# TERI SCHOOL OF ADVANCED STUDIES

# PLACEMENT BROCHURE

## MSc (Water Science and Governance) 2018
## MTech (Water Science and Governance) 2018

teri school of advanced studies

Knowledge for Sustainable Development

Deemed to be University under Section 3 of the UGC Act,1956
Accredited with grade 'A' by NAAC

# Contents

# From the desk of Vice-Chancellor

*TERI SAS can proudly say that its alumni are today part of the workforce of several forward-looking, sustainability-oriented corporates, agencies, consultancies, NGOs and even governments at all levels. The University is at the forefront of responding to global concerns on environment and sustainable development through knowledge creation and the development of a workforce that is empowered to guide sustainable economic growth and human well-being.*

*Building institutional and individual collaborations with like-minded Programmes/ Universities , our faculty ensure that the knowledge we create/imbibe through state-of-the-art research in these areas keeps our learning curriculum cutting-edge, inter-disciplinary and solutions oriented. This curriculum also benefits from a continuous feedback from academic peers at the national and global levels, from the employers of our students and from the students themselves—resulting in refined content and pedagogy on a periodic basis. The presence of international students and interactions with global experts ensures that a student of the TERI SAS is also comfortable in a multicultural setting.*

*With clearly identifiable areas of domain expertise, our students have the advantage of a systemic appreciation of problem solving needs through engagement with research projects, industry exposure and field visits. We are sure that our students will bring great value to your workforce and you will, while deploying them productively in your organization, give them the opportunity to hone their skills further for the greater global good. We would, of course, at all times value any feedback that you would like to offer us.*

**Dr Leena Srivastava**
*Vice-Chancellor*
*TERI SAS*

# From the desk of Pro-Vice Chancellor

*Academic programmes at the TERI SAS are focused around the challenges of providing for a rising global population with a limited and degraded natural resource base. In moving towards sustainability, the implicit understanding is that there is no panacea or straight road, with recognized and established methodologies, tools or specializations leading to such development. The solutions therefore do not lie in a specific subject discipline, but must be appropriate and relevant to the context or the practical problem being addressed. Developing such an understanding among its students is best achieved through exposure to a variety of subjects, tools, and methodologies offered in interdisciplinary mode. This has been the guiding philosophy behind the programmes offered by the TERI SAS and is practised by building a theoretical understanding in courses covering a variety of traditional disciplines, such as ecology, natural and social sciences, governance, policy, law, and engineering.*

*At the TERI SAS, students are exposed to a new way of thinking that looks at problems not from the lens of a subject specialist, but from the perspective of one who recognizes the complex linkages between man and his environment.*

*The TERI SAS's programmes are unique, not only in terms of the degrees, but in terms of the fact that they equip the graduates to lead in a resource-sensitive world. The programmes leverage TERI's knowledge capital in sustainable development to deepen the social and ethical consciousness of higher education in India.*

*We are sure that you will find graduates of these programmes to be competent leaders with a holistic and long-term perspective for a world that demands new skills and attitude.*

*Your feedback will be most valuable to us, and we look forward to it.*

**Dr Rajiv Seth**
*Pro-Vice Chancellor*
*TERI SAS*

# ABOUT TERI School of Advanced Studies

The TERI SAS was established to disseminate the vast reservoir of knowledge devised by The Energy and Resources Institute (TERI), a not-for-profit, independent research institute recognized globally for its contribution to scientific and policy research in the realms of energy, environment, and sustainable development. TERI SAS's academic offering is rooted in the comprehensive research, consultancy, and outreach activities of TERI.

In 1999, the University was granted the "Deemed to be University" status by the University Grants Commission (UGC) and notified vide the Ministry of Human Resources Development, Department of Education, Government of India, notification no. F.9/19/95-U-3, dated October 5, 1999. Since its inception, the TERI SAS has offered not just world-class education, but also an environment that enables its students to develop fresh perspective in their subject areas. Before moving to Vasant Kunj, the University was housed in the Darbari Seth Block of India Habitat Centre from 1998 to 2008. In 2008, TERI SAS started functioning from its new 'green campus', located in Vasant Kunj. The University aspires to be an institution of advanced learning which meets the needs of a rapidly growing nation. The academic programmes are envisioned to provide the students with a holistic perspective of the subjects offered and encourage interdisciplinary learning.

## Administration

The TERI SAS's Board of Management is responsible for its overall administration and control. All aspects of academic policy are under the purview of the Academic Council, chaired by the Vice Chancellor, which approves curricula, courses, and examination results. Furthermore, it appoints committees to look into specific academic matters arising from time to time.

## Structure

TERI SAS has structured its academic programmes around the research experience and skill sets gained by TERI over the past three decades. Since its inception, the wide array of academic programmes offered by the University have been related to sustainable development and structured around four thematic areas—Biotechnology, Regulatory and Policy aspects, Energy and Environment, and Natural Resources. The University is a first-of-its-kind university in India to dedicate itself to the study of environment, energy, and natural sciences for sustainable development.

## Department of Natural Resources

Aims to advance and impart knowledge about the environment and natural resources, including their characteristics and dynamics, their economic and societal value, and their management.

## Department of Energy and Environment

Aims to advance and impart knowledge in aspects related to clean technologies, renewable energy management, and especially the interface between energy and the environment. Engaged in research in the broad area of clean technologies to achieve energy efficiency and minimize adverse environmental impacts.

## Department of Biotechnology

Aims to advance and impart knowledge in the field of life sciences, emphasizing research and the interaction of science with society.

## Coca-Cola Department of Regional Water Studies

Aims to advance knowledge and build core competencies among students, researchers, policymakers, and professionals in order to equip them to tackle the interwoven challenges of water sustainability, beyond cultural boundaries and across sectoral divisions.

## Department of Business and Sustainability

Aims to provide research-based education that would equip students to implement an integrated approach to business sustainability.

## Department of Policy Studies

Aims to achieve a critical mass of expertise and academic excellence that would provide a basis for influencing public policy and regulatory practice.

