

E4D School on Energy

9-28 July 2017

Cape Town, South Africa

Low-Carbon Energy and Development Strategies

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Sawiris Foundation For Social Development

The Sawiris Foundation for Social Development sponsors the E4D School on Energy. The Sawiris Foundation was founded on the belief that development is only sustainable when its beneficiaries are equal partners in the process.

The Sawiris Foundation supports initiatives that encourage job creation through training, education and access to micro-credit. The Sawiris Foundation also enhances efforts to improve health and to further the endeavours of local communities to improve infrastructure and gain access to basic services – two important prerequisites for higher productivity and increased empowerment of citizens.

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Introduction

The E4D School on Energy forms part of the programme "Engineering for Development (E4D): Science & Technology for the Global South" at ETH Zürich. The goal of this programme is to promote the development of products or methods which are directly relevant for improving the livelihoods of poor people in developing countries.

The E4D programme has evolved from a scholarship scheme supported by the Sawiris Foundation for Social Development. It has awarded two doctoral scholarships annually since 2008. In 2014, the scope of the E4D programme was expanded to include a series of schools, the first of which took place in January 2015.

The E4D School on Energy will be composed of 26 graduate students from ETH Zurich and other academic institutions around the world. Students do not only come from different geographic regions, but also different disciplinary backgrounds related to the topic of energy. They will be joined by ETH Zürich faculty members and external experts in South Africa coming from academia, the private sector and NGOs.

The school will take place at the University of Cape Town (UCT) in Cape Town, South Africa. Throughout the three weeks of the school, students will develop an understanding of low-carbon energy and development through a series of lectures, discussions, excursions, exercises and group work.

Schedule Week 1

	SUNDAY JUL 9	MONDAY JUL 10	TUESDAY JUL 11	WEDNESDAY JUL 12	THURSDAY JUL 13	FRIDAY JUL 14	SATURDAY JUL 15
08							
09		09:00 Introductory Group Activity / Security Briefing <i>09:00-10:20, Smit Marine</i>	09:00 Free time <i>09:00-12:00</i>	09:00 Exercise: Renewable Energy Economic Potential Tobias Schmidt <i>09:00-10:20, ECO LT</i>	09:00 Group Work Session 2 Electricity Cost Modelling <i>09:00-10:20, ECO 1A/1C</i>	Transfer to be announced	Free Day
10		10:40 Introduction to Energy & Development Tobias Schmidt <i>10:40-12:00, Smit Marine</i>		10:40 Group Work Session 1 Group and Country Assignments <i>10:40-12:00, KRAM 2A/2B</i>	10:40 Renewable Energy Investment Risks and Derisking (Exercise) Abhishek Malhotra <i>10:40-12:00, ECO LT</i>	10:00 Excursion: Gouda Wind Farm <i>10:00-12:00</i>	
11	10:40 Cape Town and Atlantic Seaboard Tour (optional) <i>10:40-14:30</i>					Transfer to be announced	
12							
13							
14		13:30 Energy System Analysis Christian Schaffner <i>13:30-14:50, Smit Marine</i>	13:30 Renewable Energy Resource Assessment Tobias Bischof-Niemz <i>13:30-14:50, Smit Marine</i>	13:30 Introduction to Energy Finance Tobias Schmidt / Abhishek Malhotra / Tyeler Matsuo <i>13:30-14:50, ECO LT</i>	13:30 Exercise: Renewable Energy Investment Risks and Derisking (Exercise) Abhishek Malhotra <i>13:30-14:50, ECO LT</i>		
15							
16	15:00 Campus Tour <i>15:00-17:00</i>	15:10 Renewable Energy Technologies Tobias Schmidt / Christian Schaffner <i>15:10-16:30, Smit Marine</i>	15:10 Renewable Energy Economic Potential Tobias Schmidt <i>15:10-16:30, Smit Marine</i>	15:10 Energy Policy Instruments and Design Tobias Schmidt <i>15:10-16:30, ECO LT</i>	15:10 Group Work Session 3 Cornerstone Policy Instruments <i>15:10-16:30, ECO 1A/1C</i>	15:10 Group Work Session 4 (optional) Preparation of Milestone 1 <i>15:10-16:30, KRAM 2A/2B</i>	
17							
18	17:00 Welcome Reception <i>All Africa House, Middle Campus 17:00-19:00</i>						
19		Transfer to be announced					
20		18:30 Welcome Dinner <i>The Quarterdeck Restaurant at the Portsworld Hotel Portsworld Sq, Portsworld Rd, Waterfront, Cape Town, 8001 Tel: +27 21 415 1162</i>					
21							

Schedule Week 2

	SUNDAY JUL 16	MONDAY JUL 17	TUESDAY JUL 18	WEDNESDAY JUL 19	THURSDAY JUL 20	FRIDAY JUL 21	SATURDAY JUL 22	
08								
09	Free Day	09:00 Milestone 1: Group Presentations <i>09:00-10:00, ECO LT</i>	Transfer to be announced	09:00 Independent Power Producer Perspective in South Africa Egmont Ottermann <i>09:00-10:20 ECO LT</i>		09:00 Group Work Session 7 Preparation of Milestone 2 <i>09:00-12:00 ECO LT / MASI</i>	Free Day	
10		10:00 Power Sector Reform Catrina Godinho <i>10:00-12:00, ECO LT</i>	09:30 Excursion: Palmiet Pumped Storage Hydro <i>09:30-12:30</i>	10:30 Group Work Session 5 Impact of Fossil Fuel Subsidies <i>10:30-12:00 ECO 1C</i>	10:30 Electrification Business Models and Case Studies Robert Aitken <i>10:30-12:30, ECO LT</i>			
11			Transfer to be announced					
12								
13								
14			13:30 Fossil Fuel Subsidies and Their Reform Tyeler Matsuo <i>13:30-14:50, ECO LT</i>		13:30 Electricity Access Introduction Abhishek Malhotra / Tobias Schmidt <i>13:30-14:50, ECO LT</i>	14:00 Excercise: Constructive Controversy Electrification Strategies <i>14:00-15:30, ECO LT</i>		13:30 Milestone 2: Group Presentation <i>13:30-14:30, ECO LT / MASI</i>
15				14:30 Excercise: Fossil Fuel Subsidy Reform Negotiation Simulation <i>14:30-16:30, ECO LT/1C</i>				
16			15:10 Fossil Fuel Subsidies in South Africa Jesse Burton <i>15:10-16:30, ECO LT</i>		15:10 Finance For Electrification Abhishek Malhotra <i>15:10-16:30 ECO LT</i>	15:40 Group Work Session 6 Electrification Strategy <i>15:40-17:00, MASI</i>		15:00 Group Work Session 8 (optional) Additional Time for group work <i>15:00-16:30, ECO LT / MASI</i>
17								
18			18:00 Film Screening & Dinner "The Breakthrough in Renewable Energy" <i>18:00-19:00, ECO 1C</i>	18:00 Cultural Night				
19								
20								
21								

