



Sustainable Urban Drainage (SUD)

Objectives of this Task Group

- To address stormwater as a potential resource as well as a possible hazard.
- To consider the need to adapt to changing climatic conditions which may result in both excessive rainfall patterns and increasing water scarcity
- To assess the complementary benefits of SUDS (BMPS) with regard to stormwater mitigation and enhancing the environment



Sustainable Urban Drainage (SUD)

Contributing work packages

- WP 2.1: Technological options for storm water control under conditions of uncertainty (MU)
(ARUP;SUDECAP;UFMG;EPFL;IPS)
- WP2.3: Environmental change studies for stormwater control and reuse options (UNI-BHAM)
(UNESCO-IHE;MU)



Sustainable Urban Drainage (SUD)

Both WPs 2.1 and 2.3 address the use of sustainable approaches to:

- Control stormwater runoff flow quantity (runoff conveyance, capture and flow attenuation)
- Reduce contamination of surface- and ground-waters as a result of drainage discharges
- Contribute to the protection and/or enhancement of habitat/amenity aspects within the receiving water environment



Generic and specific links to other task groups

Integrator team; City Water; Institutional and financial instruments

- **Water Sensitive Urban Design:** by contributing to the opportunities which exist for enhancing the landscape within urban environments (e.g through WP 2.2 : 'Decision making processes in integrated stormwater management'.
- **Natural Systems for Treatment:** extending our knowledge of the natural pollutant treatment capacities of soil and vegetation.
- **Decentralized Wastewater Systems:** productive re-use (recycling) of urban water to increase availability and to reduce the operational costs of wastewater treatment.



Topics completed in SUD task group

An examination of the options available for stormwater control as part of IUWM as a result of changing global conditions.



Topics completed in SUD task group

- Definition of the specific threats/uncertainties associated with urban surface water management with respect to:
 - Flooding
 - Water quality
 - Receiving water ecology
 - Surface water management
 - Urban landuse planning
 - BMP/SUDS control implementation

		Severity of consequence				
		Insignificant (1)	Minor (2)	Significant (3)	Damaging (4)	Critical (5)
Likelihood of occurrence	Very Low (1)	1	2	3	4	5
	Low (2)	2	4	6	8	10
	Medium (3)	3	6	9	12	15
	High (4)	4	8	12	16	20
	Very High (5)	5	10	15	20	25

Topics completed in SUD task group

Investigation of innovative stormwater control options

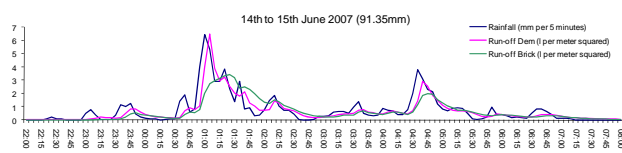
- Compiling the relevant information for 7 countries (UK, USA, Malaysia, Australia, Brazil, Germany and Switzerland).
- Opportunities for retrofitting these drainage options.
- Potentials for BMPs to contribute to other sectors of the urban water cycle.



Topics completed in SUD task group

Green/Brown roof research projects have addressed:

- Ecological and hydrological monitoring over a ~2 year period
- Statistical analysis of the ecological data
- Statistical & physical modelling of the hydraulic and hydro-chemical function of the mesocosms
- Construction of demonstration sites



Topics completed in SUD task group

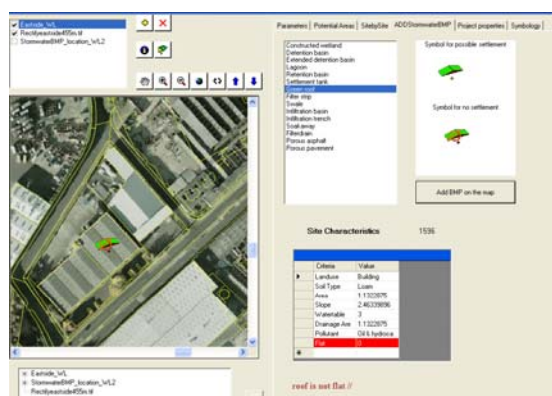
Development of a GIS tool to support the investigation of the hydrological impacts of various stormwater management approaches using:

- Site criteria
- BMP pollutant removal potentials
- Multi-criteria comparator for technical, environmental, economic, operation and maintenance, social and legal criteria

Topics completed in SUD task group

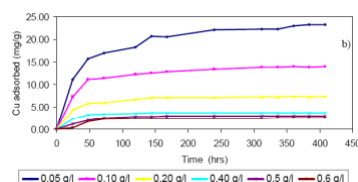
The developed tool has the ability to:

- Identify all potential areas for a particular stormwater BMP
- For a particular site, identify all potential BMPs for a particular location (together with potential benefits and pollutant removal potential.



