
International Training Programme



Centre for Science and Environment



University of Cape Town, Cape Town



Water Research Commission, Pretoria

Water Sensitive Urban Design and Planning

Organised by

Centre for Science and
Environment (CSE), New Delhi,
India

In partnership with local host

Water Research Commission
(WRC), Pretoria, South Africa

Technical research partner

University of Cape Town, Cape
Town, South Africa

Duration 23 – 26 January, 2017

Venue Cape Town Lodge Hotel, Cape Town

Language English

International Training Programme on Water Sensitive Urban Design and Planning (WSUD&P)

	Day 1 (23 January)	Day 2 (24 January)	Day 3 (25 January)
	Concept of WSUD&P	Rainwater Harvesting (RWH) as WSUD&P component	Wastewater management as WSUD&P component
8.30 – 9.30	About CSE and About WRC (SR & JB)	Reflection session	Reflection session
9.30 – 10.00	About the training programme (SR)	WSUD&P for South Africa: Framework, guidelines and policies (KC)	Case studies – South African experience (NA & KC)
10:00-10:15	Tea/Coffee Break		
10:15 – 10:30	Introduction of Participants & Ice breaking session (MM & SJ)	Introduction to RWH through Documentary film: “Rain Catchers” (MM)	Introduction to decentralised wastewater treatment (DWWT) through Documentary Film “Clean your Act” (MM)
10:30 – 11:00	Water, city and planning – Issues and challenges (SR)		
11:00 – 11:15	WSUD&P concept and principles - Evolution of knowledge and experience (SR)	Components of RWH & Data collection requirements (SJ)	DWWT for local reuse (CS)
11:15 – 11:30	WSDP: South African Perspective (KC)		
11:30 – 12:00	Sustainable urban drainage system (SUDS) and interventions – PART I Source control (NA)		
12:00 – 12:30	Sustainable urban drainage system (SUDS) and interventions – PART II Local and regional control (NA)	Brain storming exercise (SJ)	Brain storming exercise (CS)
12:30 – 1:15	Lunch		
1:15 – 2:00	Documentary: ‘Designs that hold water’ - Sustainable drainage systems explained’ by EA, UK & Leeds City Council (MM)	Designing of urban RWH: Storage & recharge (SJ)	Wastewater characteristics and data collection for DWWT (CS)
2:00 –3:00	WSUD&P at different scales part I: SUDS (SJ)	Operation & maintenance and economic feasibility of RWH (MM)	Design and construction of DWWT systems (CS)
	WSUD&P at different scales part II: Pollution abatement (CS)	Do-it-Yourself – Plan and design RWH (SJ & MM)	Operation & maintenance and economic feasibility of DWWT (MM)
3.00 - 3.15	Tea/Coffee Break		
3.15 -5.00	Do-it-Yourself – Group exercise (SJ & CS)	Do-it-Yourself – Plan and design RWH (Cont.)	Do-it-Yourself – Group exercise: Planning and designing of DWWT system (CS & MM)
5:00 – 6:00	Feedback	Feedback	Feedback and Certificate distribution

***Day 4 (26 January) – Field Visit**

SR-Dr. Suresh Rohilla, JB-Mr. Jay Bhagwan, NA-Dr. Neil Armitage, KC-Dr. Kirsty Carden, MM-Dr. Mahreen Matto, SJ-Ms. Shivali Jainar, CS-Ms. Chhavi Sharda

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About Centre for Science & Environment (CSE)

The CSE is an independent public interest research organization that aims to promote an informed public opinion in favor of environmental sustainability and sustainable development. CSE started in year 1980 by late Mr. Anil Agarwal, a leading figure in India's environment movement, to analyze and study the relationship between environment and development.

CSE's work is widely acknowledged for its intellectual leadership and the institution has grown into one of India's most influential and highly vocal environmental NGO. CSE received prestigious international awards **Stockholm Water Prize** in the year 2005 and the **Prince Albert II of Monaco Foundation Water Award** in the year 2008. CSE is actively working in India and South Asia (Bangladesh, Nepal, Bhutan and Sri Lanka).

