

COLLABORATIVE PATHWAYS

TOWARDS SUSTAINABILITY



IGCS
INDO-GERMAN Centre
for SUSTAINABILITY



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A New Passage
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Greetings from IGCS



Dear Reader,

Our colleagues and we are very pleased to provide you in this report a snapshot of the activities of the Indo-German Centre for Sustainability (IGCS), a joint initiative of the Indian Institute of Technology Madras, German universities and research institutes of excellence. IGCS has recently completed five years of its activities after a tentative beginning, when we were trying to find our feet and understand our role. We now have the confidence and the capability to move forward with purpose and agility.

IGCS hosts long-term visiting professors from Germany for up to 3 years. In addition, it offers short-term scholarships for German and Indian undergraduate, master's and Ph.D. students and postdoctoral scholars to undertake collaborative research on sustainability. It also hosts winter and summer schools, which are 2-week programmes for German and Indian students designed around one of the four broad themes of sustainability—energy, land use, waste and water—to foster interdisciplinary and intercultural exchange among highly motivated participants.

IGCS also aims to foster interdisciplinary research, training and action around the above-mentioned four broad themes of sustainability. All four themes are extremely important in the context of global change, particularly climate change. IGCS research is problem-focussed rather than abstract or theoretical, and we seek practical, workable solutions for complex real-world sustainability challenges.

The IGCS faculty and researchers continuously engage with policy makers at local, national and international levels to provide technical and policy advice for sustainability challenges. We have also begun to engage more consciously with industry and community action groups in many domains in order to create long-term change even as we address short-term problems.

Most importantly, we see IGCS as an ever-expanding network of individuals, research groups and industry and other civil society organisations from India and Germany coming together to address specific sustainability concerns of interest to both countries. We hope you too will find a way to participate in our many activities.

Sincerely
Sudhir Chella Rajan

Rafiq Azzam

Cover Design Concept

The ancient and the modern, the logical and the intuitive, the material and the metaphysical are the different contrasts through which we understand the whole. Synthesis is often a product of the collaboration between these contrasts and the cover attempts to illustrate this idea through iconic representations of Indian and German culture.



HIGHLIGHTS

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Photograph by Robert John, master's student, University of Freiburg

MESSAGE FROM THE CO-CHAIRS



The Indo-German Centre for Sustainability (IGCS) was set up as a partnership between India and Germany, to commemorate the golden jubilee of the founding of IIT Madras with German assistance. IGCS has been created jointly by IIT Madras and RWTH Aachen and is supported in equal measure by the Indian and German governments. Given the importance of research in sustainable technologies, industry has also come forward to support IGCS. Leading experts from German universities visit IIT Madras for extended periods and undertake joint projects with colleagues here, apart from teaching and supervising graduate students. IIT Madras is proud to be associated with this unique model of collaborative research on topics critical to the future well-being of our world.

This report gives you a glimpse of the diverse streams of activity undertaken at IGCS on sustainable water treatment, air and water pollution, land use, biofuels, smart grids and management of water bodies. The canvas is impressive, as is the degree and depth of collaborative research carried out by German and Indian faculty members and students. We particularly cherish the opportunity the centre provides our faculty and students to expand their horizons through such collaborative work even as they work on problems critical to regional and global challenges of sustainable development.

IGCS has made impressive strides in the years since the inception. IIT Madras looks forward to expanding the scope of its activities with continued support from the Indian and German governments. We wish to involve more experts from other Indian institutions, as well as widen the reach of our collaborations in Germany. It is our ambition that IGCS provide enduring solutions to the challenges India faces in charting a sustainable developmental path. We are confident that some of the solutions will be relevant to Germany and other parts of the world as well.

We are grateful for the joint partnership for establishing IGCS on a firm foundation and ensuring that it successfully executes challenging research projects of high quality. We hope to continue the work to take IGCS to greater heights in the coming years.

Ernst Schmachtenberg

Bhaskar Ramamurthi



A New Passage to India.

In 2008, the governments of India and Germany issued a joint declaration wherein they pledged to develop an Indo-German programme in science for sustainability. In the same year, the German Academic Exchange Service (Deutscher Akademischer Austauschdienst, DAAD) began promoting a new initiative named 'A New Passage to India' (funded by the German Federal Ministry for Education and Research). The objectives of the initiative are to strengthen the academic exchange between India and Germany, to expand the existing cooperation in research and to create new connections between institutions of higher education and the private sector.

The widespread recognition of the importance of sustainability provided the background. Sustainable development involves various interconnected domains. New technologies provide means of sustainable development.

In 2010, the Indo-German Centre for Sustainability (IGCS) was inaugurated in India as part of the efforts taken up under A New Passage to India. IGCS is now a joint venture of IIT Madras and a group of German educational and research institutions under the leadership of RWTH Aachen University, the TU9 and CAU Kiel. All these renowned institutions have expertise in various aspects of sustainable technologies. RWTH Aachen University is the largest technical university in Germany, with over 42,000 students enrolled in 144 study programmes. IIT Madras is an academic and research institution that has been recognised as an Institute of National Importance by the Government of India. It has some 8000 students and 550 faculty members in 16 departments representing various streams of technology, the humanities and the basic sciences.



A CONTINUING RELATIONSHIP

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The establishment of IIT Madras itself, in 1959, involved an association between India and Germany. The Government of West Germany provided technical, academic and financial support then. Subsequently the German government supported the creation of excellent computing facilities at IIT Madras. The association with Germany has continued over the years, with IIT Madras entering into a number of collaborations with German institutions and universities. A number of research efforts have been undertaken at IIT Madras with support from Humboldt fellowships and the DAAD programme. Many Indo-German workshops and seminars have been held.

A host of German visitors have come to IIT Madras for exchanging ideas, planning education strategies, imparting knowledge and promoting excellence in education. A number of German dignitaries have also visited the institute.

The establishment of IGCS provides an indication that the Indo-German relationship will endure. IGCS represents the nature of Indo-German technical cooperation at IIT Madras in the 21st century.



IGCS is physically located at IIT Madras and is managed by two Indo-German bodies, an Advisory Board and a Steering Committee.

The activities of the IGCS over the few years since its inception include the organisation of winter and summer schools, conferences and meetings, initiation of research projects and publication of a bulletin, apart from conducting a course in ecology that each student of IIT Madras must complete successfully.

IIT Madras offers a course on Ecology and Environment to all its undergraduate students to sensitise them towards ecosystems and environmental change, orient them towards systems thinking and motivate them to embed sustainability into whatever profession they get into. It is also aimed at demonstrating how sustainable development is inherently linked to preserving ecological and environmental balance, besides the involvement of all the stakeholder and concern for economy (thus dependent on a basic understanding of social and economic sciences). Another important aspect that students learn from this course is that 'sustainable engineering' is an interdisciplinary subject, and that professionals from varied backgrounds are needed for planning sustainable development. They also learn that any branch of engineering practice will involve strong sustainability elements. This course is taught to more than 800 undergraduate students from more than 10 departments.

In 2015, IGCS took up the ownership of this course and has since then coordinated with the associated faculty members who deliver most of the lectures. IGCS also coordinates this course for the new Indian Institute of Technology at Tirupathi.

