UNESCO Chair in Technologies for Development
2016 INTERNATIONAL CONFERENCE

FROM INNOVATION TO SOCIAL IMPACT

2–4 MAY 2016
SWISSTECH CONVENTION CENTRE
EPFL, LAUSANNE, SWITZERLAND

http://cooperation.epfl.ch/2016Tech4Dev

REACT @ #T4D2016

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Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Federal Department of Foreign Affairs

ICRC

ELSEVIER

Ingénieurs du Monde

FN·SNF
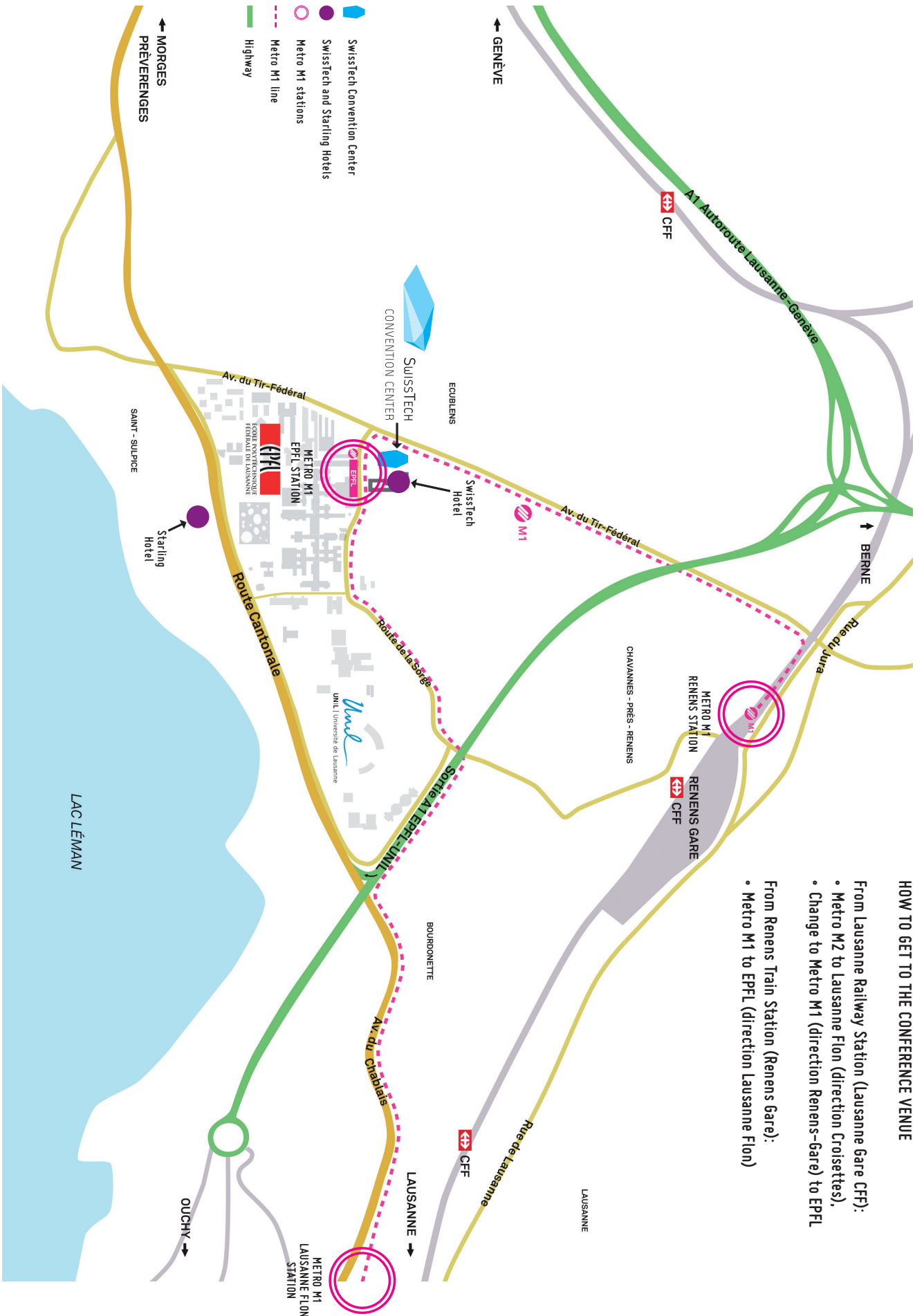SWISS NATIONAL SCIENCE FOUNDATION

LAVAUX
VIGNOBLE EN TERRASSES

EPFL
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

SwissTech
CONVENTION CENTER

CONFERENCE VENUE

SWISSTECH CONVENTION CENTER ∘ Route Louis Favre 2 ∘ 1024 Ecublens/Lausanne ∘ +41 21 693 42 42 ∘ +41 21 693 42 68 ∘ www.tstcc.ch

Legend

- SwissTech Convention Center
- SwissTech and Starling Hotels
- Metro M1 stations
- Metro M1 line
- Highway

HOW TO GET TO THE CONFERENCE VENUE

From Lausanne Railway Station (Lausanne Gare CFF):
- Metro M2 to Lausanne Flon (direction Croisettes),
- Change to Metro M1 (direction Renens-Gare) to EPFL

From Renens Train Station (Renens Gare):
- Metro M1 to EPFL (direction Lausanne Flon)

Map labels

MORGES
PRÈVERENGES

GENÈVE

A1 Autoroute Lausanne-Genève

CFF

Av. du Tir-Fédéral

SwissTech CONVENTION CENTER

ECUBLENS

SAINT-SULPICE

EPFL
ECOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

METRO M1 EPFL STATION

EPFL

SwissTech Hotel

M1

Starling Hotel

Route Cantonale

Route de la Sorge

UNIL Université de Lausanne

Av. du Tir-Fédéral

CHAVANNES-PRÈS-RENENS

METRO M1 RENENS STATION

M1

BERNE

Rue du Jura

RENENS GARE

CFF

Sortie A EPFL-UNIL

LAC LÉMAN

BOURDONNETTE

Av. du Chablais

OUCHY

LAUSANNE

METRO M1 LAUSANNE FLON STATION

CFF

Rue de Lausanne

LAUSANNE

Contents

Lausanne, May 2016

Dear Participants,
Dear Colleagues,

Welcome to the fourth UNESCO Chair Conference on Technologies for Development!

Even though significant progress in sustainable development is being made, over 2 billion people in the developing world still live on less than US$ 3 a day. We have to ask ourselves: How can it be that almost 1 billion of the world population suffers from malnutrition and hunger while 2 billion suffer from overweight and obesity? Progress has been made, some of the Millennium Development Goals have been reached, and others have even been surpassed. But we are still far away from eradicating poverty and inequalities. It is even becoming more difficult to reach those populations living in fragile contexts and rising conflict, climate change and economic shocks can force entire populations back into poverty. Access to functioning healthcare and education systems, electricity, safe water, and other critical services remains elusive for too many people. Clearly the current global development model focused on short-term economic profit is unsustainable. In an attempt to find solutions to these challenges we are turning increasingly towards innovation. But technological innovation alone will not be enough. This is why we decided to focus this year's conference on a crucial step; how do we get from innovation to social impact?

Over the next three days, 75 papers will be presented in the fields of ICT, energy, urban development, disaster risk reduction, medical technologies, and humanitarian action. Furthermore, 10 interactive sessions will give you the opportunity to learn more and contribute to discussions in crosscutting themes such as measuring development outcomes and successfully up-scaling promising technologies. Offering a platform to network is one of the main objectives of this Conference. Make it a point to talk to someone new during every break. Who knows, it might be the beginning of a new and innovative partnership.

We would like to thank all the people who contributed to make this Conference a success.

First of all, a big thank you to the session leaders, moderators, paper and poster presenters who have put in a lot of time and energy to make their sessions a success. Secondly, we would like to thank Emmanuel Estoppey and his team from the Lavaux UNESCO World Heritage Site who have once more gone out of their way to welcome us for the social event in the charming village of Grandvaux. We would also like to thank the team from Ingénieurs du Monde who has helped us on many levels. There are many more people who have contributed to the organization of this Conference; many thanks to all of them!

Finally, we are very grateful for the generous patronage of our all our conference sponsors, in particular the Swiss Agency for Development and Cooperation. Their support and partnership is critical for bringing us all together to reflect on how technological innovation can lead to stronger social impact and lead the way toward more suitable development at a global level.

Dr. Silvia Hostettler
UNESCO Conference Chair

Eileen Hazboun
UNESCO Chair Coordinator

Welcome by Prof. Patrick Aebischer, President, Ecole Polytechnique Fédérale de Lausanne – EPFL

Dear Participants,
Dear Colleagues,

On behalf of EPFL, it is my pleasure to welcome you to the fourth UNESCO Conference on Technologies for Development.

EPFL hosts the **UNESCO Chair in Technologies for Development** through its **Cooperation and Development Center, CODEV,** since 2007. CODEV is an international platform dedicated to foster exchange and collaboration in research and education to contribute to poverty reduction and sustainable development. EPFL organizes a biennial UNESCO Chair Conference that draws an ever-increasing audience of over 400 participants from over 70 countries. A warm welcome to all of you, whether you have come from near or far away!

This **UNESCO Chair**, in collaboration with partners in the Global South, creates and promotes **innovative technologies**. Indeed, EPFL is convinced that a high-level education and scientific excellence are prerequisites for sustainable development and has fostered scientific collaboration with emerging and developing countries for over 40 years.

In 2005, we established a **seed funding program** for EPFL researchers to initiate research collaborations with partner institutions in the Global South. Until today, 81 projects have been funded focusing on technology applications that help address major global challenges ranging from water pollution and infectious diseases to sustainable urban development. Many have grown into larger initiatives and have become long-term research collaborations.

EPFL is also one of the founding members of **RESCIF**, the Network of Excellence in Engineering Sciences of the French-speaking Community using a shared language as common ground to address key issues in emerging and developing countries. EPFL with its partner institutions has established two joint labs, namely **CURES**, the University Centre for Research and Energy for Health in Cameroon, and **CARE**, the Asian Center for Water Research in Vietnam.

Over the past three years, we have considerably invested in **Massive Open Online Courses – MOOCs**. MOOCs have a significant development potential as the impact of education can be scaled-up making the technological expertise of EPFL available at the global level. Many of our MOOCs have more than 10,000 students! Until today, we have launched **48** MOOCs, 8 of which are specifically targeted to offer high-quality education to thousands of students in Africa.

This year's Conference has a strong focus on medical technologies and technologies for humanitarian action. Innovative technology is needed to develop medical technologies adapted to the needs of countries in the Global South. The **EssentialTech program** at CODEV develops medical equipment that is affordable, robust, and easy to use. This program addresses challenges such as poor infrastructure, unreliable energy supply, or limited digital access. Since 70% of the world's population still has no access to diagnostic imaging, EssentialTech is developing **GlobalDiagnostiX**, a high-tech, low-cost and robust medical x-ray system bringing together a research consortium of 40 researchers from academic institutions, industry and university hospitals in Switzerland and Cameroon.

I am very pleased that the **International Committee of the Red Cross – ICRC**, is a special partner of the Conference this year. In 2015, ICRC and EPFL have decided to launch the **Humanitarian Tech Hub** combining EPFL's innovative capacity and ICRC's humanitarian experience. The Hub facilitates interactions between experts from various disciplines to find solutions that are effective and appropriate. In 2015, a project for an advanced orthopedic foot and one for monitoring of water resources via mobile phone (GPRS) network have been initiated.

The guiding question of this UNESCO Conference is how we go **from innovation to social impact**. Rising global challenges require technological innovations but ultimately we aim for impact in the real world. It is important to focus on technical excellence but even more so to build successful business models for large-scale deployment and long-term financial sustainability. This Conference brings all different stakeholders together; we believe that it is through dialogue that successful solutions will emerge.

I encourage you to use this conference to make new connections, and to make the crucial step from innovation to social impact.

Prof. Patrick Aebischer
President of EPFL

Cooperation & Development Center - CODEV
Technological Innovation for Poverty Reduction: A Priority for EPFL in a Global World

Our Mission

CODEV promotes innovative technologies to support social, environmental, and economic development in the Global South.

➢ We implement our mission through excellence in research, education, and training and by building strategic partnerships

- We help strengthen research institutions through joint research projects and education programs
- We create and promote innovative technologies aimed at poverty reduction and sustainable development.
- We encourage and support researchers in performing scientific cooperation projects
- We offer courses in development engineering and sustainable development in the Global South to undergraduate and graduate students.

Our Values

- High level of education and scientific excellence are prerequisites for sustainable development
- Innovation in appropriate technologies is a way to alleviate poverty in the Global South
- North-South and South-South scientific partnership contribute to addressing the most pressing global challenges

Our Activities

Research
- UNESCO Chair: Technologies for Development
- EssentialTech: Innovative technologies to reduce poverty
- Humanitarian Tech Hub: Joint ICRC-EPFL projects

Education
- Courses at EPFL
- Continuing education: Massive Open Online Courses (MOOCs)

Management of research programs
- EPFL Seed Money Program
- Swiss Bilateral Research Programs with India, Brazil, Vietnam and Latin America (EPFL Leading House)
- Indo-Swiss Collaboration in Biotechnology (ISCB)
- The Network of Excellence in Engineering Sciences of the French-speaking Community (RESCIF)

Communication and services
- Organization of lecture series and events
- Publications
- Advice and support in scientific cooperation to the EPFL community and partners

Our Expertise

Research, education, and training
- Positioning EPFL at the forefront of education and research in the field of innovation and technologies for development in the Global South

Innovative technologies
- Design and upscale of essential technologies in the Global South
- Innovative deployment models in a sustainable and scalable impact

Partnerships and networks
- Strategic partnerships with Swiss and international stakeholders
- Know-how in the management of international research programs an in the creation of networking platforms

Field experience
- Setting- up and managing North-South research and education projects in diverse socioeconomic and environmental contexts.

Organizers and Committees

Organizing Committee

- Silvia Hostettler, UNESCO Conference Chair, EPFL (Switzerland)
- Eileen Hazboun, UNESCO Chair Coordinator, EPFL (Switzerland)

Advisory and Scientific Committee

- Susan Amrose, University of California Berkeley (United States)
- Bipasha Baruah, Western University (Canada)
- Jean-Claude Bolay, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- Jennifer Brant, Innovation Insights (Switzerland)
- Grégoire Castella, Antenna Technologies Foundation (Switzerland)
- Marina Cracco, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- Marija Cvetinovic, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- Kate Michi Ettinger, Mural Institute (United States)
- Holger Frey, University of Zurich (Switzerland)
- Ashok Gadgil, University of California Berkeley (United States)
- Cristiano Giovando, Humanitarian OpenStreetMap Team (United States)
- Mini Govindan, The Energy Resources Institute (India)
- Christian Huggel, University of Zurich (Switzerland)
- Walter Karlen, ETH-Zurich (Switzerland)
- Lena Kruckenberg, University of Leeds (United Kingdom)
- Nicholas Loubere, Australia National University (Australia)
- Temina Madon, University of Californa Berkeley (United States)
- Solomzi Makohliso, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- Shaukat Ali Mirza, Engineers Without Borders India - EWB-India (India)
- Jacobo Quintanilla, International Committee of the Red Cross (Switzerland)
- Michelle Reddy, Stanford University (United States)
- Federico Rosei, Institut National de la Recherche Scientifique (Canada)
- Klaus Schönenberger, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- Andrew Schroeder, Humanitarian UAV Network - UAViators (United States)
- Louis Vervoort, Institut National de la Recherche Scientifique (Canada)
- Jérôme Voillat, Antenna Technologies Foundation (Switzerland)
- Marco Zennaro, Abdus Salam International Centre for Theoretical Physics (Italy)

Workshop and Event Organizers

- Anne Sophie Aublet, Swiss Water Partnership (Switzerland)
- Yesim Baykal, World Intellectual Property Organization (Switzerland)
- Jennifer Brant, Innovation Insights (Switzerland)
- Barbara Bulc, Global Development Impact (Switzerland)
- Manuel Fankhauser, Innovation Forum Lausanne (Switzerland)
- Eric Gerelle, IBEX Project Services (Switzerland)
- Marathe Kaveri, Global Innovation Forum (United States)
- Joost Monks, NORRAG (Switzerland)
- Bhavani Rao, Amrita University (India)
- Pontus Westerberg, UN-Habitat (Kenya)
- Sarah White, University of California Berkeley (United States)
- Franziska Wolf, Hamburg University of Applied Sciences (Germany)

Conference Volunteer Staff Coordinator

- Paul Koblan-Huberson, Ingénieurs du Monde (Switzerland)

LAVAUX - UNESCO World Heritage Site Coordination

- Emmanuel Estoppey (Switzerland)
- Jeanne Corthay (Switzerland)

Tech4Dev 2016 Program

DAY 1 – Monday 2 May

Time	Program / Details / Key Persons	Location
09:00-10:30	**Registration opens** **Welcome Coffee**	*Level Campus* SwissTech
PLENARY 10:30-12:00	**Welcome Address** ・ Patrick Aebischer, Ecole Polytechnique Fédérale de Lausanne ・ Flavia Schlegel, UN Educational, Scientific and Cultural Organization **Keynote Address** ・ Yves Daccord, International Committee of the Red Cross **Q&A with the Speakers**	*Auditorium B* *Level Campus* SwissTech
12:00-13:30	**Buffet Lunch**	*Level Garden* SwissTech
13:30-15:00	**Poster Presentations**	
15:00-15:30	**Coffee Break**	
BREAKOUT SESSIONS 15:30-17:00	**SE01-HUM HumTech** — **From Face-to-Face to Messaging Apps: Communicating with Communities in Complex Emergencies** ・ Jacobo Quintanilla, International Committee of the Red Cross, Switzerland	*Room 1C* *Level Garden* SwissTech
	SE05-MED MedTech — **Bright Spots: Innovations for Quality, Reliability or Safety of Medical Technologies** ・ Kate Michi Ettinger, Mural Institute, United States	*Room 3B* *Level Garden* SwissTech
	SE10-ENE Energy — **Public Sector Involvement in Sustainable Energy Access in the Global South** ・ Mini Govindan, The Energy Resources Institute, India	*Room 2B* *Level Garden* SwissTech
	SE14-ICT ICT4D — **IoT4D: Potential and Open Issues in IoT for Development** ・ Marco Zennaro, Abdus Salam International Centre for Theoretical Physics, Italy	*Room 3A* *Level Garden* SwissTech
	SE20-CCI Cross-Cutting — **Paths Towards Impact: How to Evaluate Technology for Development Interventions** ・ Marina Cracco, Ecole Polytechnique Fédérale de Lausanne, Switzerland	*Room 2C* *Level Garden* SwissTech
	EV09-CCI Cross Cutting — **Attention Innovative Start-ups! Practical Advice to Grow your Business Globally** ・ Jennifer Brant, Innovation Insights, Switzerland ・ Kaveri Marathe, Global Innovation Forum, United States	*Room 3C* *Level Garden* SwissTech
SOC. 17:00-19:00	**Welcome Aperitif** *In coordination with the International Committee of the Red Cross*	*Level Campus* SwissTech

SIDE EVENT		**Serving Base of the Pyramid (BoP) Markets and Customers : From Pilot to Scale Up** *Side Event hosted by Swiss Water Partnership, Swiss Bluetec Bridge and EAWAG*	
	09:30-10:30	**EV12-CCI Cross Cutting** — **Welcome and Introduction**	*Room 1A*
	14:00-15:00	**Case Study Presentations**	*Room 1A*
	15:30-17:00	**Workshop 1: Business Innovations for Scaling Up Businesses**	*Room 1A*
	15:30-17:00	**Workshop 2: What's your Promise to your Customers? Introducing the Value Proposition Canvas**	*Room 1B* *Level Garden*

DAY 2 – Tuesday 3 May – Morning

Time		Program / Details / Key Persons	Location
08:00-09:00		**Walk-in Registration** **Welcome Coffee**	*Level Campus* SwissTech
PLENARY — 09:00-10:00		**Return of Breakout Sessions DAY 1** · Panel Feedback · Discussion moderated by Temina Madon, UC Berkeley	*Auditorium B* *Level Campus* SwissTech
10:00-10:15		**Keynote Address** · María Fernanda Espinosa, Permanent Representative of Ecuador to the United Nations in Geneva, Switzerland	
10:15-10:30		**Launch Journal of Development Engineering** · Ashok Gadgil, University of California Berkeley, United States	
10:30-11:00		**Coffee Break**	*Level Garden*
BREAKOUT SESSIONS — 11:15-12:45	**SE02-HUM HumTech**	**UAVs: Opportunities and Challenges for International Aid and Global Development** · Andrew Schroeder, Humanitarian UAV Network – UAViators, United States	*Room 3A* *Level Garden* SwissTech
	SE07-MED_a MedTech	**Medical Technology and Innovation for Sustainable Impact in Global Health** · Klaus Schönenberger, Ecole Polytechnique Fédérale de Lausanne, Switzerland	*Room 2C* *Level Garden* SwissTech
	EV04-ENE Energy	**OER-Based Capacity-Building in the Field of Climate Change and Energy** · Franziska Wolf, Hamburg University of Applied Sciences, Germany	*Room 1A* *Level Garden* SwissTech
	EV05-ICT ICT4D	**ICTs in TVSD: Promises and Challenges for Inclusive Development Reaching the Poorest Populations** · Bhavani Rao, Amrita University, India · Joost Monks, NORRAG Network for International Policies and Cooperation in Education and Training, Switzerland	*Room 3B* *Level Garden* SwissTech
	SE08-DRR DRR	**Early Warning Systems: Design and Implementation** · Holger Frey and Christian Huggel, University of Zurich, Switzerland	*Room 3C* *Level Garden* SwissTech
	SE16-HAB Habitat	**Global Engineering and Sustainable Development** · Shaukat Ali Mirza, Engineers without Borders, India	*Room 1B* *Level Garden* SwissTech
	EV12-CCI Cross-Cutting	**Open Science: From Research Transparency to Inclusive Authorship** · Sarah White, University of California Berkeley, United States	*Room 1C* *Level Garden* SwissTech
12:45-13:45		**Buffet Lunch**	*Level Garden*

DAY 2 – Tuesday 3 May – Afternoon

Time	Program / Details / Key Persons		Location
BREAKOUT SESSIONS	**14:00-15:30**	**SE03-HUM HumTech** — **Travelling Models of Innovation and Open Spaces: Beneficiary Engagement and Cross-Case Comparisons Across Contexts** · Michelle Reddy, Stanford University, United States	*Room 3C Level Garden* SwissTech
		SE07-MED_b MedTech — **Medical Technology and Innovation for Sustainable Impact in Health** · Solomzi Makohliso, Ecole Polytechnique Fédérale de Lausanne, Switzerland	*Room 2C Level Garden* SwissTech
		SE12-ENE Energy — **Renewable Energy Technologies for Developing Countries: Case Studies in Research, North-South Collaboration, and Capacity Building** · Federico Rosei and Louis Vervoort, Institut National de la Recherche Scientifique, Canada	*Room 1B Level Garden* SwissTech
		EV06-ICT ICT4D — **ICTs for Professional Education in Developing Countries** · Eric Gerelle, IBEX Project Services, Switzerland	*Room 3B Level Garden* SwissTech
		SE09-DRR DRR — **Open Geodata and Imagery for Humanitarian Mapping** · Cristiano Giovando, Humanitarian OpenStreetMap Team, United States	*Room 1A Level Garden* SwissTech
		EV08-HAB Habitat — **Using Minecraft for Community Participation in Urban Design Projects** · Pontus Westerberg, UN-Habitat, Kenya	*Room 2A Level Garden* SwissTech
		SE17-CCI Cross-Cutting — **Measuring Development Outcomes: A New Path in Development Engineering** · Temina Madon, University of California Berkeley, United States	*Room 1C Level Garden* SwissTech
		EV10-CCI Cross-Cutting — **Unleashing Scientific Entrepreneurship: How to Turn Risks into Opportunities** · Manuel Fankhauser, Innovation Forum Lausanne Switzerland	*Room 3A Level Garden* SwissTech

	Time	Program / Details / Key Persons	Location
SOCIAL	**16:15-16:45**	**Travel by bus to Lavaux, a UNESCO World Heritage Site**	*Village of Grandvaux, Lavaux*
	16:45-21:00	**Visit of the Wine Cellars** **Cocktail Reception** **Return by bus to the SwissTech Convention Centre**	

DAY 3 – Wednesday 4 May

Time	Program / Details / Key Persons		Location
08:00-09:00	**Walk-in Registration** **Welcome Coffee**		*Level Campus* SwissTech
PLENARY **09:00-10:45**	**Return of Breakout Sessions DAY 2**· Panel Feedback· Discussion moderated by Jennifer Brant, Innovation Insights		*Auditorium B* *Level Campus* SwissTech
10:45-11:00	**Keynote Address**· Barbara Bulc, Global Development, Switzerland		
11:00-11:30	**Coffee Break**		*Level Garden*
BREAKOUT SESSIONS **11:45-13:15**	SE06-MED Medical	**The New Roles and Challenges of Technology in the Fight Against Infectious Diseases**· Walter Karlen, ETH Zurich, Switzerland	*Room 1B* *Level Garden* SwissTech
	EV02-MED Medical	**Innovative Public-Private Partnerships to Scale Up Medical Technologies**· Barbara Bulc, Global Development, Switzerland	*Room 2C* *Level Garden* SwissTech
	SE11-ENE Energy	**Social Innovations for Energy Access: Organizing Sustainable Energy for All**· Lena Kruckenberg, University of Leeds, United Kingdom	*Room 3C* *Level Garden* SwissTech
	SE15-HAB Habitat	**The Contemporary City in the North-South Debate: Innovation Trajectories in Research and Practice**· Jean-Claude Bolay and Marija Cvetinovic, Ecole Polytechnique Fédérale de Lausanne, Switzerland	*Room 1A* *Level Garden* SwissTech
	SE19-CCI Cross-Cutting	**From Developing to Scaling Up Innovative Social Businesses at the Base of the Pyramid**· Grégoire Castella and Jérôme Voillat, Antenna Technologies Foundation, Switzerland	*Room 1C* *Level Garden* SwissTech
	EV11-CCI Cross-Cutting	**Efficient Public-Private Partnerships for Technology Transfer: Lessons Learned**· Yesim Baykal, World Intellectual Property Organization, Switzerland	*Room 3A* *Level Garden* SwissTech
13:15-14:15	**Buffet Lunch**		*Level Garden*
PLENARY **14:30-15:30**	**Return of Breakout Sessions DAY 3 AM**· Panel Feedback· Discussion moderated by Kate Michi Ettinger, Mural Institute		*Auditorium B* *Level Campus* SwissTech
15:30-16:15	**Best Poster Award // Wrap-up and Closing Discussion**· Silvia Hostettler, Ecole Polytechnique Fédérale de Lausanne, Switzerland		
SOCIAL **16:15-18:00**	**Farewell Aperitif (in honor of the launch of the Journal of Development Engineering)** *Event hosted by Elsevier*		*Level Campus* SwissTech

Plenary Speakers

Plenary Speakers

DAY 1– Monday 2 May 2016

Patrick Aebischer
Ecole Polytechnique Fédérale de Lausanne – EPFL

Welcome Address

Patrick Aebischer was trained as an MD (1980) and a Neuroscientist (1983) at the University of Geneva and Fribourg in Switzerland. From 1984 to 1992, he worked at Brown University (Rhode Island, USA), as an Assistant and then Associate Professor of Medical Sciences. In 1991, he became the Chairman of the Section of Artificial Organs, Biomaterials and Cellular Technology of the Division of Biology and Medicine of Brown University. In the fall of 1992, he returned to Switzerland as a Professor and Director of the Surgical Research Division and Gene Therapy Center at the Centre Hospitalier Universitaire Vaudois (CHUV) in Lausanne. In 1999, Patrick Aebischer was nominated President of the Ecole Polytechnique Fédérale de Lausanne (EPFL) by the Swiss Federal Council. He took office as President on March, 2000 and since January 2004, he is a member of the ETH-Board. His current research focuses on the development of cell and gene transfer approaches for the treatment of neurodegenerative diseases. Patrick Aebischer is a member of numerous professional societies, both in Europe and America. He is a fellow of the American Institute for Medical and Biological Engineering and a fellow of the Swiss Academy of Medicine. Patrick Aebischer is also a founder of two biotechnology companies: CytoTherapeutics (today Stem Cell Inc.) and Modex Therapeutics (today IsoTis).

DAY 1– Monday 2 May 2016

Flavia Schlegel
United Nations Educational, Scientific and Cultural Organization – UNESCO

Technology Towards 2030

Flavia Schlegel took up her duties as Assistant Director-General for the Natural Sciences on 1 October 2014. She is the holder of a Medical Doctorate and a Master's Degree in Organizational Development. Flavia Schlegel joined the Swiss Federal Office of Public Health (Bern) in September 1997, as Director of the AIDS Section. She then became Director of the Health Policy, Research and Education Division. From 2002 to 2004, Dr. Schlegel served for the Swiss State Secretariat for Education and Research as Science Counselor for the United States and Canada with the Embassy of Switzerland in Washington D.C. Dr. Schlegel returned in October 2004 to the Swiss Federal Office of Public Health taking up the position of Vice-Director, Head of the Public Health Directorate and Member of the Executive Board until September 2008 when she was appointed Director of Swissnex China and Vice-Consul General based in Shanghai (China). During her four-year period in Shanghai, Dr. Schlegel was responsible for overseeing the establishment of Swissnex in China; a transdisciplinary institute for Science, Technology, Innovation and Culture.

Plenary Speakers

DAY 1– Monday 2 May

Yves Daccord
International Committee of the Red Cross – ICRC

Yves Daccord is Director-General of the International Committee of the Red Cross (ICRC) in Geneva, a post he has held since 2010. A former journalist, TV producer and international relations expert, his ICRC career has spanned more than two decades in a variety of posts and challenging contexts – including Israel and the Occupied Territories, Sudan, Yemen, Chechnya and Georgia. Prior to his appointment as Director-General, he held the posts of Head of Communication Division and Director of Communications. He assumed the Chair of Steering Committee for Humanitarian Response (SCHR) in January 2015. He holds a degree in political science. Born in 1964, Mr. Daccord is married with three children.

DAY 2 – Tuesday 3 May

María Fernanda Espinosa
Permanent Representative of Ecuador to the United Nations Office in Geneva

The Paradox of Technology and the Human Security Challenges

Maria Fernanda Espinosa is the Permanent Representative of Ecuador to the United Nations Office in Geneva. Prior to her appointment to Geneva, Dr. Espinosa served as Minister of National Defense of Ecuador from November 2012 to October 2014. She was Minister of Natural and Cultural Heritage of Ecuador from October 2009 to November 2012. She served as Permanent Representative of Ecuador to the United Nations in New York from 2008 to 2009. She was also Minister of Foreign Affairs, Trade and Integration of Ecuador from January 2007 to January 2008. She worked at the World Conservation Union from 2005 to 2007, including as Regional Director for South America. During her career, Dr. Espinosa has worked on numerous projects on improving environmental conservation and sustainable development, the rights of indigenous peoples, gender, migration and regional integration initiatives, among others. She has also played leadership roles in multilateral negotiations on a number of international conventions. Dr. Espinosa has a Ph.D. in environmental geography from Rutgers University; a Master's Degree in interdisciplinary social sciences from the Latin American Faculty of Social Sciences in Quito; and a Bachelor of Arts in applied linguistics from the Catholic University of Ecuador, Quito. She has published more than 30 articles and co-authored five books on geopolitics and the environment, indigenous rights and international cooperation for the environment, among others, and has taught courses in universities in Ecuador, Cuba, Chile, and the United States.

Plenary Speakers

DAY 2 – Tuesday 3 May

Ashok Gadgil
University of California Berkeley

Launch Journal of Development Engineering

Ashok Gadgil is the Director of the Environmental Energy Technologies Division at LBNL and Professor of Civil and Environmental Engineering at UCB. Dr. Gadgil holds a Ph.D. in Physics from UCB and an M.Sc. in Physics from IIT/Kanpur. He has won numerous awards and honors for his inventions, including the Heinz Award for the Environment (2009), "Sustainability Pioneer Award" from SAG/SAM of Zurich (2010), The European Inventor Award, and the NCIIA Lifetime Award for teaching innovation (both 2011), and the Zayed Future Energy Prize, and the Lemelson-MIT Global Innovation Award (both 2012). He specializes in heat transfer, fluid dynamics, and design for development. He also has substantial experience in technical, economic, and policy research on energy efficiency and its implementation – particularly in developing countries. He has several inventions in the realm of sustainable development, including the Berkeley-Darfur Stove (which is being deployed in Darfur by the nonprofit Potential Energy) and "UV Waterworks," a technology to inexpensively disinfect drinking water in the developing countries.

DAY 3 – Wednesday 4 May

Barbara Bulc
Global Development – Advising the Leaders

Unlocking the Potential of Creative Collaborations for Global Impact

Barbara Bulc is President and Founder of Global Development – Advising the Leaders based in Geneva, Switzerland. She has been a driving force in catalyzing and developing transformational global public-private partnerships to improve people's lives in developing and emerging economies. She has over 20 years of leadership and advisory experience in international development. She is a founding member of a pan-African organization, Friends of the Global Fund, Africa and a member of the United Nations' Innovation Working Group, a group that drives innovation and change in support of the UN Secretary General's transformational Every Woman Every Child movement. Prior, Ms. Bulc was Senior Advisor and a founding management team member at the President Bill Clinton Foundation in New York, where she focused on developing transformative, scalable, and sustainable partnerships with governments, industry, and financing institutions. She established and led Ambassador Richard Holbrooke's European office of Global Business Coalition in Geneva, mobilizing the power of business communities and Fortune 500 corporations in the global fight against poverty. In this role, Ms. Bulc served as a representative of the private sector on various international boards, including the Global Fund. Ms. Bulc was the CEO of KRKA Pharmaceuticals in New York, one of the leading European pharmaceutical companies and has worked in various positions with Novartis, Knoll, and BASF in various countries. Ms. Bulc holds graduate degrees in chemistry and management from Ljubljana University in Slovenia and Columbia University Business School in New York.

Social & Networking Functions

Welcome Aperitif

DAY 1 – Monday 2 May – 17:00-19:00
SwissTech Convention Centre | Level Campus

ICRC

All conference participants are cordially invited to attend the Welcome Aperitif, organized in coordination with the International Committee of the Red Cross.

Farewell Aperitif

DAY 3 – Wednesday 4 May – 16:15-18:00
SwissTech Convention Centre | Level Campus

ELSEVIER

Elsevier invites all conference participants to attend the Farewell Aperitif in honor of the launch of the Journal of Development Engineering at Tech4Dev 2016.

Lavaux Vineyards – UNESCO World Heritage Site
DAY 2 – Tuesday 3 May – 16:15-21:00

Lavaux is located in the Canton of Vaud, in the heart of French-speaking Switzerland. The Lavaux Vineyards have been part of the UNESCO World Heritage Program since 2007. The vineyard terraces of 830 hectares cover the vertiginous shores of Lac Leman between Montreux and Lausanne and offer one of the most beautiful panoramas in the world. They comprise 400 kilometers of walls and 10,000 terraces spread over 40 levels. This cultural landscape, worked since the 11th century, constitutes Switzerland's largest vineyards and encompasses 14 well-preserved villages. The Lavaux Vineyards mainly produce Chasselas wines, which are fruity and dry with subtle aromas. We hope that you will be able to join us to experience the splendor of the region!

Important Logistical Information!

Departure from the SwissTech Convention Centre (EPFL) to Grandvaux

- For conference participants who are attending an afternoon session on Tuesday 3 May, please remain with your session group. At the end of the session, conference staff dressed in red T-shirts will guide you to the busses **departing at 16:15 precisely** in front of the SwissTech Convention Centre.
- Once in Grandvaux, each participant will receive a glass and a map of the village indicating the wine cellars that will be visited.
- The pre-constituted groups will then walk to the first cellar, guided by their conference staff. Here they will receive a brief explanation from the wine grower and the wine tasting can begin!
- After this first visit, participants are free to move between the cellars in the village using the map they have received to guide them.
- At 18:30, everyone should return to the village square where the official cocktail reception will begin.

Return to the SwissTech Convention Centre after the Cocktail Reception

- At the end of the evening, conference staff will guide attendees to the busses **departing at 21:00 precisely** (journey time approx. 30 minutes).

Accompanying Guests

- Accompanying guests (non-registered conference participants) are welcome to join us for the cocktail reception at an additional cost of CHF 70.-/person payable in cash at the Registration Desk.
- Please make sure to register your guest at the Registration Desk in the morning on Monday 2 or Tuesday 3 May. Your guest will receive a badge that will need to be worn at all times.
- Guests will need to join your session group at 15:30 on Tuesday 3 May to board the bus **departing at 16:15 precisely** in front of the SwissTech Convention Centre.

Attire

- To add color to the event, attendees are encouraged to wear their national dress.
- We also recommend that you bring a light waterproof coat in case of rain and a warm sweater if you are susceptible to chilly evenings …!
- And for the ladies, no high-heeled shoes please as the village roads are of cobblestones and the Lavaux vineyards are steep.

Exhibitors

Exhibitors at Tech4Dev 2016

❖ **Cooperation & Development Center – CODEV**

CODEV promotes innovative technologies to support social, environmental, and economic development in the Global South. More information @ http://cooperation.epfl.ch

❖ **EssentialTech Program**

The EssentialTech program of CODEV aims to develop technologies that have the potential to reduce poverty. Its approach combines technology development with the elaboration of appropriate and innovative deployment models for a sustainable scalable impact. More information @ http://cooperation.epfl.ch/essentialtech-en

❖ **Ingénieurs du Monde**

Ingénieurs du Monde (IdM) is an association of students from both the Ecole Polytechnique Fédérale de Lausanne (EPFL) and the University of Lausanne (UNIL). Its members are future engineers, interested in development-related issues and committed to North-South cooperation. Offering engineering internships in developing countries, IdM is thus in contact with NGOs worldwide. It awards scholarships and partly finances selected projects. On the EPFL campus, its members organize coffee-debates, conferences, and presentations of the internships carried out with IdM's support. More information @ http://idm.epfl.ch

❖ **Journal of Development Engineering – Elsevier**

Development Engineering (DevEng) is an open access, interdisciplinary journal applying engineering and economic research to the problems of poverty. More information @ http://www.journals.elsevier.com/development-engineering

❖ **Impact Hub**

Part innovation lab, part business incubator, and part community center, Impact Hub offers its members a unique ecosystem of resources, inspiration, and collaboration opportunities to grow the positive impact of their work. Joining our diverse community of members and collaborators will inspire, connect, and enable you to develop your best work every step of the way. More information @ http://www.impacthub.net

❖ **Swiss Fresh Water – SFW**

The SFW system aims at serving populations living under water-stress and is designed both for private and community applications. More information @ http://www.swissfreshwater.com

❖ **THE Port Association**

THE Port Association fosters need driven technological innovation in the humanitarian field. It brings together creative minds from CERN, UN, ICRC, NGOs, Academia, and the Private Sector in interdisciplinary teams to work on humanitarian, technology related topics beneficial to society. More information @ http://theport.ch

❖ **UBS Optimus Foundation – Solar Suitcase**

UBS Optimus Foundation is a grant partner of We Care Solar since 2011. The Solar Suitcase developed, manufactured and distributed by We Care Solar can help overcome preventable maternal and newborn deaths in rural areas where lack of reliable electricity forces women to deliver in darkness and absence of trained medical care. The Solar Suitcase can also be used for disaster relief in the wake of natural disasters. More information @ https://wecaresolar.org

❖ **UN-Habitat – Block by Block**

All conference participants are cordially invited to visit us in **Room 2A (Level Garden)** during the breaks for a Minecraft Participatory Experience where they can explore Minecraft models, test the building process and contribute critical thoughts ... ! Block by Block is a partnership between UN-Habitat and Mojang, the makers of Minecraft that involves young people in the planning of urban public spaces. More information @ http://blockbyblock.org

Side Event SWP-SBB-EAWAG

Swiss Water Partnership - Swiss Bluetec Bridge - EAWAG

DAY 1 – Monday 2 May

[EV12-CCI] Serving Base of the Pyramid Markets and Customers: From Pilot to Scale

Side Event hosted by Swiss Water Partnership, Swiss Bluetec Bridge, and Swiss Federal Institute of Aquatic Science (EAWAG)

When	➢ Monday 2 May 2016
Location	➢ EPFL, SwissTech Convention Centre Room 1A and B, Level Garden

Co-conveners
➢ **Swiss Water Partnership** The Swiss Water Partnership is a multi-stakeholder platform bringing Swiss organizations from the academic, civil society, public and private sectors together to find innovative solutions for water security.
➢ **Swiss Bluetec Bridge** The Swiss Bluetec Bridge provides financial and technical support to Swiss start-ups and SMEs to adapt their innovative technologies and/or business models to the specific needs of under- or unserved customers in developing and emerging countries. It is funded by the Swiss Agency for Development and Cooperation (SDC).
➢ **EAWAG: Swiss Federal Institute of Aquatic Science, Business Innovation Group** In general, Eawag is concerned with concepts and technologies for dealing sustainably with water bodies and with water as a resource. The research group on business innovations explores how organization can tap into the base-of-the-pyramid markets. We invest how organization can design promising business models and how these business models need to be reconfigured in the scaling process.

