DECISION SUPPORT APPROACHES FOR THE EVALUATION AND SELECTION OF SUSTAINABLE WETLAND SYSTEMS FOR THE CONTROL AND MANAGEMENT OF DIFFUSE POLLUTION IN URBAN CATCHMENTS

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ABSTRACT

Whilst urban wetlands have been included as generic source control structures for the control and management of diffuse pollution in urban catchments, there is no clear evidence of their self-sustainability. Their evaluation as Sustainable Urban Drainage Systems (SUDS) has been to date mainly empirical and subjective in nature and lacking in the development and application of robust quantifiable sustainability criteria, particularly in respect of long term performance, downstream effects and general costs.

However, a few recent studies have opened the door to the potential use of more universal sustainable system condition indicators for the evaluation of SUDS based on limiting constraints and/or performance objectives. These constraints and objectives can in turn be related to the three core elements of SUDS drainage design; water quantity, water quality and amenity. The paper will reference the use of sustainability criteria against which these three core parameters can be evaluated. The quantified criteria include design and construction, environmental/ecological impact, O & M, health and safety, economic and socio-urban (or community/amenity) indicators to facilitate comparison (and accreditation) of wetland options with regard to issues such as capital cost, resource use, community acceptability, technical performance, maintenance etc.. The comparison is undertaken within the context of a multi-criteria decision making process.

A variety of qualitative matrix-type approaches for the comparative evaluation of differing SUDS options will firstly be considered and the problems of parameter selection, value weighting and site-specific conditions will be discussed. An alternative quantitative multi-criteria approach will be presented based on the four prime sustainability criteria of Technical & Scientific Performance, Environmental Impacts, Socio-Urban Community Benefits and Economic Costings. Primary and secondary indicators for each of the four prime criteria will be developed together with detail of possible benchmarking standards that can be placed against the primary/secondary indicators in order to derive quantitative estimations of the relative sustainability that can be achieved by any particular wetland design (or indeed for any other SUDS device). The utility of the multi-criteria approach will be evaluated by application to a wetland system intended to capture and treat the discharge from a 0.25ha highway development.

Keywords: Diffuse pollution; Urban runoff; Sustainable urban drainage systems (SUDS); wetland systems; multi-criteria decision support.