There is a Coordinator at IIT Madras and at RWTH Aachen University for each of the four broad domains in which any research or other activity is undertaken by IGCS: Waste Management, Water Management, Land Use and Energy.

IGCS serves as a platform for interdisciplinary work. It allows the integration of the different approaches of the natural sciences, technology and social sciences that is important for work in sustainability.

IGCS is also a platform where two countries share and exchange information. The Indian professors at IIT Madras and their German counterparts in the various activities of the IGCS bring in different approaches to sustainability.

Sketches of some of the research projects and other activities carried out by Indian and German professors and students through the IGCS are presented in the following pages.



Understanding Change in the WESTERN GHATS

PROJECT TITLE

Modelling the effects of land use and climate change upon in-stream hydraulics in mountainous streams in rapidly urbanizing changes (close to Pune) of the Western Ghats

PARTNERS

Institute für Geographie, Universität Augsburg and Geographisches Institut, Universität zu Köln

TEAM

B.S. Murty, Balaji Narasimhan, Venu Chandra, Peter Fiener, Karl Schneider

The Western Ghats are a range of mountains running along the 1500 kilometre western edge of the Indian peninsula. These mountains make up one of the biodiversity hotspots of the world. They play a critical role in India's climate and provide valuable ecosystem services.





With increasing human activity, areas in the Western Ghats that were hitherto covered in natural vegetation are being brought under agriculture or are being built up with concrete constructions and roads. Potentially, such land use changes could lead to loss of biodiversity, extinctions, altered stream flows and accelerated siltation of hydro-electric reservoirs.

This project aims to develop a comprehensive model for understanding how contemplated land use changes and climate change will affect the flow and material transport in streams in the Western Ghats.

Field measurements are being conducted in the northern Western Ghats, near Pune, where the streams drain into a reservoir used to generate electricity. These measurements are being complemented by laboratory studies at IIT Madras. The data obtained from these efforts will be used as the drivers in climate change scenario models to predict changes in stream flow patterns. Further studies will be conducted wherein changes in the aquatic life of the streams will be the focus.

Sophisticated techniques are being used innovatively in this project. RFID tags are being used to track the transport of individual stones.



A FAR-REACHING SOLUTION

PROJECT TITLE

Development of sustainable waste management of septage by composting minimizing greenhouse gas (GHG) emissions

PARTNERS

Universität Stuttgart, Universität Weimar

TEAM

Ligy Philip, T.S. Chandra, Martin Kranert, Christian Springer, Tobias Schnabel

As cities expand at ever-increasing rates, the provision of basic and essential services to the peri-urban areas poses a challenge. A significant proportion of the households in peri-urban and rural areas lack sewerage pipes and rely on on-site sanitation systems for waste disposal.

Septage, the solids that accumulate in septic tanks, is mostly disposed of on agricultural land and in water bodies. Only about 30 percent of the septage in a septic tank gets anaerobically digested as desired. Apart from producing unpleasant odours, septage represents a risk to public health and is an environmental hazard. It emits the primary greenhouse gases (GHGs), namely methane, N_2O and CO_2 .



The goal of the project is to establish a composting plant where municipal bio-waste and agricultural or garden waste will be treated together with septic tank residue. Replication of this model across the country at the municipal or panchayat level will result in significant recovery of organic nutrients apart from reducing GHG emission.

Samples from the Nesapakkam septage collection site, at Chennai, have been characterised. This is the first time that such characterisation has been carried out in India.

A 'wetland' has been constructed at one of the student hostels to treat waste water. The cosmopolitan reed *Phragmites australis* has been established in this wetland.





ZERO DISCHARGE

PROJECT TITLE

Design and development of solar thermal energy system for domestic sewage (black water) treatment

PARTNER

Ingenieurbüro Scheer, Germany

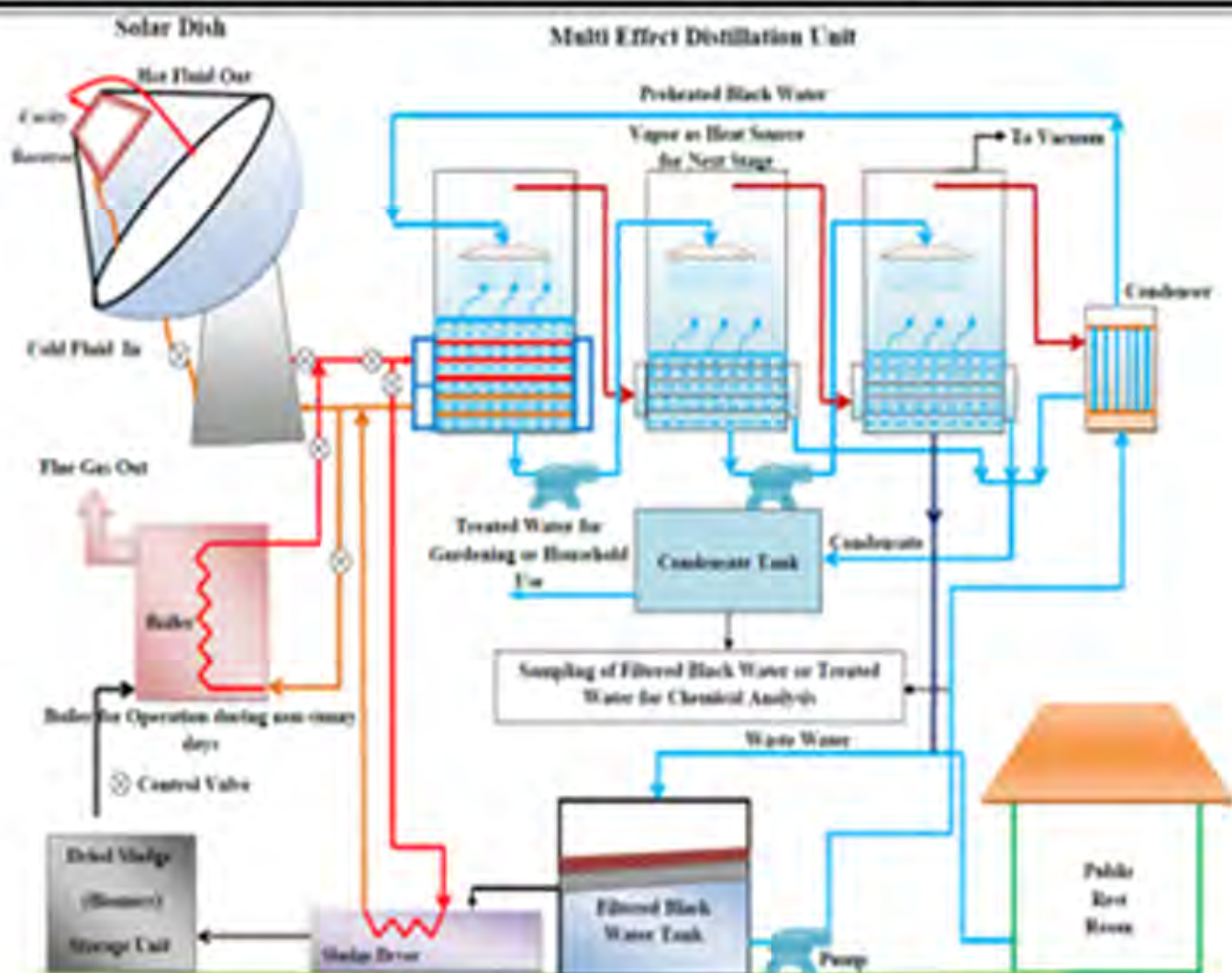
TEAM

K. Srinivasa Reddy, Ligy Philip, Martina Scheer

In recent years, the generation of wastewater in Indian cities has increased greatly. But the treatment capacity has not grown correspondingly. As a result, the waste management systems are under strain, and partly treated or untreated wastewater is discharged into rivers, the ocean and agricultural land.