Base-of-the-Pyramid (BoP) strategies have become increasingly popular among private companies, social businesses, and even non-profit organizations in recent years. BoP refers to the approximately 3.3 billion people living in extreme poverty, subsistence, and low-income segments, whose daily income ranges from 3 to 12 USD. As market-based solutions to alleviate poverty, BoP strategies consider the BoP population as consumers, who have unmet needs, and not as beneficiaries of aid programs. BoP strategies focus on charging for goods, which changes the awareness from getting something for "free" to paying for something "valuable." When BoP consumers can afford something themselves, they become more self-confident.

Few companies have so far addressed the opportunities in designing and delivering goods and services to BoP customers. However, this might change in the near future: interest for these customers is growing, on the one hand, because of its purchasing power as a group, and on the other driven by the new demanding Sustainable Development Goals.

Reasons why you should attend this side even event:

- **Get to know the specificities of the BoP market**: for some criteria, BoP markets are surprisingly similar to affluent markets – for example product desirability – but different for others – for example willingness to pay for (affordable) services.

- **Discuss the roles of private and public sector in service delivery**: public entities have a key role to play in supporting private companies to deliver services, through framework conditions that are conducive and active support measures (awareness raising, demand creation, education).

- **Discover innovative business solutions for BoP markets**: relevant business experiences from around the world will be showcased, highlighting opportunities and challenges for business solutions for BoP markets and customers. Also best practices for market entry, piloting and scale-up will be scaled-up.

- **Exchange cross-sector insights and network:** There will be participants and showcases from the agriculture, energy, sanitation, and water sectors, representing start-ups, SMEs, social entrepreneurs, the finance, and non-profit world. This means a unique chance for you to talk, learn from others, share insights, look for partners, and meet people who face similar challenges.

Join this interactive session on the essential characteristics of BoP markets and customers and how your organization can succeed in such a context.

[EV12-CCI] Serving BoP Markets and Customers

PROGRAM – DAY 1 – Monday 2 May 2016

Time	What	Topics	Speakers	Location
08:00-09:00	**Tech4Dev Conference Registration** **Welcome Coffee**			*Hall* *Level Campus* SwissTech
09:30-10:30	**Welcome & Introduction**	Welcome Decoding the DNA of BoP Markets The Role of Public and Private Sectors for Service Delivery in the Framework of the SDGs Addressing BoP Markets: Key Issues Map	Thomas Zeller, Swiss Water Partnership Heiko Gebauer, EAWAG Markus Bürli, Swiss Agency for Development and Cooperation Violette Rupanner, Strategos/ Swiss Bluetec Bridge	*Room 1A* *Level Garden* SwissTech
10:30-12:00	**Tech4Dev Official Conference Opening** • Patrick Aebischer, Ecole Polytechnique Fédérale de Lausanne • Flavia Schlegel, United Nations Educational, Scientific and Cultural Organization **Keynote Address** • Yves Daccord, International Committee of the Red Cross **Q&A with the Speakers**			*Auditorium B* *Level Campus* SwissTech
12:00-14:00	**Buffet Lunch**			*Level Garden* SwissTech
14:00-15:00	**Case Study Presentations** *[see abstracts]*	Innovative Off Grid Water and Energy Hub: Everybody Profits, Sustainably Creating Income with a Solar Pump Scaling-up Safe Water: Overcoming the Pioneering Gap Meeting the Basic Needs of the Urban BoP Customers Financing Water and Sanitation in Developing Countries	Lars Willi, weconnex Karin Jeanneret Wezzini, ennos Urs Heierli, Antenna Technologies Foundation Jessica Altenburger, x-runner venture Gaëlle Bonnieux, responsAbility	*Room 1A* *Level Garden* SwissTech
15:00-15:30	**Coffee Break**			*Level Garden* SwissTech
15:30-17:00	**Workshop 1**	Business Innovations for Scaling-up Businesses	Caroline Saul, EAWAG [Moderator]	*Room 1A* *Level Garden* SwissTech
	Workshop 2	What's your Promise to your Customers? Introducing the Value Proposition Canvas	Violette Rupanner, Strategos/ Swiss Bluetec Bridge [Moderator]	*Room 1B* *Level Garden* SwissTech
17:00-19:00	**Welcome Aperitif**			*Hall* *Level Campus* SwissTech

[EV12-CCI] Serving BoP Markets and Customers

PROGRAM – DAY 1 – Monday 2 May 2016

ABSTRACTS OF CASE STUDY PRESENTATIONS

14:00-15:00	**Innovative Off Grid Water and Energy Hub: Everybody Profits, Sustainably** Lars Willi, weconnex, lars.willi@weconnex.org	*Room 1A* *Level Garden* SwissTech

WECONNEX wants to proof, that an innovative, entrepreneurial and sustainable approach for decentralized infrastructure development can be a valid alternative to government projects or non-governmental activities. Everybody profits, sustainably. We have started our activities with 6 Watershops in August 2014 in Nepal and Madagascar. Together with our partners NEXUS Technology P. Ltd. Nepal, and WWF Madagascar, we manage these shops and plan to implement up to 100 NEXUS Centers in Southern Nepal and around 50 NEXUS Centers in Madagascar. In early 2016 we will take the next 9 NEXUS Centers in Nepal and Madagascar in operation. More countries in Asia and Africa shall follow soon.

A NEXUS Center is an "off grid" water & energy hub, with a drinking water treatment system and solar power center at its core in remote rural villages, hospitals and schools. Due to a wide range of possible additional revenue generation possibilities beyond safe drinking water and electricity, the NEXUS Center is a true "one-stop" retail and infrastructure facility that aggregates community members, helps to promote local development and creates employment opportunities

Creating Income with a Solar Pump
Karin Jeanneret Wezzini, ennos, karin.jeanneret@ennos.ch

The sunlight pump is a portable, solar-powered water pump for smallholder irrigation and drinking water supply in developing countries. It was developed at the Institute for Energy and Mobility Research at Bern University of Applied Sciences (BFH) in Biel, Switzerland. During the past few years and in the course of an iterative, human-centered design process, the technology was refined and is now market-ready. The sunlight pump is manufactured in India and distributed by the Swiss company ennos gmbh, a spin-off of BFH. The vision of ennos is to supply a high quality product and make it accessible and affordable for BoP clients. ennos is currently trying to grow beyond the initial blueprint phase during which it has executed successful field tests, refined the technology and elaborated a business plan. One of the major challenges that ennos is facing at this point, is to find applications for this technology that are feasible and profitable. The key task is to find attractive value propositions that are scalable and to answer one important question: how can the costumer make money by using the sunlight pump? During its presentation, ennos would like to elaborate how it wants to address these challenges and how it plans to go to scale by entering into strategic joint ventures.

Scaling-up Safe Water: Overcoming the Pioneering Gap
Urs Heierli, Antenna Technologies Foundation, uheierli@antenna.ch

Scaling up safe water at scale needs viable enterprises that can grow. Such business models lead to job creation and have an impact on health, time saving and economic growth in the country. But being profitable is the pre-condition for scale (losing money undermines any effort to scaling sustainably). The last years have shown some promising examples of social enterprises in safe water and sanitation, but almost all are still trapped in the so-called pioneering gap (in terms of the terminology "Beyond the Pioneers"), and are still confronted to daily challenges of scaling barriers at the enterprise level (from firm to value chain), cumulated with little support from the public sector (Public good and government).

Marketing safe water at the base of the pyramid is therefore a challenging task from a business perspective, but promising and ready to scale-up examples exist. This case study will overlook at 3 transversal themes and provide insight of the barriers for providing a sustainable long-term access to safe water to the most vulnerable population: 1) the **profitability** of social enterprises, 2) their **aspirational sales and marketing strategy** and 3) the conducive framework conditions of the government (smart subsidies).

[EV12-CCI] Serving BoP Markets and Customers

PROGRAM – DAY 1 – Monday 2 May 2016

ABSTRACTS OF CASE STUDY PRESENTATIONS (Cont.)

14:00-15:00	**Meeting the Basic Needs of the Urban BoP Customers** Jessica Altenburger, x-runner venture, j.altenburger@xrunner-venture.com X-runner is a social enterprise providing a sustainable sanitation system to low-income families in urban Peru. Lima, Peru's capital has been struggling with a growing water shortage and extending its water-based sewer network to reach all families with sanitation has become a dubious and short-sighted approach. Therefore, x-runner provides a waterless toilet for families that do not have access to a safe toilet facility nor public infrastructure. The x-runner toilet is linked with a weekly feces pick-up service and an ecological treatment process by composting the waste. As an initially unknown company in Lima, marketing such a novel service and product to families with limited spending capacities proved to be difficult in the first years of x-runner's operations. The challenge to win the trust of their customers led the young team on an interesting journey to build a deep understanding of the investment behaviors and decision making of their customers. Their research and trial and error approach has proven many of their initial assumptions based on literature to be wrong, it helped identifying a key driver in their customers spending behavior, and it highlighted the fine line among cultures of various socioeconomic groups.	*Room 1A* *Level Garden* SwissTech

Financing Water and Sanitation in Developing Countries
Gaëlle Bonnieux, responsAbility Investments
AG, gaelle.bonnieux@responsAbility.com

Access to clean water saves lives. One way to provide this is via oxo-biodegradable water sachets, as demonstrated by one Burkina Faso-based responsAbility investee. The company manufactures and sells over 100 million drinks per year at affordable prices and is now aiming to increase its outreach and expand into other West African countries.

By installing portable toilets at construction sites and large events, another responsAbility investee is addressing the lack of proper sanitation in India. The fact that people with low incomes are prepared to spend money on clean sanitation facilities forms the basis for its successful business model. The company now plans to expand its offering geographically as well as targeting new customer groups such as schools and providing public toilets for people living in slums.

In both cases, access to financing is a prerequisite for the companies' growth. This financing is provided by investment vehicles managed by responsAbility Investments, one of the world's leading asset managers in the field of development investments. Through their inclusive business models, the financed companies help to meet the basic needs of broad sections of the population and to drive economic development – leading to greater prosperity in the long term.

Breakout Sessions

Sessions-at-a-Glance

Sessions-at-a-Glance (Cont.)

Breakout Sessions
DAY 1 – Monday 2 May

[SE01-HUM] From Face-to-Face to Messaging Apps: Communicating with Communities in Complex Emergencies

DAY 1 – Monday 2 May – 15:30-17:00
SwissTech | Room 1C | Level Garden

Moderator

Jacobo Quintanilla
International Committee of the Red Cross, Switzerland
jquintanilla@icrc.org

Jacobo Quintanilla is ICRC's Community Engagement Advisor. He has been working at the intersection of media, communications, and technology in the humanitarian sector for the last 10 years in more than 20 countries with a passion for communication as form of aid in its own right. He is 2012 PopTech Social Innovation Fellow and serves as Technical Reviewer for the Humanitarian Innovation Fund (HIF) and in the judging panel on Best Use of Mobile in Humanitarian Situations for the GSMA Global Mobile Awards.

Summary

Today, with more mobiles phones than people in the world, how are local communities having a say in the relief of their own countries? How are humanitarian organizations currently engaging with, and being held to account by, communities? And, very critically, can technology create a false sense of engagement and accountability? Eighteen months of research on the Philippines post-cyclone Haiyan relief efforts seems to suggest so as aid agencies failed to make substantive corrections based on people's feedback.

Complex emergencies, however, from Yemen to Ukraine to the Central African Republic, raise specific challenges: insecurity and limited physical access, restoring disrupted energy and telecommunications infrastructure, communities' limited access and skills to use technologies, data protection, and the ever-presence of rumors, misinformation, and propaganda are the norm.

Delivering assistance and assessing its reach and effectiveness is increasingly becoming more challenging for humanitarian organizations. Collecting data and engaging with communities can also make local populations and aid agencies susceptible to digital surveillance and data breaches. How can the humanitarian sector be better prepared to "Do No (digital) Harm"? And looking ahead, how is the global communications landscape going to change over the next five years and where does that leave the aid world?

This panel will discuss these and other critical issues, and will highlight concrete initiatives, obstacles and (missed) opportunities for partnerships in the 21st century.

Panelists

- **Katie Drew**, Emergency Lab Manager, UNHCR Innovation (@KatieDrew2000)
- **Amy Rhoades**, Community Engagement Programme Manager, IOM (@iomcwc)
- **Rahel Dette**, Research Associate, Global Public Policy Institute (GPPi) (@raheldette)
- **Jonathan Corpus Ong**, Lecturer in Media & Communication, University of Leicester (@jonathan_c_ong)
- **Jennie Phillips**, Doctoral Fellow with the Citizen Lab, University of Toronto (@drchangelove)

Send @jqg your questions for the panel and follow the conversation on Twitter using #T4D2016 and #commisaid

Abstracts

Ethics, Innovation and Information Ecosystems

Katie Drew[1]
[1]UNHCR Innovation, Switzerland

Email address: drew@unhcr.org

Biography: Katie is the Emergency Lab Manager with UNHCR Innovation - with a specific focus on Communication with Communities (CwC). Katie has worked to strengthen CwC across a range of complex contexts for over six years – working previously with Save the Children in Somalia, Myanmar, Ukraine and the Syria response and with the Communicating with Disaster Affected Communities (CDAC) Network in South Sudan, Jordan and West Africa (for the Ebola Crisis). Prior to working within the humanitarian sphere Katie worked with print and broadcast media in West Africa, she holds a Master's Degree in Critical Media and Cultural studies, and an undergraduate degree in Film Making.

Abstract

For the United Nations High Commissioner for Refugees (UNHCR), Communicating with Communities and Protection are inextricably linked. Populations of concern should be agents of their own recovery - and improved dialogue with these communities ensures they have a better sense of connectedness and dignity and the ability to hold UNHCR to account. If they have access to the information they need through the most appropriate and trusted channels they can make informed decisions to protect themselves and each other. However, complex operating environments - including contexts with live conflict - raise specific challenges for communicating with communities.

UNHCR operates in such highly politicized and militarized environments; situations with grave violations of human rights and IHL, misinformation, rumor and inherent mistrust. Ensuring protection, transparency and accountability in these situations is paramount.

Communicating with Communities - including the adoption, or not, of technologies - therefore requires a deep understanding of local dynamics and social structures. Solutions to improve information sharing, provide a platform for the 'voiceless', to manage complaints and counter rumor must be grounded in these realities.

In 2014, over 42,000 people were displaced every day; and the number of people displaced by war increased by 13% from 2013. Ensuring that mobile populations have equitable and non-discriminatory access to protection and assistance programme and have a say in decisions that affect their lives is key.

In such contexts, how do we ensure that the voices of communities – including the most marginalized and vulnerable – are identified and amplified through consultation and dialogue? How can we best identify and build upon local capacities and technologies, to ensure that existing information and communication channels are complemented? Against such volatile backdrops can we support existing and forge new partnerships to improve the effectiveness of communications with communities?

UNHCR Innovation - through creation of the Emergency Lab is working with refugees, colleagues in the field and partners to identify solutions to these complex set of challenges. The Emergency Lab has a specific focus on Communicating with Communities and provides a platform for innovators within and outside UNHCR to test and prototype 'people-centered' solutions to common challenges. Recognizing the need to share learning across the humanitarian sector, and wider, UNHCR will draw on recent examples and experience from Emergency Operations in complex contexts including Europe, Ukraine, Iraq and Yemen.

Complex Emergencies 2.0: Dumb Phones, Smart People, and the Art of Humanitarian Communications

Amy Rhoades[1]
[1]International Organization for Migration, Switzerland

Email address: arhoades@iom.int

Biography: Amy Rhoades is the Community Engagement Programme Manager for the International Organization for Migration. She has over eight years of experience in communications and education programming with particular focus on two-way communications in crisis contexts, most recently based in Haiti, Dominican Republic, and the Philippines. She has worked previously with the International Labor Organization, Inter-American Development Bank, and as a documentary producer for Aljazeera. She holds a MA in International Law and Human Rights from Universidad para La Paz in Costa Rica.

Abstract

An arc of instability from Afghanistan through the Middle East to West Africa is leading to unprecedented displacement and forced migration with a staggering 87.6 million people in need of humanitarian assistance. This global crisis of epic dimensions is straining the humanitarian system to a breaking point. Despite the huge need, OCHA's recent appeal for 20.1 billion USD is 80% underfunded and that is unlikely to change. One common thread that connects the communities affected by the many intractable, complex emergencies that beset the world today is mobile technology, whether 'dumb' feature phones or new generation smartphones. They are tapping

into the social networks that enable them to stay connected to one another in every phase of the crisis. An increasingly urgent question is whether technology can do more than is currently being asked of it by enabling people in crises to be better informed and empowered to respond to needs locally in complex emergencies rather than waiting for international aid that realistically may never come.

The rapid and increasing exposure of crisis-affected populations to communications tools has profound implications for humanitarian contexts:

- It puts the power of the internet at the fingertips of people on the move, allowing them to problem solve even in complex emergencies with news, maps, money transfer and other tools.
- Crisis-affected people now have access to networks – from diaspora to smugglers – that were previously unavailable to them.
- It brings more and instant scrutiny to the work of humanitarian actors, accountability by the back door in effect.

This paper explores how the humanitarian community can work collaboratively to harness these new realities brought about by the rapid spread of mobile technology to better protect and support the most vulnerable while empowering them to find the most appropriate solutions, thereby easing some of the strain on the humanitarian system.

Challenges for Humanitarian Technologies in Insecure Environments

Rahel Dette, Julia Steets, Elias Sagmeister[1]
[1]Global Public Policy Institute (GPPi), Germany

Email address: rdette@gppi.net

Abstract

In humanitarian emergencies, tools like mobile phones and web-based platforms can offer great improvements for remote data collection and communication with communities, especially where aid access is restricted due to high levels of insecurity. But technologies also carry biases, can complicate crisis dynamics and make aid actors and recipients susceptible to digital interception and surveillance. Limitations and shortcomings have given rise to two types of concerns: First, improper or inadequate implementation can lead to problems or high expenses, for instance where long-term costs and maintenance are overlooked or technologies do not fit context conditions. Second, even seemingly successful innovations that are well received by stakeholders can create implicit harm. Technical vulnerabilities that aid actors are unprepared for can incur data breaches and compromise, but as of yet standards and good practices to prevent potential damage are not keeping up with the rapid speed of technology implementations. This paper examines some of that challenges arising from technology uses in humanitarian settings and explores mitigation measures aid organizations have started to develop or can apply from other sectors. The work is grounded in findings of a three-year research project on monitoring and evaluation (M&E) of aid in Afghanistan, Somalia, South Sudan, and Syria. It seeks to contribute to a growing field of responsible data and information management practices for technology-enabled humanitarian action.

Appealing to Agencies in Only 140 Characters? Towards More Compassionate Communication Architectures in Community Engagement

Jonathan Corpus Ong[1]
[1]University of Leicester, United Kingdom

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Abstract

International humanitarian agencies invested more into being "accountable to affected people" (AAP) in the Typhoon Haiyan response than in any other emergency. Innovations include inter-agency working groups, the early deployment of an accountability coordinator (Wigley 2015), and collective "common service" efforts in accountability practice (Jacobs 2015). Crucially, agencies set up a suite of feedback mechanisms for local people to communicate their concerns, including SMS hotlines which automatically registered feedback on computerized databases. But in spite of this high investment in "humanitarian technologies" to improve disaster response, our analysis suggests that actual achievements have been modest, as agencies actually failed to make substantive corrections to their interventions and strategically develop new programs based on community feedback,

particularly those gathered via SMS. Drawing from four months of research with humanitarian agencies and affected communities in four areas affected by Haiyan, funded by the UK's DFID (http://plan-international.org/about-plan/how-we-work/effectiveness/accountability-to-affected-people-in-the-haiyan-response), this paper critically reflects on opportunities and obstacles in using technologies for humanitarian accountability. It draws attention to the distorting effects of technologies, as the kind of feedback they elicit become decontextualized and de-emotionalized, and also leaving out non-users of technologies who are often the most marginalized in the community. At the same time, it identifies how digital feedback collection speeds up organizational processes around verification, thus facilitating opportunities to implement "tweaks" to agency interventions. This paper identifies organizational and cultural obstacles to this technologization of accountability in humanitarian agencies, where local accountability officers nevertheless reported that they felt like they "were the office at the far end of the hall" in spite of increased donor funding and organizational support extended to them following Typhoon Haiyan.

At the same time, this paper explores case studies in which effective cultures of listening developed both within agencies and between agencies and disaster-affected communities. These include best practices in: 1) organizational leadership and support in World Vision, 2) culturally sensitive community engagement by Tzu Chi Foundation, and 3) the immersion of agency workers in particular communities by diverse agencies. This paper ultimately argues that compassion must be central to the communication architecture of the humanitarian sector in its vision to build meaningful relationships with the vulnerable communities that it serves. While this recent "technology fetish" in accountability may improve efficiencies, it might come at the expense of truly compassionate community engagement.

Guidance for Developing a Local Digital Response Network (DRN)

Jennie Phillips[1], Andrej Verity[2]
[1]University of Toronto, Canada
[2]UN Office for the Coordination of Humanitarian Affairs, Switzerland

Email address: jenniep@gmail.com and andrejverity@gmail.com

Biography: Jennie Phillips is a PhD student at the University of Toronto at the Ontario Institute for Studies in Education (OISE) and Munk School of Global Affairs. Her research involves studying online engagement of civil society, specifically Volunteer Technical Communities (VTCs), in crisis situations and identifying strategies (policy, awareness, training and innovation) to bridge digital volunteerism and official emergency response efforts. Prior to her studies she has experience working in the government sector with the Privy Council Office / Prime Minister's Office and the Department of Foreign Affairs developing and delivering emergency management training programs, and private / non-profit sector as a social entrepreneur (ellips design + consulting) overseas in Swaziland and India providing Information Communications & Technology (ICT) consulting. She also holds a Master's in Education Technology from Concordia University, Montreal. She holds 5 years experience working in Emergency Management and over 9 years working in Education and ICT.

Abstract

Are you a passionate individual who wants to help harness local digitally enabled volunteers or groups in response to emergencies? Great! But, how are you going to do it? How about becoming a central figure and coordinating these groups so that any response is more than the sum of all its parts? Have you considered creating a Digital Response Network? If this describes your desire and you answered the questions positively, then this guidance is for you! Welcome to the world of digital humanitarian response.
~ the Authors

As the widespread proliferation of technology changes how communities engage and respond to crisis, new mechanisms, such as Digital Response Networks (DRNs), emerge with the potential to facilitate collaboration and situational awareness between responders and local communities. DRNs are social networks of physical responders (e.g., local government, authorities, emergency responders, communities) and digital responders i.e. Volunteer & Technical Communities (V&TCs) connected through a central hub. They are often considered a network-of-networks.

This guide will step you through creating a localized DRN by describing:

a)   the purpose and required capability of a DRN,
b)   considerations before creating a DRN,
c)   how to setup and sustain the DRN hub and larger network.

[SE05-MED] Bright Spots: Innovations for Quality, Reliability, or Safety of Medical Technologies

DAY 1 - Monday 2 May - 15:30-17:00
Swiss Tech | Room 3B | Level Garden

Session Leader

Kate Michi Ettinger
Mural Institute, United States
kate@muralinstitute.com

Kate Michi Ettinger, Senior Fellow, Center for Health Professions, UCSF, is a social innovation consultant, product designer and health care ethicist with over fifteen years of health-related experience in private, government, academic, non-profit sectors. At the catalyst at OpenQRS, Kate currently focuses on how to harness new technologies, such as sensors, wireless, mobile – to make it easy, effective and affordable to monitor data on quality, reliability and safety for medical devices deployed anywhere in the world.

Summary

Medical technologies deployed in low and middle-income countries (LMIC) often encounter a lack of clear guidelines for how to address quality, reliability, and/or safety (QRS). In this regulatory absence, innovators have stepped up to develop creative QRS solutions. This session will examine "bright spots" – promising examples of systems level innovations that address the QRS of medical technology.

The session features diverse programs from LMIC that improve QRS of medical technology. Panelists will share insights, surprises, and challenges—including failures. Our discussion will be practical as it will center on the lessons learned from implemented solutions. We will identify facilitators of success and the key stakeholders engaged in these initiatives. The session aims to enable successful replication of these promising models.

Panelists and Abstracts
(in order of presentation)

Advanced Medical Technologies Management in Limited Resources Settings Context: A 5 years' Experience from the Cardiac Centre of Shisong in Cameroon

Roberto Musi[1&3], **Emmanuel Kouemo**[2], Lionel Djankou[3]
[1]UNOPS Haiti; Cardiac Centre Shisong, Italy
[2]Cardiac Centre Shisong, Cameroon
[3]Cardiac Centre Shisong, Italy

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Biography of Presenting Author: *Emmanuel Kouemo obtained an MSc in Biomedical Engineering at Milan School of Engineering (Polytechnic) in 2011. Developed initial professional experiences in Europe, collaborating with hospitals internal Clinical Engineering units. After graduation; had several technical training with medical equipment manufacturers. He works since January 2012 in Cardiac Centre Shisong, Cameroon as Medical Equipment Engineer and Assistant Technical Coordinator. His tasks are related to the management of hospital installations (water, electrical, air treatment, waste) and more specifically medical technologies lifecycle management.*

Abstract
The Cardiac Centre Shisong (CCS) is the reference center for the cardiovascular diseases care in Central Africa. The technical /operational experience for the medical technology management capitalized in the CCS could be useful as "model of cooperation" between NGO and developing countries.

The philosophy leading the project can be described in three axes:
- Providing quality and affordable care to the populations
- Empowering local personnel
- Model of management providing that the CCS must be 100% managed by local people and possibly economically sustainable.

Materials and Methods:
The primary issues faced in the CCS were:

- The limited offer of the local market (spare part, devices, consumables)
- Huge instability of basic utilities (Electricity, Water)
- Need of skilled personnel
- Absence of reliable companies to take care of most of the medical equipment in Cameroon.

The strategies to overcome these issues have being:

- Training for the local personnel
- Helpdesk office
- Supervision on site by Europeans expert during the first years
- Collaboration with European NGO and companies for free certified technical services
- An adapted medical equipment management philosophy
- Fund raising in Europe to support the main projects.

Results and Conclusions:

- 95% of In house maintenance
- Quality and safety of equipment confirmed by certified checks
- Daily users' checks prevent 80% of medical equipment failure during use
- Trainings and collaborations of local technicians with the manufacturers permitted to reduce the maintenance cost and avoid expensive maintenance contract for 98% of our equipment
- Optimization of logistics is essential
- Strong and stable basic utilities (Energy, Water,) are a necessity.

Setup of Health Technologies Maintenance Units in Complex Settings: An Experience from Three Community Reference Hospitals in Haiti

Roberto Musi[1], Jean-Michel Bonjour[1], Ziad Hamze[1], Denis Belbes[1], Diego Maggi[1], Penel Coq[1], Tania Viala[1], Jean Francois Laurent[1]

[1]UNOPS (United Nations Office for Project Services), Haiti Office

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Abstract

This project outlines the activities and decisions undertook to implement a preventive maintenance program in complex settings. The project was financed by the Brazilian Ministry of Health. UNOPS Haiti was previously appointed by UNDP Brazil in 2011 to build and equip 3 community reference hospitals (HCR) in the capital city of Port Au Prince. The construction was completed in 2014 and the new facilities were handed over to the local Ministry of health. Following about one year of limited clinical activities and utilization, the new project was launched, in collaboration with the Haitian Ministry of Health (MSPP), with the scope to set up a roadmap for the introduction and implementation of proper health facility management policies and practices, which are essential to guarantee appropriate operations and maintenance of medical equipment and electromechanical installations and systems, together with their sustainability. While the primary objective of this project was to support the hospitals in terms of maintenance, technical support and training has been also included, in activities related to logistics, procurement of consumables, goods and services, essential for the appropriate maintenance and operation of the healthcare facilities.

At the core of the strategy of the project was a holistic vision, embracing both medical equipment and the facility installations, framed by a quality management approach adapted to the challenging local conditions. In a country where no national policy on health technologies formally exists (1), the added value brought by this project was the introduction of a novel mindset of preventive maintenance in a context where it's not generally adopted. Guided by international norms and standards, simplified procedures and processes, adapted to the local context, were produced and introduced.

The present case study describes the experience from Haiti, a limited resources country, with a local context generally characterized by gaps of capacity in terms of logistics, security and technical services availability; all aspects that deeply affect the introduction of new maintenance methodologies in the public system. A description of the background, materials and methods used to implement the project will be exposed, as well as a formal discussion of the general outcomes. Finally, the impacts that this project had along with the various challenges faced throughout the execution phase will be explained in the conclusions. Key lessons retained from this experience will equally be shared together with general recommendations for projects of this nature.

The eHATID LGU Program: A Continuing Effort in the Collaborative Challenge of Nationwide Health Informatics

Andrei Coronel[1,] Ma. Regina Estuar[1], Dennis Batangan[1], Rose Ann Camille Caliso[1], Jann Alfred Quinto[1]
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Biography of Presenting Author: Dr. Andrei D. Coronel is an Assistant Professor in the Department of Information Systems and Computer Science, Ateneo de Manila University, Philippines, teaching for more than ten years. He holds a Bachelor's degree in Biology, earned his Masters and Doctorate degree in Computer Science, from Ateneo de Manila University. His current projects reflect his research interests in the field of health informatics, environmental science, and computational music. He heads the Ateneo Computational Sound and Music Laboratory.

Abstract

The government program called eHealth TABLET for Informed Decision Making of Local Government Units [eHATID LGU] follows the success of the 2013 eTABLET Project, which aimed to leverage ICT to improve the efficiency of health care delivery across ten municipalities in the Philippines. The new program, eHATID LGU, has expanded the project to reach deployment to up to 450 cities and municipalities nationwide. The products and services of the program have expanded and serve to achieve the objectives of five new thrusts: institutional development and partnership, integration to currently existing communication channels, capacity building, systems integration, and sustainability. The program, as with its preceding pilot study, continues to work toward the actual main goal of bridging the gap across disparate manual health systems implemented in separate locations, thereby improving both health care delivery and the vertical transfer of information starting from the municipality level.

Additionality vs. Systemic Approach: ICT to support ending the Tuberculosis Epidemic in Southern Africa

David M. Garrity[1], Paula F. Lytle[2]
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[2]The World Bank, Washington, USA

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Biography of Presenting Author: David advises The World Bank Group on integrating information and communication technologies (ICT)in development projects and is an Advisory Board member at late-stage venture capital co-investment fund Pharus Capital Management, and preference analytics software-as-a-service (SaaS) software vendor TrueChoice Solutions. Prior to his corporate service as Board member & CFO at Interclick (Yahoo acquired December 2011 for US$ 270 million) and CFO & EVP Corporate Development at Aspen Group, David had an extensive career in investment research and co-founded start-up boutique American Technology Research.

Abstract

WHO recently identified tuberculosis as ranking with HIV as the leading cause of death worldwide. Furthermore, estimates are that nearly 37% of cases are undiagnosed. In southern Africa, mineworkers have the highest incidence of tuberculosis of any working population in the world; moreover, this labor force consists of a high percentage of migratory and informal workers, further complicating the diagnosis and treatment option. Based on World Bank estimates, the cost of the tuberculosis epidemic in South Africa alone in 2012 was US$ 885 million. The need to establish communication and coordination across communities spread over several countries is not only paramount, but poses a number of significant challenges requiring the development and deployment of robust technology applications. In the context of such challenges, one team working on tuberculosis surveillance and control in at least four sub-Saharan African countries (Zambia, Mozambique, Malawi and Lesotho) have identified possible ICT solutions for integrated tracking across a range of health systems functions. Solutions identified may not be domain or sector specific to health systems, and the paper will review sector-specific versus participatory design approaches.

[SE10-ENE] Public Sector Involvement in Sustainable Energy Access in the Global South

DAY 1 – Monday 2 May – 15:30-17:00
Swiss Tech | Room 2B | Level Garden

Session Leader

Mini Govindan
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Mini Govindan is a Research Fellow at the Social Transformation Division of The Energy and Resources Institute (TERI) in New Delhi, India. She earned her PhD in Development Studies in 2007 from the Institute for Social and Economic Change in Bangalore. She specializes in gender analysis and social impact assessment of water and energy policy. She has consulted extensively for the Indian Government and international organizations such as UN Women, UNDP, World Bank, DANIDA, SDC, IUCN and DFID.

Summary

The commercialization or outright privatization of water, energy, health and sanitation services was justified in much of the Global North and South by the unsatisfactory performance of state-regulated and controlled regimes.

The rationale behind such reforms was that efficiency, commercial pricing, and greater involvement by the private sector would reduce pressure on national and local government budgets and create a profitable sector, which in turn would finance necessary investments for improvements in service and access.

There is growing evidence around the world that such reform had been designed more to address macroeconomic concerns and to satisfy donor conditionalities, and with less consideration for social justice and equity issues.

In order to ensure that the technologies and infrastructures that can make the biggest differences in the lives of poor people are developed and disseminated, there is a clear need for governments to either be involved directly, or at the very least, to put incentives and subsidy structures in place that direct private investment to areas that would otherwise not be prioritized.

We are consequently witnessing a trend towards remunicipalization of basic services in some countries. Promising hybrid models (public-private and multiple-stakeholder) are also emerging in many parts of the world.

In this session, we showcase examples and case studies from developing countries and emerging economies of energy initiatives that are developed solely by the public sector, or through collaborations between public, quasi-public and non-state actors that perform roles in line with their comparative advantages.

This session should be of interest to anyone interested in energy development and dissemination strategies that generate more equitable and sustainable outcomes, including, academic and non-academic researchers, public and private enterprises in on and off-grid energy technology development and dissemination, donor agencies, development banks, labor unions, NGOs and other civil society organizations.

Panelists and Abstracts

(in alphabetical order)

Rural Electrification and Livelihood Generation for Women Enterprises in Rural India: Experience of Implementing Two-Stage Biomass Gasifiers

Sunil Dhingra[1], Barkha Tanvir[1], Ulrik Birk Henriksen[2], Pierre Jaboyedoff[3], Shirish Sinha[4], Daniel Ziegerer[4]

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[2]Technical University of Denmark (DTU), Denmark
[3]Effin Art, Switzerland
[4]Swiss Agency for Development and Cooperation (SDC), New Delhi, India

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Biography of Presenting Author: Mr. Sunil Dhingra, Masters in Mechanical Engineering, is a Senior Fellow in Energy Environment Development division of The Energy and Resources Institute. He has acquired vast expertise in the design, development and dissemination of biomass utilization and waste-to-energy systems – like design, development and dissemination of biomass gasifier systems, both for thermal and power generation (of 10 to 1 MWe capacities) for decentralized applications.

Abstract

In India, as per 2011 census, nearly 44% of rural households do not have access to electricity, and those who have access suffer from unreliable electricity supply affecting education, income generation, and access to information. For lighting one-third of households rely on kerosene, which provides poor quality lights and is damaging to health. Lack of access and reliable supply undermines the ability of the households and micro/small enterprises to move out of the vicious cycle of energy poverty. In rural India, several of these enterprises are owned and managed by women entrepreneurs and Self-help Groups (SHGs), which were established for income generating activities and empowerment of women. In 2005, Government of India initiated a large national rural electrification programme to provide electricity to all village and households. It has been recognized that grid supply may not be feasible or cost effective for every village, and hence due attention has been given to renewable based Decentralized Distributed Generation (DDG) systems such as biomass gasifiers. This paper provides insights regarding experience of developing two-stage biomass gasifier for Indian conditions through an interesting technology transfer and intellectual property rights sharing agreement and its field implementation through partnerships with the state government and community based organizations in the State of Odisha and Madhya Pradesh. This technology will provide reliable electricity to women groups owned livelihood activities, increasing the income generated by them, and electrify rural households.

Evaluation of Solar Photovoltaic Programs under Jawaharlal Nehru Solar Mission in India

Ravneet Kaur[1], Navreet Kaur[1]
[1]Panjab University, India

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Biography of Presenting Author: Ravneet Kaur finished her Master's in Public Administration in 2011 and is now pursuing a doctorate on "An Evaluation of Renewable Energy Promotion and Conservation Programs in Punjab: A Case Study of Punjab Energy Development Agency (PEDA)". Her research interest areas are policy implications related to Renewable Energy, Climate Change and Sustainable Development, etc.

Abstract

The Jawaharlal Nehru National Solar Mission (JNNSM) is an initiative taken by Government of India and State Governments through Ministry of New and Renewable Energy and State Nodal Agencies to promote environment friendly sustainable growth to address India's energy security challenge and meet the needs of approx. 1.30 billion population. The main objective of JNNSM is to generate resources for installation of Renewable energy devices and create favorable environment for the diffusion of solar energy at both Grid and Off- Grid level. The success of the mission depends on the subsidy structure, role of implementing institutions, functioning of the standardized systems and society's awareness and knowledge level. The research paper has evaluated the performance of JNNSM in India regarding dissemination of photovoltaic applications. The paper presents data and develops quantitative metrics to analyze its implementation throughout India.

Is Green Fiscal Policy as a Driver for Green Energy Economy: Empirical Evidence from Developing Countries?

Olimjon Saidmamatov[1], Bahtiyor Eshchanov[2]
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Biography of Presenting Author: Olimjon Saidmamatov is a junior researcher, interested in different aspects of green economics: investment on renewable energy, feed-in tariffs, fiscal-financial incentives, green energy policy

of developing countries. Professional experience om territorial division of JSC "Uzbekenergo" and research activity at Urgench State University which stands for developing "education-research-business" triangle for sustainable development of Uzbekistan. Foreign experiences have created opportunity for scientific relations between Institutions for learning experiences of different economies.

Abstract

Energy is fundamental to human society, social development and economic growth (WEC, 2013). Global energy demand is projected to grow by around 45 percent by 2030: more than three-quarters of the increased demand will come from developing and transition countries (IEA, 2008). The paper attempts to research the contribution of green investments to electricity generation from renewable sources. Although, RE can bring socioeconomic and environmental benefits, its implementation faces a number of obstacles, especially in non-OECD countries (Brunnschweiler, 2009) despite its socioeconomic and environmental benefits. One of these obstacles is financing: underdeveloped financial sectors are unable to efficiently channel loans to RE producers. Churchill and Saunders (1989) argues that renewable energy projects have limited access to financing because RE projects compete against fossil fuel projects, which have a longer track record, relatively lower up-front costs and often relatively favorable treatment. Brunnschweiler (2010) suggests that a more highly developed financial sector will have a positive impact on the development of the renewable energy sector. After analyzing 155 non-OECD countries, it is implied that without efficient green fiscal policy resulting to increase FDI, net flows in GDP, renewable energy is unlikely to reach its full potential in developing world.