Schedule Week 3

	SUNDAY JUL 23	MONDAY JUL 24	TUESDAY JUL 25	WEDNESDAY JUL 26	THURSDAY JUL 27	FRIDAY JUL 28	SATURDAY JUL 29
08							
09	Free Day	09:00 How to pitch Bjarne Steffen <i>09:00-10:20, ECO LT</i>	09:00 Sustainable Development & Co-Benefits Harald Winkler <i>09:00-12:00, ECO LT</i>	09:00 Urban Energy & Energy Poverty Peta Wolpe and David Hees <i>09:00-12:00, ECO LT</i>	09:00 Group Work Session 10 Preparation of Milestone 3 <i>09:00-12:00, KRAM 2A/2B/LT3</i>	09:00 Milestone 3: Final Group Presentations <i>09:00-12:00, KRAM 2A</i>	Farewell / Departure
10		10:40 Industry Policy and Energy Tobias Schmidt / Tyeler Matsuo <i>10:40-12:00, ECO LT</i>					
11							
12							
13		Transfer to be announced		Transfer to be announced			
14		13:30 Excursion 3: South African Renewable Energy Technology Centre (SARETEC) <i>13:30-15:30</i>	13:30 Group Work Session 9 Co-Benefits <i>13:30-16:30, KRAM LT1 / LT2</i>	13:30 Excursion 4: Joe Slovo Housing Development (to be confirmed)	13:30 Group Work Session 10 Preparation of Milestone 3 <i>13:30-17:00, KRAM 2A/2B/LT3</i>	13:30 Feedback Session <i>13:30-14:30, KRAM 2A</i>	
15		Transfer to be announced		Transfer to be announced		15:00 Closing Remarks and Handout of Certificates <i>15:00-16:00, KRAM 2A</i>	
16							
17							
18						18:00 Farewell Dinner	
19							
20							
21							

Low-Carbon Energy and Development Strategies (LCEDS)

Energy and economic development are intricately linked. Historically, fossil fueled technologies drove economic progress, leading to a coupling of growth with adverse environmental impacts such as climate change and local air pollution. If developing countries are to leapfrog to an alternate, low-carbon development pathway, they will likely require significant technological and structural changes within the energy sector.

Low-carbon energy for development strategies (LCEDS) that seek to decouple energy use and economic development from environmental degradation are becoming a new paradigm for policymakers. Such strategies are crucial in the electricity sector: currently electricity-related emissions account for the largest share of global CO₂ emissions; at the same time, the provision of reliable and affordable electricity services is necessary for development. Developing such LCEDS is an interdisciplinary challenge ranging from engineering to public policy and political economy. In the three weeks of the school, we will introduce these challenges and offer tools, methods, and concepts to address them.

This school will cover four subthemes related to LCEDS:

I. Renewable Energy Technologies and Policies

Renewable energy technologies offer a promising solution to decarbonising the electricity supply. Although many developing countries feature very high renewable energy resources, e.g. in form of solar irradiation, renewable energy technologies suffer from large capital costs and high risk perception – characteristics that make their deployment in developing country contexts particularly problematic. As a result, diffusion of these technologies typically requires policy intervention. During the workshop, students will gain an understanding of the feasibility

of these technologies – from a resource standpoint, as well as from a finance standpoint – and will design a policy mix to support their deployment.

II. Political Economy of the Power Sector

Low-carbon energy technologies are unlikely to take-off without addressing existing institutional deficiencies in the power sector. Monopolistic structures, opaque decision-making processes and perverse incentives such as subsidies for fossil fuels, among other challenges, all hinder the deployment of low-carbon energy. At the same time, policy change is not easy. Students will gain an understanding of the political complexity of changing these existing structures in the power sector, through both lectures as well as an interactive exercise.

III. Electricity Access

Currently 1.1 billion people in developing countries lack access to electricity. Despite goals to provide universal access to modern energy services by 2030, progress on this front has been limited. While new technologies, such as off-grid solar-home-systems, have become more reliable and affordable in recent years, a key bottleneck to reaching the electrification goal is closing the financing gap. This sub-theme addresses some of the unique challenges related to rural electrification, with a focus on financing strategies.

IV. Sustainable Development Benefits

Well-designed low-carbon energy for development strategies should not only capture direct climate benefits, but also “co-benefits” related to issues such as health, industrial development or equity. Often these “co-benefits” drive the political will for implementing low-carbon energy strategies. Understanding how to capture these synergies between mitigation and development is therefore critical in designing such strategies.

Teaching Format

Throughout the course, students will learn about each of the four subthemes generally, and also in-depth by exploring the specific case of South Africa through a series of guest lectures and excursions. South Africa is a particularly interesting case of a low-carbon energy transition occurring in an emerging economy. Historically coal-dependent and carbon-intensive, in recent years South Africa has seen a remarkable take-off of renewable energy due in large part to national low-carbon energy policies. Still, the energy transition in South Africa faces ongoing challenges related to its economic, development and political context, making it an interesting and rich setting for students to learn about the many facets of the energy challenge.

LECTURES

The general lectures will be given by ETH experts (p. 15-17). The lectures that focus on South Africa will be given by local experts (p. 18-19). These lectures will be complemented by readings and additional exercises including modelling activities, a "negotiation simulation" on fossil fuel subsidy reform and a "constructive controversy" on electrification strategies.

GROUP WORK

Students will have the opportunity to apply concepts learned from each of the subthemes in their own projects: Over the three weeks of the course, students will work in groups of five to six to complete a project to design a hypothetical low-carbon energy for development strategy for a specific case study country (see p. 21 for details).

Students will be offered tutoring during these case studies by the ETH team. At the end of the course, students will hand in their final strategy proposals and will present them to the group for feedback. A session on how to pitch a project will also be offered during the last week.

EXCURSIONS

In order to provide practical insights and illustrate the challenges and concepts taught during the lectures, the program includes several excursions to low-carbon energy projects and initiatives. These excursions provide students with a first-hand experience of the problems and solutions of low-carbon development. They will have the chance to discuss important questions with practitioners. The excursions are described in more detail on p. 25-27.

ETH Institutions

ENERGY POLITICS GROUP (EPG)

The Energy Politics Group (EPG) forms part of ETH Zürich's Department of Humanities, Social and Political Sciences (D-GESS). EPG is member of ETH's Energy Science Center (ESC) and affiliated with ETH's Institute for Science Technology and Policy (ISTP). EPG was established in early 2015 and analyses questions related to the governance of technological change in the energy sector. In their research, teaching and outreach activities, EPG takes a global perspective and includes both developed and developing countries. The partner network includes renowned academic institutions, such as Cambridge, Stanford or Yale; international organisations, such as the UNDP, the UNFCCC, or the World Bank Group; but also private sector firms, such as Allianz or SwissRe.

INSTITUTE OF SCIENCE, TECHNOLOGY AND POLICY (ISTP)

Public policies addressing key challenges of our time rely heavily on new knowledge generated by natural, engineering, and social sciences. The Institute of Science, Technology and Policy (ISTP) of ETH Zürich was founded in September 2015. It is dedicated to supporting public policy-making processes via education of future policy analysts and decision-makers; via exchange of information among scientists, policy-makers, and other members of society and via innovative and productive trans-disciplinary research collaborations.

ENERGY SCIENCE CENTER (ESC)

The ESC of ETH Zürich is an interdepartmental competence centre to facilitate energy research and teaching activities across research fields and departments. The ESC contributes to the integration of specialists and disciplines and it aims to be influential in energy research nationally and internationally. Clean, affordable, and reliably available energy is of paramount importance to the well-being of modern societies. Developing future environmentally friendly energy systems requires research in a large number of scientific disciplines. Most of these are represented at ETH Zürich, which has an impressive tradition in energy-related research. More than sixty professors at ETH Zürich currently carry out research projects with direct relevance to energy science and technology.

ETH Zürich Teaching Team



Tobias Schmidt
Head
Energy Politics Group
ETH Zürich, Switzerland

Prof. Dr. Tobias Schmidt is the head of the Energy Politics Group at ETH Zürich. Tobias holds a Bachelor of Science and Dipl. Ing. (MSc equivalent) in electrical engineering (energy focus) from TU München and a PhD from ETH Zürich in management, technology, and economics. During his postdoc, he spent time as a visiting scholar at Stanford University's Precourt Energy Efficiency Center (PEEC) and acted as consultant to the United Nations Development Programme (UNDP) working on UNDP's De-risking Renewable Energy Investment (DREI) project. He still collaborates with both institutions. In his research he analyses the interaction of energy policy and its underlying politics with technological change in the energy sector. His research covers both developed and developing countries. He also writes for ETH Zürich's *ZukunftsBlog*.