Solar Thermal Energy Unit for Sewage Treatment



Black water, the component of domestic wastewater that is generated by toilets, contains large quantities of pathogens. Treated appropriately, black water serves as a source of a nutrient-rich fertiliser and soil conditioner. Conventional methods of treating black water to reduce its adverse impacts have intensive requirements of water and energy.

This project is aimed at developing innovative decentralised wastewater treatment plants that use a 'green' source of energy and provide benefits such as total reuse of water.

A sewage treatment system is being developed in this project. The proposed system consists of solar collectors, a sewage collection unit and a sewage treatment unit. Water that can be stored for domestic purposes is recovered from the waste. The sludge is treated using solar energy, and a dry solid that is rich in organic material is produced. It can be used as a fertiliser or fuel.

The components of the proposed system, such as the solar thermal energy system, are being developed individually. A laboratory-scale demonstration unit has been built that has been tested on synthetic black water. A complete system that can cater to six families will be installed at an apartment in IIT Madras or in a peri-urban location.



CANYONS & OTHER HOTSPOTS

PROJECT TITLE

Air quality management system to study the vulnerability and health risk due to air pollution and climate change in urban areas

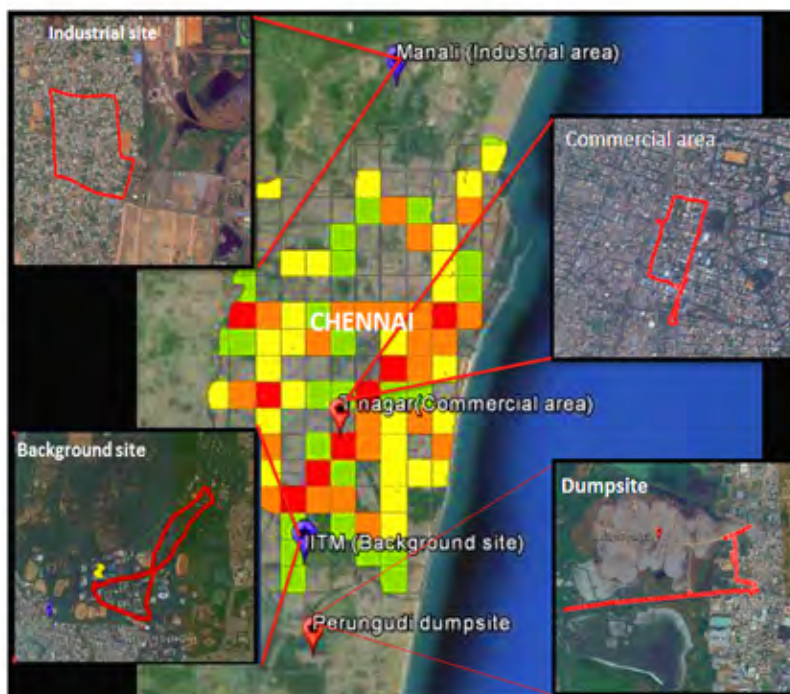
PARTNERS

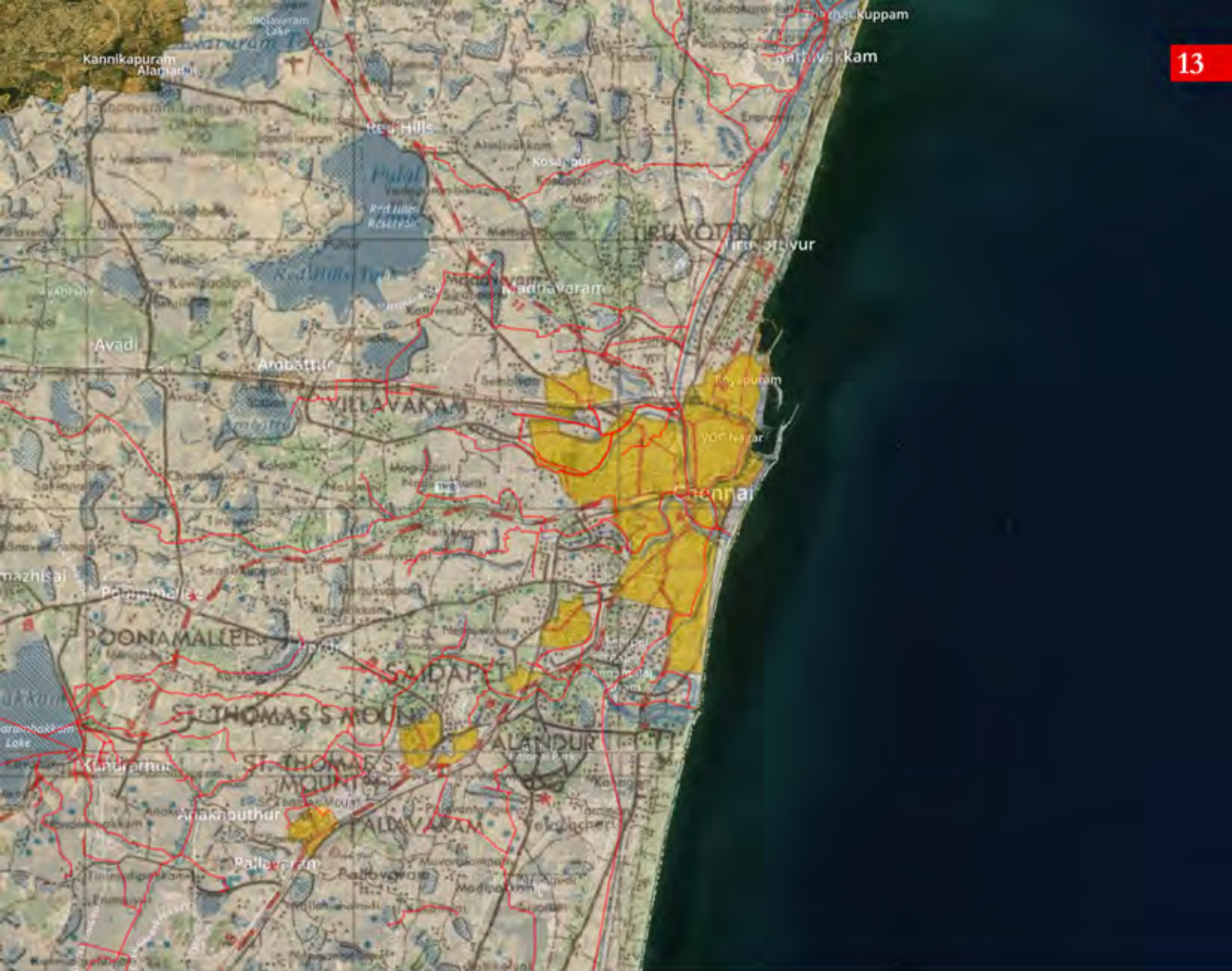
Helmholtz Centre for Environmental Research—UFZ, Department of Urban and Environmental Sociology, Leipzig

TEAM

S.M. Shiva Nagendra, R. Ravi Krishna, S.N. Gummadi, Uwe Schlink

There is little improvement in the air quality of Chennai despite the standards that have been brought in. This is in contrast to the success enjoyed by other cities, such as Leipzig. This study is being conducted to improve our understanding of the sources of pollution and the conditions required for improving air quality.