"Construction" of a Sustainable Energy Source: The Case of Jatropha in Indian Context

Rahul Shukla[1], Sambit Mallick[1]
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Biography of Presenting Author: Rahul Shukla is pursuing PhD in Sociology at the Department of Humanities and Social Sciences, Indian Institute of Technology Guwahati, India, since July 2014. He holds a Bachelor of Engineering degree in Mechanical Engineering from Rajiv Gandhi Technical University, Bhopal, and a Master of Arts degree in Development Studies from IIT Guwahati. His research interests include the interface between science, technology and society, focusing on the implications of industrialization of agriculture in India.

Abstract

Biofuels have caught the attention of the world as a source of renewable energy which can provide energy security, advance rural development, mitigate climate change, and foster international trade. India developed the National Mission on Biodiesel (NMB) as a rural development policy option to produce biodiesel from Jatropha and promoted it as a pro-poor and pro-growth initiative. The study will attempt to examine the emergence, trajectory, and the consequences of the NMB by opting the case of a public sector research institute involvement in developing and disseminating the technologies for sustainable energy in India. The study will also locate the trajectory of an object, which has been constructed into an industrial crop from a bush of semi-arid regions. What are the epistemic practices adopted by various actors in this construction? How is such knowledge diffused from laboratory to farmland? And, where does new cultivation get (the) space? These research questions will be examined within the theoretical framework of Science and Technology Studies (STS); where social, political, economic, cultural, institutional, ideological, etc. factors will account for production of knowledge, its accessibility, and application. Sources of secondary data viz. academic journals, books, policy documents will be employed to achieve the research objectives.

[SE14-ICT] IoT4D: Potential and Open Issues in IoT for Development

DAY 1 – Monday 2 May – 15:30-17:00
Swiss Tech | Room 3A | Level Garden

Session Leader

Marco Zennaro
Abdus Salam International Centre for Theoretical Physics, Italy, mzennaro@ictp.it

Marco Zennaro is a researcher at the Abdus Salam International Centre for Theoretical Physics in Trieste, Italy, where he coordinates the Telecommunications/ICT4D Laboratory. He received his PhD from the KTH-Royal Institute of Technology, Stockholm, with a thesis on Wireless Sensors for Development. His research interest is in ICT4D, the use of ICT for Development, and in particular he investigates the use of IoT in Developing Countries. He is a Visiting Professor at Kobe Institute of Computing, Japan.

Summary

The Internet of Things (IoT) has the potential to change the world, just as the Internet did. Maybe even more so. Applications of IoT can greatly benefit populations in developing countries: food safety can be checked, water quality can be monitored, air quality can be measured, landslides can be detected and mosquitoes can be counted in cities in real time. To realize these benefits, a number of issues faced by IoT applications in developing countries have to be tackled: intermittent energy availability, low speed Internet connections, harsh environmental conditions, privacy issues for underrepresented communities. These peculiar issues require solutions that will then drive new IoT architectures. Building on existing deployments, this session will look at lessons learned from the use of IoT in developing countries. We will look at the social impact of IoT and how privacy and security issues were tackled. We will discuss the best technical solutions in terms of connectivity and energy sustainability.

Panelists and Abstracts
(in order of presentation)

Can North-made IOT Solutions Address the Challenges of Emerging Cities in the South? The Case of Korean Born Smart Transportation Card Implementation in Bogota

Maxime Audouin[1], Mohamad Razaghi[1], Matthias Finger[1]
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Biography of Presenting Author: Maxime Audouin is a PhD Candidate at the Chair MIR of the College of Management of Technology in EPFL. During a visiting semester at Sungkyunkwan University in Seoul, he studied the implementation of the Seoul Transportation Smart card from the System of Innovation perspective. In his PhD dissertation, he focuses on the regulatory challenges to tackle in order to implement Mobility-as-a- Service in Urban Systems.

Abstract

During the last ten years, the urban population of the Global South grew at a rate of 1.2 million people per week, putting the developing countries at the center of the urban development in 21st century. This rapid urbanization resulted in the emergence of serious challenges, such as provision of decent mobility, requiring innovative solutions. Currently, many northern cities use Internet of Things (IoT) solutions for answering urban challenges, but there are certain doubts about their transferability to southern cities. This paper aims to study the transferability of IoT solutions from urban north to urban south. We firstly discuss the impacts of one prominent example of IoT solutions in urban transportation sector, by presenting the ability of Seoul to manage the

complexity of its public transportation system with the introduction of a Smart Transportation card. Then, we examine the key factors that enabled Bogota to benefit from the same technology, originally designed for Seoul, for resolving the challenges they were facing in their Transportation system. This case study, we hope, sheds more light on the impact of IoT solutions for cities, which usually have origins in north, on addressing the challenges of urban south and reaching the development goals.

BBOXX SMART Solar: a Case for Scalable Off-Grid Energy Services Enabled by IoT

Iwona Bisaga[1], Nathan Holford[2], **Ashley Grealish**[2], Christopher Baker-Brian[2], Priti Parikh[1]
[1]University College London, London, United Kingdom
[2]BBOXX, London, United Kingdom

Presenting author's email address: a.grealish@bboxx.co.uk

Biography of Presenting Author: Ashley Grealish is a Senior Engineering Manager at BBOXX where he leads a team who combine the power of Internet of Things (IoT) technologies with Solar Home Systems (SHSs) into the SMART Solar platform. Previously, Ashley was an engineer at e.quinox, a student-led non-profit, where he contributed to the development of one of the first pay-as-you-go SHSs and energy kiosks. Ashley co-authored a paper outlining learnings from operating four energy kiosks throughout Rwanda, published at the 3rd Symposium for Small PV Applications. Ashley holds a Master's degree in Electronic and Electrical Engineering from Imperial College London.

Abstract

This case study intends to show how Internet of Things (IoT) technology can be used to tackle development challenges by studying the example of BBOXX and its SMART Solar platform as applied to Solar Home Systems. It aims to highlight the benefits of such technology to its users and how it can be utilised to create scalable business models through user-centric design. However, it also shows the difficulties in designing, developing and deploying appropriate technologies in an affordable and impactful way. Similar applications in the water and agricultural sectors are looked at to further explore the potential and the challenges of IoT technologies in driving social and economic development. The case study raises ethical questions about the storage, collection and sharing of data and explores whether the data protection models prevalent in the developed world are applicable in a development context. It offers ideas for future research and points to the need of including financial, socioeconomic, and ethical considerations in the processes of innovative solutions development.

Design and Deployment of a Multimedia Wireless Sensor Network for Wildlife Inventory in Western Amazon Rainforest

Luis Camacho[1], **Reynaldo Baquerizo**[1], Joel Palomino[1], Michel Zarzosa[1], Giussepe Gagliard[i2]
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Biography of Presenting Author: Luis Camacho is currently enrolled as a MSc. Candidate in Telecommunications Engineering School at San Marcos National University, Lima. He holds an Electronics Engineering BSc. from Catholic University of Peru, Lima. He is the founder of Climate Change Technology Transfer Center (CCTTC, 2012) and one of the founders of Rural Telecommunications Research Group (GTR, 1998) both at Catholic University of Peru. He has managed more than twenty large grant-funded projects related to the deployment of telecommunications infrastructure in extremely rural areas of Peru. Reynaldo Baquerizo is a software developer at the Rural Telecommunications Research Group (GTR) of Pontifical Catholic University of Peru where he also received his B.Sc. At GTR, Reynaldo focuses on how to harness new technologies for social impact. His current research interests include embedded Linux systems, unmanned aerial systems and automatic speech recognition of endangered languages.

Abstract

The use of multimedia wireless sensor networks [MWSN] has spread for many sensing applications. The energy of devices consumption has drastically reduced and new protocols for low power transmission have been developed. In this paper, a MWSN was applied for animal monitoring in the Amazon rainforest of Peru. Tapirduino, the trap camera developed, is composed by an Arduino-like SBC, a CMOS camera, IR flash, PIR sensor, a SD card and a 900 MHz XBee radio. Overcome the high attenuation of radio frequency in the middle of the jungle and reduce energy consumption until very low level, were the challenges tackled in this project. The content of this paper is divided in 4 parts: 1) an introduction to previous works of WSN for animal monitoring, 2) explanation of device design, 3) deployment in rainforest and 4) the experimental results of the implementation are shown. Additionally, future research in this line is discussed.

Challenges in the Life Cycle of Sensor Networks for Automation and Densification of Environment Monitoring in Rural Africa

Bjorn Pehrson[2,4], Robert Olsson[2,4], Serdar Temiz[2], Julianne Sansa Otim[3], Mark T. Smith[2], Amos Nungu[1], Mohsen Chogolzadeh[2], Maximus Byamukama[3], Emmanuel Kondela[1], Mary Nsabagwa[3], Terrence Brown[2], Ben Khemis[5], Richard Okou[3], Joachim Reuder[4]
[1]Dar es Salaam Institute of Technology, Tanzania
[2]KTH Royal Institute of Technology, Stockholm, Sweden
[3]Makerere University, Kampala, Uganda
[4]University of Bergen, Norway
[5]University of Juba, South Sudan

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***Biography of Presenting Author:** Bjorn Pehrson is a professor emeritus in Telecommunication Systems from KTH (1992-2011), currently also associated with the University of Bergen, previously at SICS (1985-1992) and Uppsala University (1969-1985). He has his PhD in Automatic Control from Uppsala University (1975). He has since the turn of the millennium focused on challenges in the establishment of academic networks, rural broadband networks and sensor networks in Africa, together with his students.*

Abstract

Based on the authors' experience from earlier deployment of broadband and wireless sensor networks in rural Africa, we discuss challenges during the life cycle of such systems with the purpose to automate and densify sensor networks for environment monitoring. The ongoing work is being done in WIMEA-ICT, a NORAD-funded project 2013-2018, aiming at capacity building at some East African Universities in the areas of ICT-supported Applied Meteorology and Climate Change research and education. Among the deliverables from this project is the deployment of some 70 observation stations reporting synoptic weather and agricultural parameters in South Sudan, Tanzania and Uganda. A first generation prototype was deployed for field tests in Bergen in the beginning of 2015. Design documents and preliminary reports are available on the web at http://wimea-ict.gfi.uib.no. A second generation prototype will be deployed in Dar es Salaam, Kampala and Juba in the beginning of January 2016 and benchmarked with WMO-approved stations run by the meteorological agencies in South Sudan, Tanzania and Uganda. The 70 stations are expected to be deployed early 2017 to be evaluated and providing the basis for a number of PhD thesis to be presented in 2018. The rest of the paper is organized to discuss challenges in the different phases of the life cycle of the observation stations.

[SE20-CCI] Paths Towards Impact: How to Evaluate Technology for Development Interventions

DAY 1 – Monday 2 May – 15:30-17:00
Swiss Tech | Room 2C | Level Garden

Session Leader

Marina Cracco
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Marina Cracco is a sustainable development professional with experience working on project and program evaluations, biodiversity, climate change adaptation, environmental and social safeguards, gender and protected areas. She has over 17 years of experience in regional, non-governmental organizations and multilateral development funds. Prior to joining CODEV as the Education Program Coordinator, she was task-managing the First Phase of the Adaptation Fund Evaluation, and the Cuba Country Portfolio Evaluation and the Peru Impact Study for the GEF Independent Evaluation Office.

Summary

Technology for development interventions must achieve a double set of impacts; those related to the innovation or technology, such as effective performance, uptake (which includes social acceptance and access) and sustainability in particular and those concerning development and social and environmental impacts brought by the technology solution in general. Evaluating these impacts could be challenging depending on the technology per se and context where it is applied.

This session will devote time presenting experiences and discussing approaches that could offer researchers and practitioners ideas on how to develop pathways towards development impacts of technology interventions and how to approach the measure of such impacts.

This will be achieved by the presentation of four case studies, focusing on the evaluation of small-scale energy interventions and technologies or approaches to evaluation of such interventions. A discussion will follow and will be guided by one or two main discussion questions.

These questions may include: What are the major challenges faced when evaluating the impact of small-scale energy or other technology interventions? How much does the technology performance compared to other factors hinder or facilitate the achievement of development impacts and sustainability of energy or other technology interventions? What are best practices that could be applied when evaluating the impact of urgent technology interventions and solutions in humanitarian aid settings? What are the success stories in the evaluation of technology interventions?

Panelists and Abstracts
(in order of presentation)

What Kind of Impacts Do Small-Scale Energy Projects in Developing Countries Really Have? Findings from a Repeated Post-Evaluation

Julia Terrapon-Pfaff[1], Marie-Christine Gröne[1], Carmen Dienst[1], Willington Ortiz[1]
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Biography of Presenting Author: Julia Terrapon-Pfaff, PhD, is a research fellow at the Wuppertal Institute for Climate, Environment and Energy. Julia's primary research areas are renewable energy solutions for developing and emerging countries. She has experience in the fields of impact evaluation, decision analysis as well as expertise in gender and development issues, which she developed in her work in the project "WISIONS of sustainability" and her field work with local stakeholders in North and East Africa.

Abstract

It is widely recognized that access to sustainable and affordable energy services is a crucial factor to reduce poverty and enhance development. In particular, small-scale and community-based renewable energy projects are seen as important forms of development assistance for reaching the energy poor in developing countries. Like all development interventions, these energy projects are not intended to produce short-term outputs, but to create long-term impacts. However, to date only a few empirical evaluations exist which analyze and compare the impact of these projects on local living conditions and their sustainability ex-post implementation. To better understand if and how these type of technical interventions can create positive livelihood impacts and which conditions influence their sustainability, a post-evaluation of over 20 local development projects was conducted in 2012 and repeated in 2015. A standardized evaluation design was applied to the cross-sectional samples that compromised projects that implemented different renewable energy technologies in various geographic locations, thereby delivering results that are relevant across project boundaries. While the findings from the first evaluation already provided evidence on factors that contributed to the creation of positive impacts the second evaluation reveals further valuable insights on how to achieve positive and avoid negative social impacts.

Lessons Learned from a Comparison Study of Charcoal Stoves for Haiti

Kathleen Lask[1,2], Kayje Booker[2], Ashok Gadgil[1,2]
[1]University of California, Berkeley, Berkeley, CA, USA
[2]Lawrence Berkeley National Laboratory, Berkeley, CA, USA

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Biography of Presenting Author: Kathleen Lask is a doctoral candidate in Applied Science & Technology specializing in combustion engineering at the University of California, Berkeley and a graduate student researcher in the Stove Lab at Lawrence Berkeley National Laboratory. Her research interests center around energy in the developing world with her doctoral dissertation focusing on the reduction of particulate emissions from biomass cookstoves.

Abstract

Biomass cooking is heavily prevalent in Haiti, where it creates burdens on both the environment and the Haitian people. Following the 2010 earthquake in Port-au-Prince, the need for fuel-efficient cookstoves was higher than ever. Although several relief organizations were quite interested in stove dissemination efforts, there was little knowledge about the performance and usability of the proposed stoves. To help fill the knowledge gap, the stove group from Lawrence Berkeley National Laboratory evaluated and compared the performance of several cookstoves intended for dissemination in Haiti. This paper discusses the decisions made throughout the course of the comparison project, from project identification and approach through the dissemination of results. It highlights the challenges faced and how they were addressed, while briefly presenting the data from stove performance evaluated using Water Boiling and Controlled Cooking Tests.

Greenhouse Gas Assessment of Alternative Value Chains of Biomass Energy for Cooking in Kenya and Tanzania

Abigael Okoko[1, 4,] Rainer Zah[2], Boniface Kiteme[1], Juergen Reinhard[2], Susanne Wymann von Dach[3], Albrecht Ehrensperger[3]
[1]Centre for Training and Integrated Research in Arid and Semi-Arid Lands Development, Nanyuki, Kenya
[2]Quantis International, Zurich, Switzerland
[3]Centre for Development and Environment, University of Bern, Switzerland
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Biography of presenting author: Abigael Okoko is a PhD candidate at the University of Nairobi, Kenya. Her thesis is entitled 'Environmental Effects and Economic Viability of Alternative Value Chains for Biomass Energy for Cooking in Kenya and Tanzania'. Abigael's doctoral work evaluates selected biomass energy production and consumption technologies using the Life Cycle Approach. She holds an MSc and BSc in Environmental Science both from Egerton University. Her research is supported by the Swiss Program for Research on Global Issues for Development.

Abstract

Wood-based biomass energy remains vital in meeting local energy demands for cooking in many regions of the developing world due to its availability and affordability to the world's poor population. However, increasing scarcity of the feed-stock and negative socioeconomic and environmental outcomes associated with inefficient

production and consumption technologies call for alternative solutions that benefit local people without harming the environment. Tackling energy poverty is therefore considered as an important aspect of efforts aimed at meeting sustainable development goals at the household level. On a global scale, the reduction of greenhouse gas emission has gained importance over the years. The present paper focuses on greenhouse gas emissions as one aspect of environmental performance of alternative biomass energy solutions while the overall research takes a broader approach which also includes economic aspects. It compares the greenhouse gas emission of firewood, charcoal, biogas, jatropha oil and crop residue briquettes by conducting a Life Cycle Assessment (LCA) focusing on selected technologies for biomass energy production and consumption in two case study sites in Kenya and Tanzania. It further explores the potential for alternative biomass energy value chains based on their environmental performance. Finally, it reflects on LCA as a methodological approach for evaluating technological options for sustainable development in developing economies currently experiencing rapid population growth, urbanization and industrial development. Results indicate that emissions caused by use of firewood vary depending on the type of wood and the cooking device used. Jatropha oil value chain indicates greatest potential for greenhouse gas emission reduction. The charcoal value chain generates the highest greenhouse gases. The results provide first relevant information that LCA can help to raise awareness, inform stakeholders as well as decision makers on alternative and viable biomass energy value chains especially if combined with results from a Life Costing Analysis (next research step).

A Comprehensive Evaluation Approach to Iterative and Incremental Information and Communication Technology for Development

Caroline Pade-Khene[1]
[1]Rhodes University, Grahamstown, South Africa

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Biography of Presenting Author: Caroline Pade Khene is an Associate Professor in the Department of Information Systems at Rhodes University, South Africa. Her primary research interests are in information and communication technology in developing countries, focusing on evaluation, project management, and e-government; and higher education in developing countries. Caroline holds a Bachelor's Degree in Business Science, a Masters, and PhD in Information Systems, and a Postgraduate Diploma in Higher Education.

Abstract
ICT4D initiatives that are iterative and incremental should have some sort of direction in order to play a strategic role in enhancing the development initiative it supports. Informed decisions need to be made along the process, with continuous evaluation to inform decision making in ICT supported development initiatives. The Rural ICT Comprehensive Evaluation Framework (RICT-CEF) proposes a comprehensive evaluation approach to iterative and incremental ICT for development, emphasizing the need to incorporate various evaluation domains in implementation processes. A design science methodology was used to develop and implement this framework in two case studies in the Eastern Cape Province of South Africa. Various lessons have been learned overtime to revise the framework, reflecting on its suitability and shortcomings in practice. The research is ongoing, and continues to reveal other aspects of evaluation that need attention in the ICT4D field.

[EV09-CCI] Attention Innovative Start-ups! Practical Advice to Grow your Business Globally

DAY 1 – Monday 2 May – 15:30-17:00
Swiss Tech | Room 3C | Level Garden

Moderators

Jennifer Brant
Innovation Insights, Switzerland
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Jennifer Brant runs a consulting business based in Geneva. She provides policy analysis and strategic advice to companies, NGOs, and inter-governmental organizations on global market access and regulatory issues, notably in the areas of innovation, public health, technology, intellectual property, and trade. Jennifer is currently the Director of Innovation Insights, a cross-sectoral business initiative that advocates for enabling policy environments for innovation and technology diffusion. Previously she worked for Sidley Austin and Oxfam. Jennifer has graduate degrees in international law, economics, and development.

Kaveri Marathe
Global Innovation Forum, United States
info@globalinnovationforum.com

Kaveri Marathe holds a B.A. in Journalism and Art History from New York University and a M.S. in Foreign Service from Georgetown University. She started her career in journalism working in New York City for publications including Travel+Leisure Magazine and Manhattan community newspaper, WestView. In 2011, she moved to Washington, DC to begin her Master's degree and, during that time, she served as a fellow with both the U.S. Department of Commerce and UNESCO in Paris. She most recently worked for Xyntéo, a sustainability consultancy firm based in Oslo, Norway.

Summary

Thanks to global supply chains and online networks, startups and small businesses can participate effectively in the global economy for the first time in history, often alongside or in partnership with major multinational corporations, universities, and NGOs. Yet innovators and entrepreneurs have scarce resources to devote to maximizing international opportunities, and promoting and protecting their innovations on a global basis. While corporations have legal and financial resources to devote to developing impactful partnerships and protecting their intellectual assets, small and young companies are often left to fend for themselves, hoping that they do not run afoul of global laws or get taken advantage of.

This participatory workshop will engage globally-minded startups with experts and practitioners in sectors including medical technologies, clean energy, biotech, and ICT.

Participants will examine three key challenges that young companies face when they engage abroad:

- intellectual property rights (IPRs) management,

- navigating foreign legal risks and regulations, and

- modifying or "localizing" the brand and offerings for different markets.

Because collaborative, or "open," innovation is an important trend, the workshop will emphasize working with partners across borders in the digital age.

Participants will leave this workshop with new, practical knowledge that they can apply to their innovative activities.

The workshop will be managed such that participants can learn from the session even if their field of technology is not featured in the discussion, or if they are not themselves inventors.

Panelists

➢ **Emil Pot**, Independent IP Counsel, Belgium, emil.pot@saem-ip.com

➢ **Dimitra Christakou**, Managing Director, CambridgeIP, and Mentor, Ecomachines Ventures, UK
dimitra.christakou@cambridgeip.com

➢ **Mukul Kumar**, Coach for Clean Technology Start-ups, Switzerland, mukul.kumar@bluewin.ch

➢ **Marcelo do Amaral**, Chief Executive Officer, Global Yeast, Brazil,
marcelo.amaral@globalyeast.com

Breakout Sessions
DAY 2 – Tuesday 3 May – AM

[SE02-HUM] UAVs: Opportunities and Challenges for International Aid and Global Development

DAY 2 – Tuesday 3 May – 11:15-12:45
Swiss Tech | Room 3A | Level Garden

Session Leader

Andrew Schroeder
Humanitarian UAV Network – UAViators, United States
andrew@uaviators.org

Andrew Schroeder, PhD is the co-founder and Chief Operating Officer of WeRobotics, a global non-profit organization which aims to accelerate the ethical, safe and effective use of robotics technologies for humanitarian aid, development, community resilience and global health. Prior to his role at WeRobotics, Andrew was the Director of Research and Analysis for the humanitarian medical aid NGO Direct Relief. He was also co-organizer of the UAViators Humanitarian UAV Network and the founder of the UAV Working Group at Nethope. Andrew has been recognized by Esri, Fast Company, Nominet Trust, the Clinton Global Initiative, and many others as a world leader in application of geographic information systems (GIS) for humanitarian aid and global health. His work has appeared in The Lancet, The New England Journal of Medicine, SciDev, Business Week, Huffington Post, and other publications. He received his PhD in Social and Cultural Analysis from NYU and his Masters in Public Policy from the Ford School of Public Policy at the University of Michigan.

Summary

Across the landscape of disaster relief, resilience and development UAVs ("drones") are moving from the margins to the mainstream, demonstrating new types of solutions to previously intractable problems. Two distinct streams of use cases have emerged with particular force, one related to data collection and the other related to logistics. UAVs are being used by a wide variety of groups from Tanzania to Brazil to generate imagery with both high spatial and temporal resolution to support all phases of disaster preparedness, response, and recovery. Combined with advanced photogrammetric techniques, the sphere of what is knowable and actionable at each point, for instance through rapid production of accurate digital elevation models and imagery for change detection, is being steadily expanded. Likewise, early stage experiments in transportation of essential medicines and diagnostics are raising crucial questions about medical access and healthcare efficiency in remote areas. By avoiding obstacles in ground transport networks and responding dynamically to clinical demand, new models of responsive health care system design are coming into focus. Key issues remain though for realizing the potential of these innovations. Communities must be effectively engaged at the levels of systems implementation, data access, and analytical interpretation. Regulatory regimes must be redesigned to balance expanded utilization of airspace with concerns over safety and privacy. Additional comparative research into the cost structures and health impacts of UAV-based logistics, within and beyond the pilot implementation phase, must be conducted.

This panel delves into these interrelated questions and concerns in order to open up creative discourse about how the growing wave of humanitarian UAV activity may not only add new tools to the humanitarian toolkit, but also prompt rethinking of basic assumptions about what can be known and acted upon within disaster relief, resilience, and development.

Panelists and Abstracts
(in alphabetical order)

Drone Photogrammetry for Flood Preparedness

Krista Montgomery[1], **Jorge Fernandez**[1], Gabriele Ruggiero[1], Stefan Gordon[2]
[1]Pix4D SA, Lausanne, Switzerland
[2]Microsoft, Washington, United States of America

Presenting author's email address: jorge@pix4d.com, krista@pix4d.com

Biography of Presenting Authors: Jorge Fernandez works at Pix4D in Switzerland as a business developer and marketing manager. With a background in Geo-Information Science and Earth Observation, his first contact with the drone-photogrammetry industry did not come from drones, but from advanced image processing instead. Drones, like small satellites, have tremendous potential to be unlocked, especially when combined with the right state-of-the-art photogrammetric software platforms. Krista Montgomery is a writer at Pix4D, where she shares accounts of how professionals around the world are using the company's drone-photogrammetry products. With a background of science in journalism, she is based at Pix4D headquarters in Lausanne, where the company was founded as a spin-off of EPFL in 2011.

Abstract

The use of drones and drone-imagery in disaster response has become increasingly popular in recent years. However, very few organizations are currently using them to understand and reduce disaster risk in their community. Drone imagery, maps from photogrammetric software and flood simulation models present themselves as very valuable tools to survey and identify disaster-prone areas for a better understanding of flood risk. Ideally, the combination of high-resolution orthomosaics and digital elevation models (DEMs) as GIS software inputs can allow visualization of areas that would be under water at different flood intensities. DEMs and orthomosaics produced by photogrammetric software like Pix4Dmapper from drone-imagery are easily updatable, cm-grade resolution, and can be used as inputs for open source flood simulation models like Microsoft's TerrainFlow. 3D visualization of water interaction on terrain provides better understanding and location of flood-prone areas. The workflow's affordability, ease-of-use and quick data acquisition time makes it accessible to those whose situation prevents them access to high-resolution topographical information or flow models. Such information has the potential to increase flood preparedness and management strategy, reduce hazard and evaluate water behavior through the consistent gathering of high-quality data. Civil engineers, government and non-government organizations, urban planners, agriculturalists, insurance companies and more have direct use impact potential.

Unmanned Aerial Vehicles for Environmental Monitoring and Disaster Management

Tatiana Silva[1], **Raj Madhavan**[2], Edson Prestes[3], Flavia Farina[1], Tiago Gandra[1], Rodrigo Wiebbelling[1], and Daniel Almeida[1]
[1]Basin Modeling Laboratory, Institute of Geosciences, Federal University of Rio Grande do Sul, Porto Alegre, Brazil
[2]Humanitarian Robotics and Automation Technologies, USA & AMMACHI Labs, Amrita University, India
[3]Phi Robotics, Institute of Informatics, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

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Biography of Presenting Author: Raj Madhavan received a Ph.D. in Field Robotics from the University of Sydney and an ME (Research) in Systems Engineering from the Australian National University. His current research interests lie in humanitarian robotics and automation – the application and tailoring of existing and emerging robotics and automation technologies that are cost effective, reliable, efficient and geared towards improving the quality of lives of people in under-served and under-developed communities around the globe.

Abstract

This article presents our work with Unmanned Aerial Vehicles (UAVs) centered on preservation of human lives and the ecosystems that support them. In the Taim Ecological Station located in Southern Brazil, the Federal University of Rio Grande do Sul (UFRGS) and other stakeholders have acted collaboratively to assess geographic information to help the elaboration of an environmental plan to solve specific community demands and also to monitor the impact and dynamic aspects of the ecosystem, such as the occurrence of fire, invasive species, and environmental infractions. Our current work focuses on enhancing the regional models using precision and super high-resolution images taken by UAVs especially for those areas already identified as high risk. Meteorological sensors carried by UAVs can be employed to collect atmospheric information, providing better precision for the meteorological models at a local level. When these data are integrated in hydraulic/hydrological models, scene-generation becomes possible, thus allowing us to predict which regions are vulnerable to floods or landslides depending on different levels of rainfall. To foster the adaptation to global changes with the Porto Alegre Metropolitan region as a pilot area, we recently brought together individuals and volunteers willing to create technical tools and instruments. Our article also presents our views about how data from UAVs can be used in conjunction with Hackathons/Dronethons/Mapathons for environmental monitoring and disaster management.

Cost Analysis and Feasibility of Using Unmanned Aerial Vehicles to Transport Laboratory Samples for Early Infant Diagnosis of HIV in Malawi

Daniel Singer[1], Judith Sherman[2]. Emmanuel Saka[2], Emily Bancroft[3]
[1]Singer Global Health
[2]UNICEF Malawi
[3]VillageReach

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Biography of Presenting Author: *Daniel Singer is a physician and medical epidemiologist with expertise in global health policy. He has worked in multiple countries on four continents in both clinical and public health capacities. He serves as a consultant to UNICEF/Malawi on their UAV study, although most of his career has been with health agencies of the United States Government. This presentation reflects the views of the authors and does not necessarily represent the official positions of the United States Government or UNICEF.*

Abstract

An estimated 8000 new pediatric HIV infections occurred in Malawi in 2014. Successful management of these patients depends on Early Infant Diagnosis (EID), which requires a blood sample to be sent to a central laboratory for molecular diagnostic testing. Without treatment, 30% of HIV-infected children will die before their first birthday; 50% will die before the age of two. Access to life-saving treatment is hindered by an expensive and slow system for sample transportation. The average time from sample collection to receipt in the laboratory is 20.43 days. Unmanned Aerial Vehicles (UAVs) may be a cost-effective way to reduce the turnaround time between testing and results. A study currently underway in Malawi is examining the use of UAVs for sample transportation. Phase 1 will achieve the following objectives: i) optimize the design of a UAV to serve as a robust sample transport vehicle; ii) demonstrate the capability of the UAV to safely transport simulated laboratory samples from the site of collection to the site of testing; iii) estimate the cost of this form of sample transportation and to compare it to current standard forms of sample transport. If UAVs are shown to be superior to motor vehicle transport either in cost or health system performance, it may warrant their introduction to augment the existing sample transportation system. The results of this study will provide the first rigorous scientific data that international organizations and major donors will need before committing resources to UAVs in the global health sector. Further studies will be necessary to validate these results, generalize them to additional countries, and assess the impact of future advances in UAV technology.

[SE07-MED_a] Medical Technology and Innovation for Sustainable Impact in Global Health

DAY 2 – Tuesday 3 May – 11:15-12:45
Swiss Tech | Room 2C | Level Garden

Session Leader

Klaus Schönenberger
Ecole Polytechnique Fédérale de Lausanne, Switzerland
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Klaus Schönenberger obtained a PhD (1996) from EPFL on medical technology. After a post-doc at Lawrence Livermore National Laboratory, he spent 10 years working in the medical devices industry in leading positions such as Global Vice-President of Research and Technology in a company with a turnover of US$ 1 billion. In 2010 he started-up EssentialMed, an innovative non-profit venture, which he is now leading as CEO. In 2011 he joined EPFL to launch EssentialTech, a program directed at developing technologies and business models to fight poverty.

Summary

Many important medical devices, such as X-ray diagnostic imaging systems and neonatal incubators, which are essential to primary healthcare, are still not available in much of the developing world. Moreover, even when such medical devices might be available, they are often dysfunctional and not correctly utilized, thereby diminishing and/or eliminating their intended benefit and impact. The context of healthcare delivery in developing countries is characterized by scarcity in three main areas: in financial resources, in quality infrastructure and in trained personnel.

These unique features warrant a complete or significant rethink/redesign of technology solutions and business models, so as to better fit the needs, and is a necessary condition for successful large scale and sustainable deployment. However, a complete redesign/rethinking of technology and business models typically requires high financial investments, a factor that discourages companies and investors as they still perceive these "markets" as financially unattractive and too risky. Risk is inherent to entrepreneurship, but this risk is perceived as even higher in developing markets because there are few prior established benchmarks.

This session will hear from players operating in these markets how the different risks were/are mitigated, using examples of innovations that are in the process of development, deployment and/or in the scale-up phase. Participants in the session will help extract lessons about good strategies and best practice for maximizing the chances of successfully transforming a new technology to the private sector and sustainably scaling it up, thereby maximizing positive impact on global health.

Panelists and Abstracts
(in alphabetical order)

Appropriate and Affordable Medical Devices in Low Resource Countries: A Perspective from the World Health Organization

Adriana Velazquez Berumen[1] [invited speaker]
[1]Senior Advisor and Focal Point of Medical Devices, World Health Organization, Switzerland

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Biography of Presenting Author: With 30 years of experience in Biomedical Engineering, Adriana is the senior adviser and focal point on medical devices at the World Health Organization (WHO), where she has been working since 2008, and leading the work to improve access to safe, affordable, quality and appropriate medical devices. She coordinates the development of the Medical Devices Technical Series publications and all projects related with priority medical devices for clinical applications in maternal, new born, and non-communicable diseases, as well as policies for medical devices, global data on medical devices, innovative technologies, health technology assessment, and health technology management, among others. She is a Mexican Biomedical Engineer with postgraduate degree in Clinical Engineering. Before joining WHO she was the founding and Director General of the National Centre for Health Technology Excellence (CENETEC) in the Ministry of Health in Mexico, where she had more than 15 years experience as clinical engineer in private and public hospitals in Mexico. She has held various honorary positions in national and international professional societies related to Biomedical engineering and health technology assessment.

Abstract

Health technologies for global health priorities are required to be available as soon as possible, affordable to the end user, appropriate to the settings, accessible, and always of good quality that can be safely used. In the past, we were mostly looking at producing technology for high-income countries, where business was. However, over the last few years' industry, academia, manufacturers, etc. have started to become more aware of the real global needs and the trend to develop technologies for the base of the pyramid is on the upswing. Ebola taught us all that health systems need to be working well, and technology is a core component and that it is a global responsibility to keep us safe and healthy. In the medical technologies field, we all need to work together: governments, international organizations, academia, industry, regulators, innovators, procurers, to increase the availability of good simple diagnostic technologies in order to provide timely actions. As deadly diseases (non-communicable and infections) in most low-income countries increase, technologies will then allow for more effective treatment, without requiring high-level expertise or an entire infrastructure. The responsibility is on each one of us. We should not forget lives and time are the most valuables assets as once gone, cannot come back. So we should act on it and make sure we support the delivery of better health care providing health technologies that can save lives and time.

Developing a Low-Cost, Ultraportable, Modular Device Platform to Improve Access to Safe Surgery

Debbie L. Teodorescu[1,2], Dennis Nagle[1], José Gómez-Márquez[3], Anna Young[3], Christiana A. Iyasere[2,4,5], Madeline Hickman[1], David R. King[2,6,7]

[1]MIT D-Lab, Cambridge, United States of America
[2]Harvard Medical School, Boston, United States of America
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[4]Massachusetts General Hospital Department of Medicine, Boston, United States of America
[5]Massachusetts General Hospital Innovation Task Force, Boston, United States of America
[6]Massachusetts General Hospital Division of Trauma, Acute Care Surgery and Surgical Critical Care; Boston, United States of America
[7]Massachusetts General Hospital Knight Surgical Research Laboratory, Boston, United States of America

Presenting author's email address: DebbiePL@mit.edu

Biography of Presenting Author: Debbie Teodorescu is an MIT D-Lab Research Associate. She is finishing a joint MD/M.Eng (biomedical engineering) between Harvard Medical School and Boston University. Previously, she studied affordable diagnostic platforms and genetic cardiomyopathies. She has also co-directed a student clinic in Cambridge, where she had the opportunity to work with many patients with refugee backgrounds. She is now helping to build the Harvard Medical Innovation Network. Her work has been recognized by the Gates Millennium Scholars Program, American Association of University Women, and the American Association for the Advancement of Science.

Abstract

Surgery saves lives in traumas, obstetric emergencies, infections, oncology, and more. Indeed, 30% of the global disease burden requires surgical therapy, yet in lower-middle income countries, 5 billion people have little or no access to safe surgical care. Costly infections from unsterile surgeries threaten developing infrastructures. Safe surgery is thus a global health priority. SurgiBox, a joint project of MIT D-Lab and Massachusetts General Hospital, aims to develop, evaluate, and ultimately deploy a new technology to help increase access to safe surgery. SurgiBox shrinks the scope of the sterility challenge from the room to the critical space immediately over the incision. Users seal the modular system of sterile clear containers over the patient and operate via ports. An integrated airflow system controls enclosure conditions. Everything folds for rapid deployment. This project requires close dialogue among stakeholders with iterative, rapid prototyping changes. Benchtop and simulation testing to date demonstrate superior environmental control compared to standard operating rooms, notably including setup time, time to surgical site sterility, resistance to active contamination, and air changes per hour. Ongoing efforts include testing in stress use scenarios to replicate field conditions, field-testing, in vivo testing, minimizing device cost, and mapping out a sustainable deployment and scale-up strategy.

Development and Scale-Up of Essential Newborn Technologies

Kelley Maynard[1], Aba Asibon[1], Rebecca Selle[1], Laura Causey[1], Kondwani Kawaza[2], Queen Dube[2], Norman Lufesi[3], Gregory Gamula[4], Z. Maria Oden[1], Rebecca R. Richards-Kortum[1], Elizabeth M. Molyneux[2]
[1]Rice University, Houston, Texas, USA
[2]Queen Elizabeth Central Hospital, Blantyre, Malawi
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Biography of Presenting Author: Kelley Maynard is the Director of Technology Development at the Rice 360°: Institute for Global Health at Rice University. In this position, she helps bring design projects from the prototype stage into full implementation in clinical settings. While pursuing her passion for improving global health, Kelley has worked in hospitals throughout Latin America, Asia, and Africa. She holds an MSE in biomedical engineering and a BSE in mechanical engineering, both from the University of Michigan.

Abstract

Three million neonatal deaths occur each year, 99% of which take place in low- and middle-income countries. One factor contributing to this inequality is a lack of basic neonatal technologies in low-resource settings. Here, we advocate for the comprehensive development and implementation of a package of affordable, appropriate neonatal care technologies to address the primary causes of newborn death. We present a case study of one such package of newborn technologies: the Nursery of the Future project by Rice 360°: Institute for Global Health at Rice University and Queen Elizabeth Central Hospital in Malawi. Finally, we recommend key focus areas regarding implementation of technologies in low-resource settings, including early business planning, affordability, translation to scale, interdisciplinary collaboration, in-country innovation and capacity-building, and implementation research and optimization.

Innovating Beyond Technology: Building a Business Model to Distribute and Sustain the Universal Anaesthesia Machine

Lina Sayed[1], Adam Lewis[1]
[1]Gradian Health Systems, New York, United States

Presenting author's email address: lsayed@gradianhealth.org

Biography of Presenting Author: Lina Sayed — Vice President of Market Strategy, Gradian Health Systems Lina is the VP of Market Strategy at Gradian Health Systems, a medical technology company focused on improving anaesthesia and surgical care in low- and middle-income countries. Lina leads Gradian's business development in existing and new markets. She joined Gradian after eight years working in nonprofit and healthcare finance and consulting for global health product distribution initiatives. Lina has an MBA from the MIT Sloan School of Management and a B.A. in Journalism & Mass Communications from NYU.