## Centre for Post Graduate Legal Studies

Aims to be an interdisciplinary centre of excellence dedicated to legal research and teaching on issues pertaining to society and development.

Besides a set of core faculty members, the University also draws about 30 PhD qualified research professionals of TERI as adjunct faculty for its programmes. They have rich experience of working on projects related to regulatory studies, policy research, bioresources, biotechnology, energy, and environment.

# ACADEMIC PROGRAMMES

At present, the following programmes are offered:

- PhD
- MSc (Environmental Studies and Resource Management)
- MSc (Geoinformatics)
- MSc (Climate Science and Policy)
- MSc (Plant Biotechnology)
- MSc (Economics)
- MSc (Water Science and Governance)
- MA (Public Policy and Sustainable Development)
- MA (Sustainable Development Practice)
- MBA (Infrastructure)
- MBA (Business Sustainability)
- MTech (Renewable Energy Engineering and Management)
- MTech (Urban Development and Management)
- MTech (Water Resources Engineering and Management)
- LLM (specialisation in Environment and Natural Resources Law and Infrastructure and Business Law)
- Diploma in Water Science and Governance
- Diploma in Renewable Energy (distance education mode)
- Advanced PG Diploma in Renewable Energy (distance education mode)

The academic programmes offered by the TERI SAS focus on the challenges of providing for the rising global population with a limited and degraded natural resource base. In moving towards sustainability, there is no panacea, or straight road with recognized and established methodologies, tools or specializations. The solutions, therefore, do not lie in a specific subject discipline but must be appropriate and relevant to the context or the practical problem being addressed. Developing such an understanding among the students is best achieved through exposure to a variety of subjects, tools, and methodologies in the interdisciplinary mode. This has been the guiding philosophy of TERI SAS's programmes and is practised by building a theoretical understanding of courses covering a variety of traditional disciplines such as ecology, the natural and social sciences, governance, policy, law, and engineering. Over the duration of their study, students converge upon a few areas based upon their interest, having been exposed to a new way of thinking that looks at problems not from the lens of a subject specialist, but from the perspective of one who recognizes the complex linkages between man and the environment.

The TERI SAS uses modern pedagogical tools, richly supplemented by field visits, live industry projects, and hands-on applications. It provides the best equipment and instruments, which includes state-of-the art computer hardware and software, well-equipped laboratories, video-conferencing facilities, and access to South Asia's most comprehensive library on energy and environment. TERI SAS was awarded the India Today award for the most innovative curriculum. It has also received grade "A" accreditation by National Assessment and Accreditation Council (NAAC).

## Collaborations

Stressing the importance of the international perspective in its programmes, TERI SAS has entered into Memorandums of Understanding (MoUs) with several international universities aimed at facilitating a mutually beneficial exchange of students, faculty, knowledge, resources, and ideas.

The University encourages the exchange of ideas, cultural understanding, and a wide range of knowledge that would result from international exposure. In 2007, the University launched an academic exchange programme with Yale University (School of Forestry and Environmental Studies) with support from the V K Rasmussen Foundation. In 2008, the University launched another academic exchange programme with Freie University of Berlin, Germany, with support from DAAD (the German Academic Exchange Service).

TERI SAS has also signed MoUs for academic collaborations with North Carolina State University, University of Eastern Finland, Tor Vergata Economic Foundation (Rome, Italy), Utrecht University (Utrecht, The Netherlands), Carletin University (Canada), Simon Fraser University (Canada), Deakin University (Australia), University of Technology (Sydney).

# ACADEMIC CHAIRS AT THE UNIVERSITY

## Indian Railways Chair for Sustainable Mobility

The Ministry of Railways, Government of India has set up an Academic Chair on Sustainable Mobility at TERI SAS which serves to bring the most competent academicians/professors from the field of rail infrastructure to lend strength to the ongoing research activities at the University. The Chair involves itself in the issues of rail infrastructure and greening of the railways.

## UNESCO Chair

TERI SAS has been granted a UNESCO Chair in Climate Science and Policy. This is a prestigious award and is given to very few universities across the world. The TERI SAS has already tied up with various global universities for being partners in the UNESCO Chair. This includes the Scripps Institute of Oceanography, La Jolla, California, and the Yale Climate and Energy Institute at the Yale University, USA. The Chair serves as a means of facilitating collaboration between high level, internationally recognized researchers and teaching staff of the University and other institutions, particularly in India and other countries in Asia and the Pacific, as well as in Europe and North America.

## HUDCO Chair

HUDCO has established an Academic Chair at the TERI SAS with the objective to accelerate research and development, training, and capacity-building in the habitat sector, facilitate capacity-building of urban local bodies, and promote research in the field of urban development and related areas.

# INFRASTRUCTURE

## Green Campus

TERI SAS has a 'green' campus. It puts into practice the very principles taught in its classrooms. An architectural delight, the campus has been planned to provide a setting that enhances learning, while simultaneously showcasing the concept of modern green buildings. Spread over two acres, the campus comprises an administrative block, an office block, a convergence and hostel block. The green building has 10 classrooms, each having a capacity for seating 32 students, three lecture halls with a capacity for 60, and an auditorium with a capacity for 100 to 150 persons. The building also has 10 well-equipped laboratories to complement cutting-edge research at the TERI SAS. The campus is aesthetically designed with several features of passive energy-saving design, energy-efficiency, and water and waste management systems.