This project is focused on characterising air quality in terms of the NO_x, ozone and particulate matter (PM) levels at selected 'heat islands' in Chennai during different seasons. An urbanised commercial hub, that experiences increases in CO₂ concentration and consequent rises in temperature on account of vehicular traffic and the 'canyon effect', wherein there is a lack of circulation of air because of constructions, is one site. A waste yard, with frequent fires, is another. An industrial area is a third site. A wastewater treatment plant has also been selected because of the pollutants generated there. The air quality at the well wooded IIT Madras campus provides the background values.

Low-cost air quality sensors are being developed in this project. These sensors will be deployed on buses plying on the roads of Chennai. They will provide a profile of the exposure of passengers over time to pollution and can also send real-time air quality information, in the form of text messages, to passengers.

A vulnerability index or health risk index is being developed.

The correlation between the air quality, meteorological data and traffic is being analysed. The findings will have lessons for other cities as well.

FARM TO FUEL



PROJECT TITLE

Composition–property–biodiesel relationship of biodiesel fuels of Indian and German origin for use in compression ignition engines

PARTNER

Oel-Waerme-Institut GmbH, Aachen

TEAM

Pramod S. Mehta, K. Anand, Roy Hermanns

Some oils derived from sources such as the seeds of plants can be used in engines in the place of diesel. The use of these biodiesels is desirable for a number of reasons. They are renewable sources of energy and provide energy security to nations relying on depleting reserves of fossil fuels. Multiple feedstock sources are available: oils derived from the seeds of Jatropha, Pongamia, neem, coconut, sunflower, soya bean and rapeseed and from rice bran can all be used as biodiesels. The ignition quality of biodiesels is superior to that of fossil fuels, and so their fuel characteristics are better.

KNOCKING THE NO_x OUT OF BIODIESEL



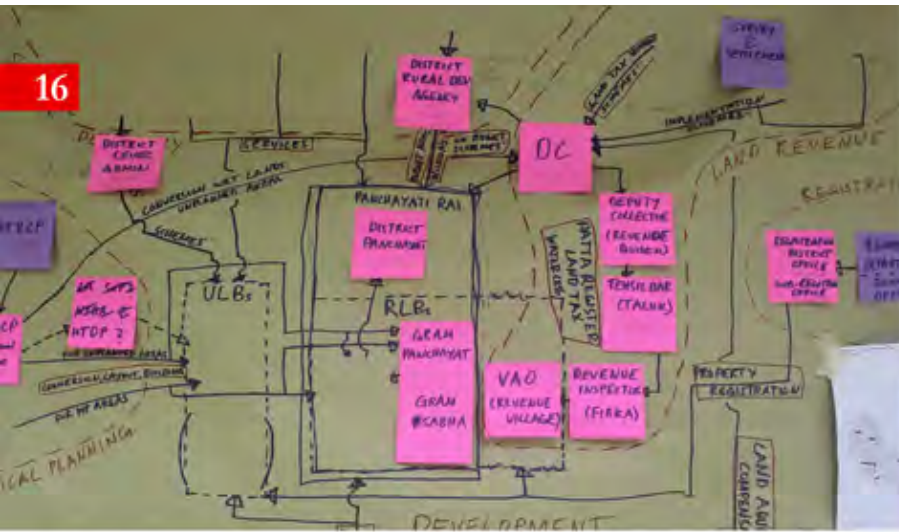
Biodiesels are also better in terms of safety of storage and operation. They are non-toxic. They contain no sulfur or aromatic compounds, as a result of which they are preferable from the emissions standpoint. The bio-degradable nature of biodiesels and the ease with which they may be adapted for use in engines are other relevant points related to the use of these fuels. Further, they are CO₂-neutral.

Blending biodiesel with diesel to an extent of 20 percent in India is feasible, and this will save foreign exchange.

The composition of biodiesel varies greatly with season and location. Characterisation of biodiesel is essential for local resources to be utilised. Thus the relationships between the composition, properties and performance of biodiesel are being investigated in this project.

It is envisaged that biodiesel will be produced on a daily-requirement basis for agricultural purposes—to drive irrigation pumps and to generate electricity, incidentally generating rural employment.





Coping with change in

SRIPERUMBUDUR

PROJECT TITLE

Design and development of solar thermal energy system for domestic sewage (black water) treatment

PARTNER

Ingenieurbüro Scheer, Germany

TEAM

K. Srinivasa Reddy, Ligy Philip, Martina Scheer

Peri-urban areas in India face the interlinked challenges of rapid economic and spatial growth even as the effects of climate change are experienced. This project has the goal of understanding the opportunities for building resilience to climate change in such areas. The Global Technology Watch on Sustainable Habitats will be initiated with the findings of this project. Practices that may enhance resilience in peri-urban areas will be identified, as will obstacles to the development of resilience, such as cultural practices, natural changes and socio-economic processes.



The project is being implemented in Sriperumbudur Taluk, in Kanchipuram District, Tamil Nadu and the area around Chembarambakkam Lake. The region is a good example of a rapidly growing area.