Abstract

An estimated 5 billion people around the world lack access to appropriate surgical and anaesthesia care – the vast majority of whom live in low- and middle-income countries (LMICs). Because of this, a third of the global disease burden is attributable to surgically treatable conditions – more than HIV/AIDS, malaria and tuberculosis combined (16.9 million deaths per year) – and the world is on pace to lose more than US$ 12.3 trillion in economic productivity by 2030. Part of the global surgery challenge lies in the infrastructural constraints facing hospitals in LMICs. On one hand, with most medical equipment in LMICs being donated or refurbished, there is often no clinical training provided, no spare parts available and few local technicians to conduct repairs, leaving up to three-quarters of all medical equipment inoperable. On the other hand, even when machines are donated, they're rarely designed for low-resource environments. This disconnect is problematic for hospitals in regions like sub-Saharan Africa, which rarely have reliable access to electricity or medical oxygen. Gradian Health Systems is presenting our approach to combat this challenge: a business model to develop, distribute and sustain medical equipment for LMICs. The company's primary product is the Universal Anaesthesia Machine (UAM) – a CE-certified device designed to deliver anaesthesia reliably and safely with or without electricity and oxygen. The UAM functions by using its built-in oxygen concentrator or by drawing oxygen from the room air when the power goes out, making it ideal for operating rooms all over the world. While the UAM itself is a critical innovation for low-resource hospitals, we believe the distribution, service, training and ongoing support we provide is just as critical. By building a global network of in-country biomedical technicians, anesthetists, spare parts depots and training hubs, we have helped enable more than 100,000 surgeries in 23 countries, and hope to expand our model to many more hospitals throughout the world.

[EV04-ENE] OER-Based Capacity-Building in the Field of Climate Change and Energy

DAY 2 – Tuesday 3 May – 11:15-12:45
Swiss Tech | Room 1A | Level Garden

Moderator

Franziska Wolf
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Franziska Wolf (B.A. int, BBA, MIBA), deputy head of the Research & Transfer Centre FTZ-ALS at the Hamburg University of Applied Sciences, coordinates and manages international climate change adaptation, sustainable energy and technology transfer projects in Europe, the ACP region and Asia. Research interests include climate change, adaptation, and adaptive capacity, particularly in SIDS and LDCs, and education for sustainable development. Further interests include ICT4Development, i.e., the development of online learning courses and online conferences.

Summary

This session highlights the need and addresses the opportunities for integrating climate change and energy access/energy security/energy efficiency into lifelong learning initiatives, e.g., by utilizing open educational resources (OER).

OER offer free access to knowledge, enable self-determined learning and interaction and facilitate the international transfer of knowledge and skills. Thus, they can play an important role in strengthening and building human capacities in less developed regions of the world, e.g. where awareness of and knowledge about sustainable energy technologies and climate change are lacking.

Selected strategies, MOOCs and project examples demonstrate how these challenges are addressed and which solutions and sustainable approaches have been developed that may, in the long run, benefit the sustainable socioeconomic development of highly vulnerable countries such as Small Island Developing States (SIDS).

It is hoped that the set of compact presentations of current and on-going initiatives trigger a lively discussion about the opportunities, but also constraints of using ICT-based lifelong learning solutions. Strengths and weaknesses of the showcased solutions will be discussed and their replication potential and/or utilization in other learning environments and for further target groups evaluated. Consistent with the need for more cross-sectoral interactions among the various stakeholders working at the interface of sustainable energy and sustainable education, the objectives of this session are as follows:

- To provide the proposed initiatives and projects (plus selected further speakers) with an opportunity to display and present their works in the field of climate change adaptation;

- To foster the exchange of information, ideas and experiences acquired in the execution of energy education projects, especially successful initiatives and good practice;

- To discuss methodological approaches and experiences deriving from case studies of initiatives and projects, which aim to show how OER may be implemented in practice;

- To network the participants and provide a platform so they can explore possibilities for cooperation.

Agenda and Speakers

➢ **Lifelong Learning for Renewable Energy, Energy Access, Efficiency and Security – The Importance of Open Educational Resources for Capacity-Building in Small Island Developing States (SIDS)**

- **Franziska Wolf**, Deputy Head of the Research & Transfer Centre, Hamburg University of Applied Sciences, Germany – franziska.wolf@haw-hamburg.de
- **Dinesh Surroop**, Senior Lecturer & Head of Department, Department of Chemical & Environmental Engineering (CEE) University of Mauritius, Mauritius – d.surroop@uom.ac.mu

➢ **Using MOOC for Inquiry-Based Learning and Diversity: The Case Leuphana Digital School**

- **Felix Seyfarth**, MOOC developer & EdTech Researcher, Leuphana University, Lüneburg, Germany – mail@felixcseyfarth.com

➢ **Lessons Learned from the MOOC Pathways to Climate Change Adaptation: The Case of Small Island Developing States**

- **Alexander Bisaro**, Global Climate Forum, Adaptation and Social Learning, Instructor Pathways to Climate Change Adaptation: The Case of Small Island Developing States, Berlin, Germany – sandy.bisaro@globalclimateforum.org

➢ **Are We Openness Ready? Moving from Open as Attribute to Open as an Ecosystem**

- **Nishant Shah**, Leuphana University, Institute for Culture and Aesthetic of Digital Media (ICAM), Lüneburg, Germany; Co-founder Centre for Internet and Society, Bangalore, India – nishant.shah@leuphana.de

➢ **Joint Discussion and Conclusions**

[EV05-ICT] ICTs in TVSD: Promises and Challenges for Inclusive Development Reaching the Poorest Populations

DAY 2 – Tuesday 3 May – 11:15-12:45
Swiss Tech | Room 3B | Level Garden

Moderators

Bhavani Rao
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Prof. Rao R. Bhavani is the Director of AMMACHI Labs at Amrita University, which focuses on innovating and deploying new applications in learning technologies to benefit the poor with a focus on women from socio-economically underserved communities. AMMACHI Labs does pioneering work on technology-enhanced learning and computerized vocational-education training delivered through multimedia-enriched applications and cost-effective haptic-enhanced simulators for perfecting manual skills. A central focus of Prof. Bhavani's work has been to explore the use of skill-development as the baseline strategy, and women empowerment as the underlying vision. Her current project is a massive sanitation-awareness campaign that empowers women in rural communities to become ambassadors of change, by educating them about sanitation practices and training them to build their own toilets.
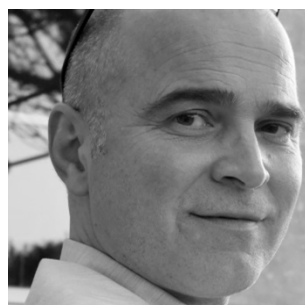
Joost Monks
NORRAG Network for International Policies for Education and Training, Switzerland,
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Joost Monks is the Managing Director of NORRAG, Switzerland. He is in charge of the Network's international development and partnership and runs the Program of Work on Urban Violence, Youth and Education. Previously he served as a management consultant in a wide range of national and international public organizations, including UNESCO, WIPO, and ILO, and he worked in the field of organizational development in higher education institutions in Europe and China. He holds a Bachelor and a Master Degree from the Graduate Institute of International and Development Studies and obtained his PhD in political economics from the University of Geneva.

Summary

Technical and Vocational Skills Development-TVSD (defined as to the acquisition of knowledge, practical competencies, knowhow and attitudes necessary to perform a certain trade or occupation in the labor market) is making a come-back on the international development agenda (in particular in relation to SDG Goal 4 and 8). One of the important drivers to this change have been the rapidly advancing ICTs that have transformed the world of work and demanded for new skills development, while offering at the same time new modes of training delivery. ICTs provide hope for equal opportunities and for marginalized groups to access TVSD, both in the formal and informal economic sectors, for instance through open educational resources, massive open online courses (MOOCs) or tablet-based training simulation for vocational training.

Nevertheless, the promises of ICTs as a vector for training democratization, of masses' integration and poverty reduction have to be demonstrated contextually. Indeed, the impact of ICTs in TVSD depends on different contextual factors, such as the infrastructure available (e.g., the access of electricity and internet), the quality and relevance of the TVSD program providers, the quality of the data collected and its utilization for policy development, the value of certification (formal and non-formal training), the recognition by employers of the skills acquired, the labor and economic markets characteristics (e.g., dominance of the informal sector in many developing countries) as well as the development of associated personal and life skills.

The session proposed by NORRAG (Geneva) and AMMACHI Labs (Amrita University, India), aims to engage a critical debate and unpack the issue of the promise and challenges of ICTs in TVSD for inclusive development, by building both on the international policy debate and evidence around the topic, as well as the practical experience and insights gained in the Indian context by AMMACHI Labs.

This includes a number of internationally recognized pioneering approaches and projects such as the Women Empowerment (WE) Project aiming at improving conditions for rural women in India through AMMACHI Labs' innovative computerized vocational education and training (cVET) programs in combination Life Enrichment Education (LEE) tailored to the needs of the community. The aim of this blended approach is to ensure students receive the technical knowledge required as well as the confidence and support to take the learned skills forward.

Agenda and Speakers

➢ **Critical Analysis of the Promises and Challenges of ICTs in TVSD for Inclusive Development**

- **Joost Monks**, Managing Director, NORRAG, Graduate Institute of International and Development Studies, Switzerland, joost.monks@graduateinstitute.ch

➢ **Indian Expertise on ICTs in TVSD Targeting Marginalized Populations**

- **Bhavani Rao**, Director, AMMACHI Labs, Amrita University, India – bhavani@ammachilabs.org

- **Ajay Balakrishnan**, Manager Content Development, AMMACHI Labs, Amrita University, India – ajay.balakrishnan@ammachilabs.org

➢ **Joint Discussion and Conclusions**

[SE08-DRR] Early Warning Systems: Design and Implementation

DAY 2 – Tuesday 3 May – 11:15-12:45
Swiss Tech | Room 3C | Level Garden

Session Leaders
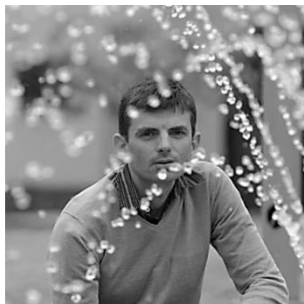
Christian Huggel
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Christian Huggel is a Senior Researcher and Group Leader at University of Zurich; long-standing track record of research and projects in climate change impacts, risks and adaptation with a focus on mountains in several regions worldwide. Lead-author of IPCC AR5 WGII.

Holger Frey
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Holger Frey is a Research Associate University of Zurich, PhD in glaciers and glacier lake mapping and analyses with GIS and remote sensing. Working experience in research and cooperation projects on climate impact in Peru and India; expertise in glacier hazards and risks.

Summary

Early Warning Systems (EWS) have become more and more important for disaster risk reduction and climate change adaptation in recent years, and this trend is expected to continue in the future. EWS aim at predicting or detecting hazardous processes by collecting and analyzing data and providing information for decision making to responsible authorities. A successful implementation requires not only detailed process understanding and adequate sensor and communication infrastructure, but also close collaboration and communication between all involved actors, including authorities and the population. This necessitates geoscientific expertise and modeling skills, knowledge of juristic and institutional rules and regulations, and awareness of the local knowledge and risk perception. EWS are thus highly complex systems that involve scientific, technical, institutional, and social aspects.

In this session different aspects addressing the key elements of EWS will be presented: Improvement of the understanding of involved physical processes, design and implementation of sensor systems and data management, analyses of data needs and availability for decision making, information and communication issues between the different actors, as well as improvements of the response to disasters. Besides specific contributions to one of the issues described above, several examples of integrative EWS implementations will be presented.

By sharing experiences from different regions in South Asia, the Caucasus, and Latin America, we expect to get an overview of both general and region-specific challenges and their potential solution. By summarizing the lessons learnt from the different EWS aspects and applications we finally aim at outlining some good practices for future EWS implementations.

Panelists and Abstracts
(in order of presentation)

Early Warning Systems for Glacier Lake Outburst Floods and Debris Flows Case Studies from China and Georgia

Daniel Tobler[1], Stefan Tobler[1], Christoph Haemmig[1], Lorenz Meier[2]
[1] GEOTEST AG, Zollikofen, Switzerland
[2] GEOPRAEVENT AG, Zurich, Switzerland

Presenting author's email address: daniel.tobler@geotest.ch

Biography of Presenting Author: Daniel Tobler is a geologist and currently works as deputy head and project manager at the engineering geology department of GEOTEST, Switzerland. GEOTEST is an internationally experienced consulting company. Daniels primary work projects are linked to natural hazard assessments (i.e. rockfall, landslides, glacial lakes), planning of mitigation measures and risk management. For the last few years he has been involved in different projects related to Climate Change and its influence in High Mountainous Areas all over the world (e.g. South America or Asia).

Abstract

Climate change affects the cryosphere in a strong way. In 2012 the IPCC (IPCC, 2012) concluded that there is high confidence that changes in heat waves, glacial retreat and/or permafrost degradation will have a strong effect on high mountain phenomena such as slope instabilities, mass movements and glacial lake outburst floods (GLOF). The overall frequency of debris flows may decrease in absolute terms, but the magnitude of events may increase. This conclusion was derived from an analysis of debris flow events in the past 150 years and from future projections on climate change based on that analysis. Two case studies from China and Georgia demonstrate the evidence of ongoing climate change. In both examples, early warning systems and glacier monitoring are the key for a) detailed hazard assessment, b) a long-term observation of the system development and c) the warning and alarming of a significant damage potential (settlements, main touristic roads, gas pipeline). While the early warning system in the Yarkant River at Kyagar glacier (Chinese Karakoram Mountains) has already been tested in a real GLOF event in 2015, the warning and alarm system in Georgia (Greater Caucasus Mountain Range) regarding huge debris flows induced by glacier collapses at the top of Mt. Kazbeg will be installed in spring 2016. In both projects GEOTEST AG and GEOPREAVENT AG build a successful joint venture; while the experienced geologists and glaciologists of GEOTEST AG assess the potential natural hazard processes and evaluate mitigation measures, the engineers of GEOPRAEVENT AG develop, install, and run early warning systems. The system in China as well as the one in Georgia are based on modern technologies and devices.

Flood Reconstruction in Kullu Valley, Himachal Pradesh (India): Implications for Disaster Risk Reduction Strategies

Juan A. Ballesteros Cánovas[1,2], Markus Stoffel[1,2], Daniel Trappmann[2]; Mayank Shekhar[3]; Amalava Bhattacharyya[3]
[1] Institute for Environmental Sciences, University of Geneva, Switzerland
[2] Dendrolab.ch, University of Bern, Switzerland
[3] Birbal Sahni Institute of Palaeobotany, Lucknow, India

Presenting author's email address: juan.ballesteros@dendrolab.ch

Biography of Presenting Author: Juan A. Ballesteros-Cánovas works on fundamental and applied research projects in the field of natural hazards. His background is in forest engineering and he is currently working as a PostDoc researcher at the Institute for Environmental Sciences (University of Geneva). His PhD aimed at integrating paleohydrological techniques in rational flood risk assessments. He has been involved is several European and national projects and has been working in Colombia, Ecuador, Poland and Spain before having joined a project on Climate Change Adaptation in India.

Abstract

The Western Himalayan region is subjected to intense and frequent disasters, resulting from intense rainfall and its steep topography. These characteristics, together with human activities concentrated in the valley, make this region highly susceptible to hydro-meteorological hazards, and frequently led to human losses. In this context, Disaster Risk Management (DRM) policies are the basis for the application of pro-active risk prevention and risk reduction strategies. However, their success will critically depend on system knowledge and hence reliable baseline data of past disasters are pre requisite. Here, we test how newly gained knowledge of past disasters can improve the assessment of hazards and risks and, thus, facilitate the definition of adaptation options for future disaster scenarios. To this end, we combined several approaches to compile and understand past flood events and their role in causing recent disasters in Kullu, Himachal Pradesh (India). This study demonstrates that the consideration of past extreme events, not gauged by conventional devices, can clearly modify the hazard assessment. Through a detailed analysis of three flood disasters in the region, we also highlight paradigms of shortcomings of conventional, but short time-series in DRM implementation and the role and interaction of civil engineering, public and private sectors as well as end-users on the severity of floods.

Enhancing Frontline Resilience: Trans- Border Community Based Flood Early Warning System in India and Nepal

Yeeshu Shukla[1], Bhanu Mall[1]
[1]Christian Aid

Presenting author's email address: yshukla@christian-aid.org

Biography of Presenting Author: Yeeshu carries nearly 8 years of experience in sectors like water and sanitation, rural livelihoods, disaster risk reduction (DRR), climate adaptation and emergency response and recovery with a focus on pro poor strategies. The specific experience includes development of range of innovative community development and humanitarian initiatives ranging from rapid response and early recovery; disaster early warning systems, policy level mainstreaming initiatives on disaster risk reduction and climate smart initiatives having long term implications for policy and practice.

Abstract
Recurring floods in the terai belt of Nepal and Eastern Uttar Pradesh in India cause extensive damage to the lives and livelihoods of the communities at-risk and increase their vulnerability to external shocks. This is further aggravated due to the several evolving complex factors like unplanned development, marginalization, demographic growth, lack of access to essential services, and growing uncertainty linked to changes in weather patterns.

To address some of these concerns, Christian Aid along with partners is supporting a cross border community-based early warning system which brings together technology and people together. Cross Border Early Warning System being implemented in India and Nepal is equipped with information and communication technology that helps to create a bridge between India and Nepal following a community-to-community resilience approach. The ICT solutions reduce resource overuse and saves energy and time.

The proposed paper tries to understand the process involved in institutionalizing the cross-border Early warning systems and underline some of the essentials of the regional cooperation to implement a system involving multiple and varied stakeholders across the region. This would also explore the ways in which early warning systems could be implemented in the context of larger disaster risk management and trans- boundary understanding on water resources management.

Bridging the Information Gap: Mapping Data Sets on Information Needs in the Preparedness and Response Phase

Marc van den Homberg[1, 2], Robert Monné[1, 2, 3,] Marco Spruit[3]
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[2] TNO, The Hague, the Netherlands
[3] Utrecht University, Utrecht, the Netherlands

Presenting author's email address: marc.van.den.homberg@cordaid.nl; marcjchr@gmail.com

Biography of Presenting Author: As an applied researcher, Marc van den Homberg focuses on improving networked organizations through coordination and information management for natural disasters and complex emergencies. Marc founded TNO's ICT4D team and is member of NATO's Research and Technology Group on Social Media and IT for Disaster and Crisis Response. For Cordaid, Marc participated in multidisciplinary field-research into the response to Typhoon Haiyan and implements a people centered early warning system in Bangladesh. Marc holds IFRC's disaster management certificate, an MBA and a PhD in physics.

Abstract
During the preparedness and response phase in regularly recurring natural disasters, the responding and professional communities have to decide which actions to take in order to support affected communities. We investigated the information needs of and the disaster management data available to both national and local decision makers during the floods that affected the riverine islands of the Sirajganj district in Bangladesh in 2014. We conducted 13 semi-structured interviews and three focus group discussions, collecting in this way input from 51 people, transcribed and coded them so that clusters of information needs emerged. Subsequently, we mapped the information needs on the available data sets and identified the needs that are not well covered, of which the need for timely and location based information is the most important. We recommend to execute identification and mapping of available data sources on the information requirements as part of the preparedness phase. Data preparedness can solve to some extent the issue of data not being available timely enough in the initial response phase. Our future research aims at further closing these information gaps by linking and integrating disparate data sets to cover more information needs and by equipping disaster management volunteers at community level with a mobile data collection app to collect data before, during and after the floods.

Highlights and Lessons from the Implementation of an Early Warning System for Glacier Lake Outburst Floods in Carhuaz, Peru

Javier Fluixá-Sanmartín[1], Javier García Hernández[1], Christian Huggel[2], Holger Frey[2], Alejo Cochachin Rapre[3], César Alfredo Gonzales Alfaro[4], Luis Meza Román[5], Paul Andree Masías Chacón[6]

[1] Centre de recherche sur l'environnement alpin (CREALP), Sion, Switzerland
[2] Department of Geography, University of Zurich (UZH), Zurich, Switzerland
[3] Unidad de Glaciología y Recursos Hídricos (UGRH), Autoridad Nacional de Agua, Huaraz, Peru
[4] CARE Perú, Huaraz, Peru
[5] Municipalidad de Carhuaz, Carhuaz, Peru
[6] Corporacion RD S.R.L., Cusco, Peru

Presenting author's email address: javier.fluixa@crealp.vs.ch

Biography of Presenting Author: *Javier Fluixá-Sanmartín is a Civil Engineer with over 6 years of experience in hydraulic modelling, dam risk management and flood forecasting. Since 2014, he has been working at the CREALP as a hydrologic and hydraulic specialist, mainly working on the implementation of flood forecasting and early warning systems in different river basins. He has also collaborated for several years with the Hydraulic and Environmental Department of the Universitat Politècnica de València in Spain, where he has developed and applied a dam risk analysis tool to several Spanish dams.*

Abstract

Glacial related risks are a key issue in Peruvian high mountains. The April 2010 outburst of the glacial Laguna 513 in the Cordillera Blanca (Ancash region), above the city of Carhuaz, is a clear example. In the context of the multidisciplinary project "Glaciares 513 - Adapting to climate change and reducing disaster risks due to receding Andes glaciers", a complex Early Warning System (EWS) has been designed and implemented in the Chucchún basin, where the Laguna 513 is located, as a component of an integrated risk reduction strategy. It supports decision-makers, authorities, civil defense platforms, etc. in their response to this type of natural hazard. This paper presents the main features of the EWS installed in the Carhuaz region (such as risk analysis, elaboration of emergency plans, or technical components), its development, and the main lessons we learned from the project as a whole.

[SE16-HAB] Global Engineering and Sustainable Development

DAY 2 – Tuesday 3 May – 11:15-12:45
Swiss Tech | Room 1B | Level Garden

Session Leader

Shaukat Ali Mirza
Engineers without Borders, India
smirza@rediffmail.com

Shaukat Mirza is the Chairman of EWB India since April 2014 and has been instrumental in catering to the needs of under privileged members of the society in the areas of sanitation, water management, power (solar) and education. Formerly the President of American University of Ras Al Khaimah, UAE, Dr. Mirza was also instrumental in establishing George Mason University Ras Al Khaimah Campus and RAK Medical & Health Sciences University in UAE. He has also held several important positions in Switzerland, USA and in India.

Summary

It has been calculated that almost two billion additional people will inhabit the Earth within the next two decades. This population growth will create unprecedented demands for energy, food, land, water, transportation, materials, waste disposal, health care, environmental clean-up, telecommunications, and infrastructure. In view of the problems faced by our planet today and the difficulties that are expected in the next few years, the engineering profession must revisit its mindset and adopt a new mission statement: to contribute to the building of a more sustainable, stable, and equitable world.

An issue of equal importance is the education of engineers interested in addressing problems which are specific to developing communities. These include water supply and purification, sanitation, power production, shelter, site planning, infrastructure, food production and distribution, and communication, among many others. Unfortunately, such problems are not usually addressed in engineering curricula hence engineers are unable to tackle the needs of the most destitute people on our planet.

Engineers of the future must be trained to take intelligent decisions that protect and enhance the quality of life on Earth rather than endangering it. Preparing students to become global engineers able to facilitate sustainable development is a formidable challenge.

This session will focus on several important issues ranging from social entrepreneurship to innovation in the construction sector, from sustainable housing in the Himalayas to connecting scientists and high school students in Latin America and so on. Faculty and professional engineers will present their research output on sustainable development. They will thus join engineering graduates, faculty interested in teaching Global Engineering, NGOs who can be instrumental in bringing about social change, and private sector representatives in interacting and defining the hurdles that still need to be overcome in implementing Global Engineering.

Panelists and Abstracts
(in alphabetical order)

iNVESTIGA: Connecting the Colombian Scientific Diaspora with Secondary Schools in Colombia

Ricardo Corredor-Jerez[1,2], Rogelio Corredor-Rincón[2], Luis Ruiz[2], Magali Bouzas[2], Rafael E. Carrillo[1,2]
[1] Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland
[2] iNVESTIGA, Colombia

Presenting author's email address: ricardo.corredor@epfl.ch

Biography of Presenting Author: Ricardo Corredor-Jerez works as scientific assistant at LTS5-EPFL laboratory, Switzerland. He obtained both the bachelor's and master's degree in Systems Engineering and Computer Science at UniAndes, Colombia, and a second master's at the University of Lyon, France, in medical image processing. He has been involved in multiple Colombian and European research projects in the medical field, but his constant relation with the academy opened questions of the role of science in education. Currently he is also leading the project iNVESTIGA.

Abstract
According to recent studies, Latin America is the region with the highest emigration rate in the world, specially affecting the highly educated population. One of the consequences of this process is the expansion of business and scientific diasporas. Colombia has launched multiple projects trying to keep contact with its scientists working abroad, but those initiatives have suffered multiple economic and political limitations. Additionally, technology did not support correctly the processes that could help the diaspora to contribute to projects from their country of residence. However, Internet nowadays allows synchronous communication providing new interactive tools to connect people. In this work we present iNVESTIGA, a project connecting the Colombian scientific diaspora with secondary schools in Colombia using technological resources. We highlight multiple advantages, e.g. increasing students' eagerness for learning, teachers' willingness for presenting innovative materials to their students using technology, and allowing scientists to contribute to projects in their home country. We present the results of three videoconferencing sessions connecting Colombian scientists with secondary schools in Yopal, Colombia. A posterior analysis of these experiences showed that current technologies support this interaction between partners in spite of the physical distance, with great benefits for students, teachers, and scientists.

Sustainable Housing for Himalayas: Adaptation of Traditional Construction Techniques Through Low-tech Innovations

Eric Domon[1], Gianluca Paglia[1], Valentin Kunik[2], Guillaume de Morsier[2]
[1] Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland
[2] Kunik de Morsier architectes, Lausanne, Switzerland

Presenting authors' email address: eric.domon@epfl.ch

Biography of Presenting Author: Eric Domon is a recently graduated civil engineer of EPFL. Throughout his studies, he has been interested in cross-disciplinary projects related to sustainable housing and construction (eg. EPFL Solar Decathlon project, in which he is closely involved). With a group of EPFL graduate architects and engineers, he launched a project of sustainable housing for the Himalayas in order to apply his knowledge and his vision of sustainability in a concrete and original humanitarian project.

Abstract
The reflections behind this project are based on the fact that emerging countries are generally already living with a small environmental footprint comparing to our developed societies. Considering sustainability at a systemic level, this project aims to adapt traditional construction techniques to the future challenges through locally available and affordable technologies. The goal is to provide to the local population of the Himalayas tools to value their sustainable lifestyles while increasing their comfort conditions. Low-tech innovation is essential to address global challenges. According to local tradition and customs, innovation in design and building techniques are collaboratively developed by an interdisciplinary group of Swiss engineers and architects with local architects and building companies. The project proposes for example to use compressed earth blocks instead of concrete blocks or solar radiation instead of fossil fuels for ecological and economical purposes. To maximize the social anchorage, participative approaches are used at every step to confirm that the design choices correspond to the expectations and cultural habits of the future users. The first building will grow near a school and is supposed to be used as an example for the villagers of the surroundings. Several didactical activities for the children of the school and their parents will happen during the construction to diffuse and raise awareness about building's energy efficiency. The extended abstract details the main low-tech innovations that are implemented to improve traditional Zanskari's housing.

Manufacturing Hand Bikes Using Recycled Bicycle Parts

Antonio de Pádua Lima Filho[1], Aurasil Ferreira Garcia Junior[1], Douglas Domingues Bueno[1], Celso Riyoitsi Sokei[1], Luis Otávio Carlin Gimenes[1], Bruno Katsuyoshi Silama Ueda[1], Bruno Kenji Ishikawa[1], Rodrigo Alessandro Nunes de Oliveira[1]
[1]UNESP-São Paulo State University – Campus of Ilha Solteira, Ilha Solteira, Brazil

Presenting author's email address: padua.dem@gmail.com

Biography of Presenting Author: *Metallurgical Engineering (1985) – "Universidade Federal Fluminense" (UFF) - Volta Redonda-RJ*, Master in Science (1991) – "Instituto Tecnológico de Aeronáutica" (ITA) – São José dos Campos-SP*, Doctor of Philosophy (1998) by The University of Sheffield, UK. Associate Professor (2009) – UNESP – São Paulo State University*, *Brazil.*

Abstract

Hand bikes made from recycled aluminum and steel bicycle parts were produced for physically disabled people with limited financial means, which encouraged accessibility, sport, and social inclusion through self-mobility on roads. Therefore, this work aims to combine environmental and social responsibility. Volunteers with varying degrees of physical disabilities, e.g., alcoholic neuropathy, amputation of one or two legs, spinal injuries, cerebral tumors on the right side of the brain, non-specified paraplegia and femoral arthralgia, agreed to test the tricycles to provide important information for the designers. The hand bikes were designed to be safe, ergonomically efficient, lightweight, and aesthetically pleasing, and they were ultimately donated. The intention here is to encourage the reproduction of hand bikes anywhere in the world at a reduced cost. One donated hand bike was modified by a hemiplegic volunteer to improve the drivability and give feedback for the team, and some bikes that were badly damaged during use were recovered, fitted and donated again. These important issues are also outlined in this work. A hand bike moving with assistance from a brushless electric motor is shown here as a future research direction. This study was supported by the Project of University Extension from Pro-Rectory of University Extension (Proex) at São Paulo State University – UNESP - Brazil with participation of the mechanical engineering students at the Discipline of Selection and Specification of the Materials as well as students from the International Association for the Exchange of Students for Technical Experience (IAESTE – Brazil).

Social Entrepreneurship and Engineering Education as a Means of Sustainable Development

Vasudevan Rajaram[1], Joshua Sperling[2,3]
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[2]Postdoc Fellow, New Concepts Incubator at the National Renewable Energy Laboratory, Golden, CO, USA and Urban Futures at the National Center for Atmospheric Research, Boulder, CO, USA, Joshuabsperling@gmail.com

Dr. Rajaram *is a geotechnical and environmental engineer with 41 years of experience in the areas of mining, tunneling, site remediation and innovative environmental management. He has a Ph.D. in Rock Mechanics from the University of Wisconsin, a M.S. from the South Dakota School of Mines and Technology and a B.E. from Osmania University. He has a J.D. from the IIT Kent College of Law. His interests include sustainable development and humanitarian service.*

Dr. Sperling *is a civil / environmental engineer and postdoc research fellow at the NREL New Concepts Incubator and visiting researcher at NCAR Urban Futures / Climate Science and Applications program in Colorado. He is a former Fulbright Scholar, NSF PIRE Fellow, and holds a PhD from the interdisciplinary Sustainable Infrastructure program at UC-Denver. His research combines engineering, planning, and policy approaches to the nexus of infrastructure systems, environmental change and public health. Recent NSF-funded research has focused on developing low-carbon, healthy and resilient cities / communities in the USA, China and India and on 'Sustainable Cities and the Energy-Water-Climate Nexus'. He also works to integrate sustainable development goal efforts.*

Abstract

Failed development engineering projects, increased demands for basic services, and the new sustainable development goals (SDGs) motivate a critical need for transitions from donor funds to self-reliance using entrepreneurial approaches to sustainable development. Social entrepreneurship can be defined as a business that addresses the social needs of society while being financially and environmentally sustainable. There are many engineers acting as social entrepreneurs around the world in order to solve increasingly complex problems of water, energy, food, education, housing, health, and other pressing social issues. Efforts vary from working with small to large organizations and from single to multiple service areas, with these engineers and SEs bringing together diverse resources toward lasting systems-based solutions, in partnership with local communities. These SEs are not only building on access to knowledge, networks, and capital, but also continuously reflecting and learning to develop locally and globally relevant skills. They are shaping and accelerating the use of multiple community innovations, designing new appropriate technologies and policies, and creating new practices and processes that can improve society and transform communities. With entrepreneurship and innovation as key drivers of human progress towards sustainable development, engineers and social entrepreneurs need to be trained and supported so they are effective in bringing about required changes in society and improving quality of life for all. Many engineering departments at universities are now building curriculum and programs in these

areas and this paper highlights a handful of these programs across the US and India. We identify and describe recently evolving educational programs in terms of proposed skills, competencies, and knowledge that can prove useful in real-world projects and ventures. The development impact that social entrepreneurs in these engineering and interdisciplinary programs are having will be detailed. Recommendations for expanding such programs in engineering and business schools will be made, and the need for role models to guide the new generation of social entrepreneurs will be described.

Progressive Housing with Permanent Core Dwelling resistant to Natural Hazards

Harry O. Sandberg[1], Alain Nussbaumer[1]

[1]Ecole Polytechnique Fédérale de Lausanne, Switzerland

Presenting author's email address: hosandberg@yahoo.co.uk

Biography of Presenting Author: Harry O. Sandberg during many years with different IGOs in and around the building sector in some twenty countries in Africa and Asia on both micro and macro level, and carried out construction sector studies in several countries. He started researching on the primary/secondary effects of habitat hazard-disaster causalities in developing countries several years ago, and developed the presented container core-dwelling concept. Later, he collaborated on this subject with Prof. Nussbaumer from 2011 to 2015. He holds postgraduate Architecture, Civil Engineering, and Business Administration.

Abstract
The present situation with an accelerating population growth worldwide will generate unprecedented demands on several crucial supply factors including shelter, especially in developing and underdeveloped countries. And as many of these countries are regularly exposed to natural hazards that frequently turn into disasters, this project has identified as a logic consequence to focus the research on securitizing the habitat. A safe habitat in these countries is of fundamental importance and necessity to allow for a dynamic growth of the grass-root and full economies. And economic strength is of major importance to solve other crucial supply problems.

The objective of this ongoing research project is to propose architectural and technical solutions for quality guaranteed, new or re-construction by first building a natural hazard resistant core dwelling using recycled 20ft ISO shipping containers, then integrating the core in a progressive owner-driven housing structure. N.B. it is not concerning container architecture/housing using containers as final residential volumes. The project demonstrates the architectural, structural and risk reduction potential of this solution. Full attention is paid to blend in the structure with the existing culture, and vernacular and prevailing local architecture. The project phases follow an evolution/feed-back system of Feasibility ⇔Implementability ⇔Adoptability ⇔Acceptability that will minimize the risks of output repellence.

The paper presents the state of progress of the research project, which deals with the production of first concepts, the outcomes of workshops held at EPFL, in India, in Malaysia about architectural and technical solutions, as well as structural tests on containers with unreinforced openings.

A truly interdisciplinary and international project. The research is implemented in international collaboration between interdisciplinary teams at three universities, whereof two in South-Asian natural-disaster-ridden developing countries with different cultural profiles.

Interdisciplinary-humanitarian student projects. In connection with the research work, the topic is also proposed to undergraduate students as projects at the participating academic institutions.

[EV12-CCI] Open Science: From Research Transparency to Inclusive Authorship

DAY 2 – Tuesday 3 May – 11:15-12:45
Swiss Tech | Room 1C | Level Garden

Moderator

Sarah White
University of California Berkeley, United States
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Sarah White is a Senior Program Associate at the Center for Effective Global Action (CEGA), a research network headquartered at the University of California, Berkeley, where she supports the Center's flagship technology initiative and leads the launch of the Development Engineering Journal. Prior to joining CEGA, Sarah consulted with the World Bank and a local NGO in rural El Salvador. Sarah holds a Masters in International Policy Studies from the Middlebury Institute of International Studies at Monterey and a BA in Economics and International Relations from Lake Forest College.

Summary

This panel discussion will illuminate two emerging trends in academic publishing: research transparency and inclusive authorship.

Both are core features of Development Engineering (DevEng), the new open access, interdisciplinary journal launching at Tech4Dev this year. DevEng prioritizes novel, experimental research that directly integrates insights from engineering and the social sciences.

The panel will engage representatives from **Elsevier**, the **Center for Open Science (COS)**, and the **Berkeley Institute for Transparency in the Social Sciences (BITSS)** to discuss the benefits and limitations of incorporating replication into the academic publishing process. We will discuss an approach that DevEng is testing in which accepted, pre-published articles are selected at random for replication. While replication is a common safeguard against publishing bias and the distorted body of evidence it can create, there is currently no systematic and commonly adopted way to verify or replicate results in a robust and transparent way. Also lacking is a positive incentive structure that rewards rigor over fishing exercises, in which a replicator is motivated to identify errors above all else.

Additionally, the panel will engage **a scholar working in technology for development** and a representative of **AuthorAid** to discuss the role of co-mentorship and collaboration in bridging the "publication gap" between authors in developing countries and their peers in more established and well-resourced research groups. We will hear about AuthorAid's work to provide mentorship, resources, and training to researchers in developing countries, as well as a similar program currently being developed by DevEng. Through mentorship and collaboration, DevEng hopes to strengthen promising manuscripts for publication and guide authors towards resources—including workshops and online courses—that will serve them throughout their academic careers.

Panelists

- **Temina Madon**, Executive Director, Center for Effective Global Action (CEGA); Berkeley Institute for Transparency in the Social Sciences (BITSS), University of California Berkeley, United States tmadon@berkeley.edu

- **Stephane Berghmans**, Vice-President EU Global Academic & Research Relations, Elsevier, Belgium, s.berghmans@elsevier.com

- **Tom Hardwicke**, Center for Open Science (COS), United Kingdom, t.hardwicke.12@ucl.ac.uk

- **Ravi Murugesan**, International Network for the Availability of Scientific Publications (INASP) and AuthorAid, United Kingdom, ravi@uwalumni.com

- **Chander Kumar Singh**, Assistant Professor, TERI University, India, chanderkumarsingh@gmail.com

Farewell Aperitif – Wednesday 4 May – 16:15-18:00 – Level Campus

Elsevier invites all conference participants to attend the Farewell Aperitif in honor of the launch of the **Journal of Development Engineering** at Tech4Dev 2016.

Breakout Sessions
DAY 2 – Tuesday 3 May – PM

[SE03-HUM] Travelling Models of Innovation and Open Spaces: Beneficiary Engagement and Cross-Case Comparisons Across Contexts

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 3C | Level Garden

Session Leader

Michelle Reddy
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A PhD candidate at Stanford University, Michelle Reddy's research interests center on innovation in peacebuilding, development and humanitarian aid, as well as organizations, entrepreneurship, and civil society networks. Prior to Stanford, she co-launched the Paris School of International Affairs at Sciences Po Paris, and served as Assistant Dean. Michelle has worked on research, communications and program design and management for universities, NGOs, and the United Nations for 7 years in Paris, Dakar, and New York.

Summary

Organizations are increasingly adopting innovation spaces and innovation labs as a means to operationalize innovation in humanitarian situations, utilizing techniques of design-thinking whether through entrepreneurship, product design, peacebuilding, and more. Yet, how do they determine "what works" for diverse, mobile, refugee populations?

This session aims to examine how organizations design and "innovate" existing models of innovation spaces across contexts, and in some instances, create "travelling models." While some innovation spaces are virtual, and others physical – each model is unique according to context. Yet, refugees are increasingly mobile, connected, and changing context, moving from one country to the next. The notion of an innovation space should not be limited to the bounds of a refugee camp; indeed, open-source approaches and innovation spaces should accompany refugees on their journey. The panel is also interested in examining how organizations and stakeholders might solicit feedback from refugees in the design and use of innovation labs and open source technologies.

How do organizations construct new models of innovation spaces for various migrating constituencies, and in different emergency contexts and degrees of emergency? The session aims to discuss how organizations working with refugees can improve upon existing models of service provision and humanitarian innovation, and facilitate travelling models of innovation spaces, particularly for mobile refugee populations. Additionally, how are innovations introduced and diffused among organizations working in emergency contexts, and how does this differ from long-term protracted emergency contests? Through discussion as well of open-source technology, the session will explore a model of humanitarian assistance beyond service provision and in consideration of refugee social and economic livelihoods, with room for discussion on social network facilitation. How can we best conceptualize, and co-create, the physical and virtual innovation spaces that provide the best environment for refugee innovation to flourish?