The centre is recognized by the Government of India as:

National Knowledge Resource Centre (KRC) in the area of sustainable drinking water and sanitation by the Union Ministry of Drinking Water and Sanitation.

Centre of Excellence (CoE) in the area of sustainable urban water management by the Union Ministry of Urban Development.

Nodal Institute for conducting short & long term training programmes for environment regulators by the union Ministry of Environment and Forests (MoEF).

Some notable environmental programmes run by CSE include following:

Sustainable water management that mobilized the country through a water literacy campaign calling for decentralised solutions to water harvesting, control water pollution, urban sewage management, catalyzing policy changes at both national and state levels. In recognition for its efforts, the CSE was awarded the Stockholm Water Prize in year 2005, the highest international award in area of water management.

Food safety and toxins programme has created far-reaching changes in the policies and regulations governing the use of toxins such as pesticides and heavy metals. The two high profile studies (in year 2002 & 2003) that found high concentrations of pesticide residues in bottled water and soft drinks served to highlight public health concerns and are important contributions in managing the toxic fallouts of rapid economic and industrial growth.

Sustainable urban transport and air quality management that has achieved remarkable success in pushing for CNG in all public transport in Delhi and more recently, in pushing for better urban mobility options that have made significant impact on the city's air quality.

Sustainable industrialization is an innovative programme that rates the environmental performance of industry in high environmental impact sectors (such as cement, automobiles, pulp and paper, chlor-alkali, among others), helps motivate industries to make improvements in reducing pollution and improve efficiency of resource use. Green Rating Project (GRP) serves as a model for an alternative form of civil society governance to control industrial pollution in India, and today a good GRP rating is considered as a valuable certification about a company's environment performance.

Addressing the urgent need to introduce meaningful environmental education at the school level in India, CSE's **Green Schools Programme** goes beyond nature education to get children to evaluate and precisely measure their own environmental footprint using the Green Schools Manual. The Green Schools Network today includes more than 5,000 schools across the country, and the manual has been translated into Hindi, Kannada, Punjabi and Arabic. In addition, *Gobar Times*, a monthly magazine for children, keeps students informed and inculcates environmental values.

CSE has worked closely with journalists for long time, recognizing the powerful role that mass media plays in setting public agendas and shaping public opinion. CSE's **Environmental capacity building with emphasis on media** has several components, from regular briefing workshops for working

journalists, maintaining a syndicated feature service to fellowship programmes that enable journalists to take time out to study and report specific issues in-depth.

In the year 2004 Anil Agarwal Green College (AAGC), an education and training initiative of CSE, was established to communicate the science, complexity and politics of environment across India, South Asia and the world. It seeks to build a constituency and cadre of knowledgeable, skilled and committed environmentalists - from students, decision-makers, field-level practitioners, civil society groups, journalists, lawyers, and concerned citizens. As part of this mandate, AAGC serves as a research, academic and capacity building hub that conducts a number of short and long-term courses and training programmes. Short-term courses range from technical workshops on how to build RWH systems and DWWT structures to policy briefings on ecological poverty and food safety, to hands-on training on environmental communication, information management and advocacy. Other training programmes – such as Environment Impact Assessment (EIA), Managing Urban Growth, and Urban Mobility, seek to actively engage with industry representatives and regulators in the country and across the developing world. Over the past five years or so, AAGC has conducted more than 100 training programmes and trained more than 2,500 participants from India and around the world. AAGC has conducted several longer-term courses, one set of which targets students and young professionals from India (titled '**Agenda for Survival**' which is held in June each year), and others that target international students (titled '**Challenge of the Balance**', which is held once in Winter and once in Summer each year).