## Green Features

- Insulation of external walls
- Insulation on terrace done with vermiculite and puff insulation topped with China mosaic for efficient heat reflection
- Double insulation synergy azure glass is used in external façade with aluminum glazing
- Earth Air Tunnel (EAT), Thermal Mass Storage, and Variable Refrigerant Volume (VRV) systems are used for cooling the building
- Hunter Douglas louvers are used in the building for controlling the intensity of incoming sun rays
- Solar water heating system
- Waste water recycling with STP
- Rainwater harvesting

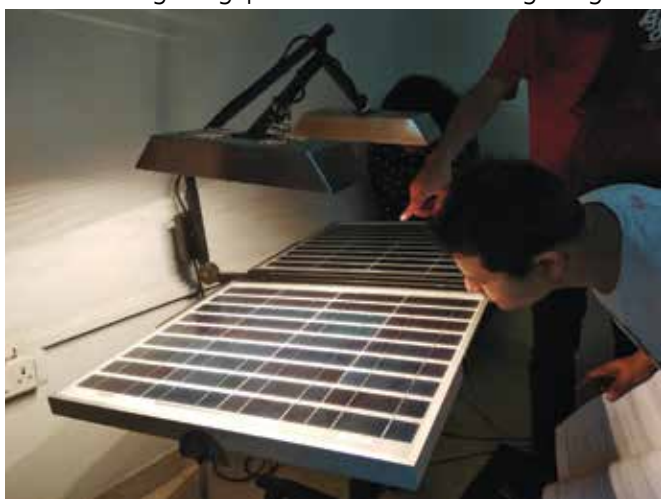
## TERI SAS Laboratories

TERI SAS harnesses the best of modern technologies to support and encourage the intellectual curiosity of its students and faculty. It also has laboratories with advanced equipment and facilities to aid and stimulate research.

# Solar Lighting Laboratory

TERI SAS has established a Solar Lighting Laboratory (SLL) which is a first-of-its-kind laboratory in India and achieved the NABL's accreditation (National Accreditation Board for Laboratories) as per IEC 62257-9-5 ed. 2.0. The laboratory adheres International Electrotechnical Commission (IEC), an international body that sets standards for all electrical, electronic and related technologies throughout the world standards for the testing of Solar Lighting Systems (SLS) and also recognized under the Lighting Global programme of International Finance Corporation (IFC). The laboratory is also supported by the Ministry of New and Renewable Energy (MNRE) and has sophisticated equipment and test setup that is used for testing lighting products.

The laboratory's facility is available for testing as per IEC and MNRE specifications for various lighting systems (both solar-based lighting and general lighting). The laboratory has also carried out various training programmes for different target groups. So far, SLL has tested more than 200 models of solar lighting systems including solar lanterns, solar home lighting systems, solar task lights, and multi-purpose solar lights. The ability of the laboratory to cater to the testing needs of both rural as well as urban lighting infrastructure makes it stand out from other laboratories. The laboratory is working towards strong quality assurance and testing programmes which will help in building consumer confidence towards the solar lighting products. The IFC's Lighting Asia–India programme is working with the University to achieve these goals.



As a way forward for the development and expansion of this laboratory, it is further planned to be linked with several other groups or programmes that require general lighting system (GLS) testing. The supreme testing equipment and authority for high quality assurance can lead to the transformation of the laboratory into a nodal agency for general (solar) lighting system testing not only for India, but entire Southeast Asia.

# Environmental Monitoring Laboratory

The Environmental Monitoring laboratory (EML) is capable of providing practical training to the students through structured laboratory curriculum, including all kinds of relevant soil, water, and air monitoring experiments required at the master's level. It caters to the interdisciplinary application in research to all the students of the University.

The EML is state of art laboratory equipped with instruments such as UV-Visible Spectrophotometer, GRIMM Aerosol Spectrophotometer, Respirable Dust Sampler, High Volume Sampler, Gaseous Monitoring Kit, Handy Low Volume Air Samplers, Stack Monitoring Kit, PH Meter, Muffle Furnace Ion Selective Electrode, Turbidity Meter, Conductivity Meter, Jar Test Assembly, COD Digester (Reflux), BOD Testing Apparatus, Sensitive Balance, Bomb Calorimeter, Kjeldahl Unit, Microscope (Primostar Halogen), Muffle , TSI Optical Sizer, Potable As Analyzer, Q Track–Indoor Air Quality Monitors And Q Track– Velocicalc.

## Combustion Laboratory

The Combustion laboratory has been established to test the performance of cookstoves based on energy efficiency as well as emissions using nationally and internationally accepted protocols such as Water Boiling Test (WBT), Controlled Cooking Test (CCT), and the Indian Standard on Solid Biomass Chulha Specification (BIS India). The hood method is used to capture and quantify the various products of incomplete combustion. The following instruments and support facilities are available in the lab: Moisture Meter, Bomb Calorimeter, Equipment to maintain isokinetic conditions, Aerosol Spectrometer And Dust Monitor, Low Flow Air Samplers (attached with SKC pump) for collection of bulk aerosols for characterization, Potable Gas Analyzer Digital Infrared Thermometer

## Geoinformatics Laboratory

The Geoinformatics Laboratory at the TERI SAS is well equipped with state-of-the-art equipment such as high-end computers (workstations), scanner, digitizer, printer, navigation devices, Infra-red thermometers and others. It has licensed version of high-end latest commercial software like ERDAS Imagine, LPS, ArcGIS, GMS, and WEAP along with other advanced support system's mechanism. The laboratory is also equipped with web publishing tools like ArcGIS Advance and ArcIMS Servers. The laboratory is also equipped with various open source geospatial softwares, to expose our students to the powerful open source environment.

The laboratory also holds a good repository of geospatial information in both digital and hard formats.

The Geoinformatics laboratory of the Natural Resources Department of TERI SAS also operates through a network with several research institutions working in the arena of Geoinformatics and other associated fields both within and outside the country. We also support research and development activities of the country wide network of The Energy Resources Institute (TERI) branches located across the country.

## Biotechnology Laboratory

Biotechnology laboratory is fortified with fundamental and advance facilities required for radical teaching and research applications in plant biotechnology. The laboratory is furnished with autoclave for sterilization, Biosafety Cabinet, Centrifuges, Conductivity Meter, Deep Freezers, Digital PH Meter, Gas Chromatography, Gel Documentation System, Ice Flaking Machine, Magnetic

Stirrer, Microscopy Facilities, Nano-Drop Spectrophotometer, Refrigerated Shaking Incubator, Plant Growth Room, Vortex Shaker with Touch Plate, Water Bath for Incubations, Laminar Air Flow, Master Cycler among other basic infrastructure. Additionally, the Bioinformatics laboratory with work station dedicated computer systems facilitated with advanced software, such as MATLAB, GCK, PAUP, and MacVector exists for 'in- silico' applications. Further, the plant biotechnology course is augmented by the support from research laboratories involved in research activities led by the faculty members in the areas of Genomics and Plant Development Biology, Nanobiotechnology, Bioinformatics, Microbial genetics and pathogenesis, Stress Physiology and Structural Biology.