Tobias is responsible for the programme of the school and will provide lectures throughout the school. His lectures cover the following topics: renewable energy technologies, economic potential assessment, energy finance, energy policy, rural electrification, and energy industry policy. He will also be part of the team tutoring students during their group work and evaluating the students' LCEDS proposals.



Tyeler Matsuo
Doctoral Candidate
Energy Politics Group
ETH Zürich, Switzerland

Tyeler Matsuo is a PhD candidate at the Energy Politics Group at ETH Zürich. Tyeler holds a Master of Science in Energy Science and Technology from ETH Zürich and a Bachelor of Engineering in mechanical engineering from McGill University in Montreal. She has also worked as a consultant for the World Bank Group and as a fellow with the energy think tank, the Rocky Mountain Institute. Her current research focuses on the role of public policy in influencing low-carbon technological change in the energy sector, with a particular focus on emerging economies.

Tyeler is responsible for the programme and organisation of the school. Her lectures and activities will focus on fossil fuel subsidies and their reform and energy industry policy. She will also be part of the team tutoring students during their group work and evaluating the students' LCEDS proposals.



Christian Schaffner
Director
Energy Science Center
ETH Zürich, Switzerland

Dr. Christian Schaffner is the Executive Director of the Energy Science Center of ETH Zürich. Until 2013, he was with the Swiss Federal Office of Energy as head of the grid section, responsible for the development of a grid expansion strategy and a smart grid road-map. He was also involved in the bilateral negotiations between Switzerland and the European Union regarding a contract on energy supply. He received his MSc degree in Electrical Engineering and his PhD degree in Electric Power Systems from ETH Zürich in 1998 and 2004, respectively, and a diploma in higher education teaching in 1999.

Christian's lecture will cover the basics of energy systems, looking at the global, regional and local energy flows as well as basic energy carriers and their specificities. We will briefly touch the fundamentals of thermodynamics and then discuss the basic data and statistics of the energy system.



Abhishek Malhotra
Doctoral Candidate
Energy Politics Group
ETH Zürich Switzerland

Abhishek Malhotra joined the Energy Politics Group in February 2015 as a PhD candidate. His research interest is on technological innovation and diffusion of renewable energy technologies, with a current focus on energy access in developing countries. Abhishek holds a Master's degree in Energy Science and Technology from ETH Zürich and a Bachelor of Technology in mechanical engineering from the Indian Institute of Technology Delhi.

Abhishek's lectures will cover the topics of risk and de-risking renewable energy investments and rural electrification. He will also be part of the team tutoring students during their group work and will lead the exercise on de-risking.



Bjarne Steffen
Senior Researcher
Energy Politics Group
ETH Zürich Switzerland

Dr. Bjarne Steffen is a senior researcher with the Energy Politics Group at ETH Zürich. His research focuses on energy finance, especially de-risking of renewables, the role of investors and banks in the dissemination of low-carbon energy technologies, and electricity storage. Before joining ETH Zürich, he was a Principal in the Boston Consulting Group's energy and infrastructure practices, and a project manager at the World Economic Forum for its Strategic Infrastructure Initiative. He studied economics at University of Mannheim (Germany) and the University of California at Berkeley (U.S.) and holds a PhD in energy economics from University of Duisburg-Essen (Germany).

Bjarne will give a lecture on how to pitch projects and will provide guidance to students in preparing their final presentations. He will also be part of the team evaluating the students' LCEDS proposals.



Marius Wälchli
Doctoral Candidate
Weather and Climate
Risk Group and Climate
Physics Group
ETH Zürich Switzerland

Marius Wälchli finished his MSc in Environmental Sciences in the Energy Politics Group of ETH Zürich. He worked as a student assistant for two real world case studies embedded in an introductory course for Environmental Science students and an introductory lecture on applied information technology. He also worked as scientific assistant at the Swiss Federal Institute for Environmental Sciences and Technology (EAWAG), and made an internship at the Impact HUB Zürich.

Marius is part of the team tutoring the students. He will assist and guide the students during the modelling exercises and their group work.

Lecturers from South Africa



Tobias Bischof-Niemz
Head
*Energy Centre at Council
for Scientific and Industrial
Research (CSIR), Pretoria,
South Africa*

Dr. Tobias Bischof-Niemz is Head of the Energy Centre at CSIR in Pretoria, where he leads the Council's energy research group. Before joining the CSIR, he was with South Africa's electric utility Eskom in the Energy Planning Unit, which developed the long-term power-capacity expansion plan for South Africa.

He was a member of the Ministerial Advisory Council on Energy (MACE) that advised the Ministry on long-term, strategic energy topics.

Tobias will give a lecture on resource assessment of renewable energy resources. CSIR is South Africa's leading centre for wind energy assessment. Assessing the renewable energy resource is a key starting point for developing a LCEDS.



Jesse Burton
Researcher
*Energy Systems and Policy
Group at the Energy Research
Centre
University of Cape Town*

Jesse Burton is a researcher in the Energy Systems and Policy Group at the Energy Research Centre at UCT. She holds an MSc in Energy Studies from UCT. Her research has focused on the South African coal and electricity sectors, i. a. on the political economy of decarbonisation, the politics of fossil fuel subsidies, and greenhouse gas implications of future coal investments. Currently her research examines the political economy of the South African coal sector, fossil fuel finance, and developing transition pathways for South Africa's coal sector.

Jesse's lecture will focus on fossil fuel subsidy mechanisms in South Africa. South Africa showcases the complexity and lack of transparency that is common in national fossil fuel subsidy schemes.



Catrina Godinho
PhD Candidate
Management Programme in
Infrastructure Reform and
Regulation
University of Cape Town

Catrina Godinho is a PhD Candidate at UCT in the Management Programme in Infrastructure Reform and Regulation at the Graduate School of Business. Her research focuses on the political economy of power sector reform and development, with special attention on the sub-Saharan African experience. She has worked in energy research since 2013, focusing on issues relating to sustainable development, energy security, energy transitions, climate change mitigation, governance, policy implementation, and sector reform.

Catrina's lecture will focus on the political economy of power sector reform, with a particular emphasis on challenges in developing and emerging economies. Her lecture will cover the topic generally, as well as draw from specific case studies of ongoing reforms.



Egmont Ottermann
Chief Executive Officer
*New Horizons Energy,
Rosebank, South Africa*

Egmont Ottermann intends to make a difference to waste management and the environment in South Africa. His experience includes development and implementation of an energy and climate change strategy for the company PPC Cement. Egmont is a chemical engineer, a Certified Energy Manager (CEM) with the Association of Energy Engineers (AEE) and is accredited as International Energy Management Expert and International Trainer with the UNIDO Industrial Energy Efficiency Project.

Egmont will present an independent power producer's perspective on the electricity sector and energy policy in South Africa. He will talk about the challenges and opportunities of a reformed power sector that is undergoing fundamental shifts towards more renewable energy sources.



Robert Aitken
Director
*Restio Energy
Cape Town, South Africa*

Robert Aitken is expert in the energy access sector. His interest is in the successful implementation, operation and uptake of off-grid renewable energy technologies, covering appropriate policy, planning requirements, institutional strengthening, service delivery models, market activation, tariffs, technical standards, etc. He has worked extensively across East and Southern Africa as well as South East Asia for international organisations and development agencies. He has Masters Degrees from the University of KwaZulu-Natal and Oxford.

Robert's lecture covers off-grid energy projects in South Africa and other sub-Saharan countries. He will highlight key success factors in developing solutions for improved access to modern energy services.