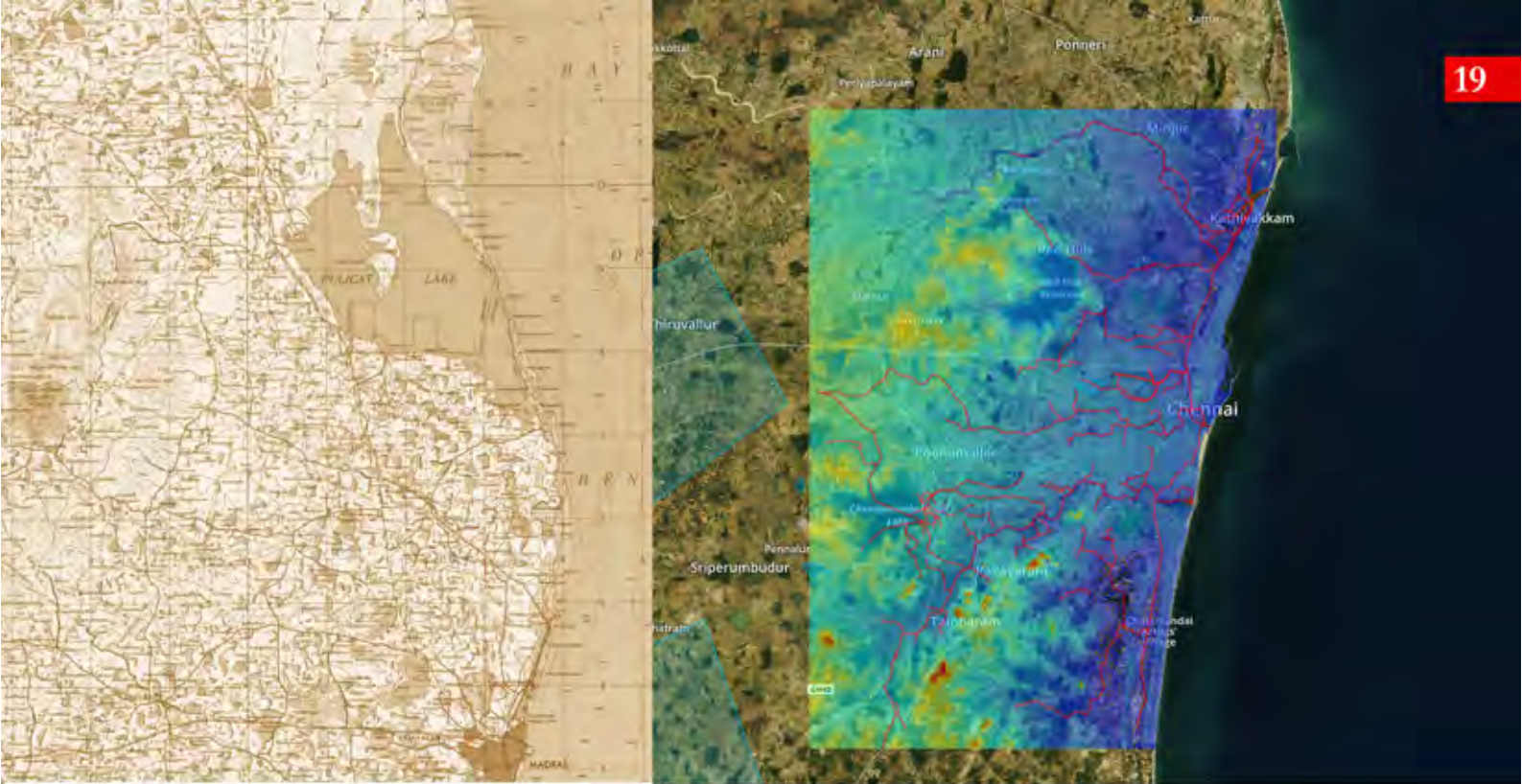
At the end of the project, a GIS map of the study region will be generated with population, land use and hydrology layers. A database of parameters related to the environment, land use, material and energy flows, economy and governance will be created, and governance and institutional structures will be mapped. Alternate development scenarios will be generated to plan for a sustainable future that will include mitigation options and adaptation strategies for climate change.

The broader goal of the project is to develop a clearer understanding of current patterns of growth in peri-urban areas in South Asia. The project will focus on exploratory research, given the great complexity and breadth of scope of understanding peri-urban dynamics in the context of climate change.





THE WATER RESOURCES OF A CITY



PROJECT TITLE

Sustainable water resources management of Chennai basin under changing climate and land use

PARTNER

Institut für Natur- und Ressourcenschutz, Abt. Hydrologie und Wasserwirtschaft

TEAM

K.P. Sudheer, Balaji Narasimhan, Indumathi Nambi, Franziska Steinbruch, Nicola Fohrer, George Hoermann

Water bodies are among the most significant features of urban situations in terms of ecosystem services. In agricultural watersheds experiencing urbanisation, there is an interaction of human demands, agricultural practices and climate change. The question of how to sustain ecosystem services arises in such situations.

This project focuses on the Chennai basin, where there were unprecedented floods at the end of 2015. There are three rivers in this basin, namely the Kosathalaiyar, Cooum and Adyar. The Buckingham canal is another significant though manmade waterway of this area.[Otteri canal]

There has been a deterioration of the groundwater recharging processes in the basin. Further, there has been a decreasing trend in the rainfall pattern in the last 20 years. The management of the watershed needs to be integrated with land-use management. The multiple needs of the communities in the basin need to be considered.

How different patterns of land use, land cover, land management and water resources engineering practices affect the resilience and sensitivity of ecosystem services under a situation of changing climate is being investigated in this project. Means of making regional governance systems for water and land use more resilient and adaptive are being sought. The resilience and the vulnerability of regional human-environment systems are being identified.

The methods used in the project include hydrological modelling, performing model experiments to assess the effects of changing drivers on a broad set of ecosystem services, information management and carrying out in-field measurements.

micro DOSES



PROJECT TITLE

Fast sampling analyses for anthropogenic micro pollutants in wet environmental compartments

PARTNER

Universitat Stuttgart, Bauhaus-Universitat Weimar

TEAM

T.S. Chandra, Ligy Philip, R. Ravi Krishna, Martin Kranert, Christian Springer, Tobias Schnabel

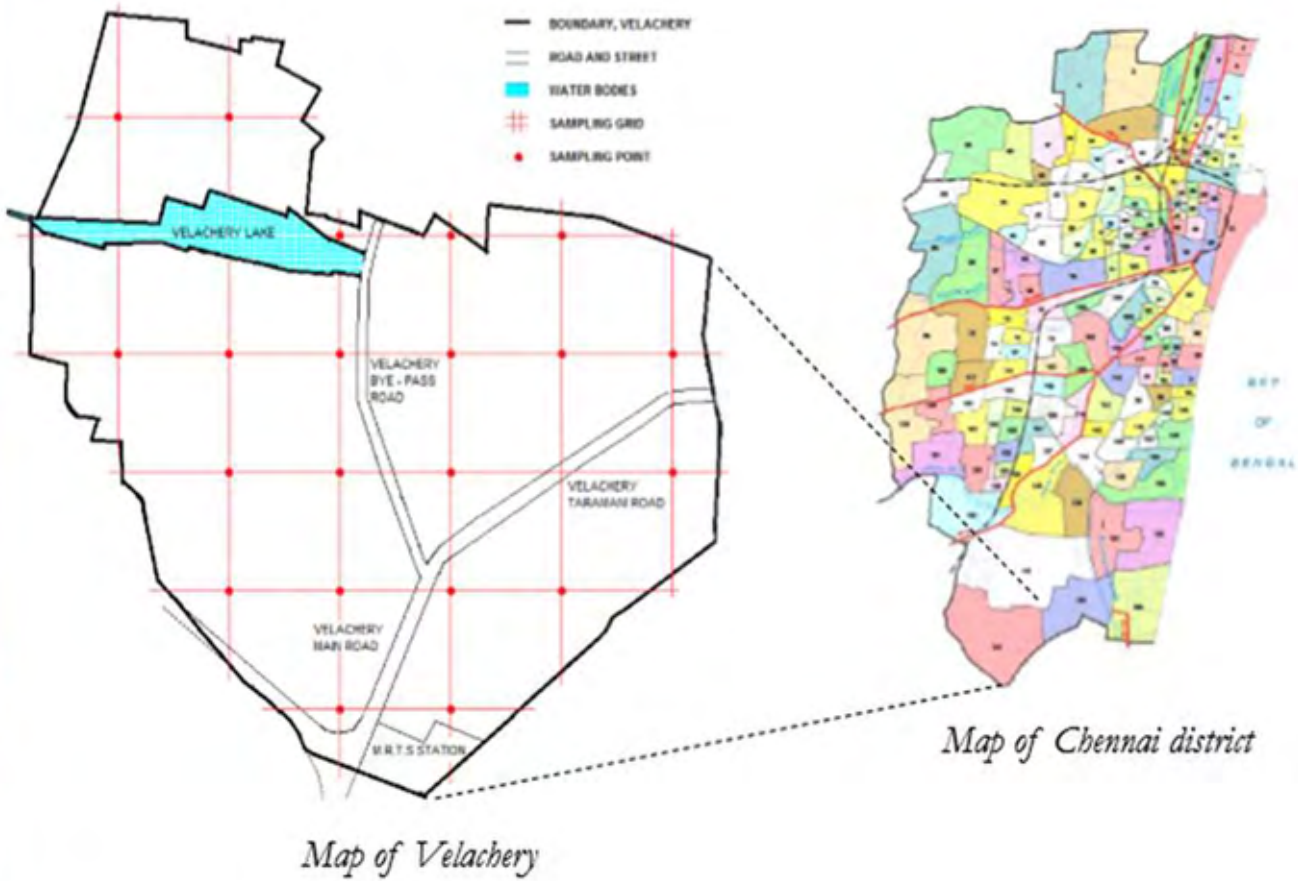
Micro pollutants (MPs) are compounds that occur at nanogram and milligram levels in water, soil and septage. Typically, MPs are synthetic compounds.