## Power System Laboratory

The Power System Laboratory gives a comprehensive idea about the practical aspects of power system infrastructure. The generated electrical power is transmitted through transmission lines and used mostly in rotating machines. The state-of-the-art laboratory infrastructure is equipped with the experimental facilities for providing training on transmission lines, DC machines, induction motors, synchronous machines, and transformers. The laboratory gives the opportunity for experimental verification of performance characteristics of the power system equipments along with exposure of modern day technologies for solving modern day power system problems. The experiments are designed keeping in mind the multidisciplinary approach of the students coming from different engineering and science backgrounds.

## Heat Transfer Laboratory

The Heat Transfer Laboratory is designed to incorporate the practical concepts of heat and mass transfer applied to renewable energy systems and energy conservation techniques. The experiments are designed to give comprehensive knowledge of heat transfer through conduction, natural convection, forced convection and radiation. The lab is fully equipped with experiments on heat exchanger. It also provides knowledge of boiling and condensation processes. The lab explores the basics of mechanical engineering and is designed such that the students are able to acquire interdisciplinary knowledge in an easy way.

## Energy Simulation Laboratory

Energy Simulation Lab enhances the soft computing skills of the students and enables them for modelling and simulation of energy systems. The laboratory experiments are designed to experimentally verify what they have learnt in the previous laboratories through software applications. The experiments are carried out using renewable energy simulation softwares viz. PVsyst for Solar PV, WAsP for wind, RET Screen for renewable energy project management, HOMER for microgrid applications. MATLAB is also discussed to be used for power flow solutions especially in renewable energy sector

## Biofuel and Waste Utilization Laboratory

The Biofuel and Waste Utilization Laboratories are distributed between the TERI SAS and TERI Gram at Gual Pahari, Gurgaon. Combustion process and fuel properties such as proximity analysis, COD, etc., are studied at the lab in TERI SAS, while experimental studies on biomass conversion processes such as gasification, biomethanation, and pyrolysis are carried out on facilities at TERI Gram.

## TERI SAS Library

The TERI SAS library supports the university's academic and research programmes by meeting the information requirements of students, researchers, and faculty members. Electronic and print resources are available in Natural Resources, Environment, Sustainable Development, Plant Biotechnology, Geoinformatics, Renewable Energy, Infrastructure, Regulations, Public Policy, and related areas.

The Digital Library provides access to electronic books, journals, databases, PhD theses, CDs, links to resources, news, and information alerts about the library. The online bibliography database of the university library can be accessed to search any particular title using the author's name, keyword or title itself. The faculty and students can retrieve online information from the dedicated terminals situated in the library. Network resource sharing facilities are provided through DELNET and interlibrary loan services from the libraries of other universities and institution, such as American Information Centre, Delhi University, Indian Institute of Technology (IIT), Jawaharlal Nehru University (JNU), and more.

Electronic Resources: Theses/ Dissertations (Submitted by the TERI SAS Students), E-journals and Databases: JSTOR/SCIENCE DIRECT /SPRINGER/OPEN ACCESS JOURNALS, E- Books, E-Government Documents and Reference Collection, In-house publications (Newsletters and Journals), Electronic articles and journal content-page alert services are available along with access to holdings of national and international university libraries.

# ACADEMIC COUNCIL

Chairperson of the Council

**Dr Leena Srivastava**
Vice-Chancellor, TERI SAS

**Dr Rajiv Seth**
Pro Vice-Chancellor, TERI SAS

Deans

**Dr Prateek Sharma**
Dean (Academic), TERI SAS

**Dr Arun Kansal**
Dean (Research and Relationships), TERI SAS

Heads of the Departments

**Dr Sapna Narula**
Department of Business and Sustainability, TERI SAS

**Dr Suresh Jain**
Department of Energy and Environment, TERI SAS

**Dr Sudipta Chatterjee**
Department of Natural Resources, TERI SAS

**Dr Chaithanya Madhurantakam**
Department of Biotechnology, TERI SAS

**Dr Nandan Nawn**
Department of Policy Studies, TERI SAS

**Mr M V Shiju**
Centre for Post Graduate Legal Studies, TERI SAS

Professors

**Mr S Sundar**
Emeritus Professor, Department of Policy Studies, TERI SAS

**Dr Anandita Singh**
Professor, Department of Biotechnology, TERI SAS

Associate Professors from Departments

**Dr Naqui Anwer**
Associate Professor, Department of Energy and Environment, TERI SAS

Assistant Professors from the Department by Rotation of Seniority

**Dr Anu Rani Sharma**
Assistant Professor, Department of Natural Resources, TERI SAS

**Ms Fawzia Tarannum**
Lecturer, Department of Regional Water Studies, TERI SAS

Nominees of the Vice Chancellor

**Dr Kanchan Chopra**
Professor and Former Director, IEG

**Dr Malathi Lakshmikumaran**
Director, Lakshmikumaran & Sridharan

**Dr T C Kandpal**
Professor, Centre for Energy Studies, IIT Delhi

Co-opted Members

**Dr Anubha Kaushik**
Professor and Dean, School of Environment Management, GGSIU

**Dr Vivek Suneja**
Dean(Planning), FMS, Delhi University

**Dr Rakesh Khosa**
Professor, Department of Civil Engineering, IIT Delhi

Secretary

**Capt Pradeep Kumar Padhy**
Registrar, TERI SAS

# About The Programmes

Water for several decades has been viewed from an engineering lens and its management has primarily been through technological interventions. This approach has distanced people who traditionally took on the responsibility to manage water from assuming ownership for the resource. The growing concerns around water and the need to adopt a triple bottom line approach to managing the resource has thus led to adopting an inclusive and integrated approach to water management.