Peta Wolpe
Managing Director,
*Sustainable Energy Africa
(SEA)*

Peta Wolpe has degrees in Sociology and Social Work from Essex University and the London School of Economics, respectively. She worked in psychiatric social work in the UK and in the development sector in South Africa. Peta joined Sustainable Energy Africa (SEA) in 2008 as Managing Director. SEA is an NGO working with cities in sub-Saharan Africa to integrate sustainable energy practices and approaches to urban development. She has managed projects on developing city capacity, energy poverty, strategy development and research.

Peta will talk about energy poverty in South Africa. She will show a documentary that highlights issues of urban energy and gender and she will discuss key national issues regarding urban energy poverty.



Harald Winkler
Director
*Energy Research Centre
University of Cape Town*

Dr. Harald Winkler is Director of the UCT Energy Research Centre. He focuses on energy and environment, in particular the economics of climate change mitigation. He led the research on South Africa's Long-Term Mitigation Scenarios, and co-directed the Mitigation Action Plans and Scenarios programme (MAPS). He is member of the Academy of Science of South Africa; was lead author for the Intergovernmental Panel on Climate Change, and a member of the SA delegation to the negotiations under the UN Framework Convention on Climate Change.

Harald's lectures will cover sustainable development co-benefits of renewable energy. He will draw on his work with Sustainable Development Policies and Measures, the MAPS programme, as well as others.



David Hees
Solar Utility Manager
*Sustainability Institute
Innovation Lab
Lynedoch, South Africa*

David Hees manages the iShack project - the flagship social enterprise of the Sustainability Institute Innovation Lab (SIIL) which provides pay-for-use solar electricity to un-electrified urban slums in South Africa. He has worked as project manager and consultant in the fields of renewable energy and energy efficiency. His skills include project planning, procurement, implementation and development of systems for quality management and financial strategy. He has been a strong advocate for solar power, sustainable development and energy conservation in developing countries throughout his career.

David will speak on the topic of energy poverty in informal settlements. Specifically, he will present on-going work from the iShack Project.



Group Work

The aim of Low Carbon Energy and Development Strategies (LCEDS) is to integrate a strategy for reducing greenhouse gas emissions in the energy sector with the national development objectives of each country. Rather than taking a project-by-project approach to low-carbon energy development and climate change mitigation, LCEDS have a longer-term planning perspective with the goal of meeting economic, social and environmental priorities. Consequently, LCEDS involve the setting of targets, as well as the strategies – including policies and measures – to reach these targets.

Students are asked, hypothetically, to provide technical assistance to assist in formulating a Low Carbon Energy and Development Strategy for one of the following countries: Egypt, Guyana, the Philippines, Rwanda and Tanzania. Throughout the three weeks of the course, students will work in groups of five to six to develop this strategy, drawing on the concepts and tools developed in lectures and exercises. During group work sessions, members of the teaching team will be available to answer questions and provide guidance in the activities. The group work will be structured around three milestones in which each group will give a presentation on their progress (see table below). The final milestone will also include a five-page brief on the LCEDS to be handed in by 17:00 on Thursday, July 27.

#	Group Work Session	Objectives	Date
1	Group and country assignments	<ul style="list-style-type: none"> Familiarisation with country context Assessing renewable energy potential using available resource maps 	July 12
2	Electricity cost modelling	<ul style="list-style-type: none"> Develop a techno-economic model to assess the cost of meeting a target of 20% new renewable energy generation by 2030. 	July 13
3	Cornerstone policy instruments	<ul style="list-style-type: none"> Identifying a cornerstone policy instrument Potentially identifying appropriate de-risking instruments Model the cost of these instruments 	July 13
4	Additional time for preparing Milestone 1		July 14
	Milestone 1: Group presentations	<ul style="list-style-type: none"> 5 min. presentation on: <ul style="list-style-type: none"> Country background Renewable energy target and chosen cornerstone policy Cost of the policy 	July 17
5	Impact of fossil fuel subsidies	<ul style="list-style-type: none"> Quantify impact of fossil fuel subsidies on the policy cost Potentially identify key stakeholders in national subsidy debates 	July 19
6	Electrification strategy	<ul style="list-style-type: none"> Outline a strategy for rural electrification 	July 20-21
7	Additional time for preparing Milestone 2		July 21
	Milestone 2: Group presentations	<ul style="list-style-type: none"> 5 minute presentation on: <ul style="list-style-type: none"> Impact of fossil fuel subsidy on policy cost Qualitative description of electrification strategy 	July 21
8	Additional group work time	<ul style="list-style-type: none"> Optional time for incorporating feedback, revising model, conducting additional research etc. 	July 21
9	Co-benefits	<ul style="list-style-type: none"> Identify co-benefits of the LCEDS 	July 25
10	Additional time for preparing Milestone 3	<ul style="list-style-type: none"> Preparation of a 5-page brief of the developed LCEDS to be handed in at 17:00 on Thursday, July 27 Preparation of a 20 minute presentation 	July 27
	Milestone 3: Final group presentations	<ul style="list-style-type: none"> 20 minute presentation on LCEDS 10 minute question & answer session for each group 	July 28

Reading List

Renewable Energy Technologies and Policies		Read by	Pages
Introduction to Energy & Development	Mandatory: Fouquet, R., 2016. Path dependence in energy systems and economic development. <i>Nature Energy</i> , 1, pp. 1-5	July 10	6
Renewable Energy Technologies	Optional: IRENA technology briefs available at: http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=283		
Renewable Energy Economic Potential	Mandatory: Brealey, Myers, 2008: Present value and the opportunity cost of capital. In: Principles of corporate finance, (15-29), McGraw Hill Optional: Huenteler, J., Niebuhr, C. & Schmidt, T.S., 2016. The effect of local and global learning on the cost of renewable energy in developing countries. <i>Journal of Cleaner Production</i> , 128.	July 11	15
Energy Finance	Mandatory: Donovan, C., 2015. Introduction to Renewable Energy Finance. In: Donovan, C.W., Renewable Energy Finance, ch. 1, 3-15. Imperial College Press	July 12	13
Energy Policy Instruments and Design	Optional: Gillingham, K. and Sweeney, J., 2010. Market failure and the structure of externalities. <i>Harnessing Renewable Energy in Electric Power Systems: Theory, Practice</i> , pp.69-92. Kemp, R. and Pontoglio, S., 2011. The innovation effects of environmental policy instruments—A typical case of the blind men and the elephant? <i>Ecological Economics</i> , 72, pp.28-36.		
Renewable Energy Investment Risks and De-risking	Mandatory: Waissbein, O. et al., 2013. <i>Derisking Renewable Energy Investment Concept Note</i> , New York: UNDP. Waissbein, O. et al., 2013. <i>Derisking Renewable Energy Investment South Africa Case Study</i> . New York: UNDP. (Will read during class) Optional: Schmidt, T.S., 2014. Low-carbon investment risks and de-risking. <i>Nature Climate Change</i> , 4(4), pp.237-239.	July 13	6
Political Economy of the Power Sector			
Power Sector Reform	Mandatory: Unruh, G.C., 2002. Escaping carbon lock-in. <i>Energy Policy</i> , 30(4), pp.317-325. Optional: Eberhard, A. et al., 2017. Accelerating investments in power in sub-Saharan Africa. <i>Nature Energy</i> , 2(2), p.17005. Available at: http://www.nature.com/articles/nenergy20175 .	July 17	9