In order to upscale the training and capacity building activities, CSE is establishing an **Environment Training Institute (ETI)** at Tijara Block in the Alwar District of Rajasthan State in India. ETI aims to strengthen capacities within the government, in the civil society, in the private sector and practitioners and the academia, and will be supported by state-of-the-art research, information services and a platform to interact and exchange ideas on best practices. The ETI will conduct short-term and long-term training programmes, tailored for different target groups, on a wide array of environment and development issues and topics. To encourage participation, the courses offered will be linked to the training needs of the specific target groups and will be synergized with certificate and diploma courses offered by mainstream universities, so that there is value addition to the career of the persons taking the courses.

Global Water Programme of CSE

The water programme of CSE has evolved to help in establish policy principles, innovative technologies and implementation strategies for water and wastewater management in India. These efforts have been directed towards meeting the twin goals of laying the foundations for a water prudent society and adapting for climate resilience.

CSE has been an important thought-leader in water management sector. It has already influenced global policies and strategies to focus on the need for technologies to augment water resources in a decentralised manner through RWH and to use that water to optimize on benefits. In 2010, CSE started the South Asia Water Programme involving three countries viz. Bangladesh, Nepal and Sri Lanka. Important objectives of the programme include awareness generation about environment and development as well as capacity building of societies to understand and deal the environmental issues. The programme is successfully ongoing since past five years. Though the main aim of the programme was training government and non-government partners, it has diversified to model curriculum development, knowledge support to a regional rain convention and providing technical guidance on the implementation of model projects related to sustainable water management. In December 2013, a meeting was conducted on South Asia Water Programme Partners and Practitioners at New Delhi, India to review the knowledge gained and shortcomings of this programme. This was essentially to decide a way forward for this programme to take the partners to the next level.

We believe this experience needs to be leveraged to share solutions with other countries in the developing world from South America, Africa and Asia that are enjoined in a common struggle to find ways of meeting the needs of urban and rural populations in the current water and wastewater paradigm which are affordable and sustainable.

In coming five years, the Centre would like to build on expanding this work to other regions in the world in particular focusing on select countries in Africa through experience sharing workshops to identify gaps and challenges in urban water management and complement it later by capacity building in the region through tailor made training programmes.

In February and March 2015, the Centre organized India-Africa experience sharing workshops and a training programme on urban RWH and DWWT and reuse. The purpose of these two events was to understand about status of water and waste water management in African countries. In both the events around 14 countries participated from all across Africa. The invited participants represented various government and non-government institutes providing services and working in water and sanitation management aspects. Also CSE Water team on invitation by **Kenya Water Institute, Rwanda Natural Resources Authority** and **Ministry of Local Government and Rural Development, Ghana** conducted capacity building trainings, supported strategy workshop followed with roundtable meetings to develop a long term partnership. The water team is partner in the **Global Faecal Sludge Management E-Learning Alliance** which is a platform to facilitate development and empower the dissemination of knowledge on faecal sludge management through e-learning means, so that the sanitation challenges can be embraced with deeper insight, advanced knowledge and greater confidence.

To find out more about workshop visit <http://www.cseindia.org/content/india-africa-experience-sharing-workshop-urban-rainwater-harvesting-mainstreaming-sustainabl>

To find out more about training programme in Sri Lanka visit <http://cseindia.org/content/international-training-programme-mainstreaming-sustainable-urban-water-management-urban-rain>

To find out more about training programme in Rwanda visit: <http://www.cseindia.org/content/training-programme-mainstreaming-sustainable-urban-water-management-kigali-rwanda>

To find out more about training programme in Kenya visit: <http://cseindia.org/content/training-programme-mainstreaming-sustainable-urban-water-management-urh>

To find out more about training programme in Ghana visit: <http://cseindia.org/node/6329>

To find out more about online training on faecal sludge management visit: <http://elearn.cseindia.org/>

About Water Research Commission (WRC), South Africa

The WRC was established in terms of the Water Research Act (Act No 34 of 1971), following a period of serious water shortage. It was deemed to be of national importance to generate new knowledge and to promote the country's water research purposefully, owing to the view held that water would be one of South Africa's most limiting factors in the 21st century. In 1971 when the WRC was founded, water research and development (R&D) in South Africa was limited to a few institutions and the funding level inadequate. There was no research co-ordination and an apparent neglect of some key research fields. In addition, there was little strategic direction or leadership that would provide for the identification of priority areas or appropriate technology transfer. It was to address these issues, that the WRC was established.