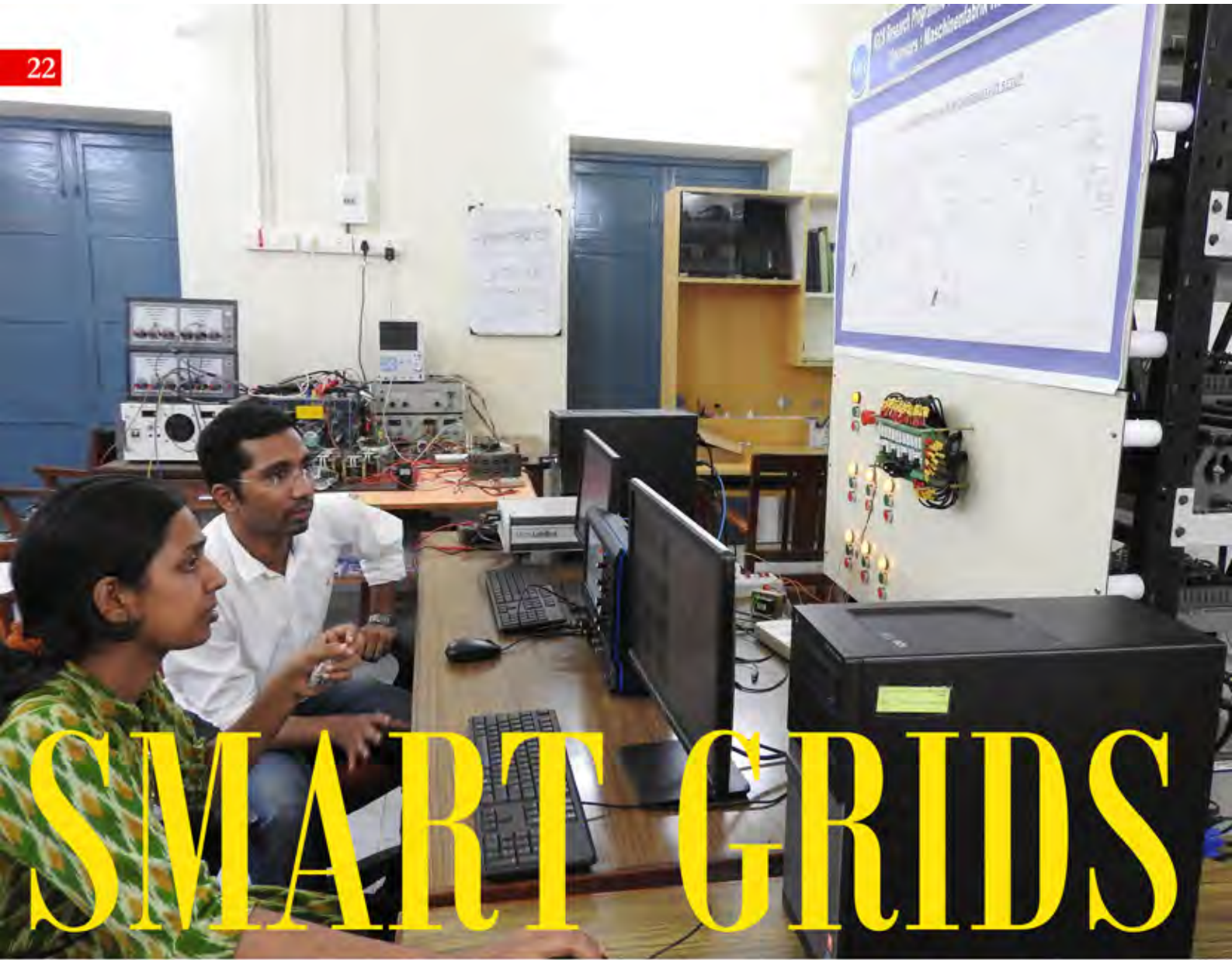
Pharmaceuticals are produced using a large number of chemicals for treating humans and animals. These compounds enter the environment through human and animal waste, persisting there as MPs. The input of pharmaceutical residues into the aquatic environment is expected to increase. But little is known about the levels of MPs in urban water bodies and the associated health risks in India.

The project is being implemented in Sriperumbudur Taluk, in Kanchipuram District, Tamil Nadu and the area around Chembarambakkam Lake. The region is a good example of a rapidly growing area.

At the end of the project, a GIS map of the study region will be generated with population, land use and hydrology layers. A database of parameters related to the environment, land use, material and energy flows, economy and governance will be created, and governance and institutional structures will be mapped. Alternate development scenarios will be generated to plan for a sustainable future that will include mitigation options and adaptation strategies for climate change.

The broader goal of the project is to develop a clearer understanding of current patterns of growth in peri-urban areas in South Asia. The project will focus on exploratory research, given the great complexity and breadth of scope of understanding peri-urban dynamics in the context of climate change.