Political Economy of the Power Sector		Read by	Pages
Fossil Fuel Subsidies and their Reform	Optional: Rentschler, J. & Bazilian, M., 2016. Reforming fossil fuel subsidies: drivers, barriers and the state of progress. <i>Climate Policy</i> , 3062(July), pp.1-24. Lockwood, M., 2015. Fossil Fuel Subsidy Reform, Rent Management and Political Fragmentation in Developing Countries. <i>New Political Economy</i> , 20(4), pp.475-494.		
Electricity Access			
Introduction to Electricity Access	Mandatory: Alstone, P., Gershenson, D. and Kammen, D.M., 2015. Decentralized energy systems for clean electricity access. <i>Nature Climate Change</i> , 5(4), pp.305-314. Optional: Detchon, R. and Van Leeuwen, R., 2014. Policy: Bring sustainable energy to the developing world. <i>Nature</i> , 508(7496), pp.309-311.	July 19	10
Finance for Electrification	Mandatory: Schmidt, T.S., 2015. Will private-sector finance support off-grid energy? <i>Smart Villages: New Thinking for Off-Grid Communities Worldwide, Banson/Smart Villages Initiative</i> , pp.81-87.	July 19	7
Sustainable Development Benefits			
Industry Policy and Energy	Optional: Schmidt, T.S. & Huenteler, J., 2016. Anticipating industry localization effects of clean technology deployment policies in developing countries. <i>Global Environmental Change</i> , 38, pp.8-20. Sagar, A.D. & van der Zwaan, B., 2006. Technological innovation in the energy sector: R&D, deployment, and learning-by-doing. <i>Energy Policy</i> , 34(17), pp.2601-2608.		
Sustainable Development & Co-Benefits	Mandatory: Winkler, H, Howells, M & Baumert, K 2007. Sustainable development policies and measures: institutional issues and electrical efficiency in South Africa. <i>Climate Policy</i> 7 (3): 212-229. Optional: Kuyasa CDM project – project design document Rennkamp, B & Boule, M 2017. Novel shapes of South-South collaboration: emerging knowledge networks on co-benefits of climate and development policies. <i>Climate and Development</i> : 1-12. http://dx.doi.org/10.1080/17565529.2017.1318741	July 25	18

Excursions

Gouda Wind Farm

FRIDAY | July 14

Gouda wind farm is a 130 megawatt (MW) wind farm located in Drakenstein, approximately 100 kilometers northeast of Cape Town. The project, which entered commercial operations in 2015, is estimated to generate enough electricity to power around 200,000 South African homes per year. Gouda wind farm was approved by the Department of Energy in the second round of South Africa's Renewable Energy Independent Power Producer Procurement Program (REIPPPP).

Under the design of the REIPPPP, projects are evaluated not only on their cost, but also on the socio-economic benefits they bring to the country such as local ownership, black economic empowerment, job creation or local content. Gouda wind farm was developed by a consortium of international and local firms that included Spanish ACCIONA Energía, the South African infrastructure firm Aveng, Soul City Broad-Based Empowerment Company – a Broad-Based Black Economic Empowerment contributor – and a community development entity.

Gouda is also South Africa's first wind project to utilize a concrete tower design – rather than the typical steel design. As concrete units were manufactured through a local company, Concrete Units, and assembled on-site, the 40% local content threshold set in Round 2 of the REIPPPP was able to be met. This design also changes the technical characteristics of the wind farm, as concrete towers often allow wind turbines to reach higher hub heights where wind resources are better.

Images: Acciona website
<http://www.acciona-energia.com/areas-of-activity/wind-power/major-projects/gouda-wind-farm/>

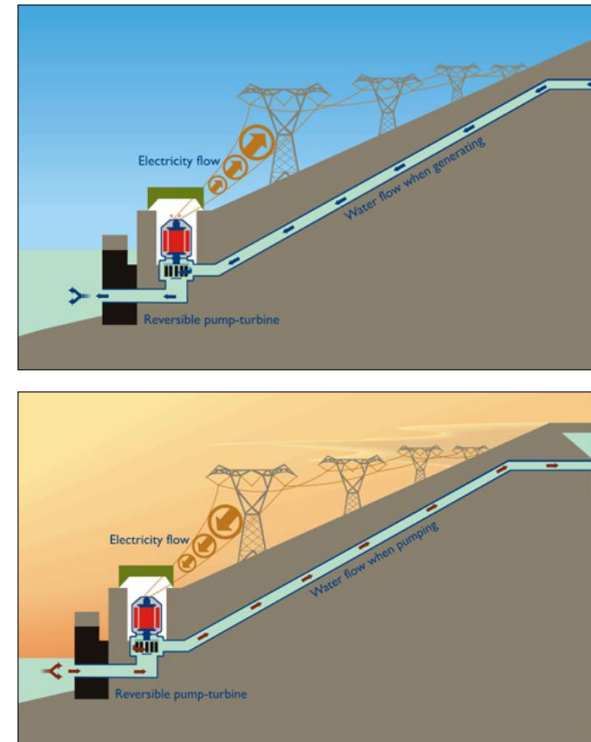


Palmiet Pumped Storage Hydro

TUESDAY | July 18

The Palmiet pumped storage hydroelectric scheme is located near Grabouw in the Western Cape. In a pumped storage scheme, water is pumped from a lower elevation reservoir to a higher elevation reservoir in times of low electricity demand. During periods of high demand, this stored water can be released to generate electricity. Such power stations can be used to respond rapidly to increases in electricity demand, and therefore can play an important role in load balancing. The Palmiet scheme is composed of two 200 megawatt units that offers peaking capacity for the national grid. In addition to providing this peak load capacity, the Palmiet scheme also transfers water from the Palmiet River to supplement Cape Town's water supply. Palmiet is owned and operated by Eskom – South Africa's state-owned power utility. A vertically integrated utility, Eskom supplies about 95% of South Africa's electricity, predominantly through coal-fired power.

The Palmiet site is a conservation area and has also been declared a Biosphere Reserve by UNESCO.



SARETEC

MONDAY | July 24

The South African Renewable Energy Technology Centre (SARETEC) is the first national renewable energy technology centre in South Africa, located at the Cape Peninsula University of Technology in Bellville. Its goal is to help in building a skilled workforce for the renewable energy sector in Africa by providing renewable energy training and education in Africa. SARETEC expedites specialized industry-related and accredited training for the entire renewable energy industry including short courses and workshops. As a National Centre, SARETEC also endeavours to make locally developed technologies more accessible to the renewable energy industry in partnership with education and research institutions in all provinces.

The SARETEC facility is also a green building, and is designed to showcase the use of renewable energy and energy efficient technology.



Images: Eskom website http://www.eskom.co.za/AboutElectricity/VisitorCentres/Pages/Palmiet_Pumped_Storage_Scheme.aspx



Images: SARETEC website, <https://www.saretec.org.za/about.html>

Participants

Welcome!

It is our great pleasure to welcome you to the E4D School on Energy in Cape Town. We look forward to our challenging and exciting programme and many constructive and fruitful discussions.

The E4D School on Energy is organised by ETH Global, the staff unit for international matters at ETH Zürich, in collaboration with the Energy Politics Group, the Energy Science Center, the Institute of Science, Technology and Policy, and the University of Cape Town.

ETH Zurich passes on to its students the highest level of knowledge and skills. It wants everyone to feel at ease and capable in complex and rapidly evolving environments, while at the same time being able to maintain an understanding for ethical and cultural values. The E4D School on Energy aims to expose the participants to a selected topic of high relevance in E4D and to provide them some tools to develop context-sensitive solutions.

Please do not hesitate to contact us if we may be of assistance – the team on-site in Cape Town and Romana Mayer back in Switzerland. We wish you a successful participation in the E4D School on Energy and a pleasant time throughout your stay in Cape Town.

We look forward to working and learning with you.

The ETH Zürich and UCT Organising Team



Churchill Omondi Agutu
MEng in Chemical
Engineering
University of Pretoria, South
Africa

I was born in Kisumu, Kenya. I moved to South Africa in 2012 to pursue my undergraduate degree in chemical engineering at University of Pretoria. My interests are in renewable energy and sustainability and my current research is focused on Spectral beam splitting to improve the efficiency of solar cells. I am a MasterCard Foundation Scholar and an alumnus of the climate change programme: "Youth Encounter on Sustainability" (YES). As a project leader of Engineers Without Borders, I've been involved with projects such as the Litre of Light (LOL) and student mentorship.