Topics completed in SUD task group

- Investigations of novel metal removal procedures for contaminated waters:
 - Optimisation of heavy metal removal from urban runoff using IOCS and GFH (metals investigated Cr(VI), Cr(III), Cu and Cd)

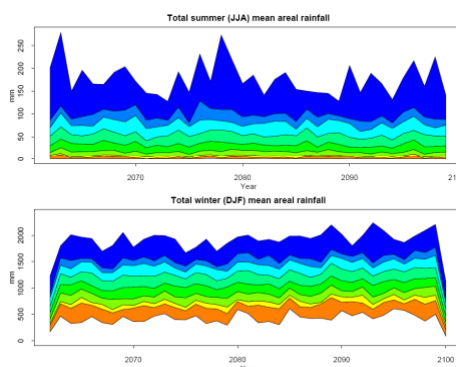


- Optimisation of manganese removal with IHE family filter under laboratory conditions

Topics currently underway in SUD task group

- Development of a stochastic rainfall series to assess the impact of climate change scenarios on urban hydrology

Predictions for
Belo Horizonte;
2060-2099



Topics currently underway in SUD task group

- The existing STORM hydraulic model and SEWSYS source apportionment model are being linked to the developed GIS approach
- To enable prediction of the best site locations for BMPs to achieve effective quantity and quality control of stormwater.
- Discussions have taken place with the City Water (Tool and Model) task group about the integration of this model within the developing decision support system.

Topics currently underway in SUD task group

Areas of ongoing research linked to groundwater in Birmingham:

- Determining the potentials for further raising the groundwater levels due to enhanced filtration as a consequence of BMP installations (using City Water Balance)
- Addressing the potential risks to aquifer storage recovery options from the migration of surface derived viruses in the aquifer
- Using rain water harvesting to support micro-scale aquifer storage recovery for small scale groundwater abstractions (completed MSc study suggests lateral rate of groundwater migration is too rapid to make storage a viable option)

Topics currently underway in SUD task group

Further investigations of novel metal removal procedures for contaminated waters:

- Effect of water quality on Cr adsorption on iron (hydro) oxide based adsorbents
- Adsorptive removal of Cu and Cd from urban stormwater with IOCS and GFH
- Effect of pH and silica on As removal by iron oxide coated sand.

Workshops involving the SUD task group

- November 2006: Green roofs and biodiversity (Birmingham)
- January 2007: Stormwater Management and GIS Decision Support Systems in Urban Water Management (Lodz)
- January 2007: Stormwater re-use seminar (Birmingham)
- July 2007: Actions to combat climate change and benefit biodiversity in an urban environment (Birmingham)
- August 2007: SUDS and Integrated Urban Water Management

Workshops involving the SUD task group

- August 2007: SWITCH – Integrated urban water management in the city of the future (Belo Horizonte)
- September 2007: Innovation in stormwater management: a SWITCH in concepts and practices (Belo Horizonte)
- June 2008: Birmingham Climate Change Festival
- July 2008: SWITCH Theme 2 meeting (Essen)
- October 2008: Planning for stormwater management in the cities of the future (Birmingham)
- December 2008: Stormwater and natural systems (Lodz)

On-line training course linked to SUD task group

- On-line learning course on Stormwater Management
- The course is aimed at supporting the needs of Learning Alliances including municipal officers, drainage engineers, policy-makers, urban planners and designers, water industry, environmental regulators and property developers as well as providing research/educational material for university staff and research students
- The first course commenced in January 2008 with 18 students and has recently been evaluated

Demonstration activities closely linked to SUD task group

Established and on-going:

- **Birmingham:** Green/brown roofs; Eastside regeneration area.
- **Belo Horizonte:** a range BMPs being investigated in terms of design, implementation, operation and maintenance, performance and life cycle costs
- **Emscher:** The role of BMPs in contributing to the re-construction of the River Emscher and its tributaries.

New developments:

- **Lodz:** eco-hydrological approaches for the re-naturalisation of water ecosystems; the Sokolowka and Ner Rivers
- **Hamburg:** the development of an integrated urban water management plan for Wilhelmsburg 2030