It is also no longer an easily accessible and free resource because of its indiscriminate use. Rather than looking at it as just a technical issue, time has come to go back to the roots and look water from a socio-technical perspective. We are blessed to have a rich history of traditional water management systems wherein science was used to harness the water and communities took the initiative to manage and govern it.

Further, the water market is itself on the brink of a change, and the push for greater water security and sustainability has increased over the past decade. Emerging markets are investing heavily in water sector and companies are realizing that sustainable water use is not only good for the environment — it is also good for their bottom line.

The MTech programme in Water Science and Governance integrates engineering and technological principles with socio-economic perspectives. Interdisciplinary in its scope and objectives, the program aims to train young graduates and professionals into water leaders who can provide multi-faceted perspectives on water related issues rather than just technical ones, thereby contributing to development of both technical insights and policy prescriptions for effective implementation.

The M.Sc. programme in Water Science and Governance is an interdisciplinary program with special emphasis on development of socio-economic perspectives. The objective of the program is to create water professionals equipped to examine water issues in a trans-boundary and cross-cultural framework transcending environmental, technical, social, economic and legal discourses.

The students of these programmes are molded and equipped to take up jobs in corporate houses, water industry, government departments, donor agencies, NGOs and research institutions, or join the band of entrepreneurs passionately working for the cause of water availability, affordability and accessibility.

# Courses Taught

## Courses Common to both M.Sc. and M.Tech.

### FIRST SEMESTER

1. Applied Hydrology and Meteorology
2. Water Planning and Management
3. Water Quality monitoring methods and analysis
4. Social Research Methods
5. Gender, rights and equity perspectives for sustainable water management
6. Water Resources-Institutions and Governance
7. Geoinformatics for water resources

### SECOND SEMESTER

8. Water security and conflict management
9. Water resources economics
10. Irrigation water and drainage management

### THIRD SEMESTER

11. Water Law
12. Industrial Pollution Control (elective)
13. Groundwater Hydrology and Management (elective)
14. Integrated Impact Assessment(elective)
15. Wildlife conservation and management (elective)
16. Minor Project

### FOURTH SEMSTER

1. Major Project

## Other Courses

### FIRST SEMESTER – M.TECH.

1. Stochastic Modelling
2. Advanced Hydraulics

### SECOND SEMESTER – M.TECH.

1. Design of water supply and sanitation system
2. Water quality modelling and application
3. Optimization techniques for water management
4. Advanced geoinformatics for water resources

### FIRST SEMESTER - M.Sc.

1. Environmental Statistics
2. Hydraulics

### SECOND SEMESTER – M.Sc.

1. Water supply and sanitation
2. Integrated watershed and river basin management
3. Water audit and demand management
4. Aquatic eco-system management

# OUR FACULTY

PROF. ARUN KANSAL is the Head of the Coca-Cola Department of Regional Water Studies at TERI SAS. He received his PhD degree in Environmental Engineering from Indian Institute of Technology, Delhi. He has over 20 years of research/ consultancy/teaching experience in the areas of water resource management, waste management with a focus on resource recovery and recycling, urban environment, and energy–environment–climate linkages. He has also served as a Lead Author for IPCC 5th Assessment Report WGIII.

PROF. PRATEEK SHARMA is Dean (Academics) at TERI SAS. He pursued his PhD degree in Environmental Engineering from Indian Institute of Technology, Delhi. He has more than 18 years of research and teaching experience. His general research interests focus on environmental systems modelling, statistical applications in environmental and water resources engineering, and environmental risk assessment. He has contributed to several high impact academic journals and authored two books in vehicular pollution modelling and stochastic modelling and one monograph. Prof. Sharma has been admitted as a Fellow of Wessex Institute of Great Britain in 2004, in recognition of outstanding scholarly work. Prior to joining TERI SAS, he worked for the School of Environment Management, GGS Indraprastha University for eight years where he was involved in developing the curriculum for the Masters programme in Environmental Management and Disaster Management.

MS. RANJANA RAY CHAUDHURI has worked for the last 20 years in the field of academics and infrastructure involving feasibility studies, design, and evaluation. She holds an ME in Civil Engineering from the Delhi College of Engineering. Her areas of interest include water and resource management, watershed hydrology, and analysis of hydrologic systems including predictions.

MS. FAWZIA TARANNUM is an Electrical Engineer by qualification. For the last 10 years, she has been working in the field of de-silting and de-weeding of lakes, rivers, and other shallow water bodies in various parts of India. Her research interests include public participation in water resource management and community based adaptation for tackling water scarcity.

DR SUDIPTA CHATTERJEE has been working for conservation of forests and biodiversity for over two decades and is presently an Associate Professor at TERI SAS. He is a recipient of the Whitley Associate Award, UK, in 2009, for conservation of Rhododendrons in Eastern Himalayas. Earlier, he worked as Biodiversity and Protected Area management specialist at Sikkim Biodiversity Conservation and Forest Management Project, Integrated Development Division, Louis and Berger Group and served as the Head of the Communities and Biodiversity and Forests and Carbon Division of the Wildlife Trust of India.

DR. RINKI DEO has her basic educational background in Physics and specializes in remote sensing and GIS. She completed her PhD in Resources Engineering from CSRE, IIT Bombay. While pursuing PhD, she got the DAAD fellowship (16 months including 4 months German language course) to work at the prestigious German Aerospace Center (DLR), Germany for one year. In addition to her PhD work which focuses on Evaluation of TanDEM-X Interferometric Digital Elevation Models, she was also involved in research work in various other fields such as SAR polarimetry, PSInSAR, SAR signal processing, Speckle filtering, etc. She has contributed in the development of software named TARANG which is being used by many users in India to process Radarsat-2, ALOS-2, TerraSAR-X and Indian RISAT-1 SAR data for various applications. She possesses the knowledge of interferometric SAR data processing using different softwares like SARscape, Doris and GAMMA and have gained considerable expertise in image processing and GIS softwares (ERDAS, ENVI, ArcGIS, etc) and in programming language like C and IDL

DR NIRUPAM DATTA is an economist by training. He has received his PhD from Indira Gandhi Institute of Development Research (IGIDR), Mumbai. His PhD thesis titled 'Essays on Some Issues in Resource Conserving Technologies and Practices in Agriculture in India' looks at the issues associated with resource conserving technologies from three different perspectives: impact, social learning and continuation of usage. He has a rich experience of personally conducting or overseeing the survey of around 4000 agricultural households and 400 consumers across diverse agro ecological regions and socio-economic environments. Prior to this, he has worked both under fulltime and temporary assignments with International Food Policy Research Institute (IFPRI), Housing Development Finance Corporation Limited (HDFC) and IGIDR. His current research interests are agriculture and resource economics, health & nutrition and housing issues.