Mohamed Bakr
MSc in Energy Engineering
Technische Universität Berlin,
Germany

Mohamed is an enthusiastic engineer and researcher from Egypt. He acquired his bachelor's in Mechanical Engineering from Loughborough University (UK) and is currently finalising a double master programme in Energy Engineering, Climate Change, Innovation, and Entrepreneurship at Technische Universität Berlin and EIT's Climate KIC. Mohamed is interested in innovation, particularly in the fields of mechanical and energy engineering, as he aims at contributing to enhancing energy efficiency and mitigating climate change. Mohamed enjoys working in interdisciplinary teams. He is a very social person who likes making new friends. He has a passion for sports, travelling and exploring new places and cooking.



Andrea Binkert
MSc in Environmental
Engineering
ETH Zürich, Switzerland

The topic of my bachelor thesis and master project work in the field of renewable energy technologies raised my awareness for the global challenge of low-carbon energy strategies. I realized that transforming the current energy system is not only a question of technology but also of public policy and political will. I am striving for a broader understanding of the market mechanisms, policy schemes and development strategies. The School on Energy seems to be the perfect opportunity to pursue this goal. I believe gathering, discussing, dismissing and rethinking our ideas and thoughts will provide us with a more vivid and accurate picture of this global challenge and will give us important visions to take along for our future.



Felix Böwing
MSc in Electrical
Engineering and Information
Technology
ETH Zürich, Switzerland

Since I was little I liked blinking things with buttons to push. My fascination continued and that's why I study Electrical Engineering. After finishing the BSc I did an internship in consulting mostly focusing on the supply chains in the pharma industry. Immediately before our winter school I was travelling through Asia for several months. Spending two months in Indonesia I could see how this country has so many different paces of development. On the one hand, I saw the very basic life on a rice farm firsthand. On the other hand, there is the city of Jakarta where expats can live in bubbles of luxury. Besides travelling I also do hiking and sailing. I hope we'll find time for hiking.



Maksims Feofilovs
PhD and MSc Eng in
Environmental Science
*Riga Technical University,
Latvia, and ETH Zürich,
Switzerland*

Maksims Feofilovs received his Master's degree in Environmental Science at Riga Technical University and has an environmental engineer qualification in Environmental Protection Technology and Management at Vilnius Gediminas Technical University. He was awarded with the best student's paper at the International Scientific Conference of Environmental and Climate Technologies 2016. Maksims is continuing his doctoral research and working for the Ministry of Economics of Latvia as Senior Officer in the Energy Market and Infrastructure Department. He participated in the European Campus of Excellence course on energy at ETH Zurich and EU's main climate innovation initiative Climate-KIC event, The Climathon 2016 in Riga.



Paolo Gabrielli
PhD in Mechanical
Engineering Institute of
Process Engineering
ETH Zürich, Switzerland

Paolo Gabrielli received his BSc and MSc in Energy and Nuclear Engineering from the University of Bologna. He completed the MSc at the University of California, Los Angeles, and the master thesis at Denmark Technical University, where he focused on the design of turbo-expanders for organic Rankine cycles. Currently, he is a doctoral student at ETH Zurich, where he researches on the design of integrated multi-energy systems with particular focus on electrochemical conversion technologies and seasonal storage systems. His research activity aims at considering technical, economic and policy aspects to provide guidelines for the development and deployment of sustainable energy systems.



Cloudio K. Chikeya
PhD in Management Studies
(Finance)
*University of South Africa,
South Africa*

I am a Zimbabwean interested in investments, financial markets, green energy financing and mineral resources valuation. My experience includes working as an investment analyst, lecturing and research. I have published on share price response to rights issues, use of derivatives in financial markets and external debt management. I hold a MSc in Finance and Investment, Bachelor of Commerce, Diploma in Banking and various certificates. I am a lecturer at the National University of Science and Technology NUST (Zimbabwe), lecturing on Institutional Investment Analysis and Management, Corporate Financial Strategy and Financial Engineering. I am pursuing a PhD in Management Studies at the University of South Africa and a Post Graduate Diploma in Higher Education with NUST.



Lukasz Chmielnicki
MSc in Sustainable Energy
Engineering
*Royal Institute of Technology
Stockholm (KTH), Sweden*

Originally I come from Poland, where I graduated from Warsaw University of Technology with a BSc in Energy Engineering. Currently, I am pursuing my Master in the EIT Innoenergy Programme SELECT – Environmental Pathways for Sustainable Energy Systems, with the first year at KTH in Stockholm and the second one at UPC in Barcelona. I am particularly interested in using big data for integrating energy storage and electric vehicles in the smart grid solutions. Apart from studying, I am head over the heels with basketball and travelling by exploring cultural differences and nuances. Lastly, I am enormously fond of cooking Italian dishes.



Tulus Imaro
MSc in Applied Earth
Sciences
TU Delft, The Netherlands

My profile is quite unique, a blended background between a petroleum engineer, geothermal enthusiast, strategy management consultant and an education supporter. I have a passion for energy development, especially the one with geosciences background, and human development in rural areas. My evidence-based practices taught me to appraise things concretely, however, I still believe in the non-tangible subjects. I live today for a reason and I have promised to myself to be more philanthropic than before.



Selma Janssen
MSc in Design and
Construction; MSc in Energy
Science and Engineering
*Technical University of
Darmstadt, Germany*

I study Energy Science and Engineering at the Technical University of Darmstadt. The efficient use of energy and the chances renewable energies offer fascinate me. Besides my studies I work at an engineering consultancy that helps local municipalities to cut their greenhouse gas emissions. In cooperation with that company I am currently writing my Master's thesis about tools that can be used to calculate and monitor the emissions of urban districts. In my free time I like to play badminton and sing in a choir. Furthermore I am part of a local chapter of the NGO Engineers without Borders. We are currently planning a water supply system at a rural school in Uganda.



Akhil Joseph
PhD in Energy and Sustainability
Indian Institute of Science (IISc), Bangalore, India

Akhil is a PhD scholar from IISc, Bangalore, India. His realm of research interests cover power market, renewable energy integration to grid, smart grid, energy economics, etc. He has obtained his Master's degree in Power Management and Bachelor's degree in Electrical and Electronics Engineering. He has published papers in international journals and has presented at conferences. His current work is on the design and development of tailor-made Indian Energy Internet, which involves modelling and policy development aspects.



Armilda Lackaj
Energy and Environmental Management
International Business Administration
University of Vienna, Austria

Armilda is a consultant with expertise and profound experience in multiple industries including utility, services, high tech, and telecommunications. When she isn't helping clients weave their words into gold, she volunteers and participates in workshops and organizes exhibitions, which bring global climate change and sustainable development into focus. Despite of the wide range of energy markets and resources (fossil fuels, electricity, renewable energy resources), Armilda nurtures a keen interest in sustainable energy management. Her research interest encompasses green architecture, energy (transition) systems and environmental policy.



Pratik Nayak
MSc in Mechanical Engineering
TU Delft, The Netherlands

Pratik Nayak moved to Delft for his Master's in 2015 from Bangalore, India. He studies fluid mechanics and computational science in the Mechanical Engineering Department at the Technical University of Delft. He hopes to work on a challenging problem that involves the societal issue of efficient and sustainable energy for his PhD after his Master's. In his free time, he loves to play the guitar, cycle and read. He hopes his career will take him to new places and allow him to explore and discover them by learning about their cultures.