Panelists and Abstracts
(in alphabetical order)

The School Bus Project: Mobile Education for Refugees

Stephanie Bengtsson[1], Kate McAllister[2], Darren Abrahams[2]
[1] Institute of Development Studies, Brighton, UK
[2] The School Bus Project, Brighton, UK

Presenting author's email address: s.bengtsson@ids.ac.uk

Biography of Presenting Author: Stephanie is an educator and development practitioner, specializing in inclusive education, fragile contexts, teacher training, and the Education for All agenda. She holds a Master's from Cambridge in Inclusive Education and a Doctorate in International Educational Development from Columbia University, Teachers College. She is a Research Officer with the Health & Education Advice & Resource Team at IDS, a Postdoc Researcher with the Wittgenstein Centre for Demography and Global Human Capital, and a founding member of the School Bus Project.

Abstract

Both the UNHCR and governments around the world talk about three 'durable solutions' to addressing rising refugee populations: voluntary repatriation to the country of origin, local integration into the asylum country, or resettlement to a third country. However, these solutions are rarely realized and refugees instead find themselves in unstable, unsafe situations of displacement, with limited access to basic services. Up until now, the priority for many volunteers responding to the crisis has been on improving access to water, health, nutrition, and shelter, however, there is a strong argument for including education as part of the basic level response. Not only is education an enabling right, recent research demonstrates it is a priority for refugees themselves, who see it as a driver for change that they own. The objective of this case study is to support the development of innovative and inclusive educational spaces for Calais refugees that are responsive to their needs and capacities and to the changing dynamics of the camp. Using an action research approach, our innovation is to convert a bus into a mobile school that not only houses classrooms, but also serves as a basecamp for storage and recharging of 'pop-up schools' and 'lessons-in-a-box' that can be transported to different camp sections, digital technology resources that open up individual virtual learning spaces, and an access point for resources needed by the existing schools in camp. At the heart of this innovation is our commitment to improving the quality of teaching and learning within these educational spaces by staffing the school with trained volunteers who share in the School Bus Project vision. Our approach goes beyond understanding education as a unidirectional transfer of knowledge from an 'expert' to a 'novice' to seeing it as a process by which knowledge is co-constructed and shared by all participants.

Higher Education Spaces and Protracted Displacement: How Learner-Centered Pedagogies and Human-Centered Design can Unleash Refugee Innovation

Barbara Moser-Mercer[1], Erin Hayba[1], Joshua Goldsmith[1]
[1] University of Geneva/InZone, Geneva, Switzerland

Presenting author's email address: Barbara.Moser@unige.ch

Biography of Presenting Author: Barbara Moser-Mercer is Professor, founder and Director of InZone, University of Geneva. Her research focuses on cognitive and cognitive neuroscience aspects of the interpreting process and on the human performance dimension of skill development. She has co-developed the Virtualinstitute©, a fully integrated virtual learning environment, which she also leverages in partnership with ICRC, ILO, UNHCR, UNOCHA, UNWFP, and UNAMA for the provision of higher education in emergencies. Through the development and installation of InZone Learning Hubs in refugee camps in the Horn of Africa, she has expanded InZone's activities to address the formal and non-formal higher education needs of refugees, working in close collaboration with UNHCR, the International Network for Education in Emergencies (INEE), and higher education institutions in the Global North and South.

Abstract

The number of refugees and displaced persons around the world is the largest in history. Education in Emergencies responses have traditionally focused on primary education; higher education opportunities have often been perceived as a luxury. However, in 2015 the United Nations adopted the Sustainable Development Goals, thereby broadening the education mandate to include lifelong learning. Refugee youth have extremely limited options in conflict and crisis zones. However, rapid advances in technology and online learning have laid the foundations for making higher education opportunities accessible for refugee youth.
Education fosters innovation and entrepreneurial skills that are important for economic activity and job creation – elements that are critical for stability during times of reconstruction and for longer-term sustainable development. If refugees and internally displaced persons receive a quality education while in exile, they are more likely to develop the necessary skills to make use of the existing economic, social and political systems in their host communities as well as upon returning home.

This paper analyses the contribution of Open Educational Resources (OERs) to building 21st century skills and explores the value of tutoring and mentoring models, learner retention, learning technologies, and provision of language and subject matter support that best mediate higher-level learning in fragile contexts. Variables such as sustainability, operability, equal access, cultural and linguistic ownership, livelihoods and context relevance were used to analyze available evidence in an effort to inform optimal design and scalability of such learning spaces, as well as their potential use in migrant refugee contexts. The importance of refugee ownership and empowerment are emphasized as vectors for ensuring the sustainability of HE spaces in fragile contexts and for fostering creativity and innovation, thereby feeding into the larger framework of Education for All and Sustainable Development Goal 4.

The Faceless Mobile Youth of Africa Drive Change

Darelle van Greunen[1], Alida Veldsman[1]

[1]The Centre for Community Technologies, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa

Presenting author's email address: Darelle.vanGreunen@nmmu.ac.za

Biography of Presenting Author: Darelle is a Professor and the Director of the Center for Community Technologies at the Nelson Mandela University in South Africa. The social activist and award-winning researcher holds a number of degrees with her PhD being in Computer Science. Her research focuses on using technology as an enabler in society but with a strong focus on how humans interact with technology combining it with real-life interventions in different communities of Africa. She is best known for her passion to transform low-income communities through the use of technology as an enabler and catalyst to respond to social issues.

Abstract

Over decades millions of rands and countless volunteer hours were used to attack the problems facing youth across the nation. Yet, by most standards, problems have worsened. There are no simple answers as the obstacles that today's youth have to overcome, are many and formidable. It is the aim of this project to create a concentrated effort in the Gelvandale area using mobile technology to address a number of the challenges faced by at-risk-youth in this area. The primary aim of the research is to determine and develop best practices and strategies for overcoming challenges and creating successful leadership experience for youth from the Gelvandale area. A secondary objective of the research is to determine how Information Communication Technology and then specifically mobile technologies can be used to achieve the primary aim without excluding human participation. This paper will discuss the approach taken to the exploratory study, outline the objectives, and highlight not only the impact achieved to date but also the lessons learnt.

[SE07-MED_b] Medical Technology and Innovation for Sustainable Impact in Global Health

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 2C | Level Garden

Session Leader

Solomzi Makohliso
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Solomzi Makohliso is a member of the the EssentialTech Program at EPFL. He is an international entrepreneur with biotechnology industry experience from the United States, Europe, and South Africa. He was also the founder and CEO of Ayanda Biosystems in Switzerland, and a Resident Entrepreneur at the Council for Scientific and Industrial Research (CSIR) in Pretoria, South Africa. He currently serves on the Swiss National Steering Committee for Bilateral Cooperation in Science & Technology with Africa. Previously, he served as a member of the Biotechnology Advisory Panel for the national Technology Innovation Agency (TIA) in South Africa and was a Member of the Nanotechnology Advisory Board in South Africa. He holds a PhD in Biomaterials from EPFL.

Summary

Many important medical devices, such as X-ray diagnostic imaging systems and neonatal incubators, which are essential to primary healthcare, are still not available in much of the developing world. Moreover, even when such medical devices might be available, they are often dysfunctional and not correctly utilized, thereby diminishing and/or eliminating their intended benefit and impact. The context of healthcare delivery in developing countries is characterized by scarcity in three main areas: in financial resources, in quality infrastructure and in trained personnel.

These unique features warrant a complete or significant rethink/redesign of technology solutions and business models, so as to better fit the needs, and is a necessary condition for successful large scale and sustainable deployment. However, a complete redesign/rethinking of technology and business models typically requires high financial investments, a factor that discourages companies and investors as they still perceive these "markets" as financially unattractive and too risky. Risk is inherent to entrepreneurship, but this risk is perceived as even higher in developing markets because there are few prior established benchmarks.

This session will hear from players operating in these markets how the different risks were/are mitigated, using examples of innovations that are in the process of development, deployment and/or in the scale-up phase. Participants in the session will help extract lessons about good strategies and best practice for maximizing the chances of successfully transforming a new technology to the private sector and sustainably scaling it up, thereby maximizing positive impact on global health.

Panelists and Abstracts
(in alphabetical order)

Why Physicians Need Greater Collaboration from Technology Players to Improve Health Outcomes in LMIC [invited speaker]

Patrick Petignat[1]
[1]Hôpitaux Universitaires de Genève (HUG), Switzerland

Presenting author's email address: Patrick.Petignat@hcuge.ch

Biography: Prof. Patrick Petignat is Head of the Surgical Gynecologic Oncology Unit and Head of the Gynecologic Division at University Hospitals of Geneva, Geneva, Switzerland. He has been trained in Gynecologic Oncology at the University of Montreal, Canada. His clinical and research interests include innovative cervical cancer screening and HPV-related disease. He has international experience in cervical cancer prevention, providing education and training in low- and medium resourced countries.

Abstract

Cervical cancer is the main cause of women cancer death in sub-Saharan countries because of the absence of screening. The main obstacles inherent to these countries are lack of healthcare infrastructures and trained practitioners. With the availability of new technologies, researchers have attempted to find new strategies that are adapted to this context. The aim of this lecture will be to present how technology can to promote early diagnosis of cervical cancer.

Paper Dipsticks for Disease Diagnosis Produced with Domestic Inkjet Printers

B. Leticia Fernández-Carballo[1], Albert Comellas-del-Castillo[1], Salvador Borrós[1]
[1]Grup d'Enginyeria de Materials (GEMAT), Institut Químic de Sarrià, Universitat Ramón Lllull, Barcelona, Spain

Presenting author's email address: blancafernandezc@iqs.url.edu

Biography of Presenting Author: Leticia Fernández-Carballo is currently in the final year of her PhD which is focused on low-cost diagnostic devices for low resource settings. Her work is being conducted at the Institut Químic de Sarrià (Spain) and Fraunhofer Center for Manufacturing Innovation (USA) with the supervision of Dr. Borrós, Dr. Sauer-Budge and Dr. Florensa. Leticia obtained her BSc in Chemical Engineering at Universidad de Santiago de Compostela (Spain) and an MSc in Bioengineering at the Institut Químic de Sarrià (Spain).

Abstract

Medical devices play a key role for the success of health care interventions. Most medical devices are fabricated and designed to be used in developed countries. In developing countries, those medical devices are often inappropriate and difficult to use and end up malfunctioning or broken due to lack of maintenance know-how and/or in-country spare parts and supplies. It is worldwide accepted that medical devices should be adapted to the environment and needs of the countries of intended use. Most of these issues could be solved by enabling developing nations to design and manufacture their own medical devices. In this context, we present a medical device that can be easily manufactured in limited resources laboratories: paper diagnostic dipsticks to detect biomarkers present in biological fluids produced with domestic inkjet printers and simple ink preparation recipes. This fabrication technique for diagnostic strips was tested for the detection of iodine deficiency, a severe global health problem worldwide. We herein present successful experiments for chemical inks preparation, printing in paper and detection of iodine in the concentrations present in the urine. This simple and versatile manufacturing process for diagnostic tests would allow hospitals and laboratories with limited infrastructure to design diagnostics for relevant diseases in a format and quantity adapted to each community needs.

Health Hackathons Drive Affordable Medical Technology Innovation through Community Engagement

Aikaterini Mantzavinou[1,2,3], **Bryan J. Ranger**[1,2,4], Smitha Gudapakkam[5], Katharine G. Broach Hutchins[5], Elizabeth Bailey[5], Kristian R. Olson[5,6]
[1]Harvard-MIT Program in Health Sciences and Technology, Institute for Medical Engineering and Science, Massachusetts Institute of Technology, Cambridge, MA 02139
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Boston, MA 02114
[6]Harvard Medical School, Boston, MA 02115

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Biography of Presenting Authors: Aikaterini (Katerina) Mantzavinou and Bryan Ranger are PhD students and members of MIT Hacking Medicine. Katerina designs implants for cancer therapy at the MIT Koch Institute. Bryan uses ultrasound imaging for prosthetic socket design at the MIT Media Lab, and previously worked in Zambia, Uganda, the WHO, and USAID. They co-teach a course on design and commercialization of cost-effective prosthetic technologies with the MIT DLab, and have driven affordable medical technology innovation with the MGH Consortium for Affordable Medical Technologies.

Abstract

Health hackathons are multidisciplinary events bringing together diverse healthcare stakeholders to solve key health challenges through a process of co-creation. Health hackathons have gained significant traction as sources of medical innovation globally. They carry particular significance for addressing health discrepancies in resource-limited settings, where there is dire need for cost-effective medical technologies that can deliver high-quality health in an affordable and sustainable way. This paper discusses the model of MIT Hacking Medicine's health hackathons, and its application to hackathons in India and Uganda for medical innovation by the Consortium for Affordable Medical Technologies (CAMTech) of the Massachusetts General Hospital (MGH) Center for Global Health. The CAMTech health hackathons in resource-limited settings engage the local communities, innovators, and stakeholders in medical innovation, resulting in breakthrough projects that address urgent needs and hold promise for further development after the end of the hackathon. Case studies of successful projects coming out of these hackathons are discussed to illustrate the potential of such innovations for real-world impact and sustainable growth in frontier markets. Examples of the tools developed to support further project development after the end of the hackathon and to keep track of project progress and impact are presented. The hacking philosophy pioneered by MIT Hacking Medicine is taken one-step further with the establishment of CAMTech Co-Creation Labs on the ground in India and Uganda and the CAMTech Innovation Platform. The CAMTech Co-Creation Labs and Innovation Platform form long-lasting international partnerships that seek to reinvent healthcare in low- and middle-income countries and offer promise for cost-effective medical solutions in both resource-limited and resource-rich settings.

Low-Cost High Performance Low-Field MRI

Mathieu Sarracanie[1,2,3], Cristen LaPierre[1,2,3,] Najat Salameh[1,2,3,4,] David Waddington[1,2,5,] Thomas Witzel[1,2,3,] and Matthew Rosen[1,2,3]

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[2]Department of Physics, Harvard University, 17 Oxford St, Cambridge, MA 02138, USA.
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[5]School of Physics, University of Sydney, Physics Rd, Sydney NSW 2006, Australia.

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Biography of Presenting Authors: Dr Sarracanie's research focuses on the development of tools, hardware and software, applied to Magnetic Resonance Imaging (MRI). Dr Sarracanie obtained his Ph.D. in Physics from Université Paris Sud, France, in 2011, which aim was the development of hyperpolarized helium-3 MRI to probe super-paramagnetic aerosol deposition in the airways. Since Sept. 2011, Dr Sarracanie is a research fellow at the department of Physics, Harvard University, and the MGH/Athinoula.A. Martinos Center, where he developed MRI at ultra-low magnetic field strength.

Abstract

Envisioning the healthcare technology of tomorrow requires one to break from the mainstream and explore alternative approaches to develop accessible, ubiquitous diagnostic tools. In the field of magnetic resonance imaging (MRI), despite considerable improvements in imaging quality and speed, the underlying technology remains remarkably unchanged compared to the first generation scanners that emerged on the market 30 years ago. Undeniably, one of the next revolutions in health care is cost-effectiveness. Using only simple and robust hardware technologies and state-of-the-art acquisition and processing strategies, low-cost scanners could democratize MRI, moving it away from demanding siting requirements and colossal costs, and opening up a wide range of unprecedented new applications. We believe our work will enable the realization of an inexpensive portable MRI system for use in a variety of situations where MRI systems are not traditionally available such as resource-poor environments, emergency responses, and remote regions. At 6.5 mT (more than 450 times lower than clinical MRI scanners), our group has demonstrated (2.5×3.5×8.5) mm3 imaging resolution in the living human brain using a simple, open-geometry electromagnet, with 3D image acquisition over the entire brain in 6 minutes. Without pre-polarization or cryogenic SQUID detection, we have developed the fastest 3D MRI of the living human brain to date in the very low-field regime.

[SE12-ENE] Renewable Energy Technologies for Developing Countries: Case Studies in Research, North-South Collaboration, & Capacity Building

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 1B | Level Garden

Session Leaders

Federico Rosei
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rosei@emt.inrs.ca

Federico Rosei is a Professor at the Institut National de la Recherche Scientifique (INRS) and holds the UNESCO Chair in Materials and Technologies for Energy Conversion, Saving and Storage (MATECSS), since 2014. He is a physicist with wide-ranging interests that bridge from fundamental studies of surfaces and interfaces to materials for third generation solar cells. He has published over 200 papers in refereed journals and delivered more than 210 invited talks at international conferences. Since 2011, he has been the Director of the Centre for Energy, Materials and Telecommunications of INRS.

Louis Vervoort
Institut National de la Recherche Scientifique, Canada
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A polytechnical engineer from the University of Ghent in Belgium, Louis holds a PhD in physics from the University of Marseille and a post-doc at the École Normale Supérieure in Paris. His original field of research is condensed matter physics (in particular semiconductor nanostructures). He was appointed Coordinator of the UNESCO Chair MATECS, hosted at INRS in 2015. His main motivations to join the Chair are twofold: First, it allows him to be at the heart of what disruptive innovation in renewable energies and new materials may be in the near future. Second, it allows him to contribute to an endeavor that aims at alleviating one of the crucial problems of our time, global climate change.

Summary

This session will highlight and discuss a few salient case studies related to new technologies for sustainable energy, as applied to developing countries. The contributions either stem from researchers from developing countries, or concern effective North-South collaborations. They all share as common denominator new efforts of innovation in renewable energy technologies. The spectrum of renewable energy technologies addressed is wide; also, the contributions range from hands-on development projects to managerial and research policy analyses.

The first speaker will present her experience in the implementation, in rural India, of photovoltaic water pumps and solar irrigation technology developed at the Bern University of Applied Sciences. This project aims in particular to support and involve women in more efficient and sustainable agricultural activities. A researcher from Nigeria will present a technical description of a homemade plug-flow biodigester, that is easy to make and can provide biogas (e.g., for cooking) to, in principle, large parts of the rural population. Regarding knowledge transfer and networking, a UK-based researcher will describe his experience in managing networks in the field of renewable energy technologies, with the aim to distill the key lessons learned. Finally, an Egyptian researcher will address her country's efforts in capacity building in research and science and in developing renewable energy resources. A detailed

overview will be given of the Egyptian government's programs and initiatives related to sustainable energy resources and research development.

Besides presenting these case studies, the discussion session will aim at identifying best practices not only in research and innovation, but also in training, networking and knowledge transfer. How can the respective innovations have the biggest impact? How to ensure an optimum dynamics of acceptance, dissemination, and/or application of the new technologies in the respective countries?

Panelists and Abstracts
(in order of presentation)

Capacity Building in Solar Irrigation Technology among Female Farmers in Rural India

Eva Schuepbach[1], Tharun Anto[2], Elias Achamma[3], Ken Gnanakan[4], Andrea Vezzini[5], Urs Muntwyler[1], Alois Müller[6], Karin Imoberdorf[6], Urs Heierli[6], Ashok Mattoo[7]
[1]Bern University of Applied Sciences BFH, Burgdorf, Switzerland
[2]Thitali Low Carbon Solutions Pvt. Ltd., Kochi, Kerala, India
[3]Kudumbashree, District Mission, Collectorate Ernakulam, Kerala, India
[4]ACTS Education Group, Bangalore, Karnataka, India
[5]Bern University of Applied Sciences BFH, Biel, Switzerland
[6]Solar Pump Association Switzerland (SoPAS), Bern, Switzerland
[7]Amro Technology P Ltd., Bangalore, Karnataka, India

Presenting author's email address: eva.schuepbach@bfh.ch

Biography of Presenting Author: Eva Schuepbach is a climate scientist holding a PhD from the University of East Anglia, Norwich, U.K. (www.uea.ac.uk). She initiated an educational Far East Programme in an EU-funded Network of Excellence in FP6 and - thereafter - set up a pilot project on "Micro-Business and Female Small-Scale Farmers in Rural India: Innovation Through Sustainable Energy Technology" with Bern University of Applied Sciences BFH. The pilot was carried out (2012-15) jointly with partners (education, business, NGOs) from India and Switzerland and co-funded by REPIC.

Abstract
This pilot project aims at paving the way towards women empowerment through modern solar irrigation technology in rural India. The technology deployed is a photovoltaic water pump developed by the Institute for Energy and Mobility Research, Bern University of Applied Sciences BFH, Switzerland and now locally manufactured in India. Main collaboration partners are female farmers' associations in Kerala (southern India) with whom the photovoltaic water pumps are deployed as part of an extended irrigation infrastructure with water tanks and drip irrigation kits / sprinkler system. Capacity building of the female farmers, the elected bodies of the local self-government in rural India (Panchayats) and the local village offices are conducted by Swiss engineers during the installation and inaugural events. Among the added value of the deployed solar irrigation technology are the safety of farming village women (avoid overnight irrigation) and health (inexhaustible technology, no water and soil pollution), in addition to the cost-free energy source of the sun that allows independency from the electricity grid or expensive diesel once the technology is paid off. There is currently a high acceptance for the photovoltaic water pump and water tanks. The female farmers adopt these to generate a continuous domestic water supply for backyard cultivation at their homes and plan to transfer this knowhow to urban farming projects in nearby Kochi, Kerala. The modern irrigation infrastructure (drip kits / sprinkler systems) is not perceived yet as beneficial when compared to traditional flood irrigation. Electric pumps are still used as they are cheaper and available on the local market; in addition, electricity is subsidized for farmers in Kerala. Recently, diesel pumps have become more attractive due to the low oil price. Continued capacity building and support is needed if solar irrigation technology is to make a sustainable contribution towards women empowerment in rural India.

Development and Evaluation of a Semi-Automated Stirrer for a Domestic Plug-Flow Biodigester
Gbolabo Ogunwande[1], Mayomi Alege[2]

[1]Department of Agricultural and Environmental Engineering, Obafemi Awolowo University, Ile-Ife, Nigeria
[2]Prototype Engineering Development Institute, National Agency for Science and Engineering Infrastructure, Abuja, Nigeria

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Biography of Presenting Author: Gbolabo Ogunwande is a Senior Lecturer in the Department of Agricultural and Environmental Engineering, Obafemi Awolowo University (OAU), Nigeria. He received Bachelor's, Master's and Doctorate degrees (Agricultural Engineering) from OAU and a Master's degree (Industrial and Production Engineering) from University of Ibadan, Nigeria. His research activities have been on solid waste management with

focus on composting and anaerobic digestion from which he has published in reputable local and international journals/conferences. He is a registered Engineer/Waste Management Consultant in Nigeria and member of various professional bodies.

Abstract

This paper presents a simple technique to stir substrates and enhance the performance of plug-flow biodigesters. A framework of PVC pipes was constructed and fitted as a semi-automated stirrer in two 2.0 m3 plug-flow biodigesters fabricated using locally sourced materials. The stirrer in one biodigester was operated while the other biodigester served as the control. Air bags were improvised using a tarpaulin material to collect and store the biogas produced while a locally fabricated double-burner biogas stove was used to utilize the gas for cooking. The biodigesters were loaded to 70% of the capacity on installation and fed every two days with 12 kg (wet weight) of mixed household wastes (dog, chicken and rabbit urine and faeces and left over food). The substrates were stirred three times daily without opening the biodigester. The results showed that the stirrer aided digestion and by implication, prevented a reduction in biogas production by 1.31%/week ($R2 = 0.92$) when it was operated. By the end of the 186 day study, up to 41% of biogas reduction was being recorded weekly in the control biodigester, indicating the effect of buildup and hardening of the scum stratum which limited the production and passage of biogas. In addition, effluent drip was observed at the outlet pipe especially in the afternoon around the peak temperatures period when production was high, indicating that the rate of biogas production exceeded the rate of exit thereby resulting in biogas displacing substrates. Bubbling sound that emanated from the biodigester each time the substrates were stirred suggested that trapped gas was released from the strata. The biogas produced from both biodigesters burnt with clear blue flame and was used for domestic cooking. The stirrer was easy to develop, install and operate and can be adapted to different sizes of plug-flow biodigesters.

Resilience, Adaptability and Solidarity: Auto-Ethnographic Reflections on Four Years of Networking Energy for Development

Jon Sumanik-Leary[123], Ed Brown[13], Ben Campbell[34], Jon Cloke[13], Aran Eales[2], Carmen Dienst[5]

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[2]Wind Empowerment
[3]Low Carbon Energy for Development Network
[4]Durham University, Durham, UK
[5]Wuppertal Institute for Climate, Environment and Energy, Wuppertal, Germany

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Biography of Presenting Author: Dr Sumanik-Leary is a multidisciplinary researcher specializing in appropriate renewable energy technology for sustainable development. He completed a mechanical engineering MEng, interdisciplinary PhD (E-Futures DTC) and postdoctoral fellowship at the University of Sheffield, which involved field work in Latin America, Africa and Asia and drew methodologies from across the social sciences and engineering to evaluate small wind turbines as a technological solution for rural electrification. He currently coordinates Wind Empowerment and is a LCEDN Research Associate at Loughborough University.

Abstract

This paper focuses on the development and operationalization of a specific type of social innovation: networks. It draws upon the authors' experiences as coordinators of the Low Carbon Energy for Development Network (LCEDN) and Wind Empowerment (WE) to offer a comparative analysis of two different organizations, which have the shared goal of facilitating access to sustainable energy by providing opportunities for knowledge sharing and collaboration between experts. As would be expected in the field of international development, the geographical and cultural distances between network partners are large, which presents particular challenges for the establishment and development of a network –the core task has been how to reduce such challenges to the minimum online, whilst not losing nuances and understandings of socio-cultural difference key to making such a network more effective. The paper offers auto-ethnographic reflections from the past four years, highlighting the key lessons learned and will be of relevance to those looking to initiate or sustain a network in the field of energy for development, or even development more broadly. Resilience (recovering from external shocks, such as unstable funding sources), solidarity (mutual support between members during difficult times) and adaptability (evolving with the changing interests of members and broader context) were three cross-cutting themes that were found to be crucial for the sustainability of both networks.

Present Capacity Building Schemes in Egypt

Ghada Bassioni[1]
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Biography of Presenting Author: Ghada Bassioni; M.Sc. 2000, Technische Universität München, Germany / Ain Shams University, Egypt; Dr. rer. nat. 2004, Technische Universität München, Germany. She is currently an Associate Professor and the Head of the Chemistry Division at the Faculty of Engineering, Ain Shams University,

Cairo, Egypt and an international project officer at the Science and Technology Development Fund (STDF), Egyptian Ministry of Scientific Research. She is a member of the Egyptian National Committee for Pure and Applied Chemistry and a member of the Executive Committee of the Global Young Academy.

Abstract

Building of capacities that stimulates the sharing of scientific knowledge and best practices, promotes the development of energy policies, supports pilot initiatives and provides technical assistance to the government. The number one barrier to renewable energy scale-up in Egypt - and the developing world in general - is identified to be cost. In Egypt, the Science and Technology Development Fund (STDF) has been found in 2007 as a governmental entity that helps building capacities in terms of infrastructure and human resources with an annual budget of US$ 100 million. It is under the umbrella of the Egyptian Ministry of Scientific Research and is therefore considered as the focal point to solve national challenges from an R&D perspective. Targeting research proposals that deal with energy-food-water has been a focus in the last two years. In collaboration with the Ministry of Electricity and Energy large solar power plants, with production capacities ranging from 20 MW to 50 MW, will start operation in 2016 and will add 1,500 MW to the grid's total capacity.

[EV06-ICT] ICTs for Professional Education in Developing Countries

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 3B | Level Garden

Moderator

Eric Gerelle
IBEX Project Services, Switzerland
erg@ibex.ch

Eric Gerelle is an international consultant and has worked with UN agencies, donor organizations, multi-national corporations, and universities. He is leading the Microinsurance Initiative for the Yverdon Insurance Consortium, supporting capacity building and access to information technology in microinsurance projects. During his career, he has worked both in academia and the private sector in development and marketing, organizing international conferences and workshops on sustainable development, knowledge management and project financing. He is currently developing mathematical models of development and applying them to scenario planning in health, insurance, employment and education. Eric has designed and developed information systems for data acquisition, workflow management, systems integration and knowledge management. Through cooperation with mobile solutions providers, he has created solutions for microinsurance, microfinance, health, nutrition and education in developing countries. He has set up several EU funded projects in Manufacturing, Health and Knowledge Management. His published works include papers in the areas of Industrial Automation, Production Management and a book on Computer Integrated Manufacturing. Eric Gerelle earned a BA in Physics from Oxford University and a PhD from Kansas State University in Mathematics and was awarded the Distinguished Alumnus Award from the Mathematics Department of Kansas State University.

Summary

The need for professional education in developing countries is in constant progression as economies grow and societies evolve. Professional education modes, tools, and techniques are rapidly changing, with a number of innovations linked to the development of Internet and mobile technologies.

The evolution in information communication technologies (ICTs) has resulted in the rise of new education modalities (distance or blended learning, online courses, etc.), and the development of a variety of tools (eLearning, MOOCs, etc.). Dispensing with constraints of time and place, internet-based solutions offer an incomparable opportunity for large scale, flexible and cheap knowledge-sharing and capacity building initiatives, which can be tailored to developing countries. The objective of this session is to identify the main challenges faced by developing countries in professional education and to review a panorama of innovative ICT solutions that could reply to those needs.

Presentations will show both the demand and offer aspects in the field of professional education in developing countries, namely the needs and the innovative tools available (eLearning, MOOCs, Simulations, Serious Games, e-Mentoring, etc.). The ensuing discussion will focus on designing a double-entry matrix of educational needs on one hand, and ICT educational solutions on the other hand. This will allow us to evaluate any matches, and point out the gaps.

To summarize, the objectives for this session are threefold:

- To present the latest developments in ICT-supported educational tools and solutions to education providers in developing countries;
- To show the critical educational needs and constraints of e-Education tools and services in developing countries;
- To initiate and favor dialog and cooperation between the two communities, to orientate research and development towards delivering adapted and effective solutions.

Participants are encouraged to take advantage of this session to establish contacts and collaborations with a view to building and delivering effective ICT-based educational solutions with social impact in developing countries.

Agenda and Speakers

➢ **Introduction: Professional Education as a basis for Social Impact in Developing Countries**

- **Alejandro Bonilla Garcia**, former ILO Social Protection Department Director, bonilla@actuarial-i.com

➢ **Training needs for Actuaries in Developing Countries**

- **Carlos Arocha**, Chairperson, International Section Council, Society of Actuaries, ca@arochaandassociates.ch

➢ **Meeting Actuarial, Organizational and Technical Challenges, A Case Study on Microinsurance**

- **Eric Gerelle**, Director, IBEX Project Services, erg@ibex.ch

➢ **Impact of Academic MOOCs in Developing Countries**

- **Patrick Jermann**, Executive Director, Center for Digital Education, EPFL MOOCs Factory, patrick.jermann@epfl.ch

➢ **Content, Tools and Services, To Deliver Effective Professional Education in Developing Countries**

- **Stefano Riboni**, Yverdon Insurance Consortium, stefano.riboni@ebizgames.com

➢ **Panel Discussion and Conclusion: Are ICT Educational Tools Matching the Needs? What are the Critical Gaps?**

- **Michael Horner**, Scientific & Medical Network Coordinator, Yverdon Insurance Consortium, mhorner@iprolink.ch

[SE09-DRR] Open Geodata and Imagery for Humanitarian Mapping

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 1A | Level Garden

Session Leader

Cristiano Giovando

Humanitarian OpenStreetMap Team, United States
cristiano.giovando@hotosm.org

Cristiano Giovando is a geographer and advocate of open data and open source geospatial software. At the Humanitarian OpenStreetMap Team, he coordinates technical project and imagery acquisition during disaster response activations. In 2015 Cristiano lead the creation of OpenAerialMap, a platform for sharing and finding openly licensed imagery. He was previously a scientific officer at the European Commission, developing an open source system for wildfire information and mapping called EFFIS.

Summary

Projects such as OpenStreetMap have demonstrated how free and open geographic data is vital to many aspects of disaster response and preparedness efforts. Governments and communities are realizing the importance of open data not only in support of risk modelling and humanitarian response, but also to foster economic development. The increasing availability of very high-resolution satellite, aircraft and drone open imagery, is enabling the creation of even more comprehensive, up-to-date and detailed maps. This session explores how such open data policies and technologies are being applied to different aspects of the humanitarian response cycle including:

- preparedness mapping
- support of disaster response teams
- training of local communities
- risk modelling

Presenters will share lessons learned and discuss how crowdsource-mapping initiatives such as OpenStreetMap have been integrated into preparedness and humanitarian response projects. The session will focus specifically on:

- humanitarian response and preparedness scenarios benefiting from data openness
- how open source software provides more sustainable tools to humanitarian mapping
- data models, standards and interoperable services in support of open geodata exchange
- innovative technology and best practices for sharing open geographic data
- successes of community mapping initiatives in the Global South

Panelists and Abstracts
(in alphabetical order)

Putting 20 Million People "On the Map": Evolving Methods and Tech Tools

Emily Eros[1], Dale Kunce[1], Drishtie Patel[1]
[1]American Red Cross, Washington, DC, United States

Presenting author's email address: emily.eros@redcross.org

Biography of Presenting Author: Emily Eros is an urban planner with a background in geographic information systems (GIS) and international development. As a GIS Officer at the American Red Cross, she is responsible for a

variety of mapping, information management, and data visualization projects to support international programs and disaster responses – including the new West Africa mapping project. Emily holds a masters degree in city planning from MIT and a bachelors in geography from Dartmouth.

Abstract

Accurate maps play a critical role in understanding human communities, particularly in post-disaster settings and for populations at risk. While open geospatial data has become more common over the past decade, additional work is necessary to map vulnerable communities before a disaster or crisis occurs. As part of their Missing Maps project, the American Red Cross and its partner organizations are actively working to map 20 million of the world's vulnerable people by 2017, creating open map data for anyone to access, use, and update. This paper (1) describes the project's remote and field mapping methods, (2) outlines the technical tools developed for the project, (3) highlights how humanitarian and development organizations can adapt these tools and methods to other initiatives, and (4) explores current challenges and research questions surrounding mapping initiatives focused on the Global South. In doing so, this paper provides an overview of current trends in crowdsourced mapping and emerging data collection methods, with the aim to share tools and experiences with others in the humanitarian community.

Ramani Huria and Community Mapping - Towards Free and Open Map Data and Imagery for Dar es Salaam

Deogratias Minja[1], Mark Iliffe[2], Edward Anderson[1]
[1]World Bank, Dar es Salaam, Tanzania
[2]Research Fellow, Nottingham University Business School, University of Nottingham, United Kingdom

Presenting author's email address: deo76em@gmail.com

Biography of Presenting Author: Deogratias E. Minja, Town Planner and Community Mapper. Currently, Deogratias Minja is a Community Mapping Analyst working with the World Bank's Global Practice for Transportation in Tanzania, supporting open data and community mapping activities. A town planning professional, having graduated from Ardhi University with B.Sc. Regional Development Planning. Prior to joining the World Bank, he worked with Kinondoni Municipal Council as a town planner, participating in the planning and development of Mabwepande Satellite town towards reducing the congestion of business centers within the Dar es Salaam.

Abstract

This paper provides a detailed investigation of the in-field experience of using community mapping as a participatory action research tool with communities. It describes two case studies. The first case study examines the environment of Dar es Salaam, through an exposition of community mapping in Tanzania. The second case study investigates how a participatory method can elicit flood inundation areas.

Due to various factors, including rapid urbanization and climate change, Dar es Salaam currently faces the challenge of periodic flooding, this impacting local residents and businesses. This research presents methods for mapping all flood prone areas through engagement of community members. By tapping this local knowledge, it is possible to create flood inundation scenarios and identify flood exposure, using a low-cost participatory process. These in turn lead to realistic natural hazard impact scenarios allowing for improved planning, preparedness, and response activities.

Community mapping has proved to be an inclusive and appropriate tool to elicit and codify the perspectives of communities. Evidence from this research suggests that innovative data collection tools such as Unmanned Aerial Vehicles (UAV), Global Positioning System (GPS) and Field Papers – a tool for annotating maps - the mapping process can successfully engage community members, not just as participants but as key stakeholders in a holistic flood resilience process. This in turn provides opportunities to support facilitators to build risk and disaster management teams to aid in mitigating and responding to flood and other hazard events.

Healthsites.io: The Global Healthsites Mapping Project

René Saameli[1], Dikolela Kalubi[1], Mark Herringer[2], Tim Sutton[2], Eric de Roodenbeke[3]
[1]International Committee of the Red-Cross, Lausanne, Switzerland
[2]Healthsites.io
[3]International Hospital Federation

Presenting author's email address: rsaameli@icrc.org

Biography of Presenting Author: René Saameli graduated in 1995 from the Swiss Federal Institute of Technology (EPFL) with a master's degree in civil engineering and hydrology. He joined the International Committee of the Red Cross (ICRC) in 2000. After several assignments in Africa and Middle East as an ICRC Water and Habitat coordinator, he joined in 2006 the ICRC headquarters in Geneva, where he set up a mapping and geographic information management capacity. He now supervises a distributed team of over 30 GIS officers working in the headquarters and major ICRC operations.

Abstract

Open geographic data and crowdsourcing mapping activities have made geodata more accessible for humanitarian actors and the opportunities of use greater. However, large volumes of data spread over multiple datasets combined with poor information management rules make efficient use by humanitarian actors difficult. Locating health facilities in disaster areas is a good example of this challenge. Many databases on health sites are available. Some, such as Open Street Map (OSM), are easily accessible but still largely incomplete and unreliable, others are much better but are not easily shared outside of the organizations which have gathered them, or are regional in their coverage. All these datasets complement each other in terms of geographical coverage and in terms of the information they contain, however they are almost never readily available in a consolidated, freely accessible way. This can seriously hamper initial relief efforts in emergencies.

To address these issues healthsites.io, the International Committee of the Red-Cross (ICRC) and the International Hospital Federation (IHF) have joined their competences and networks in order to create a free, curated, global source of healthcare location data. This open development initiative called The Global Healthsites Mapping Project aims to create an online map of every health facility in the world and make the details of each location easily accessible. In order to achieve this goal, the project has developed a specific master data management methodology which the healthsites.io team are in the process of implementing.

This paper will present in details the technical, but also institutional, challenges that need to be overcome to collect, aggregate, consolidate, quality-assure and distribute more than 150,000 reliable locations of health sites throughout the world.

OpenAerialMap: Empowering Disaster Response and Preparedness Communities with Aerial Imagery

Nate Smith[1], Cristiano Giovando[2], Rob Emanuele[3], Ian Schuler[1]
[1] Development Seed, Washington, DC, USA
[2] Humanitarian OpenStreetMap Team, San Diego, CA, USA
[3] Azavea, Philadelphia, PA, USA

Presenting author's email address: nate@developmentseed.org

Biography of Presenting Author: Nate leads strategy, research, and helps run projects at Development Seed. He has experience working with partners to process data to build APIs and develop open data and coordination strategies. Nate has a rich international experience in public health and humanitarian aid. Before joining Development Seed, Nate worked on projects in Haiti, Kenya, Morocco, and Thailand with humanitarian and academic organizations. Nate received a master's degree in public health from George Washington University in Washington, DC.

Abstract

Small unmanned aerial systems (sUAS) and nanosatellites are revolutionizing earth observation and democratizing remote sensing. Increasing amounts of aerial imagery are now being acquired both from these novel systems and from traditional satellite and aircraft platforms. Earth observation and remote sensing research and activities have the potential to gain from this increase in amount and quality of data. But the use of this data is still limited because of the difficulty of access. OpenAerialMap (OAM) seeks to solve this problem by providing a simple open way to search and retrieve open imagery. OAM is both a set of tools and community built on open source and open standards. OAM launched in the summer of 2015 in support of humanitarian response and development mapping projects through the Humanitarian OpenStreetMap Team (HOT). OAM is growing the community of contributors; currently there are thousands of images freely available for use.