# DEPARTMENTAL ACTIVITIES

## EXPERT LECTURES, WEBINARS & INTERACTIONS

- Lecture on "Estuarine Modelling of Eutrophication and Toxics" by Professor Wu Seng, Professor of Environmental Engineering at University of Virginia.
- Interaction with Associate Professor Eva Abal from The University of Queensland on Solutions and Leadership for a Sustainable Water Future.
- Lecture on "Managed Aquifer Recharge by Small Diameter Wells and Thermal Modelling of Shallow Aquifers" by Dr Falk Haendel, Institute for Groundwater Management Technical University, Dresden Germany.
- Lecture on "Water, Complexity & Public Policy" by Professor Robert James Wassan, National University, Singapore.
- Lecture on "Waste-water Treatment Technologies with Focus on Social Context" by Professor Eddy Moors, Professor-Water and Climate, VU Amsterdam.
- Webinar on Drought Risk Assessment in South Asia by Dr. Soni M Pradhanang, University of Rhode Island.

## WORKSHOPS AND SEMINARS

- Roundtable conference on Sustainable Industrial Water Management, CEEW, IHC 2017
- Jal Kranti Abhiyan conference on Water Management, Ministry of Water Resources, Constitutional Club, New Delhi – 2017.
- Workshop on Tracking Management Initiatives for Water security organised by NEETI AYOG Vigyan Bhawan – 2017
- Seminar on Benchmarking Industrial Water Use to Assist Policy for Industrial Water Use Efficiency organised by TERI, IHC - 2017

## EVENTS
## S.W.A.S.H. : SAVE WATER AND SAVE HUMANITY


The Coca-Cola Department of Regional Water Studies hosted its annual event S.W.A.S.H. on March 28, 2017. The theme for the event, "Water and Wastewater- Opportunities and Challenges" was based on the Theme of the World Water Day -" Why Waste Water?". Wastewater is being widely acknowledged as a resource out of place with enormous potential to complement freshwater. Thus, it becomes imperative to understand the symbiosis between water and wastewater in the quest for sustainable development. The aim of the event was to bring students and professionals together to creatively participate in deliberations to address the issues related to use and management of wastewater to provide respite from the prevailing water scarcity.

## SITE VISITS

**Yamuna Biodiversity Park**

The students visited Yamuna Biodiversity Park, Delhi, to learn about the role of wetlands in the restoration of the ecosystem of a region. The trip was facilitated by Dr. Sudipta Chatterjee, and formed a part of the course work on Aquatic Ecosystem Management. Interaction with the park authorities revealed the steps taken towards the conservation of local flora and fauna and its importance in maintaining a healthy soil-water-forest nexus.

## DEPARMENTAL FIELD TRIP

**Ahmedabad**


In the second semester, the students went on a study tour to Ahmedabad. The tour was facilitated by Dr. Nirupam Datta. The students visited the Sabarmati Riverfront and interacted with the Sabarmati Riverfront Development Authority officials to understand the success behind the river front development process and how it helped in flood control and land reclamation in Ahmedabad city. Visits to Nalsarovar Wetland, a Ramsar Site and Space Application Centre, ISRO Ahmedabad were also undertaken.

## OTHER FIELD TRIPS




**Roorkee**

In the first semester a group of students from the Department was taken to NIH, CBRI Roorkee and to Robbers Cave, Dehradun as part of 1st semester field trip where they had an interaction with the researchers and scientists. Here students were told about the aspects of hydrology and water resources, impact of climate change on water resources and about the ongoing researches on integrated water resources management, flood and drought management and various research work on hydropower generation. At the Central Building Research Institute (CBRI) students came to know about the various work done in setting up standard parameters and development in the field of building science and technology. Robbers cave being the natural water body, students learned about the necessity of our resources and how it affects and support the livelihood for many.

## Jaipur and Alwar


Other groups of students from the department went on a field visit to Jaipur and Alwar. The students visited to Tarun Bharat Sangh (TBS) in Alwar, the city of palaces Jaipur and the Sariska National Park. The three-day trip was filled with learning and new experiences; students got a chance to stay in TBS Ashram where they learned about the principles the Sangh believes in and how each member contributes in conserving the resources. Students learned about the heritage and culture and the importance of resources, traditions and flora-fauna in people's lives.

# STUDENTS' PROFILES

## M. TECH WSG

### Aparajeeta Vaibhav

ACADEMIC BACKGROUND: B.Tech Mechanical Engineering, Magadh University.

AREAS OF INTEREST: Sanitation and supply, Water law, water planning and management, River basin management, Water and waste water treatment, Irrigation and Drainage.

THESIS TOPIC: Virtual trade in water and agriculture water-nutrition nexus: This study aims to provide an in-depth analysis of various aspects and consequences of India's agriculture trade which is also resulting in a virtual export of water from the country. With increasing demand for food and depleting water resources, it might prove to be a challenge for the country to feed its continuously increasing population in future. This study also plan to understand various parameters like population growth, export, composition etc. of India over the last few years to develop an understanding of this virtual water export issue, critically evaluate it and develop a scalable and sustainable plan to mitigate it.

ORGANISATION/DURATION: TERI SAS/6 months.

## Ashu Balhara

ACADEMIC BACKGROUND: B.Tech Biotechnology, University School Of Biotechnology, Guru Gobind Singh Indraprastha. University.