Olufolahan O. Osunmuyiwa
PhD in Environmental Policy Analysis
Vrije Universiteit Amsterdam, The Netherlands

Olufolahan Osunmuyiwa is a development professional and a PhD researcher at the Institute for Environmental Studies (IVM). She is a social scientist by training with both Bachelor's and Master's degrees in International Relations. She specializes in the analysis and governance of innovations and low carbon transition pathways in developing countries. Her work has appeared in international peer-reviewed journals and media sites including Environmental Innovation and Societal Transitions and Climate. She is fascinated with opportunities to apply skills garnered in the development and execution of projects that will influence and trigger radical energy and environmental change.



Agnes Linnet
MSc in Electric Power Engineering
Royal Institute of Technology, Stockholm (KTH), Sweden

I am a 24-year-old student from Iceland, studying in Sweden and attending this course in South Africa; needless to say I love to travel. I currently work as an intern at an engineering consulting company alongside my studies were I have had the chance of working on various projects for different companies in Iceland, Norway, and West Africa. I am interested to work in a field in the future were I can have an impact of improving the power system in different parts of the world. I am always interested in pushing my limits and thus have developed an interest in long distance running and long distance cycling – just to prove to myself I can accomplish it.



Jeremiah Mbazor
PhD in Nuclear Engineering
UNIST, South Korea

One Nigerian studying in Korea who seeks to utilize all skills gained so far to meeting major energy needs in developed and developing countries while enjoying doing so.



Ram Parameswaran
MSc in Energy Change Engineering
Australian National University

Growing up in sunny Australia, I have always had a great appreciation for the natural environment. Recently I've also discovered my passion for working in the energy sector. When not at university, I work at an energy sector consultancy in Canberra, which specialises in design and development of local renewable projects. However, particularly exciting to me are the opportunities that are upcoming in developing and transition economies. Personally, I enjoy nothing better than exploring new places and countries. My favourite experiences so far have been spending a month hiking and camping in Norway, and driving from coast-to-coast across Australia.



Diana Pérez
MSc in Management and Engineering of Energy and Environment
Ecole des Mines de Nantes, France

I am from Turbo in Colombia, a town with strong African roots. I was awarded the BEng(Hons) in Petroleum Engineering by the Universidad Nacional de Colombia, ranked number one in Colombia by QS World University. After this, I took a four-month training course in Russia taught by Schlumberger, the company in which I had worked for three years in the conventional energy industry. Currently, I am finishing my second semester in France, in a two year's master course in Management and Engineering of Energy and Environment, with special focus on sustainable energy systems. This is carried out in Spain, France and Sweden, the KTH Royal Institute of Technology in Sweden, being my next destination after the summer course.



Balasubramanian Sambasivam
PhD in Energy and Sustainability
Indian Institute of Science (IISc) Bangalore, India

I am Balasubramanian (Bala) from India. Presently I am doing my PhD at the Indian Institute of Science, Bangalore, India. I have a Bachelor's degree in Mechatronics and a Master's in renewable energy from the Technical University of Berlin, Germany. As part of my Master's thesis I worked on developing microgrids for rural areas. Presently, I am working on the solutions for reducing the fossil fuel electricity generation through distributed low carbon energy systems, energy transitions and demand response. I am eagerly awaiting to be part of this E4D School on energy to get new ideas and solutions which I try to incorporate in my research work.



Sarah Schmidt
PhD in Industrial Ecology
Norwegian University of Science and Technology Norway

My name is Sarah and I am a 30-year old German engineer in physics, working on my PhD (2nd year) in energy and development (environmentally extended multi-regional input-output analysis). In my free time, I lead the NGO Punte Nica e.V. that works with improving access to high quality education in Nicaragua. For almost ten years, I have been involved in volunteering work on education in Nicaragua. At the age of fifteen, I was on my first student exchange in Johannesburg. After high school, I volunteered and travelled South America for a year. Then I studied (Bachelors and Masters) in Sweden and I now live in Norway.



Felix Steinberg
PhD in Science and Technology Policy Studies
University of Sussex, Science Policy Research Unit (SPRU) United Kingdom

Felix Steinberg holds a BA in Economics from the Ludwig-Maximilians University in Munich and a MA in International Relations and International Economics from the Johns Hopkins University SAIS in Washington D.C and Bologna. In 2012 he joined the German Development Bank KfW as Project Manager, responsible for the implementation of climate finance and natural resource conservation projects in Latin America, particularly Peru and Brazil. In 2016, Felix started his PhD in Science and Technology Policy Studies at the University of Sussex. His research focus lies on the nexus of technological capability development and the localization potential



Dina Subkhankulova
PhD in Security Science
University College London United Kingdom

I am a third year PhD student at the UCL Energy Institute aiming to graduate in March 2018. My research interests include investigating how storage and demand side management (DSM) can help integrate renewable energy into the grid. I studied Physics at the Imperial College London, after which I worked for an engineering start-up (Duvas Technologies) and finance (Credit Suisse). During my time at UCL I have completed internships at the International Energy Agency (IEA) and the International Institute for Applied Systems Analysis (IIASA). I am passionate about clean technology and spent two years as part of the "CleanTech Challenge" committee. I love to dance and travel.



Katyayan Sharma
Masters in Public Policy
O. P. Jindal Global University Sonipat, India

Katyayan Sharma is a graduate in Energy Engineering from the National Institute of Technology, Bhopal, India. He is pursuing his Masters at Jindal School of Government and Public Policy. A self-avowed policy enthusiast, who pertains himself to that which specifically involves Renewable Energy and Environment, his current projects include waste management solutions for Delhi and global policies on electric vehicles. A small town kid from Jabalpur, Katyayan likes cross country biking, photography and chess.



Lakshmi Srinivasan
MSc in Energy Science and Technology
ETH Zürich, Switzerland

Lakshmi Srinivasan is a former mechanical engineer, future electrical engineer, and current SET all-star player. She's worked on all kinds of alternative energy technologies - like nuclear, wind, and batteries, to name a few - but hasn't yet found the one true hero that will save the world. Lakshmi is focusing her studies on grid technologies and power electronics, and plans to be done with her master's degree at the end of July. She likes chocolate, kung fu and science fiction, in that order.



Megan Ward
Master of Energy Change
Australian National University (ANU), Australia

I am from the small Australian island Tasmania, but am currently living in Australia's capital Canberra. I live with my partner, two very energetic puppies and lots of ducks and chickens on a small property. I'm passionate about sustainable development and action on climate change. I'm excited about completing this course as it complements my passions and current role with the Australian Capital Territory (ACT) Government, where I have worked for the past six years. In this role I have the exciting task of ensuring the ACT's target of 100% renewable electricity by 2020 is achieved, and I hope one day to take these experiences and work overseas on renewable energy projects.



Fasil Teshome Worku
MSc in Water Resources
Arba Minch University, Arba Minch, Ethiopia

Fasil completed his BSc in Hydraulic and Water Resources Engineering at Arba Minch University, his MSc in Water Resources Engineering and Management at Addis Ababa University with technical support from the University of Connecticut, and MAS in Sustainable Water Resources from ETH Zürich. In the MSc thesis, he analyzed hydrologic partitioning and vegetation response at a catchment-scale. In the MAS thesis, he dealt with understanding the spatiotemporal dynamics of NDVI and its coupling with rainfall at a country-scale. Fasil has been teaching undergraduate courses such as hydraulics, hydrology, and water resource systems at Arba Minch University since 2010.

ETH Zürich Organising Team

ETH ZÜRICH

ETH Zürich is one of the leading universities for engineering and the natural sciences. It is well known for its excellent education, groundbreaking fundamental research and effective knowledge transfer benefitting society and the economy.