[EV08-HAB] Using Minecraft for Community Participation in Urban Design Projects

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 2A | Level Garden

Moderator

Pontus Westerberg
UN-Habitat, Kenya
Pontus.Westerberg@unhabitat.org

Pontus Westerberg is coordinator of Block by Block, an innovative partnership between UN-Habitat, the UN programme for sustainable cities, and Mojang, the makers of Minecraft, in which Minecraft is used as community participation tool in urban planning projects. For the last 10 years he has worked with ICT4D, digital technology and communications in Europe, Africa and Latin America and holds an MA in Global Media and International Communication from the School of Oriental and African Studies, University of London.

Summary

Since 2012, UN-Habitat, the UN programme for sustainable cities, and Mojang, the makers of Minecraft, have been collaborating on an innovative private-public partnership in which Minecraft is used as a community participation tool in the design of urban public spaces. Minecraft is one of the world's most popular computer games, with over 100 million users, best imagined as a 'digital Lego', in which players build complex structures or compete against each other in community-designed competitions.

Experiences from projects in Nigeria, Kenya, Somalia, South Africa, Peru, Mexico, Haiti, Nepal, Bangladesh, Solomon Islands and the Philippines show that Minecraft is a useful tool for engaging communities, particularly youth, women and slum dwellers in urban design processes. Through five-day participatory design workshops, UN-Habitat and partners bring people together to visualize their urban design ideas in Minecraft, and present these to city authorities and local government officials.

This session will explain the methodology, the innovative partnership, showcase examples and case studies from cities in the Global South and give participants an opportunity to experience Minecraft hands-on. It is relevant to both the Habitat and Sustainable Cities and ICT4D thematic areas. In addition, it highlights Experiences from Hands on Models for Engagement and Public-Private Partnerships to Advance Technology for Development.

Panelists

➢ **UN-Habitat's Approach to Using Minecraft for Community Participation**

- **Pontus Westerberg**, Digital Projects Officer, UN-Habitat, pontus.westerberg@unhabitat.org

➢ **Case Study from Bangladesh**

- **Sohel Rana**, Urban Planner, UN-Habitat Bangladesh, sohel.rana@unhabitat.org

➢ **Case Study from Kosovo**

- **Klodeta Krasniqi**, Urban Planner, UN-Habitat Kosovo, klodeta.krasniqi@unhabitat-kosovo.org

➢ **Demo of the Minecraft Methodology, Using a Real Case Study from Mexico**

- **Eugenio Gastelum**, Minecraft Mexico, eugenio.gastelum@gmail.com

Visit Us in Room 2A for a Minecraft Participatory Experience

We will be onsite for the 3 days of the conference … Do drop by to say hello!

All conference participants are cordially invited to visit us in Room 2A during the breaks for a Minecraft participatory experience where they can explore Minecraft models, test the building process and contribute critical thoughts...

This is a new, innovative approach to urban design and participation, and while sharing learning and experiences from the programme, UN-Habitat and Mojang hope to learn and receive critical feedback from conference participants.

Visit Us in Room 2A for a Minecraft Participatory Experience

We will be onsite for the 3 days of the conference … Do drop by to say hello!

[SE17-CCI] Measuring Development Outcomes: A New Path in Development Engineering

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 1C | Level Garden

Session Leader

Temina Madon
University of California Berkeley, United States
tmadon@berkeley.edu

Temina Madon directs the Center for Effective Global Action (CEGA), a research network headquartered at the University of California, Berkeley. CEGA creates innovative products, services, and technologies for economic development. Temina has advised the WHO, World Bank, and Gates Foundation. Previously, she held positions in science policy at the National Institutes of Health and U.S. Congress, where she served as AAAS Science and Technology Policy fellow. She has a PhD in health sciences from UC Berkeley and an SB in engineering from MIT.

Summary

Development engineering (Dev Eng) applies principles from engineering, economics, and the social sciences to solve challenges arising from global poverty. A core focus of the Dev Eng research community is to improve the measurement of development indicators. How can we cost-effectively capture inputs from low-income, remote, and excluded communities? How can real-time, high frequency, more reliable information be integrated into social policy and program design? How can we track progress toward poverty reduction—especially in light of the new Sustainable Development Goals (SDGs)?

New technologies—from satellites and mobile data streams, to sensors and administrative "big data"—are revealing the demands, preferences, and realities of people living in poverty. This rich information can inform the design of new products, services, and interventions that target poverty alleviation. It also facilitates the evaluation of new anti-poverty strategies and learning about what works. However, mainstreaming these innovations within the social sector has proven slow, given budget constraints, missing technical expertise, and lack of incentives to improve efficiency.

This session invites researchers and private sector product developers to showcase new measurement technologies and strategies that have been adapted for use in developing country contexts. Presentations will highlight how these innovations affect development practice in the field—in terms of resource allocation, program decision-making, and evaluation. We will also examine issues related to privacy and safety, particularly in fragile or conflict-affected areas.

Panelists and Abstracts
(in alphabetical order)

Monitoring and Evaluating Development Impacts: Case Examples from Implementing a Mobile Vaccination Registry System in Different Contexts
Lauren Spigel[1], Korinne Chiu[1]
[1]VaxTrac, Washington, DC

Presenting author's email address: lauren.spigel@vaxtrac.com

Biography of Presenting Author: Lauren Spigel is the Monitoring and Evaluation Coordinator at VaxTrac. VaxTrac designs, builds, supports, and evaluates a mobile vaccine registry system for frontline health workers. She works with staff to assess the effectiveness of VaxTrac's work, use findings to improve system usability, build evaluation capacity and present findings to various audiences. Ms. Spigel received her Master of Public Health from Johns Hopkins School of Public Health.

Abstract

This presentation will provide case examples and experiences with developing evaluation frameworks to assess the adoption and impact of a mobile vaccination registry system for children in Benin and Nepal. VaxTrac designs, builds, supports, and evaluates a mobile vaccine registry system aimed to increase the availability, quality and use of vaccine data. This tablet-based system was implemented in 2014. A process and outcome evaluation framework was created to capture both technology adoption and health indicators using multiple methods of data collection. The evaluation framework intends to capture the impacts of having better quality data in a shorter time frame to make decisions about vaccine waste, coverage rates, and schedule adherence as well as successes and challenges with implementing a mobile vaccination registry. Data collection methods for technology adoption and use as well as health outputs and outcomes will be shared. Challenges and accomplishments in framework development and execution will be described, with an emphasis on the importance of understanding the context within which a technology for development intervention is implemented. Findings will be presented, compared, and contrasted for each country context. Lessons learned and reflections for designing and implementing technology for development evaluation frameworks and tools will be discussed.

Information Driven Socio-Behavioral Change to Mitigate Arsenic Crisis

Chander Kumar Singh[1], Prabhat Barnwal[2], Jan von der Goltz[3], Alexander van Geen[4]
[1]Dept. of Regional Water Studies, TERI Uinversity, India,
[2]Dept. of Economics, Michigan State University
[3]School of International and Public Affairs, Columbia University
[4]Lamont Doherty Observatory, Columbia University

Presenting author's email address: chanderkumarsingh@gmail.com

Biography of Presenting Author: Chander Kumar Singh is Assistant Professor, Coca-Cola Department of Regional Water Studies in the Department of Natural Resources at TERI University, New Delhi. His main research interests are in the fields of remote sensing and GIS applications, hydrogeology, geophysics, water resource management and geology. He has previously worked for the School of Environmental Sciences at Jawaharlal Nehru University and was awarded a Sat Pal Mittal Research Fellowship based on his academic excellence for the year 2006-2010. He was awarded a Young Scientist Award by International Union of Geological Sciences in Euro Conference 2009, Switzerland.

Abstract

Groundwater contaminated with arsenic of natural origin poses a serious threat to the health of tens of millions of villagers across South and Southeast Asia. Testing wells for arsenic provides information that is not substitutable. Because the distribution of arsenic incidence in groundwater is difficult to predict, and varies greatly even over small distances, the safety of a well cannot be predicted without a test. A well that meets guidelines for arsenic in drinking water may be found in immediate neighborhood of a very unsafe well. There is no systematic and predictable relationship between and arsenic and well depth. At the same time, precisely because arsenic contamination varies greatly over small distances, well tests make available an effective way to avoid exposure, namely by switching to a nearby safe well. A blanket testing campaign was conducted in approx. 200 villages in Indus River Basin under PEER Science grant of USAID as well as 26 villages in Gangetic River Basin from the grant by International Growth Centre to quantify the problem of Arsenic contamination of Groundwater. A fee-based arsenic testing was offered in a randomized controlled trial in 26 villages in Bihar, India, from 2012-2015. We also tried to emulate socio-behavioral impacts by disseminating the information on well water content of Arsenic by onsite field kit testing and then using google earth posters for larger dissemination of results in the village. A survey along with a follow-up testing after two years of first wave of testing was offered. During first wave of testing 31% of households switched to Arsenic safe wells. To assess the question of sustainability, we repeated the sales offer two years after the initial campaign, at the same (nominal) sales price. We recorded significant additional demand at the time of the repeat offer, with overall coverage rising from 27% to 45%. Data limitations do not allow us to ascertain what mechanisms lie behind additional demand: wealth increases, learning, or the direct effect of repeating the offer (what one might call a 'marketing' or 'nudge' effect). However, from the vantage point of policy interest in sustainability, the reduced-form effect of making a repeat offer is highly relevant. A key finding is that a repeat offer made within two years met with significant demand. This underscores the need for a more careful assessment of experimental evidence generated with one time offers, or offers available only for a short period. Given selective recall, the question of how best to provide information to households in a way that is salient but not socially costly deserves additional attention.

Financial Diaries and Financial Awareness: Evidence from a Randomized Experiment

Joeri Smits[1], Isabel Günther[1]
[1]Center for Development and Cooperation (NADEL), Eidgenössische Technische Hochschule (ETH) Zurich, Zurich, Switzerland

Presenting author's email address: smits@nadel.ethz.ch

Biography of Presenting Author: *Joeri Smits studied development economics at Wageningen University in the Netherlands and obtained an MSc in Development and Natural Resource Economics from the Norwegian University of Life Sciences (NMBU). Currently Smits is a PhD student at the Center for Development and Cooperation (NADEL) at ETH Zurich. His primary research measures and analyzes household overindebtedness among microcredit borrowers and non-borrowers in Uganda. His other research topics include causal inference with observational data and the economic causes of violent conflict.*

Abstract

Income and expenditure data, a key development outcome, is often of low quality and it does not capture the highly temporally variable and irregular nature of cash flows of households and individuals in low-income countries. This paper reports on an experiment wherein the members of microcredit groups were randomly assigned to being offered "financial diaries" to keep record of their daily cash flows. One of the aims of the experiment was to see if keeping track of the diaries changes financial behavior and outcomes, as that could reduce the validity of the diaries as a measurement instrument. Intent-to-treat effects are not found to be significantly different from zero for all outcomes, except food consumption. This effect is driven by increases in the perception of consumption, but not consumption itself. Given the cost and high dropout, the approach seems not scalable.

Filling Spatial and Temporal Gaps in Development Surveys Using Night Lights

Adedamola Adepetu[1], **Jay Taneja**[2]
[1] Cheriton School of Computer Science, University of Waterloo, Canada
[2] IBM Research – Africa, Kenya

Presenting author's email address: taneja@ke.ibm.com

Biography of Presenting Author: *Dr. Jay Taneja is a research scientist at the IBM Research - Africa lab, headquartered in Nairobi, Kenya. Jay leads the lab's efforts on improving energy access, reliability, and quality in Sub-Saharan Africa. His research interests are in applying information and communication technology to improve energy networks, both on and off the electricity grid. He completed his PhD in Computer Science from the University of California, Berkeley, U.S.A., where his research was focused on novel uses of embedded systems for managing electricity loads to enable electricity grids to incorporate large amounts of renewable generation.*

Abstract

Survey data are often used to measure development outcomes, but can be imprecise, biased, and expensive. Even datasets that manage to meet stringent quality criteria often have limited statistical coverage and are not collected frequently enough to remain relevant. In this work, we develop a method to address the spatial and temporal "gaps" that result from household survey-driven datasets commonly used in development studies, such as the USAID Demographic and Health Survey. Our method employs satellite night lighting data to enable more granular and timely assessments of community development than are available from traditional datasets. We also show how pairing the night lighting data with our methods can provide deeper insight of household wealth than current methods used in census data, representing a step forward for measurement of development outcomes.

[EV10-CCI] Unleashing Scientific Entrepreneurship: How to Turn Risks into Opportunities

DAY 2 – Tuesday 3 May – 14:00-15:30
Swiss Tech | Room 3A | Level Garden

Moderator

Manuel Fankhauser
Innovation Forum Lausanne, Switzerland
manuel.fankhauser@epfl.ch

Besides doing his thesis research in tumor immunology at EPFL, Manuel is passionate about innovation and entrepreneurship. Being on the biology advisory board of the EPFL based startup Nanolive, he has gained insight in how a startup is evolving from vision to market. Furthermore, he has been a Founding Member and President of Innovation Forum Lausanne, an EPFL association that aims at unleashing the potential of scientific entrepreneurship to solve tomorrow's problems.

Summary

Do we need to establish a "Global Challenges Institute" in which all global resources are accumulated to achieve a common goal: to mitigate the risks that threaten human civilization?

A recent report by the Global Challenges Foundation names 12 risks that have the potential to end human life. Some of these risks, such as extreme climate change and nuclear war, are well known amongst the broad public. However, others, such as global system collapse, artificial intelligence, or bad global governance are only rarely part of the public debate.

The aims of this session are twofold: first, to raise awareness about the existence and the nature of the 12 risks. This will be achieved by a keynote lecture given by Dennis Pamlin, one of the authors of the Global Challenges Report. Second, in the format of a roundtable debate, we will be exploring how scientific entrepreneurship could be used to turn some of these risks into opportunities. Specifically, we will try to identify the key ingredients and action points that are needed to foster an environment that would allow entrepreneurial-minded scientists to tackle these risks in real life.

Agenda and Panelists

➢ **Keynote: What are the 12 risks that threaten human civilization and which ones could be mitigated by scientific entrepreneurship?**

- **Dennis Pamlin**, Founder, 21st Century Frontiers, Sweden, dennis@pamlin.net

➢ **Interactive roundtable discussion**

- **Dennis Pamlin**, Founder, 21st Century Frontiers, Sweden, dennis@pamlin.net

- **Marie-Valentine Florin**, Executive Director, International Risk Governance Center, EPFL, Switzerland, marie-valentine.florin@epfl.ch

- **Lorenzo Massa**, Assistant Professor at Vienna University of Economics and Business, Chair of Green Economy and Resource Governance, EPFL, lorenzo.massa@epfl.ch

Breakout Sessions

DAY 3 – Wednesday 4 May

[SE06-MED] The New Roles and Challenges of Technology in the Fight Against Infectious Diseases

DAY 3 – Wednesday 4 May – 11:45-13:15
Swiss Tech | Room 1B | Level Garden

Session Leader

Walter Karlen
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Walter Karlen is an Assistant Professor in the Department for Health Sciences and Technology heading the Mobile Health Systems Laboratory at ETH Zurich since October 2014. He received an MSc degree in micro engineering and a PhD in Computer, Communication and Information Sciences from the Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland. He has worked extensively on mobile phone implementations of biomedical sensors for global health applications and developed novel algorithms for the automated analysis of biomedical signals and diagnosis of infectious diseases.

Summary

Parasite born infectious diseases such as malaria cause a large burden on low-resource health care systems. Current in-field diagnostic devices have limited sensitivity and inconsistent performance and preventive technologies have had limited effectiveness. New developments are sought to fight malaria and other infectious diseases. Pre-symptom diagnostic tests that allow for early screening of infections must address apart from improved sensitivity also better specificity. Furthermore, to have impact and allow scalable implementation in low resource settings, novel interventions have to satisfy the ASSURED (Affordable, Sensitive, Specific, User-friendly, Rapid and robust, Equipment free and Delivered) criteria set out by the World Health Organization for rapid diagnostic tests.

While research focuses largely in satisfying sensitivity and specificity, other aspects of ASSURED such as low cost, usability, robustness and implementation strategies are often neglected during the initial development stages. The goal of this session is to bring together researchers and implementers from various fields to discuss common strategies to address challenges that new technologies for infectious diseases eradication must meet.

Panelists and Abstracts
(in alphabetical order)

Barriers to Point of Care Testing in India and South Africa

Nora Engel[1], Vijayashree Yellappa[2], Malika Davids[3], Keertan Dheda[3], Nitika Pant Pai[4], Madhukar Pai[4]
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[2] Institute of Public Health, Bangalore, India
[3] University of Cape Town, Cape Town, South Africa
[4] McGill University, Montreal, Canada

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Biography of Presenting Author: Nora Engel is an assistant professor of Global Health at Maastricht University. Her work focuses on innovation dynamics in global health challenges (such as tuberculosis) and on the sociology of diagnostics and innovations at the point-of-care in India and South Africa. She has done extensive fieldwork in India and South Africa, among others on challenges to point of care testing across different settings, diseases and actor groups.

Abstract: Point of care (POC) testing in communities, home settings and primary healthcare centers has tremendous potential in reducing delays in diagnosing and initiating treatment for diseases such as HIV, tuberculosis, syphilis and malaria. Quick diagnosis and further management decisions completed in the same clinical encounter or at least the same day, while the patient waits, promise to overcome delays associated with conventional laboratory-based testing. However, the availability of cheap, simple and rapid tests that can be conducted outside laboratories does not automatically ensure successful POC testing. In order to understand the new roles and challenges medical devices such as these encounter, we need to study how tests are used at the POC and integrated into workflow and patient pathways.

This paper reviews selected results from a qualitative research project on barriers to point of care testing in India and South Africa and discusses them comparatively. The project used semi-structured interviews and focus group discussions to examine diagnostic practices across major diseases and actors in homes, clinics, communities, hospitals and laboratories in South Africa and India. In comparing selected results, it becomes clear that both countries have very different diagnostic eco-systems that provide very different conditions for POC testing. The paper concludes by reflecting on how to take such insights into account when designing POC testing programs.

Supporting the Development and Implementation of Improved Diagnostic Solutions for Malaria Control and Elimination

Iveth J. González[1]
[1]Head of malaria and acute febrile syndrome programme – FIND, Switzerland

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Biography of Presenting Author: Iveth J. González is medical doctor from Colombia with a PhD degree in basic sciences from the University of Lausanne in Switzerland. She has worked on basic and clinical research applied to tropical diseases, more specifically malaria, leishmaniasis and Chagas disease. She is currently the head of the Malaria & Acute Febrile Syndrome programme at FIND in Geneva, where she has contributed to the development and implementation of diagnostics solutions for malaria and neglected tropical diseases.

Abstract: Malaria is one of the four most burdensome infectious diseases globally and the fifth highest cause of child mortality. The 2014 World Malaria Report estimates that in 2013, there were 198 million cases and 584,000 deaths due to malaria. However, remarkable progress has been made in malaria control during the last decade. For the second time in history, the world is actively fighting toward malaria elimination. Sustaining global gains and accelerating actions toward malaria elimination requires better access to appropriate individual diagnosis and effective surveillance and response tools. FIND is committed to increasing access, even in the remotest areas, to high-quality malaria diagnostic tools that have the confidence of health workers and patients. As progress towards elimination is made, country by country, our ability to accurately identify the remaining malaria infections with effective diagnostic tests will be critical for success. Across all FIND's activities, collaborating with partners is essential. We work with academia, industry, national malaria control programmes, other international organizations, implementation agencies and global procurement agencies to increase access to effective malaria diagnosis.

Integrating Waterborne Disease Modeling in a Participatory Approach to Tackle Schistosomiasis in Burkina Faso

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Biography of Presenting Author: Javier Perez-Saez is an italo-venezuelan doctoral student at the Ecohydrology laboratory (ECHO) at EPFL. With a Master in environmental engineering from EPFL, his work focuses on understanding the socioecological drivers of waterborne diseases to develop decision support tools for public health authorities. His doctoral project is on spatially explicit models of schistosomiasis in Burkina Faso.

Abstract: The Sustainable Development Goals charge the global community to end poverty, ensure healthy lives and grant access to water and sanitation within 2030. Waterborne diseases, with a global footprint, a significant health burden, and complex transmission cycles, lie at the nexus of these challenges, especially in those areas where the population's livelihood depends on water resources. We study a tropical neglected and waterborne disease, schistosomiasis, of great public health importance in Burkina Faso. Moving beyond our cutting-edge modeling of the ecohydrological controls of the disease, we propose a vision through a participatory approach that includes social aspects in our mathematical model to study the disease in a rural Sahelian village. Our participatory approach aligns our research objectives with local challenges in water resources management including waterborne diseases. Our results suggest that although the community depends on a small reservoir for subsistence agriculture, it is the culprit for schistosomiasis infections because it causes behavioral changes, in addition to providing favorable habitats for the snail intermediate hosts of the parasite. Through our participatory research process, we lay the foundation for an early warning and surveillance-response tool which will: 1) provide valuable support to public health authorities, 2) enhance capacities of all local stakeholders and 3) be adaptable to other diseases and settings across sub-Saharan Africa.

[EV02-MED] How to Accelerate Scale-Up of Medical Technologies through Innovative Public – Private Partnerships

DAY 3 – Wednesday 4 May – 11:45-13:15
Swiss Tech | Room 2C | Level Garden

Moderator

Barbara Bulc
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Barbara Bulc is President and Founder of Global Development – Advising the Leaders based in Geneva, Switzerland. She has been a driving force in catalyzing and developing transformational global public-private partnerships to improve people's lives in developing and emerging economies. She has over 20 years of leadership and advisory experience in healthcare business and international development. Barbara holds graduate degrees in chemistry and management from Ljubljana University in Slovenia and Columbia University Business School in New York, and has studied leadership of professional services at the University of Cambridge, Judge Business School.

Summary

We live in an era of rapidly growing and increasingly complex global health challenges. We have the knowledge, financing and ever-improving technical capacity, including medical technologies, to address these challenges. In spite of that, medical technologies for resource-limited settings are often challenged by late market introductions and slow scale-up. How can we change this paradigm?

Today's global health problems require us to act and think differently than when these problems were created. Whether there is an outbreak of a new virus, a misdiagnosed tuberculosis, or a growing diabetes pandemic, we need holistic solutions coupled with sustainable business models to effectively expand access to appropriate and affordable medical technologies. This is particularly important in resource-limited settings where no single public or private sector organization can solve these problems alone. Multi-sectorial collaborations, beyond health sector actors, and the participation of consumers, are key for success.

This interactive session will convene thought leaders and practitioners from private and public sector organizations that are instrumental in scaling up medical technologies. Panelists will share insights and practical examples of creative collaborations accelerating product development, launch and market access of high-quality and affordable medical technologies. Discussions will also highlight the importance of selecting and incentivizing the right partners across different sectors, and planning for scale early, to deliver these solutions at global scale. The catalytic role of communication and advocacy in shaping partnerships and pursuing scale will also be described.

The key objectives of this session are:

- Discussing needs and opportunities for innovative public-private partnerships to scale up medical technologies.

- Shedding light on the new roles for public and private sector actors to accelerate the delivery of medical technologies at scale.

- Sharing the emerging financing and risk-sharing models in cross-sector collaborations.

Panelists

- **Klaus Schönenberger**, Project Leader, EssentialTech Programme, Cooperation & Development Center,EPFL, klaus.schonenberger@epfl.ch

- **Thomas Zeltner**, President Science-et-Cité, Swiss Academies of Arts and Science and Vice President Swiss National Commission for UNESCO, t.zelt@bluewin.ch

- **Frederik Kristensen**, Senior Advisor on Innovations to the Assistant Director General, World Health Organization, kristensenf@who.int

- **Jeremy Lack**, Attorney-at-law, Lawtech and ADR Mediator, jlack@lawtech.ch

- **Sanne Fournier-Wendes**, Advisor to the Executive Director, UNITAID Innovating for Global Health, wendess@unitaid.who.int

[SE11-ENE] Social Innovations for Energy Access: Organizing Sustainable Energy for All

DAY 3 – Wednesday 4 May – 11:45-13:15
Swiss Tech | Room 3C | Level Garden

Session Leader

Lena Kruckenberg
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Lena Kruckenberg investigates renewable energy technology adoption and market development through interorganizational networks in Central America. She has recently published an article on renewable energy partnerships in development cooperation in *Energy Policy*.

Summary

Several sessions at the Tech4Dev 2014 Conference pointed to the importance of social innovation for the adoption of technologies in marginalized contexts. It was concluded that the sustainable adoption of low-carbon technologies is conditioned not only by the technologies themselves, or on how they are provided, but also depends on how processes of technological development, financing, transfer and adoption connect with local institutions and practices. Multi-stakeholder collaboration and participatory engagement are seen as best practice – but also as difficult and costly. As we witness a shift from technology-driven to stakeholder-oriented initiatives, questions arise as to how a more sustainable uptake of low-carbon technologies can be organized. This session invites participants to discuss the roles of various forms of social organization in enhancing energy access in marginalized contexts.

The session aims to identify organizational processes and social innovations that open up new avenues for achieving the United Nations' goal of 'Sustainable Energy for All'. In particular, it focuses on:

a) Innovative business models for the diffusion of clean energy products;

b) On how such models have to be aligned with the wider socio-economic context to which they are introduced, and

c) On the potential of novel forms of stakeholder management and 'institutional innovation' for meeting the organizational challenges associated with mini-grids for rural electrification and with rice straw-based electricity generation.

Panelists and Abstracts
(in alphabetical order)

Institutional Innovation in the Management of Pro-Poor Energy Access in East Africa

Lorenz Gollwitzer[1], David Ockwell[2], Adrian Ely[1]
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[2]Department of Geography, STEPS Centre, Sussex Energy Group and Tyndall Centre for Climate Change Research, School of Global Studies, University of Sussex, UK

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Biography of Presenting Author: Lorenz Gollwitzer is currently researching issues surrounding socio-cultural interventions to operational challenges in mini-grids for rural electrification in East Africa for his PhD at SPRU - Science Policy Research Unit. His past research and work has focused on accelerating deployment of low-carbon technologies for rural electrification in developing countries as well as new financing mechanisms for resilient and sustainable infrastructure. He holds an MA in International Economics and International Relations from the Johns

Hopkins School for Advanced International Studies (SAIS) as well as a BSc in Engineering and Business Studies from the University of Warwick and Warwick Business School.

Abstract

This paper articulates a new theoretical perspective on the management of rural mini-grids for facilitating pro-poor electricity access in developing countries. Bridging the literature on common pool resource (CPR) management/collective action (including its application to irrigation systems) with the hydraulic analogy for explaining the behaviour of electricity in closed electrical circuits, a refined theoretical framework is produced for analysing the socio-cultural institutional conditions for sustainable management of rural mini-grids. The utility of the framework is demonstrated via empirical analysis of mini-grids in rural Kenya. This yields insights on socio-cultural approaches to addressing challenges relating to sustainable mini-grid management, e.g. seasonality of demand and fair allocation of limited amounts of electricity to different consumers, in ways that are acceptable to, and to some extent also enforced by the entire group of diverse resource users. The paper contributes to both the literatures on sustainable CPR management/collective action and the literature on pro-poor sustainable energy access in developing countries, providing a novel theoretical and empirical contribution to the emerging sociocultural turn in the latter.

Boosting Impact at the Base of the Pyramid: Enhancing the Uptake of Sustainable Energy

Amelie Heuer[1]
[1]SEED, hosted by Adelphi Research

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Biography of Presenting Author: With over 10 years' experience in the field of sustainable development, Amélie Heuër currently heads the research programme at SEED to provide evidence about the impacts of social and environmental entrepreneurship and its contribution to sustainable development. Prior to joining SEED, Amélie worked for several years on marine conservation and coastal resources management in the Philippines. She has specific expertise on multi-stakeholder partnerships, eco-entrepreneurship, capacity building, livelihood development and coastal resources management.

Abstract

Adoption of existing green solutions at the Base of the Pyramid (BoP) remains a challenge due to the expensive upfront investments, the lack of infrastructure in remote areas, but also due to a lack of awareness and trust in new technologies, and due to the lack of technical knowledge and skills for the upkeep of those innovative products.

Social and environmental small, medium and micro enterprises (SMMEs) offer one concrete means of addressing these issues, primarily because they are specialists in understanding local challenges and needs and with their extended local networks have the ability to reach the last-mile beneficiaries. By introducing new products, services and models that serve social needs and create new social relationships, they are able to maximise the uptake of green solutions in the long term.

While there is no 'one-size-fits-all' solution to clean energy distribution or adoption, the paper looks at the case of Solar Sister in Uganda, Tanzania and Nigeria, to highlight how SMMEs can introduce innovative social structures through a Triple Bottom Line (TBL) approach.

Through their unique women-to-women network and dedicated women empowerment, the enterprise offers a wide range of high quality clean energy products with a long life-cycle, and has created an innovative value chain that works for those at the base of the pyramid by positioning themselves close to their markets, tailoring innovation to social needs, mitigating high costs through micro-entrepreneurship and by growing networks and expertise through multi-stakeholder partnerships. Subsequently, they have increased local awareness, trust and ownership in the innovative products, and succeeded in large scale dissemination of the new technologies at the BoP.

Critical Perspectives on Farmer Engagement in Rice Straw Management and Bioenergy Development: Cases from Southeast Asia

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[2]International Rice Research Institute, Los Baños, Laguna, Philippines

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Biography of Presenting Author: Angela Minas is a PhD researcher at the Tyndall Centre for Climate Change Research in The University of Manchester, and a research scholar at the International Rice Research Institute. Prior to this, she earned a degree in MSc Sustainability (Environment and Development) at the University of Leeds where her research focused on analysing social learning in agricultural innovation systems. Her other research interests include, among others, community-based environmental management and socio-political dimensions of climate change adaptation and mitigation.

Abstract

Rice straw is one of the major agricultural by-products in many rice-producing countries in Southeast Asia. It is also one of the largest contributors to their biomass energy resource. Various studies have been conducted to assess its potential for bioenergy development and as a means to mitigate climate change by reducing emissions from burning and providing a low carbon energy alternative, but there is only limitedly research on local business models and how smallholder rice farmers might be involved in developing and adopting this innovation. This paper reviews the recent literature in bioenergy from rice straw, and delves into the different perspectives on how rice farmers are or might be engaged in the process. By reviewing empirical case studies in Southeast Asia, it presents both the research trends and current gaps in understanding, and further provides recommendations on how knowledge in this field could be expanded and contribute to energy security and agricultural development.

Sawdust Pellets, Micro Gasifying Cook Stoves and Charcoal in Zambia: Understanding the Reasons behind Failure and Success of Improved Cook Stove Initiatives

Iva Peša[1]

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Biography of Presenting Author: Iva Peša studies frugal innovations in Zambia, such as improved cook stoves and mobile money services. These innovations aim to dramatically reduce the costs of existing products, systems and services, without sacrificing user value. She holds a PhD in Zambian history and has an interest in how technology is socially embedded. She has published an edited volume, entitled 'Transforming Innovations in Africa' (Brill, 2012).

Abstract

In Zambia one influential initiative to ensure 'Sustainable Energy for All' has been the introduction of micro gasifying cook stoves and sawdust pellets to replace cooking on charcoal. From 2010 onwards several commercial companies – with various organisational structures – have been trying to market these stoves at the 'Bottom of the Pyramid', with varying degrees of success. This paper will explore the organisational aspects of several improved cook stove initiatives to see whether organisational set-up influences stove adoption and market penetration. It will be argued that initiatives to market improved cook stoves can, paradoxically enough, learn a lot from the existing charcoal value chain and its marketing structure. Improved cook stove initiatives have to be understood within a technical, organisational, social and economic context, as markets, people and locality matter and one size does not fit all.

[SE15-HAB] The Contemporary City in the North-South Debate: Innovation Trajectories in Research and Practice

DAY 3 – Wednesday 4 May – 11:45-13:15
Swiss Tech | Room 1A | Level Garden

Session Leaders

Jean-Claude Bolay
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Jean-Claude Bolay is the Director of the Cooperation & Development Center (CODEV) at EPFL. A sociologist by training, he specialized in urban issues in Latin America, Asia, and West Africa. He prepared his PhD in Political Sciences at El Colegio de Mexico, then at UC Berkeley, USA. He has carried out many international research projects in urban societies, sustainable development, and poverty reduction in developing countries. He was a scientific advisor and evaluator for Swiss and European institutions. Since 2005, he is Adjunct Professor at the Laboratory of Urban Sociology (LaSUR) at EPFL.

Marija Cvetinovic
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Marija Cvetinovic is a PhD candidate at EPFL. Her research focuses on urban development, post-socialist urban planning, participatory processes, and their potential to reduce the negative effects of globalization and urbanization in post-socialist cities. She obtained her Master degree in Architecture (University of Belgrade), has worked in architectural practices, and been involved in artistic and social activities in Belgrade which gave her a broader picture of current potentials and conflicts in transitional countries.

Summary

The city is dynamic, itinerant, multi-layered, contingent - an arena of exchange among urban actors and stakeholders, built environment, technologies, and infrastructures. This is accentuated in the modern globalized world where the rapid flow of people and information has profoundly transformed the perception of space and time, lifestyles and our sense of community and self. The contemporary city becomes an interface of flattened reality in which the various disciplinary concepts are merely particular entry points from which to reflect on cities and to address the urban in its elusive complexity and dynamics. Meanwhile, the focus of these processes and their immediate effects has shifted to poorer and less developed regions. Although the urban conflicts faced by developing countries seem particularly serious and complex, the possible solutions are not radically different from those applied in developed countries. At this point, we are interested in examining the relationship between technologies, knowledge and power in advanced technological, technical and methodological approaches in urban research and practice worldwide, with an emphasis on Global South.

Starting with formulating the path of innovation in urban research and practice, the focus will be tackling strategies, approaches, and tools to enhance the social impact of various urban decision making approaches. The session will concentrate on knowledge transfer and encourage the exchange of North-North, North-South, South-North, and South-South experience with regards to the various

stages in the application of technological and methodological innovation in the academic, administrative, technical and practical domains in cities and in urban research. The major challenge is to examine if we can find common ground where contextualized theory, practices, techniques, expertise and politics come together in discussing the interplay between the different power poles that deal with urban planning, governance and management in developing, emerging and transitional countries. The intended far-reaching goal is to empower the scientific community, local stakeholders, non-governmental and civil sectors dealing with these topics (urban development, governance, management, and planning) and bring about trans-, multi- and pluri-disciplinary cooperation for technological and social innovation.

Panelists and Abstracts
(in order of presentation)

Miramap: A Collective Awareness Platform to Support Open Policy-Making and the Integration of the Citizens' Perspective in Urban Planning and Governance

Francesca De Filippi[1], Cristina Coscia[1], Anna Cantini[1], Roberta Guido[2]
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[2]Dept. Architecture Design and Urban Planning, University of Sassari, Italy

Presenting author's email address: francesca.defilippi@polito.it

Biography of Presenting Author: Architect and PhD, lecturer and adjunct professor at the Dept. Architecture and Design and director of the Research and Documentation Centre in Technology, Architecture and City in Developing Countries (CRD-PVS) at the Politecnico di Torino (Italy). Research interests mainly focus on urban regeneration, ICT for development, social inclusion and participative planning. She is the coordinator (with C. Coscia) of the Crowdmapping Mirafiori Sud Project, that has been granted with the SiforAge EU Social Innovation Research Prize in 2015.

Abstract
The paper intends to explore an innovative approach for a more inclusive and sustainable urban planning and governance through the use of the ICT matched with a participatory process. It describes the transition process from a pilot project (Crowdmapping Mirafiori Sud/CMMS) headed by the Politecnico di Torino in 2013 in the Mirafiori Sud district of Turin (Italy) – whose aim was to design and test an open source crowdmapping platform to identify and categorize, aggregating large amounts of user-generated inputs, the nature, the location and the consistency of the obstacles which prevent vulnerable categories to use the public space in their neighborhood – to the set up of a proper governing tool (Miramap) to enhance open policy-making and the integration of the citizens' perspective through their effective engagement.
Such platform is expected to have very concrete impacts both in empowering citizens, supporting grassroots processes and practices, sharing knowledge, and in allowing policy options and design to become more informed and targeted.
The methodology and the technological implementation supporting the creation of the platform have been developed by a multidisciplinary research team (urban planners, architects, sociologists, engineers, computer scientists, legal experts) in consultation with - and with the support of - the local public administration and the community based organizations.

Advancing Analytical Tools to Understand Urban Planning: Mapping Controversies around the Mumbai Development Plan 2014-2034

Tobias Baitsch[1], Salomé Houllier[1], Richa Bhardwaj[2], Luca Pattaroni[1], Christine Lutringer[1], Amita Bhide[2]
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[2]Tata Institute of Social Sciences, Mumbai, India

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Biography of Presenting Author: Tobias Baitsch graduated as an architect form ETH Zurich in 2007, after which he practiced with several architectural offices in Zurich and Paris. Since 2012 he is a PhD candidate and doctoral assistant at the Laboratory of Urban Sociology in the School of Architecture, Civil and Environmental Engineering at the EPF Lausanne where he pursues his research on incremental urban development in India.

Abstract
The proposed article suggests that urban studies are in need of new tools to describe and analyze the different "regimes of urbanization" in an increasingly heterogeneous urban world. In order to create dynamic and relational descriptions of contemporary cities, we propose to use innovative mapping and analytical tools, which allow representing the richness and complexity of the controversies that accompany the making of a common urban future. Such tools are urgently needed to understand better the conflicting processes that drive urban development and to improve planning methods and policies. Through the event of the publication of draft Mumbai Development Plan (MDP) 2014-2034 and its temporary withdrawal and revision due to an unprecedented public outcry and strong criticism, we propose to use the methodological tool of mapping

controversies in the field of urban planning. This event is highly representative of the tensions and conflicts pervading the development and regulation of contemporary cities in the Global South as well as in the North. Using preliminary findings from this ongoing study this article highlights the need for new descriptive methodology that would describe better the heterogeneous characteristic of the cities. Thereby, it proposes to contribute to the international debates on the transformation of urban conflicts and more broadly on the renewal of critical urban studies.

Megaprojects as an Instrument of Urban Planning and Development: Example of Belgrade Waterfront Project

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[1]Institute of Architecture and Urban and Spatial Planning of Serbia, Belgrade, Serbia

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Biography of Presenting Author: *Slavka Zeković, scientific adviser at the Institute of Architecture and Urban & Spatial Planning of Serbia She was a researcher at the Yugoslav Institute of Urbanism and Housing in Belgrade. She obtained her PhD in Regional Industrial Development and Planning at the University of Belgrade. She has participated in several international research projects in urban planning and urban development and is a member of the Serbian Engineering Chamber, the Serbian Association of Spatial Planners, and the Serbian Commission for Plans.*

Abstract

The research is devoted to the analyses of the theoretical and methodological backgrounds of urban planning trends from the perspective of megaprojects (MPs), with specific reference to the Belgrade Waterfront Project (BWP). In analysis we combined a contextually appropriate approach, some elements of the phronetic planning approach and the heuristic approach to planning and development of megaprojects. BWP induced a change of the institutional framework (the introduction of specific legal and policy instruments), as a key source of future changes in the metropolitan tissue. Preliminary impact assessment of the BWP indicates the following: slow development & economic effects, low transparency, social inequalities, marginal social mobilization and weak networks between the key actors, public funds overuse, limitation of government independence in law-making, displacement impacts, high public financial risk, strong urban transformations, environmental impacts, medium-technological modernization, etc. The research highlights the differences in the political, institutional, social and economic environment that shape the BWP. It provides recommendations for future research and application, for a continuing in-depth & sensitivity analysis for managing the undesirable consequences of the BWP, including the determination of the interplay between different pools of powers that are important in urban planning, governance and the implementation of MPs ('from power to tower').