SMART GRIDS

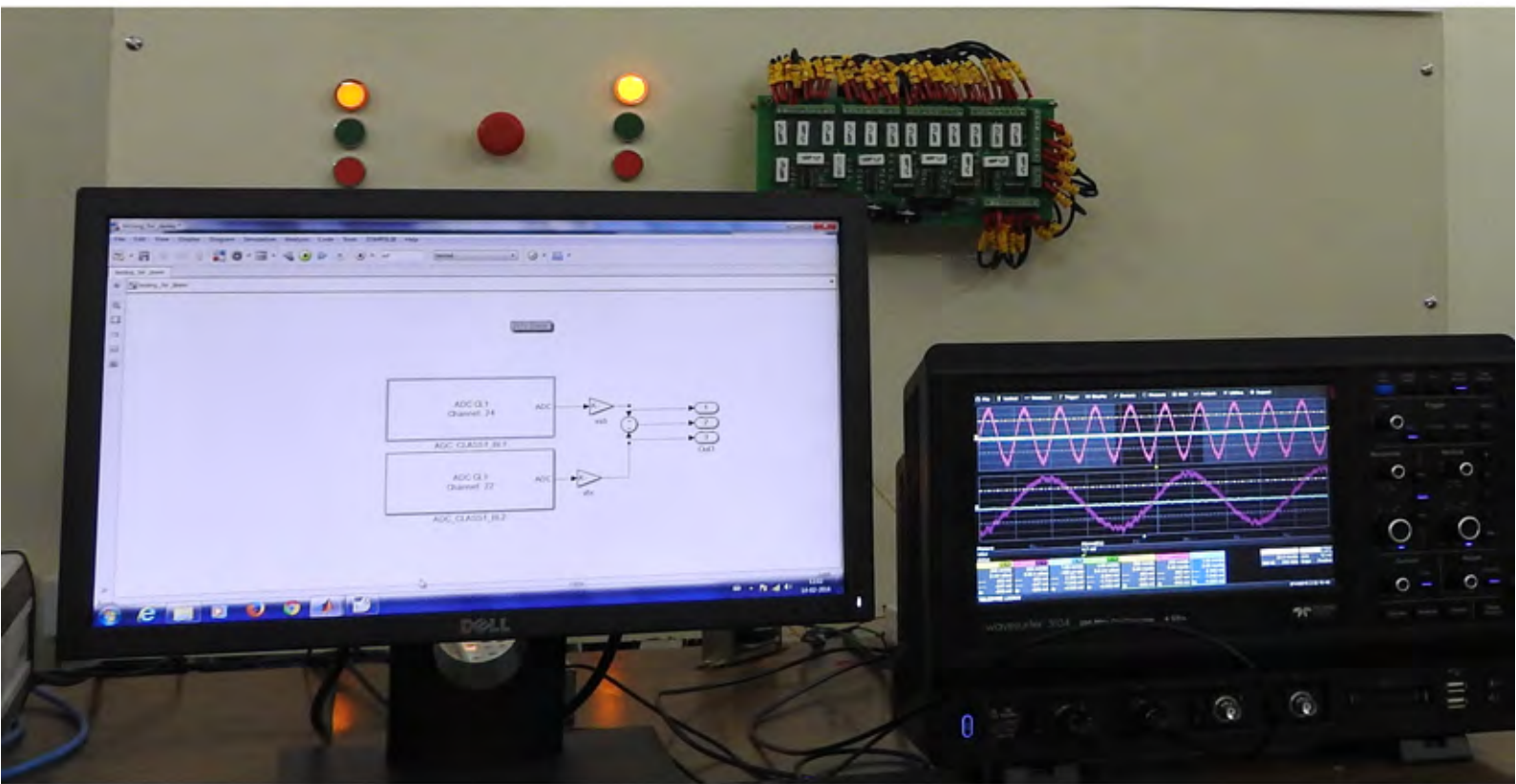
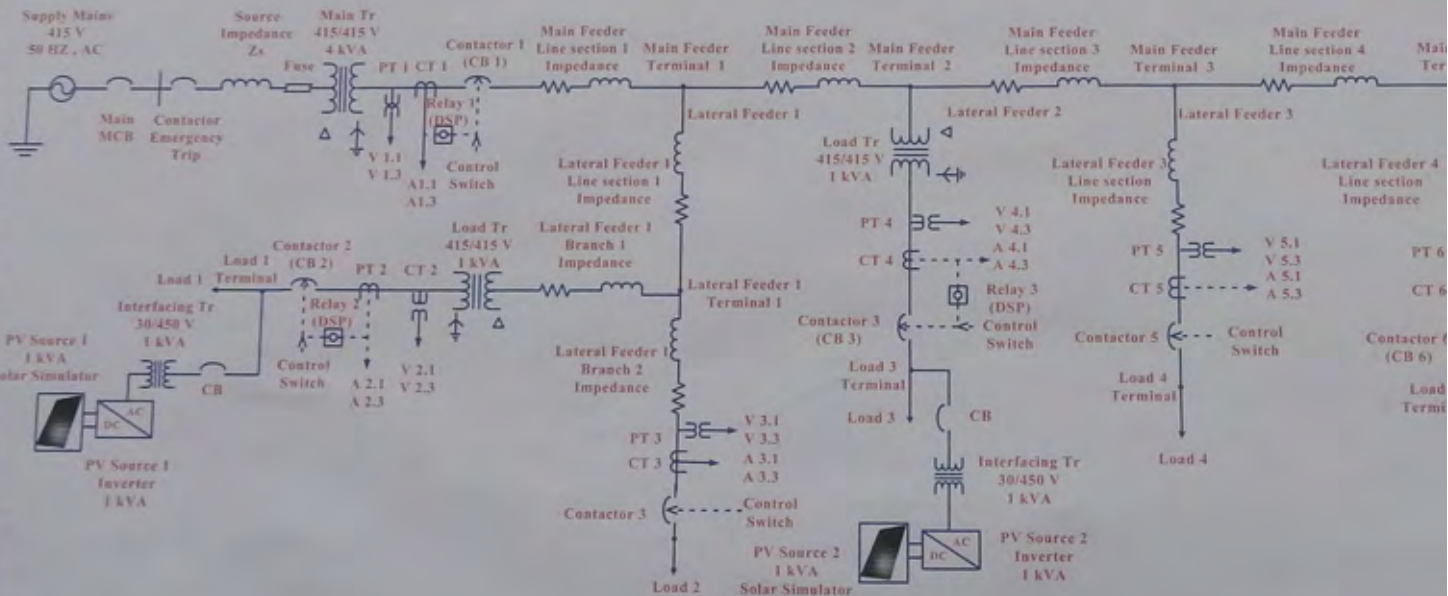
IGCS conducts a research programme in sustainable power engineering. This highly specialised programme is focused on aspects of sustainable operation of electrical power grids.

With the development of renewable sources of energy, alternating current power grids need to change from centralised configurations to highly distributed ones. A large number of distributed feed-in points need to be accommodated. Since the availability of solar and wind energy is very variable, power generation may fluctuate rapidly due to gusty or cloudy weather. The power in the grid needs to be maintained at stable levels by varying the output of generators such as hydroelectric plants and gas turbines, which are more controllable.

Electric utilities need to add digital layers to their infrastructure and make their grids 'smart' so that data flow and information management are feasible. Smart grids have improved the flexibility of grids. This permits the incorporation of renewable energy sources without the addition of energy storage.

Smart grid research is highly relevant in India now, with a rapid expansion of the grid foreseen. The sustainable grid research programme is being funded by Maschinenfabrik Reinhausen (MR), a major high-voltage equipment manufacturer from Germany, with strong links with RWTH Aachen University.

To avail themselves of MR's support, research scholars need to submit proposals. MR sponsors the work as well as international travel of research scholars whose proposals have been selected.