ETH GLOBAL

ETH Global is the staff unit for international relations at ETH Zürich. It fosters international partnerships in research and education and enhances the institution's visibility abroad. ETH Global is responsible for implementing the global strategic goals of ETH Zürich and cooperates with other offices working with international issues. Its crosscutting mission complements the international relations of research groups, departments or administrative units at the institutional level.



Barbara Becker
Director, Global
Transformation Affairs
ETH Global
ETH Zürich, Switzerland

Dr. Barbara Becker is Director for Global Transformation Affairs and as such member of the Management Team of ETH Global. Formerly, she has been Managing Director of the North-South Centre of ETH Zürich. Her professional background is tropical agro-ecology. She gained international experience as UNEP field project officer investigating Andean land use systems in Peru. Her doctoral research focused on edible wild plants in Africa. Her experience in research management is based on former positions with the German government and functions in various governance bodies related to international agricultural research and partnerships. Since 1999, she has held several functions related to research for development (R4D) at ETH Zürich.



Lucia Arpagaus
ETH Global
ETH Zürich, Switzerland

Lucia Arpagaus is responsible for finance at ETH Global and for the administration of the bilateral collaboration programme with Asian countries. Her organisational skills have been successfully applied by organising the logistics of various events. In her previous position at the HSR University of Applied Sciences in Rapperswil she managed the Secretariat of the Department of Mechanical Engineering, as assistant to the Dean, and also worked in the Student Admissions Office. Further professional education in Human Resources Management and her interest in languages give her a broad knowledge of handling the internal workings of a departmental office.



Romana Mayer
ETH Global
ETH Zürich, Switzerland

Romana Mayer studied economics, business administration and economic pedagogy at the University of St. Gallen (HSG). After graduating with a Master's degree, she worked for an international consulting company, a NGO and as a flight attendant. In 2012, Romana joined ETH Global as a programme manager and is responsible for various international projects of ETH Zürich – among others, the organisation of this year's E4D School on Energy. Mother of a sweet little girl, she chose not to travel to Cape Town in July 2017 but will support the group from back home.

UCT Organising Team

The University of Cape Town (UCT) is a public university located in Cape Town, South Africa. It is the oldest university in South Africa, founded in 1829, and the highest ranked university in Africa. The language of instruction is English, and approximately 20% of the UCT student body is international students, representing over 100 countries. UCT contributions to teaching and research are well recognised in a variety of fields with benefits for South Africa, Africa and the global community.



Jonathan Mitchell
Programme Officer
Short Term International
Programmes (STIP)
University of Cape Town (UCT)

Jonathan Mitchell previously worked in the financial services sector, and joined the UCT International Academics Programmes Office (IAPO) in 2010. As the Programme Officer he is in charge of logistical requirements and arrangements including accommodation, transport, tours and excursions as well as booking of classroom venues and ICTS support. Jonathan Mitchell also organises Group Orientations and Safety and Security briefings and ensures all STIP groups receive UCT access cards.

SHORT TERM INTERNATIONAL PROGRAMMES (STIP)

Short Term International Programmes (STIP) at UCT's International Office provides customised short courses to international delegates. The programmes are designed in accordance with specialised topics to cover a broad range of strategic academic areas that are innovative, relevant and educative incorporating a multidisciplinary or discipline-focused approach within the African and global context.



Nicola Latchiah
Manager
Short Term International
Programmes (STIP)
University of Cape Town (UCT)

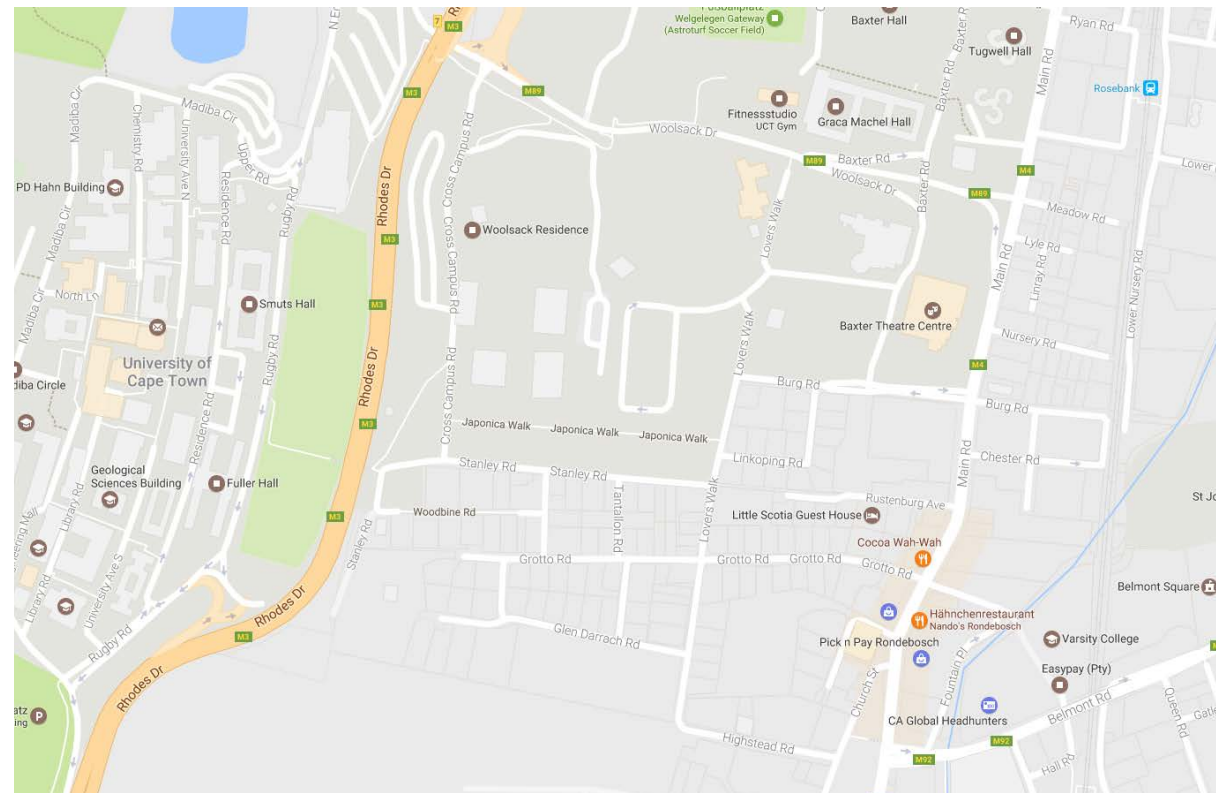
Nicola Latchiah has extensive experience and skills in Higher Education. Having worked in various portfolios in higher education for the past 23 years, her areas of expertise lie in international education, advancement, advocacy and student mentorship. Her current portfolio as STIP Manager aims at the establishment of an enterprise to strengthen links with strategic partners by devising unique programmes in fulfilment of the internationalisation agenda of UCT. She has interfaced strategically with key regional, national, continental and the international community, in building a national and international network in support of internationalisation. She has a Master's Degree in Industrial Psychology from the University of KwaZulu-Natal.



Njeri Mwangi
Coordination
Short Term International
Programmes (STIP)
University of Cape Town (UCT)

Njeri Mwangi coordinates Short Term International Programmes (STIP) at the University of Cape Town, and provides strategic support to the STIP Office. Responsibilities involve facilitating strategic partnerships and collaboration for delivery and growth of programmes. She recently completed her PhD in Business Administration at the UCT Graduate School of Business, and her doctoral thesis focused on issues of organisational leadership, knowledge, diversity and transformation. Njeri is a Kenyan national who has lived in different countries internationally, and has been resident in South Africa for the past ten years.

Maps



<https://www.google.ch/maps/@-33.957979,18.46612,17z>

Emergency Contacts

Please save these numbers on your mobile phone and carry them with you at all times.

Team Contact in Cape Town

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Emergency Contacts at UCT

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