AREAS OF INTEREST: Water audit, Waste water Treatment, Industrial Biotechnology, River basin management, Irrigation Water management, GIS in water resources.

THESIS TOPIC: To develop correlation between agriculture, water with various drivers that influence water consumption: The study aims to understand the linkage between the crops and agricultural water usage and how various drivers are related with it and with each other, and what could be optimal combination for increasing the yield with the highest possible efficiency for the given irrigation method and practice. The study also attempts to compare the various irrigation practices to make standard bench marks for these practices which will help us in identifying the grey areas on which we need to focus on and identifying the opportunities it could provide for improving the efficiencies for fragmented land holdings.

ORGANIZATION / DURATION: TERI SAS/6 months.

## Harsha

ACADEMIC BACKGROUND: B.Tech Chemical engineering, Banasthali Vidyapith.

WORK EXPERIENCE: Service Executive, Clock Soft Solutions Private Limited.

AREAS OF INTEREST: Water, sanitation, distribution and management, gender realization, planning and monitoring, wastewater treatment and designs, water auditing and quality control.

THESIS TOPIC: Impact on water budget due to agriculture pattern in various states of India: The study aims to understand the changing trend of net sown area under various crops, spatial distribution of these crop and their linkages with the surface and ground water consumption. The aim is to achieve the overall water consumption trend in various regions due to agriculture and map the water surplus and deficit regions in India and simulate it with an addendum for the best suitable techniques.

ORGANIZATION/DURATION: TERI SAS / 6 months.

## Harsh Ganapathi

ACADEMIC BACKGROUND: B.Tech Mechatronics, SASTRA University, Thanjavur.

WORK EXPERIENCE: Associate System Engineer, Tata Consultancy Services.

AREAS OF INTEREST: Water Technology & Intelligent Water Management.

THESIS TOPIC: Water use benchmarks for irrigation systems in best practices for drought- proofing of agriculture: A comprehensive study for identification of indicators to benchmark efficient water use for various agricultural systems in an event of drought. It aims to establish a structure for the best agricultural practices to be implemented so as to combat crop failure in a drought like scenario leading to agricultural drought being eradicated in future years to come.

ORGANIZATION/DURATION: TERI SAS / 6 months.

## Pragya Gangal

ACADEMIC BACKGROUND: B.Tech Biotechnology, Banasthali Vidyapith.

AREAS OF INTEREST: Wastewater treatment, Water quality monitoring and modelling, GIS in water resource management and water audit.

THESIS TOPIC: Assessment of historical trends and current status of drought, its linkages with Indian agriculture and proposing an early warning and drought forecasting system using GIS and remote sensing: The study focuses on the relationship between the historical trends of drought occurrence and the factors responsible for it. With the slow onset of drought, evolving over months or years, it becomes essential to have an efficient early warning and forecasting system. The study aims to provide a proficient remote sensing based early detection mechanism to enhance prevention and mitigation strategies. It will also elaborate on the status of various mitigation policies in India like water conservation measures, crop insurance and relief etc.

ORGANIZATION/DURATION: TERI SAS/ 6 months.

## Ravi Prakash

ACADEMIC BACKGROUND: B.Tech, Civil engineering, Dr. A.P.J. Abdul Kalam Technical University, GNOIT Greater Noida.

AREAS OF INTEREST: Water Audit, Wastewater Treatment and Reuse.

THESIS TOPIC: The significance of Decentralized Wastewater treatment in drought prone rural areas of Uttarakhand and Himachal Pradesh: The research aims at analysing the hydrological, economic and social viability of decentralized wastewater treatment and reuses in rural areas. The study also aims at understanding the existing coping mechanism from drought in such areas.

ORGANISATION/DURATION: TERI SAS/ 6 Months.

## Sonali Agray

ACADEMIC BACKGROUND: B.E. Civil Engineering, Shri Ramdeobaba College of Engineering and Management, Nagpur.

AREAS OF INTEREST: Wastewater Treatment, Water supply and sanitation, Water quality monitoring.

THESIS TOPIC: Drought Monitoring and Assessment Using Remote Sensing Data - A Review in Indian Context: The study provides a review of fundamental concepts of drought and its classification with a focus on the assessment of nature, severity, historical trends and current status with its linkages to Indian agriculture. It further focused on various aspects related to drought monitoring and assessment using remote sensing data and GIS techniques. Based on this study the limitations and gaps in the existing research will also be identified.

ORGANIZATION/DURATION: TERI SAS/6 months.

## Yashi Gautam

ACADEMIC BACKGROUND: B.Tech Biotechnology,
Banasthali Vidhyapith.

AREAS OF INTEREST: Wastewater treatment, Sustainability.

THESIS TOPIC: Concentrating sewage by Forward Osmosis using Biomimetic Aquaporin Membrane, Anaerobic Digestion and Nutrient recovery from concentrated sewage through struvite crystallization: The research study aims at concentrating sewage by the process of Forward Osmosis where sewage acts as feed solution and magnesium chloride hexahydrate as draw solution using aquaporin based biomimetic. Recovering nutrients as struvite from concentrated sewage will go a long way in reducing quantity of sewage & use of nutrients.

ORGANISATION/DURATION: TERI/6 Months.

## Zeba Zoariah Ahsan

ACADEMIC BACKGROUND: B.Tech, Mechanical Engineering,
Sikkim Manipal Institute of Technology, Majitar, Sikkim.

AREAS OF INTEREST: Water governance, water security and conflict management, water quality analysis and water law.

THESIS TOPIC: Past and current efforts of the government for drought proofing of agriculture: The study aims to conduct meta-analysis of the past research works for various watershed development projects across the country using statistical platform R.

ORGANIZATION/ DURATION: TERI SAS/ 6 months.

## M.Sc. WSG

### Bommaraboyina Prithvi Ram

ACADEMIC BACKGROUND: B.Sc. (H) Agriculture Science, Lovely Professional University.

AREAS OF INTEREST: Agriculture, Soil-less Crop Cultivation, Irrigation Water Management, Water Supply and Sanitation, Peri-Urban Water Resource Management, Water Policy & Governance, River Ecosystem Conservation & Rejuvenation, Social Studies around Agriculture and Water Resources.