WRC actively contributes to South Africa's water knowledge base by funding fundamental water research, growing scientific capacity and disseminating knowledge to important stakeholders through various formats. WRC-funded projects directly address the country's water challenges by investigating new technologies and methods to enhance water and sanitation supply, supporting policy and legislation, and providing much-needed guidance to implementers. The organisation funds research touching all aspects of the water cycle, including water resource management, aquatic ecosystems, water use and waste management, and the use of water in agriculture. The WRC also looks at aspects like climate change that may affect our water resources in the future. "The mission of the WRC is to be a dynamic hub for water-centered knowledge, innovation and intellectual capital. We provide leadership for research and development through the support of knowledge creation, transfer and application. We engage stakeholders and partners in solving water-related problems which are critical to South Africa's sustainable development and economic growth, and are committed to promoting a better quality of life for all."

Key Strategic Areas

- Generate the knowledge, tools and skills to ensure that water resources of South Africa are protected, utilised, developed, conserved and managed to achieve environmental, social and economic sustainability;
- Providing knowledge to ensure sustained functioning of aquatic ecosystems and ongoing provision of ecosystem goods and services;
- Researching effective and efficient water service provision to, and use of water in, the domestic, industrial and mining sectors. This includes the prevention of pollution and the development of technologies for treatment of water and wastewater;
- Meeting needs of present and future generations of subsistence and commercial farmers through researching the role water (quantity and quality) plays in agriculture and forestry and supporting the development of water-efficient production technologies, decision-support models and information systems;
- Providing internal, knowledge-based support for the WRC and service to the water sector and society through IT services, knowledge sharing, scientific communication and the furthering of public understanding of science.

About the Training Programme

CSE in collaboration with WRC and University of Cape Town (as technical research partners) is organizing a four day international training programme on “Water Sensitive Urban Design and Planning”. The four day training includes first three days of classroom training, followed by a field exposure visit (optional).

Aim:

Capacity enhancement of city officials for ‘Integrating water management at the strategic scale of planning and design to achieve sustainable development in towns/cities’.

Objectives:

- To provide knowledge, skill development and attitude change of participants towards sustainable water management.
- To capacitate participants for planning, designing and implementing low cost decentralised water and wastewater management at different scales.
- To share experiences on existing and upcoming policies and practices from International experience on urban water management.
- To build south-south network of practitioners (state/non-state) for mainstreaming sustainable water management practices.

The three days training will be interactive and include following themes:

January 23, 2017: Concept of WSUD&P

This module will focus on latest WSUD&P guidance and policies. The sessions will give the overview of the aims, benefits and the components of WSUD&P for any new developments and redevelopments. The programme will focus on Sustainable Urban Drainage System (SUDS) that will include interventions at source, local and regional level to reduce velocity and peak flow and improve quality of urban runoff in order to move away from typical drainage design.

January 24, 2017: RWH as WSUD&P component

This module will focus on urban RWH and the potential it holds in augmentation of water availability by using public spaces to recharge their groundwater or store and reuse the rainwater. The training will also showcase examples to bring in required laws to enable individuals to undertake RWH.






January 25, 2017: Wastewater management as WSUD&P component

This module will focus on DWWT for local reuse. The training will provide hands-on experience in planning, designing & implementation of DWWT for augmenting water resource by using treated water. This will be showcased by case examples at various scales.