Summer & Winter Schools

Since 2012, IGCS has been conducting summer and winter schools around one of the four broad themes of sustainability—energy, land use, waste and water—to foster interdisciplinary and intercultural exchange among highly motivated participants. The purpose of these schools is to create future ambassadors for IGCS who will propagate the concept of sustainable development. Participants are treated as part of the ‘IGCS alumni’ network and sometimes return for short-term research visits or are involved with our network in other ways.

These schools are typically of 2 weeks’ duration. The number of participants is usually limited to a maximum of 30, up to 15 Indian and German students each.

The schools are held alternately in India (IIT Madras) and in Germany. They are open to German and Indian postgraduate students and research scholars, typically those specialising in engineering streams or environmental and social sciences.

The resource persons of the schools include IGCS professors and faculty members of IIT Madras or the German institution involved. Sometimes experts from industry, research organisations and government join these resource persons.

There are lectures as well as work group sessions in the schedules of the courses. In the working groups, participants form small teams, select topics and work on small research projects. The teams prepare reports of their findings and present them at a colloquium.

The travel of each student is supported through a travel grant or reimbursement and a lump sum payment towards living expenses. Accommodation is provided at IIT Madras or in a hostel of the German institution involved.

Winter & Summer Schools

S. No.	Year	Winter School	Summer School
1	2012	Meeting the Challenges of Sustainability in a Socio-economically Dynamic Region of South-East India (20 February to 4 March 2012, IIT Madras)	Meeting the Challenges of Advanced Energy Systems of the Future (7–18 July 2012, TU Berlin)
2	2013	Growth and Sustainability in a Highly Dynamic City— Exploring the Urban Development in South Chennai (24 February to 10 March 2013)	Integrated Approaches for Sustainable Waste and Water Management, RWTH Aachen University (2–14 July 2013)
3	2014	Sustainability in Theory and Practice— Exploring Sustainable Development (3–16 March 2014, IIT Madras)	Sustainable Management of Resources— Closing the Loop: Solid Waste and Waste Water Management (16–28 June 2013, University of Stuttgart)
4	2015	Sustainable Water Management in Urban Areas (2 February to 15 March 2015)	Sustainable Water Management in Rural Landscapes (27 May to 10 June 2015, University of Kiel)



Academic Exchange

Long-term visiting professors	<ol style="list-style-type: none"> 1. Dr. Kristin Steger (June 2011 to December 2012; Waste Management) 2. Dr. Peter Fiener (June 2011 to December 2012; Water Management) 3. Dr. Sibylle Petrak (April 2012 to July 2013; Energy Management) 4. Dr. Christoph Woiwode (September 2013 to date; Land Use) 5. Dr. Franziska Steinbruch (January 2014 to date; Water Management)
Short-term visiting faculty/scientists	<ol style="list-style-type: none"> 1. Dr. Christopher Martius (Autumn 2012) 2. Cindy Hugenschmidt (March–April 2012) 3. Tom Gottfried (June 2012) 4. Dr. Kathrin Premke (January/February/October 2012, March 2014) 5. Dr. Paul Wagner (June–September 2013) 6. Dr. Christian Springer (November 2013) 7. Dr. Manfred Schneider (January–March 2014) 8. Dr. Sabine Flury (February–March 2014) 9. Dr. Katrin Attermeyer (February–March 2014) 10. Dr. Satvanarayana Narra (August–September 2014) 11. Dr. Georg Hörmann (September–October 2014) 12. Prof. Pramod S. Mehta visited Aachen, Germany in December 2013 and November 2014 in connection with an DST-IGCS project
Student scholars	More than 20 student scholars have carried out or are carrying out part of their research at IGCS, IIT Madras.



List of Workshops/Conferences

S. No.	Topic/Title	Dates	No. of Participants
1	Symposium on Marine Conservation	28–29 September 2012	30
2	Exploring Current Issues in Sustainability	10 December 2012	60
3	National Level Dialogue on Transdisciplinary Research on Agro-biodiversity and Land Use Change—Cultivating Diversity	2–4 September 2013	50
4	Fourth National Research Conference on Climate Change	26–27 October 2013	100
5	Symposium on Future Energy Trends	5 December 2013	100
6	IGCS Research Meeting on Sustainable Power Engineering	11 April 2014	50
7	Exploring Current Issues in Sustainable Energy	5 June 2014	85
8	Rural Sustainable Tourism and Land Use	29 September 29 to 2 October 2014	15
9	Stakeholder Meeting on Issues Related to Sustainable Development of Chennai	17 September 2014	20
10	Isotopes in Our Environment—From Climate Change Analysis to Contaminant Tracking	21–24 October 2014	20
11	Globalization, Sustainability, Lifestyles—Think Globally, Act Locally	6–7 November 2014	20
12	DSDS 2015—Regional Dialogues: Chennai	1 December 2014	100
13	Improving Energy Sustainability—Conventional and Renewable	4–5 December 2014	50
14	Micropollutants(MPS) in Water and Their Hazards	12–13 January 2015	75
15	Promise and Challenges of Biodiesel as Sustainable Fuel for Future Use	19–21 February 2015	75
16	Indo-German Expert Meeting on Subsurface Rainwater Storage in Dry Areas	11 May 2015	30
17	Pen-urban Dynamics and Sustainability—The Case of Sriperumbudur	21 April 2015	50

Collaborative pathways

IGCS brings together the resources and expertise of IIT Madras and those of RWTH Aachen University and other German universities. As a place where two nations meet, it facilitates cooperation between complementary approaches and experiences. It places few restrictions on the means of developing technology for sustainable development: IGCS is a platform on which sustainability may be worked towards in a variety of ways.

To exploit the possibilities that hover within reach, IGCS seeks engagement with organisations and individuals. As an individual or as a member of a foundation, an embassy, a bilateral agency a corporate or any other entity, you can identify numerous ways in which you can become involved with IGCS. The human and other resources you share with IGCS will help IGCS realise its goals holistically.

The examples of the ongoing and newly initiated activities of IGCS appearing in this brochure were facilitated by financial support from various agencies. The various innovative research and training projects could be carried out thanks to funding and support from IIT Madras, the DST, Government of India, the German Academic Exchange Service (DAAD)—which funds mobility of academics and students, therefore facilitating numerous visits by scholars in both directions who contribute regularly to ongoing research activities—and state and national agencies in India as well as research organisations, which have been valuable partners. IGCS looks forward to continued support from these organisations. At the same time, IGCS welcomes funding from other entities.

Corporate firms could sponsor research work at IGCS in the manner in which Maschinenfabrik Reinhausen (MR) GmbH has supported work on sustainable grids. They could also support sustainability-related research work similar to CSR-funded activity.

IGCS can also carry out projects related to sustainability as a consultant or policy advisor for individual organisations.

You may identify different ways of taking part in IGCS activities including as an individual. For instance, you may see yourself becoming an allied researcher in ongoing projects or participate in preparing proposals for new ones, engage in training in the winter and summer Schools and other courses offered. If you are an alumnus of IIT Madras, you could contribute funds to your alma mater, earmarking the funds for use by IGCS.

You are a potential partner. Please get in touch with IGCS to initiate a discussion about getting involved.

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