater project with the results being used to update and refine development of the MCC. The modified matrix with four drainage options was relatively simple to comprehend and complete. It was shown to be a useful component of the stakeholder consultation process in that it enabled the views of different stakeholders to be ascertained and displayed in a transparent format. Ideally, the stakeholders would have been brought together and completed the modified MCC as part of a facilitated seminar group, enabling a wider discussion of views and issues to support the development of a single order of preference which represented the stakeholders as a whole to be developed. However, a combination of time constraints of participants and concerns expressed over confidentiality of results, prevented such an event occurring and the significance of these factors should not be over-looked by future researchers working within this area. The final DayWater MCC has 15 BMP options and ideally requires that users have, either a prior knowledge of all of these systems or are willing to review the supporting information also contained within the DayWater ADSS to support the development of informed choices. It is acknowledged that this could be a costly procedure which may require the provision of stakeholder support over a sustained period of time. However this was an approach which was demonstrated to work well within the context of a major river rehabilitation scheme (www.smurf-project.info). The use of such an approach opens the way for preparation of education materials and development of strong links with a wide stakeholder group across a range of issues. Within this context, the use of the DayWater MCC approach is seen as a useful tool in raising awareness, providing information, improving the

robustness and transparency of BMP decision-making processes and encouraging dialogue and partnership between stakeholders.

Acknowledgements

The results presented in this publication have been obtained within the framework of the EC funded research project DayWater "Adaptive Decision Support System for Stormwater Pollution Control", contract no EVK1-CT-2002-00111, co-ordinated by Cereve at ENPC (F) and including Tauw BV (Tauw) (NL), Department of Water Environment Transport at Chalmers University of Technology (Chalmers) (SE), Environment and Resources DTU at Technical University of Denmark (DTU) (DK), Urban Pollution Research Centre at Middlesex University (MU) (UK), Department of Water Resources Hydraulic and Maritime Works at National Technical University of Athens (NTUA) (GR), DHI Hydroinform, a.s. (DHI HIF) (CZ), Ingenieurgesellschaft Prof. Dr. Sieker GmbH (IPS) (D), Water Pollution Unit at Laboratoire Central des Ponts et Chaussées (LCPC) (F) and Division of Sanitary Engineering at Luleå University of Technology (LTU) (SE).

This project is organised within the "Energy, Environment and Sustainable Development" Programme in the 5th Framework Programme for "Science Research and Technological Development" of the European Commission and is part of the CityNet Cluster, the network of European research projects on integrated urban water management.

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