Training Team

 <p>Suresh Kumar Rohilla Programme Director Water Management Unit Centre for Science & Environment, New Delhi Email: srohilla@cseindia.org</p>	<p>Dr Rohilla has over 22 years of experience working with national / international NGOs, government and academics. He leads the water programme at CSE, New Delhi. He is involved in policy advocacy, research and capacity building aimed at mainstreaming water and environmental sustainability in South Asia and Africa. He is Head of the Centre of Excellence in Urban Development sustainable Water Management Area of the Ministry of Urban Development and the National Key Resource Centre of the Ministry of Drinking Water Supply and Sanitation, Government of India. Some of his previous assignments include – Director Environment & Development (Living Ganga Programme) at World Wide Fund for Nature - India, Associate Professor (Environment Management and Sustainability) at Administrative Staff College India, Hyderabad and Lecturer in Environment Management and Sustainability at University of Bradford, U.K; Director (Technical) at the National Capital Regional Planning Board, Ministry of Urban Development and Director - Natural Heritage Division, Indian National Trust for Art and Cultural Heritage (INTACH), India. He holds a doctoral degree from Queen's University Belfast and post-graduation degree(s) from Jawahar Lal Nehru University and School of Planning & Architecture, New Delhi. He is recipient of the British Chevening Indian Young Environmental Manager Fellowship (2001), Fulbright Nehru Environmental Leaders Programme Fellow (2012) and Government of Netherlands Fellowship (2014). He has been an affiliated Visiting Professor / Researcher at University of California – Berkeley in U.S.A.</p>
 <p>Jay Bhagwan Executive Manager Water Research Commission South Africa Email: jayb@wrc.org.za</p>	<p>Mr Bhagwan is the executive manager of the key strategic area of water use and waste management at the WRC, which focuses on the management of water and wastewater in the domestic, mining and industrial sector. He has been instrumental in creating the portfolio of research projects and innovations related to water supply and wastewater management. He completed his master's degree in Tropical Public Health Engineering from Leeds University, UK. With his knowledge and experienced gained in implementation of water and sanitation projects, he has played and participated in the shaping of national water policy and legislation. He held the posts of the President of the Water Institute of Southern Africa, Chairperson of the Minister of Water Affairs and Forestry Water Advisory Committee, as well as international advisory positions with the Water Supply and Sanitation Collaborative Council, IWA- Global Development Agency and UNEP. He continues to be actively involved in a broad range of areas in the field of water supply, wastewater and sanitation, with current focus being on sanitation technologies for the future, technology innovation and application, social franchising of O&M, conduit hydropower, benchmarking, reuse and reclamation of effluents.</p>
 <p>Neil Armitage Head of Department Urban Water Management University of Cape Town South Africa Email: neil.armitage@uct.ac.za</p>	<p>Dr Armitage has BSc(Eng), MSc(Eng) and PhD degrees from the Universities of Natal, Cape Town and Stellenbosch, respectively. He is a professional engineer, registered with the Engineering Council of South Africa (ECSA) with more than 30 years' experience – both as a consultant and an academic – in a wide range of water-related work. This includes water supply, sewerage, stormwater management, coastal engineering, river engineering, water treatment and wastewater treatment. Inter alia, he was responsible for the development of the WRC guidelines on SuDS and WSUD. He has been employed by UCT since 1995, initially as senior lecturer, then from 2005 as an associate professor, and finally from 2015 as a professor teaching various courses in hydraulics, hydrology, urban water management and professional practice. He served as Deputy Dean (undergraduate affairs) in the faculty of engineering and the built environment 2011-12. Currently he is Head of the Department of civil engineering and director of the interdisciplinary Urban Water Management research unit. He has authored or co-authored some 90 publications and supervised 15 masters' students and two PhD students to graduation. In</p>