THESIS TOPIC: Creation of Micro Watershed at Restored Open Cast Mines at Muradih, Jharkhand: The study aims to explore on physiography of landscape, ecological (Forest/Agricultural) dynamics hydrological and climatological aspects to convert a patch of land depression in to a micro watershed as small water source. Based on the study, possible recommendations will be made for interventions in the depression structure which could be converted into the water bodies creating a water source for the ongoing project, which also help in reclaiming the aquatic biodiversity.

ORGANIZATION/DURATION: Coal India / 6 months.

### Gunjan Chawla

ACADEMIC BACKGROUND: B.Sc. (H) Botany, University of Delhi

AREAS OF INTEREST: Wetland Management and Restoration, constructed Wetlands, Water Quality Monitoring, Eutrophication and River pollution, Environmental influence on planktons productivity, Biophysical linkages in seas.

THESIS TOPIC: Limnological study of planktons and their relation with the nutrient levels and Ecosystem under Hemendra Kothari Fellowship: This project involves the study of species composition of planktons, diversity and their growth relation with the nutrient levels in the Sanjay Van Lake. This has an indicative value in determination of water quality and helps in maintaining the ecosystem for migratory birds visiting the lake.

ORGANIZATION/DURATION: TERI SAS/ 6 months.

## Lucas Robert Luhunga

ACADEMIC BACKGROUND: Bachelor of Science with education - Geography and Biology, Sokoine University of Agriculture (SUA) Morogoro, Tanzania.

WORK EXPERIENCE: Academic Administrator and Instructor, Secondary Education Department, Mtwara DC; Water, Sanitation, and Hygiene program officer Baobab Home organization Bagamoyo, Tanzania.

AREAS OF INTEREST: Water supply and sanitation, water audit and Environmental Impact Assessment (EIA).

THESIS TOPIC: Water-Energy Nexus in Indian Agriculture: The study aims to explore the water-energy nexus for selected crops grown in India for different categories of agricultural operations that entail usage of water as one of the inputs.

ORGANIZATION/DURATION: TERI SAS/ 6 months.

## Mayuri Phukan

ACADEMIC BACKGROUND: B.Sc. Physics, St. Xavier's College, Mumbai

AREAS OF INTEREST: GIS, Flood Resilience, Hydrology, Waste Water Management, Spring Rejuvenation, High Altitude Water Scarcity Mitigation

THESIS TOPIC: Economic Viability of Treated Waste Water Use in Agriculture: The study aims to understand the suitability of treated waste water as a drought resilience measure. The technological, economic and social costs associated with the use of treated sewage for agriculture will be analysed. An economically feasible model will be suggested to be replicated in areas with similar agro-ecological conditions as an outcome of the study.

ORGANIZATION/DURATION: TERI SAS/6 months

## Ranu Shukla

ACADEMIC BACKGROUND: B.Sc. (H) Home Science, University of Delhi.

AREAS OF INTEREST: Water Audit, Wetland and Coastal Ecosystem Management, Water Institutions, Irrigation Water Management, Watershed development and Management, Water Supply and Sanitation.

THESIS TOPIC: Past and current efforts of the government for drought proofing of agriculture- institutions, policies and governance, budgetary allocation: The study presents the comprehensive analysis about the institutional and policy development after the drought in Maharashtra in early 1970s and their impact on the people. It shows the conditions and circumstances that lead to a drought like situation and the policies made by government and their implementation at the ground level and their actual impact on affected people. The study also presents the account of developmental steps taken by local institutions along with the government for combating the impacts of drought by micro-irrigation technologies and water shed development programmes.

ORGANIZATION/DURATION: TERI SAS/ 6 months.

## Shubham Nandanwar

ACADEMIC BACKGROUND: B.Sc. Environmental Science, Fergusson College, Pune

AREAS OF INTEREST: Water audit, Water treatment, recycling and management, Water planning and management, Food and beverage industries, Quality monitoring, River restoration.

THESIS TOPIC: Water Use Benchmarks of Irrigation Systems: Water availability is a huge issue in our country especially in the agricultural sector. Being a very important component of agriculture, there is a need to come up with new technologies which use less amount of water and the yield is not compromised. This research topic focuses on identifying water sources for agriculture in India, identification of indicators for benchmarking, studying irrigation systems and their water use efficiency; a major focus will be on how to minimize water usage in agriculture without compromising yield by using several technologies like solar water pumps and drip irrigation and groundwater. It also aims to understand the inter-linkage between solar water pumps and drip irrigation, their accessibility to the farmers and how the government support can promote solar water pumps and drip irrigation.

ORGANIZATION/ DURATION: TERI SAS/ 6 Months

# PLACEMENT PROCEDURE AND GUIDELINES FOR RECRUITERS

The campus recruitment activity for MSc & Mtech (Water Science and Governance) is conducted to serve dual purposes—placement of the students for their final project which is undertaken in the fourth semester and the formal job recruitment on completion of the programme.

## Our placement process consists of two phases:

| Masters' Thesis Project | |
|---|---|
| Recruitment Period | Availability of Students |
| October to December 2017 | January to June 2018 |
| **Job Placement** | |
| Recruitment Period | Availability of Students |
| October 2017 to June 2018 | June 2018 onwards |

We welcome you to visit our campus for interviewing and selecting students for major projects and final placements. You may interact with the students either through telephone, video conference, or in person. Interested organizations may contact the Placement Cell. The contact details are mentioned at the back of the brochure.

## OUR RECRUITERS

1. Global Hydrological Solutions
2. Solidaridad
3. Pratibha Syntex
4. TATA Trust
5. Hindustan Coca-Cola Beverages Pvt Ltd
6. GE Power and Water Systems
7. TERI
8. National Institute for Urban Affairs
9. Vyakti Vikas Kendra India, the Art of Living
10. Citizen Consumer & Civic Action Group
11. Navjyoti India Foundation

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# PLACEMENT CELL


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