Technologies for Energy-Efficient Residential Buildings in Cities in Tropical Climates of Developing Countries. The Case of India

Pierre Jaboyedoff[1], Sameer Maithel[2], Bhanware Prashant[2], Chetia Saswati[2], Aiulfi Dario[1], Chuard Dominique[1], Cusack Kira[1]
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Biography of Presenting Author: *Pierre Jaboyedoff is an engineer specialised in energy efficiency and renewable in buildings and industry with a master in Thermal Engineering from EPFL (1981). During his career, he has been representing Switzerland in number of International Energy Agency projects in solar and building programs. He has been hired regularly since 1981 in India as a consultant for the Swiss Agency for Development and Cooperation (SDC). He is presently the leader of the Indo-Swiss Building Energy Efficiency Project (BEEP), a bilateral cooperation project between the Ministry of Power, Government of India and the Federal Department of Foreign Affairs (FDFA) of the Swiss Confederation.*

Abstract

This contribution presents the ongoing work and the new technologies under development and facilitated by the Indo-Swiss Building Energy Efficiency Project (BEEP), focusing on the warm and humid climate residential building energy use and comfort issues. BEEP is a bilateral cooperation project between the Ministry of Power, Government of India and the Federal Department of Foreign Affairs (FDFA) of the Swiss Confederation. The Bureau of Energy Efficiency (BEE) is the implementing agency on behalf of the MoP while the Swiss Agency for Development and Cooperation (SDC) is the agency in charge on behalf of the FDFA. The BEEP project contributes to strengthening and broadening the Government of India's building energy conservation programme by developing and supporting early design workshops (charrettes) for incorporating energy-efficiency in building design; propagation of external movable shading systems and insulation; conducting advanced training programmes on design processes, technologies and tools concerning building energy efficiency; and developing design guidelines for energy-efficient multi-storey residential buildings.

[SE19-CCI] From Developing to Scaling Up Innovative Social Businesses at the Base of the Pyramid

DAY 3 – Wednesday 4 May – 11:45-13:15
Swiss Tech | Room 1C | Level Garden

Session Leaders

Grégoire Castella
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After completing his PhD in Life Sciences at EPFL in 2008, Greg got out of the lab and joined the International Committee of the Red Cross. He served as a delegate and manager in Ivory Coast, Afghanistan, and Colombia. After returning to Switzerland, Greg joined Antenna Technologies, an innovation-for-development foundation, which has successfully brought to the market innovative products to meet the basic needs of people living at the bottom of the pyramid. Greg and his team recently launched OOLUX SA, a startup marketing a solar kit designed for off grid populations.

Jérôme Voillat
Antenna Technologies Foundation, Switzerland
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After studying international business in Reins, Jérôme worked in various positions in large private companies. He was then involved for several years in the non-profit sector as a project manager (Cameroon and Laos). Following these field experiences, he was appointed in Paris as project coordinator for an EU cooperation program in the horn of Africa. He joined Antenna Technologies Water Department early 2015. With his team, he implements projects on autonomous technology and business models for vulnerable communities lacking access to safe water.

Summary

Identifying and understanding the challenges of scaling up social businesses is key for technology-for-development entrepreneurs. From spotting a promising technology, developing its potential, to scaling it up and building a commercially viable company, many obstacles await the social entrepreneur. At every stage, the startup has to tackle external and internal barriers, ranging from changing a customer's mindset, expanding reach or establishing meaningful partnerships, to accessing financing or building in-house expertise.

This session will entail presentations of companies at every step of the business development. Starting with experience sharing on key processes developed by early-stage companies, the focus will then be given to more mature companies discussing the challenges of scaling up. The importance of building value-creating partnerships and initiatives in this field will also be described. Concrete field examples from various industries (including energy access, safe water, and agriculture technologies) will emphasize solutions that work. The discussion will focus on successful business models that brought to the market innovative solutions to reach the customers (last-mile distribution) and to make the technology affordable.

The session objective is to draw general lessons that will benefit stakeholders active in various social businesses and to identify the key factors young entrepreneurs should keep in mind when designing

their own business model. This session will allow experienced and aspiring social entrepreneurs in technology-for-development businesses to interact and figure out what hurdles still need to be overcome to scale up the ventures to create even greater social impact.

Panelists and Abstracts
(in alphabetical order)

Challenges in Building up a Solar Business

Joel Jeanloz[1]
[1]African Solar Generation (ASG) and OOLUX SA

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Biography of the Presenting Author: Joel Jeanloz studied international affairs at the University of St. Gallen. In 2013 he travelled to Cameroon for several months where he wrote his master thesis on "Social Business at the base of the pyramid." After his return Joel launched together with different organisations a project to promote solar energy in developing countries. Core of the project was the development of a leasing and distribution system for portable solar kits. Today it has successfully been transformed into the social business OOLUX SA. Besides, Joel co-founded the company "African Solar Generation" in Yaoundé installing smaller and bigger photovoltaic systems.

Abstract

When marketing solar energy in developing countries two dimensions need to be distinguished: first, a creative, innovative and more concept oriented dimension, and second, a practical, entrepreneurial and more process oriented dimension. Both have to go together to form a successful business model that can be scaled up. The evolution of OOLUX SA in Switzerland as well as the creation of ASG, a solar company in Cameroon, is a good example of how these two dimensions interacted. At the beginning was a great idea: OOLUX. This solar power kit, developed by different organizations in Switzerland, was designed to be marketed to the people living at the base of the pyramid in order to tackle energy poverty and to fight climate change.

But the problem of last mile distribution and affordability had not been solved at that point. To overcome these challenges a comprehensive distribution and leasing concept was developed relying on a smartphone application and a web portal. This ICT system allows to hire small retailers in rural areas and to monitor and manage their business activities. At the same time a reliable partner on the ground had to be found. The most pragmatic way to ensure that the partner is sharing the same ideas on how the field test should be conducted was to co-found a company in Cameroon. A legal entity would not only allow to test the concept but also to build upon a business later on. With the new company born called "African Solar Generation" (ASG) the endeavor became an entrepreneurial drive. While the ICT system was still under development, ASG became operative and added complimentary products such as photovoltaic systems and high efficient electronic devices to its portfolio. With increasing complexity many entrepreneurial aspects turned up: Who is taking care of the accounting? How will logistics been organized? What kind of processes are crucial? How can the management deal with the challenging business environment of a developing country? etc. Once again, what has been designed comfortable from a desk quickly brought up practical problems demanding for solutions.

Today, OOLUX SA was successfully established in Switzerland with the aim to market the OOLUX solar power kits in Cameroon and hopefully soon in other African countries. The ICT system is still not completely mature and there is still room for improvement. Moreover, new challenges will certainly arise while when scaling up: the expansion of a sustainable last mile distribution network, the building of an efficient logistics or the growing credit risk. But not just only OOLUX will require additional efforts. The solar company ASG is expanding and the growing customer base is posing new challenges to the management. In addition, more investment is needed which is not easy to attract when working in fragile countries. It appears evident that creative solutions need to be figured out for both partners, the solar company ASG and OOLUX SA. The interaction between the two dimensions came to a new round.

Scaling up Household Water Treatment Systems (HWTS) in Pakistan, with WATA Technology

Saad Khan[1]
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Biography of the Presenting Author: Mr. Saad Khan, a Swiss and Pakistani national, has a diversified professional background: an educator/trainer; a Swiss private banker; an innovator and humanitarian / development specialist. He has 10 years' experience in humanitarian and development sector. He has worked closely as advisor with various national and international governmental and non-governmental organisations and UN bodies. His present focus is on the area of: safe drinking water; energy conservation; building back safer with vernacular and green construction methods; for the benefit of the population at the base of the pyramid.

Abstract

Ten percent of the world population lack access to safe drinking water. In Pakistan 44% of the 180 million population is without access to safe drinking water, 64% of urban and 84% of rural population do not treat their drinking water and consequently waterborne diseases are the leading cause of mortality and morbidity. High stress in the use of ground and surface water, fast growth in population and frequent flooding caused by the climate change further aggravate the availability of drinking water. Injecting active chlorine into drinking water eliminates the pathogenic microorganisms and prevents possible recontamination. Unfortunately, supply chains of chlorine do not always reach communities in developing countries, especially communities in rural areas. The paper describes the lesson learnt from the initial research that led to a start-up of a business of centralised production of liquid chlorine in Pakistan for water treatment at point of use by households. It presents the outcome of the business model of introducing the innovative WATA Technology in Pakistan for locally producing chlorine as a simple and cost-effective means for improving access to drinking water. The challenges identified during the 12 months' pilot of selling liquid chlorine helped transforming the single product business model into a diversified portfolio of innovative Household Water Treatment and Safe-Storage (HWTS) systems that are based on WATA Technology and better integrate point-of-use water treatment in the lifestyle of targeted market segments, particularly the population at the Base of the Pyramid (BoP).

Reaching the Last Mile – Technology Solutions and Models for Service Delivery

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Biography of Presenting Author: With over 3 years of relevant experience in the Water Sanitation and Hygiene (WASH) and Natural Resource Management (NRM) sector, SanghamitraMisra is a Deputy Manager at Development Alternatives. She holds an MBA in Public Systems Management with specialization in Environment Management. She has been involved in technology research & development, environmental quality assessment and management, policy advocacy, capacity building, program designing and field implementation of water service delivery models and community based climate change adaptation and resilience models.

Abstract

The accessibility to safe drinking water is a major challenge India faces as a developing nation. The condition is grimmer in rural areas where only 45% of the population has access to clean drinking water, a number significantly low when compared to urban areas (79%). The issue has become relevant and will continue to do so in the coming years as more and more water sources get contaminated with both biological and chemical pollutants. Annually, 1.5 million children die from diarrhea after consuming contaminated water. Despite various technological breakthroughs and innovations, especially involving nano materials, the research benefits have not percolated to the vulnerable communities at the Bottom of the Economic Pyramid (BoP). Experience suggests that this can be achieved through innovative approaches on behavior change, service delivery models and sustainable supply chains. Technology and Action for Rural Advancement (TARA) and Development Alternatives (DA) are involved in ensuring access to safe water to the BoP through testing innovative delivery models. The action research tested the potential for scalability of these sustainable and affordable solutions for a wider dissemination in the BoP market. Based on the end user preference, the TATA Group introduced a product, TATA Swach filter, at an affordable rate of Rs 999. Through design and implementation of a sustainable supply chain mechanism, the demand for the Swach filter has increased exponentially with consumers placing immediate orders for its procurement. The paper will further elaborate on the features of the supply chains, delivery models, drivers and barriers within the larger scheme of sustainability.

A Review of the Behavioural Change Challenges Facing a Proposed Solar and Battery Electric Cooking Concept

Ed Brown[1], **Jon Sumanik-Leary**[1], Gillian Davies[2], Simon Batchelor[3], Nigel Scott[3]
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Biography of Presenting Author: Dr Sumanik-Leary is a multidisciplinary researcher specialising in appropriate renewable energy technology for sustainable development. He completed a mechanical engineering MEng, interdisciplinary PhD (E-Futures DTC) and postdoctoral fellowship at the University of Sheffield, which involved field work in Latin America, Africa and Asia and drew methodologies from across the social sciences and engineering to evaluate small wind turbines as a technological solution for rural electrification. He currently coordinates Wind Empowerment and is a LCEDN Research Associate at Loughborough University.

Abstract

This paper aims to identify and understand the challenges that may confront the scaling up of a proposed electric cooking concept (Batchelor 2013), eCook, which offers the potential for emission free cooking, with time/money savings and broader environmental benefits from reduced fuelwood/charcoal consumption. By drawing on the literature on the transition to electric cooking in locations such as South Africa and more broadly from that concerning the uptake of improved cookstoves, transitions to LPG (liquid petroleum gas) for cooking and the adoption of solar home systems in the Global South, this study identifies the factors (e.g. successful delivery models and marketing strategies) that have enabled these innovations to reach scale. This knowledge is then related to the eCook concept, by identifying the potential users of this promising technology and outlining potential marketing strategies, as well as a user-focused iterative design process, that will enable future social businesses established to bring the eCook concept to market to reach them. Uptake is predicted to be most rapid in hot climates where fuelwood/charcoal is purchased and low energy diets and low power cooking devices are the standard. Mobile enabled fee-for-service (utility) business models, the establishment of a service network, awareness raising campaigns on the benefits of clean cooking, female-focussed training programs and bundling eCook systems with locally appropriate appliances to enable productive activities are seen as key to reaching scale.

[EV11-CCI] Efficient Public-Private Partnerships for Technology Transfer: Lessons Learned

DAY 3 – Wednesday 4 May – 11:45-13:15
Swiss Tech | Room 3A | Level Garden

Moderator

Yesim Baykal
World Intellectual Property Organization, Switzerland
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Yesim Baykal has worked as a diplomat and a legal counsellor at the Turkish Mission to the World Trade Organization in Geneva, between 2006 - 2010, She followed IP and trade issues in Geneva during her years at the Turkish Mission. Currently, she is the Senior Program Officer at the Global Challenges Division of WIPO, focusing on climate change and food security. She is working on the public-private multi-stakeholder platform WIPO GREEN.

Summary

This breakout session will discuss opportunities, challenges and strategies to consider while building and sustaining technology transfer and capacity building through effective public-private partnerships (PPP). Focus will be on the WIPO GREEN multistakeholder platform, launched in 2013. WIPO GREEN is an interactive marketplace that promotes innovation and diffusion of green technologies. WIPO GREEN Network has 65 Partners that include regional development banks, public and private entities, climate innovation centers and the Climate and Technology Centre and Network (CTCN). Also discussed will be the WIPO Re:Search consortium for sharing innovation in the fight against neglected tropical diseases. A PPP can be an effective vehicle for accelerating the development and deployment of technologies. They aim to involve a wide range of stakeholders and engage them in substantive collaborations that advance R&D and/or the transfer and diffusion of technology. This can be a challenging undertaking. WIPO, along with key Partners, will share experiences, lessons learned, and insights gained from creating and managing public-private partnerships in areas of climate change and health.

Agenda and Panelists

➢ **Public-Private Partnerships for Green Tech Dissemination: Introduction to WIPO GREEN**
  - **Yesim Baykal**, Senior Program Officer, Climate Change and Food Security, WIPO

➢ **Working with the Private Sector: Lessons Learned from WIPO GREEN and WBCSD Low Carbon Technology Partnerships Initiative (LCTPi)**
  - **Maria Mendiluce**, Director, Climate & Energy, World Business Council for Sustainable Development, Mendiluce@wbcsd.org

➢ **Capacity Building and Sustainable Tech Transfer: Practical Steps for Commercialization**
  - **Laurent H. Selles**, CEO, Patenterprise Technologies Holdings SA, Laurent.selles@worldonline.fr

➢ **Introduction to WIPO Re:Search – Sharing Innovation in the Fight Against NTDs, TB, and Malaria**
  - **Meghana Sharafudeen**, Associate Program Officer, Global Health, Climate Change & Food Security, WIPO, meghana.sharafudeen@wipo.int

➢ **Public Private Partnerships and Bridging Gaps for Technology Transfer**
  - **Yuzuki Nagakoshi**, Lecturer, Tokyo University, Institute of Science and Technology, Yuzuki16@live.jp

➢ **Moderated discussion with audience and panelists**
  - **Yesim Baykal**, Senior Program Officer, Climate Change and Food Security, WIPO

Poster Presentations
DAY 1 – Monday 2 May

Posters-at-a-Glance

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[DR-Posters] Disaster Risk Reduction

DAY 1 – Monday 2 May – 13:30-15:00
Swiss Tech | Level Garden

Member of the Jury

Silvia Hostettler
Ecole Polytechnique Fédérale de Lausanne, Switzerland
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Silvia Hostettler has a background in environmental science and development studies. From 2008 to 2012 she was based in Bangalore, India as Executive Director of swissnex, a Swiss House for Science. Since 2012, she is Deputy Director of the Cooperation and Development Center (CODEV) at EPFL where she is responsible for coordinating research activities and for the UNESCO Chair in Technologies for Development. She is also in charge of the educational program offered by CODEV and gives lectures in the field of development cooperation, in particular on the potential of technologies and innovation in the Global South. She is a member of the Editorial Board of the Journal of Development Engineering and of the Commission for Research Partnerships with Developing Countries (KFPE).

ID#: DR01

How Can Academic and Research Tools Help Reducing Flood Risk in Haiti?
Olivier Carlier d'Odeigne[1], Adermus Joseph[2], Sandra Soares-Frazão1,
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[2]Université d'Etat d'Haïti, Port-au-Prince, Haïti

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Biography of Presenting Author: Olivier Carlier d'Odeigne is PhD student in the Université catholique de Louvain (UCL). After civil engineer degree, he works in construction sector during 2 years before coming back to University to study river management and development engineering. Besides his teaching activities, Olivier is actively involved in a cooperation project between his research team and hydraulics engineers of the Université d'Etat d'Haïti. His thesis work is part of this overall project that is the focus of this paper.

Abstract
The Cavaillon is a Southern Haitian River causing considerable management problems since its behavior is uncertain and likely to cause serious damage to surrounding populations. Within the framework of a scientific cooperation project funded by the Belgian government, linking up the Université catholique de Louvain (UCL) and the Univeristé d'Etat d'Haïti (UEH), our willingness is to improve the ability of local institutions to manage the river. The approach chosen is to enhance expertise and resources of the main hydraulic engineering faculty of Haïti. Through several common academic activities, as doctoral theses, student's exchanges or university seminars, coupled with the implementation of research methods in the field of the river, the objective is double. First, develop a low-cost methodology applicable only with local human and material resources to design hydraulic models and flood mitigation devices or procedures. Secondly, contribute to the development of a social dynamics about flood prevention by bringing together the key stakeholders from the public, non-governmental, private, and academic sectors.

ID#: DR02

***eBayanihan:* Digitizing Humanitarian Action in A Nationwide Web – Mobile Participatory Disaster Management System**
Maria Regina Justina E. Estuar[1], Marlene M. De Leon[1], John Noel C. Victorino[1], Jhoanna T. Isla[1], John Owen C. Ilagan[1], John Sixto Santos[1], John Boaz Lee[2], Sakiko Kanbara[3], and **Andrei D. Coronel**[1]
[1]Ateneo de Manila University, Quezon City, Philippines
[2]Worcester Polytechnic Institute, Massachusetts, USA
[3]University of Kochi, Japan

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Biography of Presenting Author: Dr. Andrei D. Coronel is an Assistant Professor, Department of Information Systems and Computer Science, Ateneo de Manila University, Philippines, teaching for more than ten years. He holds a Bachelor's degree in Biology, earned his Masters and Doctorate degree in Computer Science, from Ateneo de Manila University. His current projects reflect his research interests in the field of health informatics, environmental science, and computational music. He heads the Ateneo Computational Sound and Music Laboratory.

Abstract

The rising usage and affordability of ICT for management and mitigation of disaster has led to accessibility of disaster information to the general public. However, with disaster being a complex system that depends on the action and interaction of agents with and against environmental parameters, there is a need to create a system that can collect, analyze and model human behavior during a disaster. eBayanihan, with its root word coming from 1) bayanihan, a Filipino collectivist behavior of volunteering to help in a community, 2) bayani, which means hero, and 3) bayan which means nation or country, is nationwide ICT based participatory disaster management system, available on the web and mobile, designed to capture human experiences of ordinary citizens during a disaster. eBayanihan is designed to accommodate real time workflow environments of agency clusters and local government units. This paper discusses the main components (eHANDA – prepare, eBayanihan – Post information, and eULAT – Report) as a result of two years of agile development, focusing on design, development and deployment of eBayanihan grounded on community experiences in the Philippines.

ID#: DR03

Changing Cryosphere and Emerging GLOF Risks: a Scientific Baseline Study Towards Early Warning and other Adaptation Measures for the Kullu District, HP, India

Andreas Linsbauer[1,2], Simon Keith Allen[2], Surjeet Singh Randhawa[3], Christian Huggel[2], Nadine Salzmann[1]
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[2]Department of Geography, University of Zurich, Switzerland
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Biography of Presenting Author: Research associate at University of Fribourg and University of Zürich, PhD in modelling glacier ice thickness and assessing future glacier changes. Working experience in research and cooperation projects on climate impact in India; expertise in glacier hazards and risks, in mountain-environmental analysis using climate and spatial data, and in transferring scientific content to a non-scientific audience.

Abstract

Within the Indian Himalayas Climate Adaptation Programme (IHCAP), integrated vulnerability, hazard and risk assessments studies for the Kullu district (Himachal Pradesh, India), have been conducted within a comprehensive conceptual framework, for the sake of supporting climate change adaptation planning. Within this contribution, we focus on the changes in the cryosphere cumulating in the danger of potential glacial lake outburst flooding (GLOF) for the people living there. An early warning of such emerging threats needs to be based on scientific baseline and modeling studies, and local expert knowledge. With a suit of methodologies, we model GLOF paths from current and future glacial lakes, recognize affected land areas and assess the underlying societal vulnerability to derive a first-order assessment of changing GLOF hazard and risk. These kind of scientific baseline studies allow early anticipation and warning of current and future threats and provides a scientific basis for sound adaptation and planning responses. Subsequent early warning and adaptation measures must be planned, developed and implemented together with the local authorities and population.

ID#: DR04

Robotics and Automation Technologies for the Benefit of Humanity

Raj Madhavan[1], Satoshi Tadokoro[2]
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[2]Graduate School of Information Sciences & International Research Institute of Disaster Science, Tohoku University, Sendai, Japan

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Biography of Presenting Author: Raj Madhavan is a Distinguished Visiting Professor of Robotics with AMMACHI Labs, Amrita University, India. He received a Ph.D. in Field Robotics from the University of Sydney and an ME (Research) in Systems Engineering from the Australian National University. His current research interests lie in humanitarian robotics and automation – the application and tailoring of existing and emerging robotics and automation technologies that are cost effective, reliable, efficient and geared towards improving the quality of lives of people.

Abstract

The Institute of Electrical and Electronic Engineers (IEEE) is the world's largest professional engineering society with 420,000 members. IEEE Robotics and Automation Society (RAS) is one of the fastest growing Societies within IEEE with more than 12,000 members worldwide. RAS members carry out significant robotics R&D and influence

the practical use of robots and systems. Within RAS, the Special Interest Group on Humanitarian Technology (RAS-SIGHT) was formed in September 2012. The mission of RAS-SIGHT is the application of robotics and automation technologies for promoting humanitarian causes around the globe, and to leverage existing and emerging technologies for the benefit of humanity towards increasing the quality of life in underserved, underdeveloped areas in collaboration with existing global communities and organizations. To engage the international community in these causes, RAS-SIGHT has been organizing the Humanitarian Robotics and Automation Technology Challenge (HRATC) focusing on landmine clearance. Under RAS-SIGHT, there are currently 8 funded projects on various aspects of robotics and automation technologies addressing humanitarian causes. See http://www.ieee-ras.org/educational-resources-outreach/humanitarian-efforts for more details. In recent years, robotics has become practical for reducing disaster risks. For example, drones can quickly survey wide disaster areas, remotely operated underwater vehicles can repair leakage of subsea oil plants, and ground vehicles work in contaminated areas of damaged nuclear plants. However, there remain social gaps for effective usage of robotic solutions. Many issues on social implementation and industrialization are yet to be solved. To address these issues, in May 2015, RAS established the International Committee of Robotics for Disaster Risk Reduction (ICRDRR) under RAS-SIGHT with a three-year budget from 2016 in order to contribute to the Sendai Framework. This Committee is exploring solutions for the following aspects:

- How social gaps impeding effective implementation of disaster robotics can be bridged by strategic discussion and actions of stakeholders and leaders;
- How disaster risk can be reduced by thorough inspection of structures, quicker emergency response, and safer recovery actions by applying robotic solutions; and
- How social cost of risk reduction can be significantly reduced by using robotics.

This poster will describe the current and planned activities of RAS-SIGHT and ICRDRR to foster discussion and collaboration among the conference attendees from different agencies and organizations from across the globe.

[ER-Posters] Sustainable Access to Energy

DAY 1 – Monday 2 May – 13:30-15:00
Swiss Tech | Level Garden

Member of the Jury

Susan Amrose
University of California Berkeley, United States
susan.amrose@gmail.com

Susan Amrose is a Project Scientist and Lecturer in Civil and Environmental Engineering at the University of California, Berkeley, and a Program Director at the LBNL Institute for Globally Transformative Technologies (LIGTT). At UC Berkeley, Susan heads the water program at the Gadgil Lab for Energy and Water Research and played a key role in the development of ECAR technology to affordably remove arsenic from drinking water in rural South Asia. She continues to work on the ECAR scale-up effort in West Bengal, India and manages ongoing projects in fluoride and brackish water treatment in East Africa and North India. Susan is co-founder and CSO at SimpleWater.

ID#: ER01

Energy Technologies for Food Utilization for Displaced People: From Identification to Evaluation
Marco Caniato[1], **Jacopo Barbieri**[2], Emanuela Colombo[2]
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Biography of Presenting Authors: Marco Caniato, MEng, PhD, is an environmental engineer, and WASH and energy expert in humanitarian and development contexts. He worked in the Balkans, South Sudan, the Gaza Strip, Thailand and Sierra Leone with NGOs and research centers. His main areas of expertise are waste management, water access and treatment, sanitation, and access to energy. Currently he is Innovation Advisor in the SET4food project, and represents COOPI in the Technologies & Innovation Working Group of the global Food Security Cluster. Jacobo Barbieri, MEng, is an energy and sustainability specialist at UNESCO Chair in Energy for Sustainable Development at the Politecnico di Milano. His activities focus on international cooperation mainly concerning: energy and exergy analysis and energy assessments; Integrated Renewable Energy Systems (IRES); Bioenergy; sustainable development and sustainability. He has worked in many countries such as Mozambique, Angola, Tanzania, Lebanon, Nepal for assessment studies, surveys, and capacity building programs.

Abstract

The increasing number of displaced people in the World not only requires humanitarian action, but also attention to host communities and holistic and long-term vision. Energy has not been really considered a topic relevant in displacement, yet, resulting in negative impacts on several aspects, including food utilization, and thus food security. New solutions are required, as well as sensitization, training, and support to humanitarian actors. The "Sustainable Energy Technologies for Food Utilization (SET4food)" project provided tools to support identification and introduction of appropriate solutions, tested innovations in some of the currently most important crises, and promoted the enhancement of humanitarian response capacity. Although still ongoing and with a very limited monitoring period, field activities are giving interesting and promising indications regarding the overall impact of improved access to energy for displaced people, and opening new scenarios. Evaluation of such experiences is essential to bring solid evidences, and foster the implementation of integrated energy programs. Indeed the project is designed to learn from experience, and transfer knowledge and recommendations have been developed to improve support, tools, and training activities for humanitarian actors.

ID#: ER02

Decentralized Electrification with Productive Use Along Rivers. Hybrid Systems with Hydrokinetic Turbines are Proved to be Efficient and Economical Solutions
Juliana Carneiro da Cunha Baumgartl[1], Clarissa Belloni Jane Jones[2]
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Abstract

Following the lately initiatives to promote energy access worldwide, technologies have been put to the test. Learnings from projects installed in remote areas, using different technologies, helped in order to design energy systems focusing on efficacy and sustainability. From these learnings, it became clear that one of the key sustainability factors of energy access is to bring productive use with decentralized electrification systems. In order to do so, Uninterruptible Power Supply (UPS) is required and the best economical way to achieve that is through hybrid systems. According to the International Energy Agency (IEA) billions of people still lack access to very basic energy services and most of them are located in remote areas, where agriculture and forestry are the main source of income. In these regions grid extension is not a reasonable solution, because of technical and economic reasons. Thereupon, diesel generators are common source of energy in these places, sometimes counting with heavy government subsidizes. However, these generators do not run for longer than a couple of hours per day, therefore hindering the productive use in the communities. Neither allowing reliable, nor sustainable energy access. Nowadays renewables are proved suitable solutions for this problem, however forms such as solar or wind power is often curbed by the high power fluctuations and the therefore coinciding high costs of energy storage in batteries to accomplish reliable power supply. While hydrokinetic has the advantage of generating base load, uninterrupted power supply, which enable comprise of productive use appliances, such as water treatment and irrigation. Even though, hydrokinetic turbines are not self-sustainable in in tropical regions, where there are intense rainy and dry seasons. For these conditions, these turbines eventually combined with other renewable sources (as a hybrid system), can provide, through UPS supply, a suitable solution for these communities.

ID#: ER03

Modelling Sustainable Energy Delivery for the Rural Off Grid Areas in Nigeria. An Innovation Systems Approach to Anticipating and Influencing System Functions Towards Emerging Renewable Rural Electrification Solutions

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Biography of Presenting Author: Hafiz Bello is currently a Doctoral Researcher at Imperial College London in the Centre for Environmental Policy (CEP). Hafiz is a Civil Engineering graduate from the University of Ibadan, Nigeria. In February 2013, Hafiz commenced his PhD at Imperial College London's Centre for Environmental Policy (CEP) under the supervision of Dr. Rocio Diaz-Chavez working on the Sustainable Electrification Delivery Models using renewables for the rural areas in Nigeria. His research interest include technological forecasting, system dynamics and generating critical mass for collective action.

Abstract

Modern energy provision and electricity in particular is widely regarded as the missing millennium development goal. Decentralized generation and distribution using renewables is often advocated as a least cost option for the rural communities, but there has been limited insights into how the contribution to socio economic development will be practically and pragmatically achieved. In the short term, it is difficult to analyze what bearing the electricity delivery has on the envisaged long-term future in rural Nigeria. For an end use oriented planning of the electrification system such as suggested in this research, there needs to be an attempt to understand how developments in markets, attitudes, policies and behaviors co-evolve with the introduced innovation in the envisioned acceptable future system. These dynamics needed for "eco-restructuring" are complex, poorly understood and paid insufficient attention during policy making and rural electrification project execution. This is a key cause of a failure of projects to achieve scale and falling short of expectations in the energy and economic development sectors.

ID#: ER04

Emission Data Generation Addressed to Diagnostic Air Quality Modeling for the Assessment of Integrated Energy Strategies

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Biography of Presenting Author: Jessie Madrazo Bacallao was born in Havana, Cuba the June 22, 1982. She is Civil Engineer graduated at Higher Polytechnic Institute Jose Antonio Echeverria, Cuba 2005 and Master in Transport Systems from the same institution in 2009. Since 2006, she has participated on different collaboration project with Swiss Academical institutions being Researcher & Assistant Professor at Higher Polytechnic Institute of Havana, Cuba. 2005-2012. At the present time she is Scientific collaborator & Doctoral Assistant at EPFL, Lausanne, Switzerland.

Abstract

The worldwide increasing energy consumption, mainly based on fossil fuel, and its harmful impacts on the environment and on public health, calls for relevant measures and policies from every government. Different modeling and decision support approaches have been developed, mainly in industrialized countries, to address energy transition. However, these approaches usually lack coherent integration and rely on expensive and often unavailable detailed data, especially in developing countries. This paper is inscribed in a North-South collaboration research project in which the main goal is to design a novel integrated assessment methodology for energy strategies combining process system design methods (used for the conception of energy strategies) with emission and air quality models. The methodology includes two key steps: (i) calculation of an emission inventory and implementation of an air quality simulation process and (ii) implementation of the energy system models and classification of the different technologies by optimization. In the first step, the generation of emission data is one of the most uncertainty processes to be managed in developing countries. Thus, this paper is more specifically focused on this first step for investigating how to reduce air pollution as a preliminary purpose. Data with different levels of detail and accuracy will be consistently aggregated, allowing for simplified operation relevant for both developing and industrialized countries. This study aims at linking these two spheres, proposing a model of a coupled human-environment system, focused on problems in energy management.

ID#: ER05

Small Scale Regenerative Desulfurization of Biogas

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Biography of Presenting Author: Mathilde Miedema is currently program manager at TNO – the Innovation Institute of the Netherlands with 3900 employees and a turnover of 564 M€ in 2015. Mathilde manages the corporate program Innovation for Development with focus on Inclusive Innovation and Inclusive Business. Mathilde studied Physiotherapy at The Hague (graduated 1986) and Human Movement Science at the Rijks Universiteit Groningen in the Netherlands and got her Master's on the major Work and Health (graduated 1992). She worked in Indonesia for 1.5 years and conducted projects from the Netherlands in many African and Asian countries. Since 1993, she works at the Department of Ergonomic Innovation at TNO Quality of Life in the Netherlands. Starting as researcher/consultant on physical load and ergonomics and growing to senior project manager and account manager. Since 2007, she is program manager Innovation for Development. She participates in networks like Inclusive Business Alliance, Global Research Alliance, WAITRO and NABC.

Abstract

The application of small-scale biogas digesters to supply biogas to households in developing countries is well established. The biogas is used for different applications, amongst other cooking. Generally, no further treatment of the biogas is applied. Hydrogen Sulfide (H2S) is present in varying concentrations within the biogas. H2S has negative effects on the durability of the equipment (highly corrosive), thus resulting in high material replacement costs. Furthermore, H2S is very poisonous and exposure must be prohibited. Removal of H2S is essential for an optimal functioning of the biogas system as well as for the health of the people and the environment. The challenge is to provide a cost-effective, robust, regenerative system for effective removal of H2S from small-scale biogas digesters. TNO has developed an energy efficient, robust and cheap removal system of H2S from small-scale biogas digesters (1-20 Nm3/day) to the lower ppm range. The technology uses an iron chelate solvent. The absorption of H2S and the regeneration of the solvent is combined in a single vessel. A small volume of air is required to be mixed with the incoming biogas to regenerate the solvent, causing the extension of the lifetime of the solvent.

ID#: ER06

Semi-industrial Production of Dry Briquettes from Agricultural Residues as Alternative Fuels to Wood and Charcoal in Artisanal and Industrial Centers of Haiti

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Abstract

In Haiti, firewood and charcoal represent about 70% of the primary energy supply, an annual consumption of 4 million tons of wood, corresponding to the destruction of 30 million trees or the consumption of 1.5 Mtoe. The turnover generated by the sale of these resources represents about 10% of the GDP (approx. US$ 270 million), charcoal being still used by nearly 90% of households in major Haitian cities. Meanwhile, large amounts of agricultural residues are released in the natural environment. For example, more than 440'000 tons of sugar cane bagasse are produced annually, mainly in four Haitian departments, including the ones of Artibonite and of

Centre. Furthermore, about 550'000 tons of rice husk are generated annually, with nearly 60% concentrated in the department of Artibonite, but less than 20% of this production is valorized today. The recovery and recycling of these residues in wood energy as an energy alternative at a competitive cost, represents a significant potential to create jobs opportunities and to develop new activities both in the sectors of agriculture and energy. The production of fuel briquettes from agricultural residues provides an alternative source of energy, which is cleaner and economical knowing that more than half of the Haitian population is living with less than US$ 1 per day. The development of this new activity also aims to reconvert charcoal and firewood sellers and producers into sellers and distributors of briquettes with higher income, the current income from charcoal is estimated at less than 2.00 US$ per day. Similarly, industries and services consuming dry briquettes can improve their financial profitability and enhance a more "eco-friendly" image, in addition to various other benefits.

ID#: ER07

Investigating the Drivers of Energy Transitions between Communities, Local Governments and Non-Governmental Organizations

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Biography of Presenting Author: Alex Ndibwami works primarily in the area of architectural education and research. Alex's teaching and research interests are based around sustainability in the built environment, architecture, energy, community and culture.

Abstract

African populations remain among the poorest in the world, and efforts to achieve the energy-related dimensions of the Millennium Development Goals have in most cases not had significant impact on urban populations. The situation can be summarized as one where much urban energy transformation research does not understand the detailed organizational dynamics and constraints in cities and therefore is often of limited use. While acknowledging the gap between policy and implementation; lack of capacity within local/national government departments; and where modes of knowledge transfer are not effective in facilitating sustainable energy transitions in cities, this paper investigates what drives decision making, endorsement, acceptance and penetration on issues related to energy transitions between communities, local governments and non-governmental organizations. It focuses on the relationship that exists between them in ensuring access to affordable, reliable, sustainable and modern energy for all. While questioning approaches that promise/promote appropriateness without community engagement while overly technocratic, the paper delves deeper into the socio-cultural diversity of energy poor communities, stating that only by giving these people a voice in the decisions being made about their socio-technical futures can truly appropriate delivery models be developed.

ID#: ER08

Crowd-sourcing Energy Poverty Data in South African Informal Settlements: The Opportunity of Mobile Phone Technology

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Biography of Presenting Author: Kimenthrie Pillay is a Masters student at the Energy Research Centre at the University of Cape Town. She has a background in Environmental Science and an interest in energy access and poverty alleviation. She has experience in the renewable energy and energy poverty field while her interests on problems of climate change, globalization, and inequality of access to energy resources drive her research interests. She hopes to make a meaningful impact in addressing energy poverty globally.

Abstract

Energy poverty undermines development on a large scale. It is most overtly experienced in informal settlements, where the use of fuels like paraffin, charcoal, and wood prove hazardous and harmful to health and wellbeing. The expenditure on and use of energy services in informal settlements are largely undefined, which undermines the success of energy access and safety initiatives. Despite widespread poverty in informal settlements, mobile phone ownership is high in these areas. This research aims to explore the potential and applicability of a digital data collecting systems using a mobile application that is accessible on entry-level mobile phones with basic internet access to collect information about energy access, affordability and multiple fuel use in these areas. As part of this research, a mobile application platform and data collection platform was developed which enables survey design and data collection in real time. The platform allows for creation of weekly surveys that question energy use, expenditure, and affordability; it also offers other functions that are designed to increase awareness of fuel safety and efficiency. The application was piloted in Imizamo Yethu in Cape Town. Six weeks of continuous data was extracted from 200 users using airtime incentives. The quality and quantity of data received was high. The results indicate that the potential for using this system and mobile phones as a data-collecting tool in Africa is great.

ID#: ER09

Excess for Access. Interconnecting Solar Home Systems in Bangladesh towards an Internet of Energy – Definition and Modeling of a Swarm Type DC Microgrid

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Biography of Presenting Author: *Lia Strenge studied Energy Engineering (BSc), Scientific Computing (MSc) and partly Renewable Energy Systems at the Technische Universität (TU) Berlin. In 2014, she worked as a Renewable Energy and Microfinance Consultant in Armenia, India, Nepal, Pakistan and mostly Bangladesh. She is currently a PhD scholar of the Berlin International Graduate School in Model and Simulation based Research (BIMoS) of the TU Berlin in the Control Systems Group, focusing on modeling, control and simulation of swarm type DC microgrids.*

Abstract

Energy from renewable sources is on the rise, especially in the Global South and in particular in Bangladesh (IDCOL 2015). In this work, we study the interconnection of existing solar home systems (SHSs) in order to form an organically growing microgrid from the bottom up: the concept of swarm electrification. The excess energy which may otherwise be lost is shared providing energy access to currently unelectrified people. Hence, the energy service provision is improved with the same installed capacity. We define the basic concepts of a Solar Home System (SHS), swarm electrification and a swarm type low voltage (LV) DC microgrid. A physical model of a swarm type LVDC microgrid is presented as basis for future control design in accordance with the research and development in practice. We identify that droop control is a good first control approach and a more detailed model is needed for practical importance. Further research is also needed on the technical design of a suitable swarm controller and its integration in the village life. Finally, swarm electrification may have a positive development impact on environmental, economic and social level.