	<p>2013 he received the WRC of South Africa's Award for Human Capital Development in water and science Sectors.</p>
 <p>Kirsty Carden Research Officer Urban Water Management University of Cape Town South Africa Email: kirsty.carden@uct.ac.za</p>	<p>Dr Carden has a BSc (Chemistry), an MSc (Applied Science in Civil Engineering) and a PhD from the University of Cape Town. She has over 25 years of experience working in academia, for government and the private sector in the field of water quality management, and is a Fellow of the Water Institute of South Africa. She has been a researcher in the Urban Water Management research unit in the department of civil engineering at UCT since 2004, and was appointed as the unit's Research Officer in 2013. Dr Carden has been involved in various projects on integrated and sustainable approaches for addressing problems of water management in the urban areas of South Africa. She is currently Project Leader on three WRC projects. Her research interests include:</p> <p>Urban water management and service provision; Sustainability assessment in water management and Integrated approaches geared towards sustainable urban development (e.g. WSUD) and water sensitive cities / settlements.</p>
 <p>Mahreen Matto Programme Manager Centre for Science & Environment, New Delhi Email: mahreen@cseindia.org</p>	<p>Dr Matto is doctorate in Environmental Biotechnology from Aligarh Muslim University, India; her area of research was on 'Cost Effective and Affordable means of Treating Industrial Wastewater by Enzymes'. She has credit of publishing 9 international research articles in the area of water/waste water management in reputed journals. She has been extensively working in the area of water, waste water and faecal sludge management with CSE, India. In CSE, she has contributed in the publication of reports and manuals on RWH, DWWT and Reuse, City Sanitation Plan-Trainers manual and City Sanitation Plan-Practitioner guide. She is also been preparing modules and conducting trainings of various stakeholders across India, Bangladesh and Africa on sustainable water management.</p>
 <p>Shivali Jainer Programme Officer Centre for Science & Environment, New Delhi Email: shivali@cseindia.org</p>	<p>Ms Jainer is Graduate in Architecture and Post Graduate in Environmental Planning from School of Planning and Architecture, Delhi. She is trainer in Urban Water Management training programs for municipal functionaries, practitioners, academicians, policy makers, architects. She is mainly working in area of water sensitive urban design and planning and is involved in development of tools for designing sustainable urban drainage system options in urban areas. Her previous experience includes training and research on urban metabolism and growth with field of research focusing on evolving strategies for storm water drainage and resource management in urban areas.</p>
 <p>Chhavi Sharda Programme Officer Centre for Science & Environment, New Delhi Email: chhavi@cseindia.org</p>	<p>Ms Sharda has been conducting technical sessions in capacity building programs for municipal functionaries, practitioners, academicians, policy makers on DWWT for water sensitive planning and urban lake conservation since three years. She also supports technical consultations to support implementation of DWWT projects. Previously, she has documented various case studies on DWWT systems across India. She is an Engineer with her post-graduation in Environmental Engineering and also holds PG Diploma in Urban Environmental Management and Law. Previously she has also been involved in implementation of model projects for DWWT and local reuse at high-visibility sites in India and South Asia.</p>



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Mr Kumar is post graduate in Environmental Engineering. He has five years of experience in design of conventional water, wastewater and storm water conveyance system. He has also been involved in designing of waste-water treatment system based on Activated Sludge Process. He is working in CSE on Water Conservation and Efficiency and is also part of capacity building team on similar subjects.



Shirley Machelesi
Training Coordinator
Water Research Commission
South Africa
Email: Shirley@wrc.org.za

Ms Shirley holds a bachelor's degree in public administration and an honours degree in development studies. She started her career in the United Nations as an administrator for various projects. She later joined Cap-Net, an international network for capacity building in integrated water resources management as a programme administrator. She is now part of the WRC where she coordinates special projects within the portfolio of water use and wastewater management. She has over 10 years' experience in project administration and donor fund management and six years' experience in multi-sectoral programme development, monitoring and evaluation.

List of Reading and Reference Material

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FOLDER 3 - RWH

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FOLDER 4- DWWT

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