[HA-Posters] Habitat & Cities

DAY 1 – Monday 2 May – 13:30-15:00
Swiss Tech | Level Garden

Member of the Jury

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Jean-Claude Bolay is the Director of the Cooperation & Development Center (CODEV) at EPFL. A sociologist by training, he specialized in urban issues in Latin America, Asia, and West Africa. He prepared his PhD in Political Sciences at El Colegio de Mexico, then at UC Berkeley, USA. He has carried out many international research projects in urban societies, sustainable development, and poverty reduction in developing countries. He was a scientific advisor and evaluator for Swiss and European institutions. Since 2005, he is Adjunct Professor at the Laboratory of Urban Sociology (LaSUR) at EPFL.

ID#: HA01

Low Carbon Limestone Calcined Clay Cement

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François Avet is a PhD student – Low Carbon Cement Project, Laboratory of Construction Materials. Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland. Karen Scrivener graduated from the University of Cambridge in 1979 in Materials Science. She went on to do a PhD at Imperial College. In 1995, she joined the Central Research Laboratories of Lafarge near Lyon in France. In March 2001 she was appointed as Professor and Head of the Laboratory of Construction Materials, Department of Materials at EPFL. The work of this laboratory is focused on improving the sustainability of cementitious building materials.

Abstract

Ordinary Portland Cement (OPC) and types of blended cements are the most used man made material. Each year the requirement for cement is increasing due to growth in urbanization and increase infrastructure development. Cement is responsible for approx. 5 - 10% of global CO_2 emissions. EPFL has developed a new cement called LC3 (Limestone Calcined Clay Cement). Lab and industrial trials have produced a material that has similar characteristics to OPC. LC3 is cement that produces 30% savings in CO_2, It can be made in small-scale artisan kilns which have huge potential for grass roots construction material production, and in large production plants where current technology can be modified with low levels of capital investment. When the world is running out of high quality resources using present cement technology, LC3 can meet the cement market needs of a significant number of developing countries in Asia, Africa and Latin America where there are abundant reserves of the required low grade kaolin clay. Current research and practice shows LC3 can provide a large share of the market with a low carbon, low cost, low investment, and an easy to use material.

ID#: HA02

The Crowdmapping Mirafiori Sud (Torino, Italy): An Application of Community Impact Analysis (CIA) to Impact Evaluation of the Social Empowerment Strategies

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Biography of Presenting Author: Cristina Coscia is an Adjunct Professor in the Department Estimate Architecture and Design at the Politecnico of Turin, and a member of the Board of Architects. Since 2001 she has been teaching and undertaking research on issues of enhancement of the architectural and cultural resources and the feasibility of projects of public and private investment. It is on the staff's work Real Estate of the City of Turin (OICT). She's responsible with Francesca De Filippi of Crowdmapping Mirafiori Sud Project.

Abstract

The evaluation technologies for development interventions is a complex issue. The literature highlights that the evaluation method provide for estimating the cost-efficiency and potential risk of technologies tools, but the level of complexity that characterizes the ICT matched with a participatory process is different: it can not only be measured by quantitative techniques. This paper intends to explore a methodological proposal in order to evaluate the strategies in the framework of the Crowdmapping Mirafiori Sud project, whose goal is to create a collaborative map through which citizen and Public Administration can cooperate in the management of public goods and micro-projects in the area of the improvement of urban quality to the neighborhood level. The paper focuses on the socioeconomic feasibility plan, in particular on the application of Community Impact Analysis (CIA), developed by Lichfield. These processes can be defined as sustainable? In conclusion, the simulation of the CIA produce the final framework of social impacts assessment and the achievement goals matrix of strategic issues: the technique shows that no group of interest is affected by the use of a platform once improvement of the territory, but rather that the positive impact of the process would cross over all stakeholders.

ID#: HA03

SMART Centres: An Innovative Approach to Provide Water and Sanitation at the Base of the Pyramid

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Biography of Presenting Author: Henk Holtslag has 28 years experience in developing countries, in both failures and successes. He was involved in the Nicaraguan Rope pump of which there now are over 70,000 produced by the local private sector. Now he is training the local private sector in Africa in manual drilling, rope pumps and 10 other SMARTechs that can be produced locally. The focus is on options for self-supply because of its effect on income generation. André Olschewski has a professional background in rural engineering, business engineering and spatial planning. He has over 18 years of working experience as consultant and project manager in the area of environmental engineering, strategic planning and project management of infrastructure projects. He is currently working as water and environmental sanitation specialist at Skat Consulting. In the Rural Water Supply Network (RWSN) he is engaged as thematic coordinator for accelerating self-supply.

Abstract

The Sustainable Development Goals promise water and sanitation for all but how to reach the BoP, the small rural families where machine drilled boreholes are too expensive? How to make access sustainable? One option is to apply SMARTechs being Simple, Market-based, Affordable, Repairable Technologies that are innovative and can be produced with local skills and materials. They can reduce the cost of communal rural water supply by 60% but also increase options for self-supply for households and so increase incomes and food security. An example of a SMARTech is the rope pump, a simple, low cost hand pump that can be produced by the local private sector. Worldwide there now are 110,000 Rope pumps of which some 40,000 in Africa used by small communities and families who use it also for life stock and irrigation. Other examples are manual drilling, wire cement tanks, ground water recharge and household water filters that produce safe drinking water and costs US$ 20. Technologies are in place, lessons are learned; the question now is how to scale up. One option is via SMART Centres that train local entrepreneurs in production, marketing, and business skills. An example is the SHIPO SMART Centre in Tanzania. After 9 years the result is 30 pump and drilling companies, 2000 wells and 10,000 pumps installed. This promising concept is now starting in Malawi, Mozambique and has much potential for other countries.

ID#: HA04

From Innovation in the Construction Sector in Haiti to Social Impact on the Haitian Society

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Biography of Presenting Authors: Abigaïl-Laure Kern is a scientific advisor for the Cooperation & Development Center at EPFL, in charge of the Sustainable Habitat and Cities of the UNESCO Chair in Technologies for Development. She holds two Masters in Political Sciences and Public Policies and she is currently finalyzing her PhD at EPFL on Governance of Haitian intermediate cities in a context of crisis. She is also an invited researcher supporting the direction of the Centre de Recherche et d'Appui aux Politiques Urbaines CRAPU, University of Quisqueya (Haiti). Hervé Manaud has coordinated a number of emergency projects in humanitarian aid and co-founded several companies. He has worked for the Catholic University of Lyons (France) within the International Centre for Studies in Local Development (CIEDEL). Project leader in Haiti after the earthquake of 2010, he managed two projects of building construction and coordinated the cholera emergency for a Swiss consortium, including the

Swiss Development and Cooperation agency (SDC). In May 2011, he co-founded the Rustic Superior Foundation, based in Grand Goâve, Haiti.

Abstract

In the aftermath of the 2010 earthquake in Haiti, an initiative carried out by Rustic Superior has implemented an innovative approach in the field of construction based on an alternative pedagogy; an incubator process with a social business orientation. By offering innovative training and creating new economic opportunities, Rustic Superior is a resource center focusing on the capacity-building of professional skills in all building requirements for earthquake and hurricane zones. Currently, Rustic Superior's main objective is to offer the acquisition of technical skills to the largest number of persons by launching its new project: 'Digital Learning Tools'1 The final goal would be to provide the content of the first Haitian Massive Online Open Course (MOOC), which will be the first MOOC dedicated to vocational training in a developing country, and to disseminate this approach to a larger geographical area as well as to other priority areas.

ID#: HA05

Eco-Responsible and Sustainable Sanitation, Epuration and Valorization Solution for Developing Countries

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Biography of Presenting Author: Stefano Riboni is Professor at the Haute Ecole d'Ingénierie et de Gestion (HEIG-VD), and at the Ecole Polytechnique Fédérale de Lausanne (EPFL) since 15 years, teaching Logistics and Project Management, after a career in industrial management in various sectors. Stefano developed a particular concern for social and environmental issues in developing countries, with a particular focus on Africa. He is presently active on various development projects in the field of technological transfer, professional education and capability building in southern countries.

Abstract

Developing countries are facing multiple issues, often interdependent, impossible to solve durably with isolated and partial approaches. Our research tried to develop a coherent and comprehensive solution to a set of these inter-related problems, starting from the critical need for sanitation infrastructure in most developing countries cities. In search for a scalable, ecological and economically sustainable solution, our research ended-up proposing an integrated concept including: 1) Cloakroom Modules made out of recycled containers, offering men and women WC and showers. Existing technologies will be used to minimize water consumption while optimizing the volume and nature of wastes produced (blackwater and urine); 2) One or more Sewage Treatment Station(s) to treat the blackwater produced by the WCs. The Treatment Stations will produce clear water and sewage sludge; 3) A Waste Valorization Center, that will collect both the urine and the sewage sludge, to produce fertilizers for the agriculture; 4) An adapted Logistical System to collect and transport blackwater and urine from the Cloakroom Modules to respectively the Treatment Station and the Valorization Center. Our study shows that our integrated concept is ecologically and economically viable, and technically feasible, maximizing social impact by offering accessible sanitation services to large populations, and generating revenues to a whole ecosystem. To definitely validate the concept, the next steps we are presently working on are to find funding and select partners to set-up a Pilot Project, with 3 to 5 Cloakroom Modules, a Treatment Station, a Valorization Center, and the needed Logistical System, in Kinshasa (Democratic Republic of the Congo – DRC). This will demonstrate the value of the concept, and allow us to select the best-adapted technologies, and find the local partners, to further deploy the solution, in Kinshasa and/or in other African cities.

ID#: HA06

Reclamation of Building Materials: Heritage Preservation Community Engagement and Design-Build Practice in Post-Catastrophe Reconstruction

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Biography of Presenting Author: Federico Rota is a registered Architect in Italy; he pursed his Bachelor and Master degrees at the Politecnico of Milan and at the Technische Universität Berlin. Beyond working for the private sector, he has been a teaching assistant and visiting lecturer at the Politecnico of Milan and at the TU Berlin. His field of

interest includes the rehabilitation of dismissed industrial plants, the reuse of building materials in post-catastrophes reconstruction scenarios and the study of local and traditional construction techniques.

Abstract

Catastrophes management and reconstruction of built heritage have long exceeded the technical and financing dimensions, to include social, cultural and environmental elements. It have recently begun to be considered as a multidimensional challenge. While emergency practices attempt to respond to more pressing needs, several other issues arise, such as the appropriate regeneration of urban fabric and buildings materials; the social acceptance and participation in the reconstruction; the cultural pertinence to specific social contexts; the huge losses of valuable built and intangible heritage, thus increasing the effects of alienation suffered by the victims. The problem addressed in this project is how to improve reconstruction by turning the earthquake from being a catastrophe and turning it into an opportunity. Our hypothesis facing this problem is that rubble is an asset. Reclamation of building materials helps counter the difficulties of debris management in a way that has already been tested in other post-disaster scenarios, especially by dealing with debris in-site. A controlled deconstruction of damaged assets shifts demolition costs from machinery to local labor and provides initial materials that considerably reduce the cost of reconstruction.

ID#: HA07

Three Visible Cities: Understanding Urban Perception through Youth Action and Mobile Data in Mexico

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Biography of Presenting Author: Darshan Santani is a graduate student at EPFL and the Social Computing Group at Idiap Research Institute. His research interests lie broadly at the intersection of computer science and social science, in particular application of large-scale (mobile) data mining to various social and urban contexts. Before joining Idiap, Darshan completed his Masters at ETH Zurich.

Abstract

The explosion in use of mobile Internet and social media not only represents an enormous possibility for social and economic development, but also an unprecedented scientific opportunity to study how people go about their daily routines using new ways to perceive, understand, and interact with the world, while equipped with Internet-enabled mobile computing devices that harness powerful sensing and computer processing hardware.This opportunity has motivated our collective to think of new ways of using mobile devices, social media platforms, and crowdsourcing techniques, to help improve the life of people in developing cities, through projects that involve the collective participation of citizens and their synergistic interaction with academia and government. Here, we describe ongoing results of a project aimed at implementing and validating a framework to study urban awareness through mobile sensing and the participation of populations in three Mexican cities that possess distinctive urban contexts and history. The key idea of the project is to integrate the collective action of citizens with existing mobile sensing and social media technologies, to document their perceptions and experiences concerning the urban environment, and to investigate and address concrete urban challenges for holistic development of their communities. Our approach provides a general methodology to engage people for exploring, documenting, and proposing solutions with synergistic interaction with other social actors. In the final paper, we will compare our work with several other existing initiatives that have points in common to ours, and share the main lessons of our experience.

ID# HA08

Participatory Urban Planning and Land Tenure for Afro-Colombian Communities

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Biography of Presenting Author: Ana Maria is a social catalyst working for different NGOs and acting as executive director and cofounder of FEM. Her experience is mainly with social innovation with vulnerable populations such as indigenous peoples, afrodescendants, and ageing communities.

Abstract

This paper aims to expose the process through which afro-Colombian communities of the outskirts of Cartagena have started to express the role they intend to occupy as active stakeholders on the development process of the city, exerting the rights recognized to ethnic groups by Colombian constitution of 1991. The ethnic-based participatory-planning and land tenure Project (PAT) was born from the reflection on how do we relate with the environment and to what surround us, particularly focusing on ethnic issues. FEM had been working with the Association of Afro-Colombian Communities for several years as technical advisor, and, with the support of ASF UK, this support became a tool for communities advocacy on what concerns rights to land, self-governance and territorial development, whilst striking on urban racism, environmental racism and the prevention of segregation. The document reviews (1) the empowerment and self-recognizing issues linked to law 70 of 1993 on ethnic rights and land property in Colombia; (2) the role of stakeholders in the urban planning process for suburban Cartagena; (3) the place of technology in both, the implementation of the project (volunteers and experts participation) and life quality improvement for communities, and finally; (4) actual proposals resulting from the experience.

[IC-Posters] ICT for Development

DAY 1 – Monday 2 May – 13:30-15:00
Swiss Tech | Level Garden

Member of the Jury

Ashok Gadgil
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Ashok Gadgil is the Director of the Environmental Energy Technologies Division at Lawrence Berkeley National Laboratory and Professor of Civil and Environmental Engineering at UC Berkeley. He specializes in heat transfer, fluid dynamics, and design for development. He also has substantial experience in technical, economic, and policy research on energy efficiency and its implementation – particularly in developing countries. He has several inventions in the realm of sustainable development, including the Berkeley-Darfur Stove and UV Waterworks, a technology to inexpensively disinfect drinking water in developing countries. He has more than 80 refereed archival journal papers, 120 conference papers, and several patents.

ID#: IC01

Spatial and Social Diffusion of Mobile Banking Services. The Case of the Burkinabé Diaspora in Rural Ivory Coast

Simon, Barussaud[1], Stéphane Reuse[2], Camille Compaoré[2], Dieudonné Ilboudou[4] & Solène Morvant-Roux[1]
[1] University of Geneva, Geneva, Switzerland
[2] PEASA, Ouagadougou, Burkina Faso
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Presenting author's email address: simon.barussaud@unige.ch

Biography of Presenting Author: Simon Barussaud is a research and teaching assistant at the School of social sciences, University of Geneva. He has a background in socioeconomics and his research topics involve entrepreneurship, informality and financial inclusion in West African countries.

Abstract
Remittances sent by migrant workers to their family fellows represent an important flow of money in home countries. However, many migrant workers often face difficulties for sending money due to weak sending facilities which hinder their ability to send money and translate into the use of informal remittances channels such as friends and neighbors or via ground transportation. In rural areas the low banking services coverage mainly results from low density, transaction costs, high risks, insecurity, etc. In that context, the recent launch of mobile money services brings the promise of facilitating cross-border remittances and to foster mobile banking development in several West African countries. The Ivory Coast and Burkina Faso are among the few countries where such services have recently been implemented targeting one of the largest diaspora in Sub-Saharan Africa (1.3 million people). The poster intends to share the results of an in-depth analysis of the social and spatial spreads of mobile money services by Burkinabé migrant workers settled in Ivory Coast. While to a large extent the literature on financial exclusion of poor households in developing countries analyses who is excluded, our study (in line with other research works) will not only highlight which categories of the diaspora are being reached (along gender, age, ethnic lines) by Mobile money services, but will also help better understand which factors play an instrumental role in maintaining some categories of the population excluded from these services or are not interested in using them. The study relies on a combination of qualitative and quantitative data gathered with a variety of actors. We conducted a survey with 150 migrant workers in five (5) main municipalities located in the southwest of Ivory Coast (Meagui zone). Méagui and its surroundings is a very dynamic agricultural region but of course strong disparities exist between the main urban center and remote rural villages. The Burkinabé diaspora has a long history in the region. Living conditions exhibit important disparities; some migrants own a plot of land and live in villages while others live in illegal settlements (camps). Most of them make their living with agricultural production (hévéa, cocoa) or as agricultural wage workers.

The first survey component with migrants was matched with another survey with remittances' recipients in Burkina Faso. These two surveys were complemented by interviews and geo-mapping of local mobile banking suppliers and with interviews with local suppliers as well as top managers of several mobile banking companies in each country/region (Airtel, Orange, etc.). Relying on original data and a combination of quantitative and qualitative tools, spatial analysis combined with a matched samples survey the Poster will thus offer an overview of spatial and social diffusion of Mobile banking services among the Burkinabé diaspora in Ivory Coast and the underlying processes that are instrumental in explaining the spatial diffusion in the region of the study and usage of mobile baking services by Burkinabé migrant workers in Ivory Coast and their family fellows in Burkina Faso.

ID#: IC02

Service Platform for the Exchange of Services with Developing Countries

Hans-Peter Hutter[1], Andreas Ahlenstorf[1], Julia Klammer[2], Fred van den Anker[2], Adrian Wiedmer[3]

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[2] University of Applied Sciences and Arts Northwestern Switzerland FHNW, Olten, Switzerland

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Biography of Presenting Author: Hans-Peter Hutter is Professor in Computer Science at the Zurich University of Applied Sciences (ZHAW). He is the founder and former head of the Institute of Applied Information Technology at ZHAW and leads the Human-Information Interaction research group and the Mobile Usability Lab at the institute. His research activities comprise customer-centered design of mobile application and services, mobile usability as well as advanced user interfaces. His is the project leader of the PESCO project presented in this paper.

Abstract
This paper presents the new PESCO service platform that offers an Access-To-Market (A2M) and other services to connect farmers in the global south with consumer networks in the global north and setup long term relationships between them. PESCO is the result of a CTI-project of ZHAW, FHNW and gebana AG. The A2M service supports gebana in enabling farmers in developing countries to get access for their products to the fairtrade market in Europe. Interested farmers or NGOs can post their product suggestions to PESCO. After gebana has decided to start the A2M project PESCO supports the communication between the farmers, agents and gebana employees. To that end the agents get a smartphone with the PESCO app that allows them to easily collect the data for the A2M process and exchange it with gebana. PESCO further supports the A2M process in all phases, e.g. to setup a supporting community in the developed countries or by visualizing the status of the project for all stakeholders. PESCO can be a model how producer networks in the global south and consumer networks in the global north can set up long-term relationships to exchange products and services in a direct fair-trade manner.

ID#: IC03

Java and Web World Wind Based Social Volunteered Geographic Information Platform

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Biography of Presenting Author: Eng. Candan Eylül Kilsedar obtained her BSc degree in Computer Science and Engineering from Sabancı University in 2012 and her MSc degree in Informatics Engineering from Politecnico di Milano in 2014. She is strongly interested in web technologies and started working on geospatial data visualization on web during her MSc education. Since November 2015, she is a PhD student in Environmental and Infrastructure Engineering and temporary research fellow at the GEOlab of the Como Campus at Politecnico di Milano.

Abstract
A virtual globe based on NASA Java World Wind, that is able to display data collected through a Volunteered Geographic Information system can be taken further by re-implementing the platform based on NASA Web World Wind, which is an important step for improving the prevalence and usability of the platform. The importance stems from the fact that NASA Web World Wind API, written in JavaScript and based on WebGL is cross-platform and cross-browser, so that the virtual globe can be accessible through any modern browser. As a result of this implementation, users simply using their mobile devices can contribute to the database and visualize all the contributions on a virtual globe which is more intuitive and realistic compared to classical two dimensional visualization.

ID#: IC04

Development, Adaptation and Marketing Strategy for an Innovating Technology of Irrigation Water Management

Tom Müller[1], Aïda Ganaba[2], Clémence Ranquet Bouleau[1]

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[2]iDE Burkina Faso, Burkina Faso

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Biography of Presenting Author: Tom Müller has recently received his Master's Degree in Environmental Engineering at the Ecole Polytechnique Fédérale de Lausanne. He focuses his activities on water resources management in developing countries. He collaborated in Kenya on sanitation planning for low income areas and in Burkina Faso on a project aiming to optimize irrigation by the use of a wireless sensor networks. He is now project manager at the Cooperation and Development Center, coordinating the project Info4Dourou2.0 in Burkina Faso.

Abstract

Innovative technologies for agriculture in semi-arid regions are required to improve yields and save precious water resources in developing countries. Research project Info4Dourou2.0 has been testing since 2012, together with family farmers in Burkina Faso, an autonomous Wireless Sensor Network which indicates when irrigation must be triggered via text message. Following successful results in terms of increased yields, reduced use of irrigation water and positive feedbacks from the producers, the project is aiming to scale up from a research technology to a marketable product that can be accessible to poor family farmers. Major challenges will be faced to create a technology adapted both technically and economically to the farmers' needs. The creation of a local manufacturing industry and a partnership with an existing provider of drip-irrigation kits constitute the stepping-stones of the approach. This abstract focuses on the prerequisites towards the creation of a sustainable enterprise and highlights an innovative supply chain to reach farmers at the base of the pyramid. Finally, key aspects for a sustainable integration of the technology in the market are discussed, such as the presence of a nearby farm advisor, a strong after-sales service, demonstration of the product benefits and adaption to the farmers' requirements.

ID#: IC05

Wireless Sensor Networks for Tea Farm Monitoring in Rwanda

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Biography of Presenting Author: Raymond Ndacyayisaba holds a bachelor's degree in electronics and telecommunications obtained from Rwanda, he started teaching as assistant lecturer at Tumba College of technology of Rwanda since 2009. He is currently pursuing a Master of Science in Information Systems degree at Kobe Institute of Computing in Japan and research interest is in embedded systems, computer networking, wireless sensor networks, particularly for solving social problems in agriculture and the environment.

Abstract

Tea production is a major component of the Rwandan economy, thus improving tea cultivation has a large potential economic impact. Tea farming is typically on a large scale, making monitoring by visual inspection inefficient. We propose introducing low-cost WSN (Wireless Sensor Network) technology to provide tea farms with an efficient means to continually monitor soil conditions, tea leaf health, weather etc. throughout the farm. In this paper we describe the background of tea plantation monitoring, the major issues facing tea farmers, our proposed WSN solution, and preliminary experimental results obtained in the field. We believe that similar technologies could be beneficent in tea growing areas not just in Rwanda but in other countries with similar conditions.

ID#: IC06

Potential and Open Issues in Internet of Things for Development: Wireless Sensor Networks for Irrigation in Burkina Faso

Clémence Ranquet Bouleau[1], Tom Müller[1], François Ingelrest[2], Davis Daidie[2], John Carmichael[2]
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Biography of Presenting Author: Clémence Bouleau holds a Master's Degree in geology and environmental sciences from the ENSG, Ecole Nationale Supérieure de Géologie in France. She specialized in hydrogeology and has worked in Mauritania, Senegal, and Burkina Faso. She is currently project manager at the Cooperation & Development Center at the Ecole Polytechnique Fédérale de Lausanne (CODEV EPFL) in Switzerland. She coordinates the Info4Dourou 2.0 research project on the topic of "ICT applied to the environment and development."

Abstract

Collecting environmental data necessary to improve resilience to climate change affecting food security in arid and semi-arid areas in developing countries requires specific tools. The Info4Dourou2.0 research project led by the Cooperation and Development Center at the Ecole Polytechnique Fédérale de Lausanne focuses on two

themes in Burkina Faso: environmental data collection for national weather services and dryland irrigation support. EPFL and Sensorscope have developed automatic wireless sensor networks to make data available in real time via mobile phones and a web interface to optimize dryland drip irrigation; tested in Burkina Faso since 2012. Several technical difficulties were resolved in the field to create an efficient, working system. The developed system allows better yields and more efficient use of water resources in addition to providing centralized data via IoT technologies for long-term analysis of agricultural practice. Info4Dourou2.0 plans to create a company in Burkina Faso to manufacture the system locally and offers a complete service for irrigation support using the techniques developed by Info4Dourou2.0. Efforts will be made to lower the cost of the equipment, which, together with savings on customs and shipping fees, will ensure long-term sustainability. This abstract presents and discusses the technical challenges encountered and future perspectives.

ID#: IC07

Technology-Based Social Innovation: Driver Of Social Change In Small Developing Countries

Dimitar Trajanov[1,3], Jasmina Belcovska-Tasevska[2], Natalija Najdova[3]
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Biography of Presenting Author: Dimitar Trajanov is associate professor at the Faculty of Computer Science and Engineering, Cyril and Methodius University –Skopje. From 2011 until September 2015, he was the Dean of the Faculty of Computer Science and Engineering. He is the leader of Social Innovation Hub and a member of the National Committee for Innovation and Entrepreneurship where he is working on creating strategies and legislation to encourage innovation and entrepreneurship in the country through inspiring the use of technology for economic development.

Abstract

Social innovation has gained more attention over the last decade mainly because the traditional structures, institutions or governments acting alone, failed to inadequately solve complex issues and societal needs of nowadays. In the developed countries social innovation facilities proved to have profound impact in solving some of the greatest challenges like health care and services, pollution, climate change, sustainable development etc. The main goal of this paper was to research how these kind of facilities might impact the developing countries and put the country potential into practice. In order to encourage innovation to tackle societal issues in a developing country, the Faculty of Computer Science and Engineering and United Nation Development Programme (UNDP) in Skopje, established a facility called Social Innovation Hub. The mission of the Hub is to catalyze social innovation in the country by using innovative approaches and ICT solutions with a limited resource perspective. During the two years existence, the Social Innovation Hub has illustrated the importance of such facilities for the development of the country and some of them reached beyond local level and gained regional and global recognition.

[ME-Posters] Medical Technologies

DAY 1 – Monday 2 May – 13:30-15:00
Swiss Tech | Level Garden

Member of the Jury

Temina Madon
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Temina Madon directs the Center for Effective Global Action (CEGA), a research network headquartered at the University of California, Berkeley. CEGA creates innovative products, services, and technologies for economic development. Temina has advised the WHO, World Bank, and Gates Foundation. Previously, she held positions in science policy at the National Institutes of Health and U.S. Congress, where she served as AAAS Science and Technology Policy fellow. She has a PhD in health sciences from UC Berkeley and an SB in engineering from MIT.

ID#: ME01

Survey of Medical Devices "Appropriate for Developing Countries"

Cassandre Lemoine[1&2], **Mélanie Amrouche**[1&2], Robin Walz[1], Maurice Page[1]
[1]Université de Technologie de Compiègne, France
[2]Humatem, France

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Biography of Presenting Authors: Cassandre Lemoine and Mélanie Amrouche are two biomedical engineering students from the University of Technology of Compiègne (UTC) and are currently interning with the organization Humatem. Robin Walz is a biomedical engineer and he is currently volunteering for Humatem as Maurice Page who is a retired biomedical physicist and engineer. Maurice Page has worked on many projects to assess medical device structures in developing countries. He has mentored many African biomedical engineering students from UTC and has connected with them about existing problems in their countries. He is a consultant for the R. Malkin's Developing Healthcare Technology Laboratory at DUKE University.

Abstract

According to WHO, in the Sub-Saharan Africa region, a large proportion (up to 70 per cent) of equipment lies idle due to mismanagement of the technology acquisition process, lack of user-training and lack of effective technical support. This is often associated with inadaptability of the medical devices produced by developed countries, in the context of developing countries. Given this situation, the NGO Humatem, in an official collaboration with WHO, seeks sustainable solutions for a real strengthening of health infrastructures in developing countries. It is looking particularly at an innovative concept: medical technologies considered "appropriate for developing countries". The technologies can be qualified as "appropriate" if they match certain criteria such as the toughness, the ease of use, the adaptation to the local context, the reduced capital and operational cost, the availability of local maintenance and training, etc. Certain technologies considered "appropriate" are currently commercialized in these countries. It appears however, that these technologies remain nevertheless relatively unknown to most users, biomedical workers, health authorities of developing countries, and international development organizations. With the potential of these technologies at stake, Humatem is conducting a survey, which should validate the importance and interest in elaborating this information and awareness support to promote this innovative concept. The poster will showcase the initial problem statement, the survey methodology, as well as the key results and testimonies obtained.

ID#: ME02

Portable and Low-Cost Quantitative Pathogen Detection Device

B. Leticia Fernández-Carballo[1,2], Ian McGuiness[1], Christine McBeth[1], Maxim Kalashnikov[1], Salvador Borrós-Gómez[2], Andre Sharon[1,3], Alexis F. Sauer-Budge[1,4]
[1]Fraunhofer Center for Manufacturing Innovation, Brookline, USA
[2]Institut Químic de Sarrià Grup d'Enginyeria de Materials (GEMAT), Universitat Ramón Lllull, Barcelona, Spain
[3]Boston University Mechanical Engineering Department, Boston, USA
[4]Boston University Biomedical Engineering Department, Boston, USA

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Biography of Presenting Author: B. Leticia Fernández-Carballo is currently in the final year of her PhD which is focused on low-cost diagnostic devices for low resource settings. Her work is being conducted at the Institut Químic de Sarrià (Spain) and Fraunhofer Center for Manufacturing Innovation (USA) with the supervision of Dr. Borrós, Dr. Sauer-Budge and Dr. Florensa. Leticia obtained her BSc in Chemical Engineering at Universidad de Santiago de Compostela (Spain) and an MSc in Bioengineering at the Institut Químic de Sarrià (Spain).

Abstract

Point-of-care (POC) medical devices combine promising suites of technologies for diagnosing and managing diseases in limited resource settings. Their essential characteristics are rapidity and the ability to be performed near the patient with limited infrastructure. We present a portable and low cost POC real-time fluorescence-based continuous flow polymerase chain reaction (PCR) system that allows identifying and quantifying DNA from target pathogens within 20 min. The PCR system is designed around a 4.5cm x 3cm x 0.05cm thermoplastic microfluidic chip produced by hot embossing at low cost. The chip works by introducing the pathogen sample along with nucleic acid reagents into a microfluidic channel that travel between two heat zones. By thermally cycling the sample, the DNA is amplified and detected within 20 min on chip by real time fluorescence measurements. To demonstrate the function of the chip, two infectious bacteria were selected: Chlamydia trachomatis and Escherichia coli O157:H7. For both bacteria, the limit of detection of the system was determined, PCR efficiencies were calculated, and different flow velocities were tested. We have demonstrated successful detection for these two bacterial pathogens highlighting the versatility and broad utility of our portable, low-cost, and rapid PCR diagnostic device.

ID#: ME03

Online Remote Monitoring of Physiological Signal

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Biography of Presenting Author: Degree in Physics by National University of Tucumán, Argentina. Master degree in Electrical Engineering by University of São Paulo, Brazil. PhD in Biomedical Engineering by University of São Paulo, Brazil. Coordinator of Research and Development at the Faculty of Medicine, University of São Paulo. Visiting Professor at MIT, Boston. At the moment, Researcher of University Mogi das Cruzes and Associate Professor of Federal University of São Paulo, São José dos Campos, Brazil.

Abstract

Statistics in Latin America and particularly Brazil shows an increase in non-communicable diseases. The serious consequences of these diseases can be prevented through continuous monitoring of clinical factors, avoiding major drawbacks. However, most of the causes of the increase of these diseases arise as a consequence of the lack of perseverance of the care required by the patient himself. This research developed an e-health service for online remote monitoring of heart rate, heart rate variability, nutritional balance, control of physical activity. The system takes advantage of advances in information and communication technology (3G/4G, Wi-Fi) to acquire, process and visualize physiologic information of people in their day to day, it offers direct applications to the user of each physiological variable and their backgrounds. The application architecture was based on free tools without licensing costs, generating a runtime environment that is flexible, scalable, global, in a 24×7 regime, safe, with reliable coverage and massive capacity to care for patients at the same time. The proposed remote monitoring system showed to be a promising tool for evaluating quality of life, prevention and control of the risk factors of non-communicable chronic diseases (obesity and cardiovascular), being an alternative low cost tool.

ID#: ME04

How Accurate is the News for Reporting Ebola Case and Mortality? Review from March 14-August 28 2014

Roxanne Moore[1], Eli Rosenberg[1]
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Abstract

Background: The public is more likely to obtain information regarding Ebola through the news as compared to scientific journals or official reports. The manner in which news portrays scientific information, particularly case and mortality values has an impact upon trust in formal health agencies, public donations, and fear mongering.
Methods: This study uses HealthMap identified news articles as a representative sample of online news to evaluate the variation between news-derived case and mortality as compared to the World Health Organization (WHO) and Ministry of Health (MOH) official reports via the Humanitarian Data Exchange (HDX) sub-national time

series dataset. Results: HealthMap counts, country, and reoriented date accurately predicts 75.9% of the change in estimate for WHO/MOH cases and 90.3% for deaths. When limited to news articles providing a citation for case and mortality counts, prediction increases to 92.2% for cases and 95.9% for deaths with no statistically significant difference in news-derived and WHO/MOH official estimates for cases under the subset model. Discussion: It is hypothesized that lower predictive capacity for cases is related to greater variability in case estimates due to multiple definitions (suspected, probable, and confirmed cases) as well as changes in case reporting for Sierra Leone during the time of study. Future Directions: Five alternative analyses are highlighted. News-derived predictive models should not be used as a supplement to official estimates. Rather, news articles should link the public to official reports; therefore reducing variability in the public domain.

ID#: ME05

Assessing the Use of Open Medical Record System to Manage HIV Patient Records in Rwanda

Uwamahoro Munezero Christa[1], Markon Sandor[1,] Akaliza Keza Gara[1]
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Biography of Presenting Author: *Christa Munezero Uwamahoro is an information and communications technology for development (ICT4D) enthusiast. She is pursuing a Master of Science in Information Systems at Kobe Institute of Computing. After completing a BSc at Adventist University of Central Africa in Information Technology, she worked for Microsoft in Rwanda as a software developer intern. Christa won the Best Performing ICT Innovator award in the Hackathon held in Rwanda, a competition that gathered software engineers to develop solutions which respond to global issues.*

Abstract

Africa is facing an issue of having both a large number of people living with HIV as well as high rate of transmission. HIV is causing African countries to fall into poverty, increasing the number of orphans and is dramatically killing its future generations. Antiretrovirals are provided in order to reverse the spread of HIV and to provide access to those who need treatment. However, antiretroviral programs have a continuous need of data management. In that regard, Electronic Medical Record (EMR) systems are being used to track the progress of patients and get alerts about dangerous trends. The implementation of EMR systems in some African countries face a lot of challenges resulting from a lack of infrastructure, financial constraints and human resources. In this paper, we describe the impact of using Open Medical Record System (OpenMRS) in managing HIV patients' records in Rwanda and its contribution to improve the quality of clinical care. An analysis on the quality, reliability and safety issues of the OpenMRS is presented and lastly, we propose an additional feature which can contribute to the successful implementation of OpenMRS in developing countries.

ID#: ME06

Review of Recent Advancements in Diagnostic Technologies to Defeat Malaria

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Biography of Presenting Author: *Gemma is a doctoral student at the Mobile Health Systems Lab at ETH Zurich. Her research focuses on the development of microfluidics-based immunoassays for malaria detection and the application of mobile phones for POC diagnostics. She received her bachelor degree in Chemistry from Imperial College London and masters Mechanical Engineering from University of Toronto. She is the recipient of the "Innovation most likely to be commercialized" award (University of Toronto) and the 'Engineering for Development' fellowship (ETH Zurich).*

Abstract

According to the World Health Organization (WHO), malaria caused the deaths of nearly half a million people in 2015. Nevertheless, malaria elimination and eradication have become within reach. Effective and accurate diagnostic tools are critical in monitoring the transmission reduction and in detecting low parasite density. We present a review of recent techniques in point-of-care diagnostics for malaria. We categorized tests into existing diagnostic tests, recently commercialized devices, and promising prototypes. Evaluation criteria were the Affordable, Sensitive, Specific, User-friendly, Rapid & Equipment-free and Delivered (ASSURED) standards for rapid diagnostic tests set by the WHO. Furthermore, we took into account malaria-specific evaluation criteria, such as integration of positive control, development of a detection method for Plasmodium vivax, and glucose-6-phosphate deficiency. Our findings confirm that lateral flow-based approaches remain the most popular rapid tests at the moment. For the ultimate goal of complete parasite eradication, a new generation of diagnostics featuring superior sensitivity while retaining the ASSURED criteria is needed.

ID#: ME07

Maximizing the Value of Identifying Appropriate Medical Devices for Managing Acute Respiratory Diseases in Settings with Limited Resources

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Biography of Presenting Author: Dinsie B. Williams is a PhD Candidate in the Collaborative Doctoral Program in Global Health at the University of Toronto. Her interests lie in equitable access to electro-medical equipment in limited-resource settings. She has extensive technical research and development experience in x-ray, magnetic resonance, electrical impedance, and computed tomography. She received a B.Eng. and a MSc. in Biomedical Engineering from Dartmouth College (United Sates), and a MSc. in Health Policy Management and Evaluation from the University of Toronto (Canada).

Abstract

Objective: Medical equipment is essential to healthcare delivery yet, in resource-limited countries there is a pervasive shortage that severely limits the capacity of clinicians to assess, diagnose, treat, monitor, and prevent conditions such as childhood respiratory diseases. Transnational donors provide funds for almost 80% of medical equipment in these countries. Yet an interesting juxtaposition exists wherein approximately 70% of available equipment remains unused, abandoned, and left to accumulate as waste at hospitals and clinics. This means that for every dollar spent on donations, at least 62.5 cents ends up as financial and material waste. In other words, donors of medical equipment are generating new forms of waste without getting any value for money. There is a need to identify opportunities for donors and recipients to optimize the value of donated medical equipment. Methodology: By probing recipients and donors, we aim to deconstruct equipment donation practices and so identify opportunities for maximizing the value of medical equipment procured through donations. Employing a case study approach, we will review policy and guideline documents, survey donors and recipients, and interview key stakeholders in Ghana and Sierra Leone. Impact: This study will contribute to the growing body of research at the intersection of health policy, transnational philanthropy, and development. Findings from the study will be useful to policymakers interested in improving healthcare delivery by enhancing utility of donated medical equipment.

ID#: ME08

Producing Medicines at Point-of-Care and on Demand for Disaster Management and Global Health

Nima Yazdanpanah[1]
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Biography of Presenting Author: Nima is a Postdoctoral Associate at MIT, Department of Chemical Engineering. His research covers continuous manufacturing of pharmaceutical agents in robust and intensified fashion. He born and raised in Iran. He obtained his PhD in Chemical Engineering from University of Sydney, Australia. He has worked in industry for six years. He has published numerous journal papers, a book chapter, and presented in several international conferences.

Abstract

Availability of drugs and medicines is crucial for global health. This role is extremely vital in emergency situations, such as the 2014 West Africa Ebola outbreak or 2015 Syrian refugee camps, and for places with less and harder access to regular medical supply. Providing adequate amount of medicines on time, and maintaining the supply flux is a challenging logistic issue, especially if the infrastructure facilities were damaged, like in a case of earthquake. A solution to supply and meet continuous demand of drugs is to produce the medicines on site (point-of-care). An intensified pharmaceutical plant, based on continuous manufacturing techniques, can be packed in a small cargo container to shipped to the disaster zones in order to produce and supply the required amount of drugs on site. New technological advancements in continuous manufacturing, Vs. the traditional batch methods, have been demonstrated for the ability to produce medicines in faster, more efficient, with smaller foot-print and more economical ways. Case studies show compact and fully automated small size phrama plants can compete with the larger production capacities, such as 1000 dose/day, with the advantage of being agile, flexible, and on demand.

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