

UNESCO CHAIR/UNITWIN NETWORK PROGRESS REPORT FORM

Title of the Chair/Network:	UNESCO Chair in Energy for Sustainable Development
Host Institution:	Politecnico di Milano
Date of establishment of Chair/Network:	03, 2012
Period of activity under report:	04, 2013 - 03, 2014
Report established by:	Emanuela Colombo, Chair Holder Professor at the Department of Energy Rector's Delegate to Cooperation and Development

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1. Executive Summary:

Major outcomes, results and impact of the Chair, including on national policies, in relation to its objectives as stated in Article 2 of the Chair Agreement (between the Institution and UNESCO)
(Not exceeding 300 words)

The UNESCO Chair in Energy for Sustainable Development, established at Politecnico di Milano in March 2012, has continued its activities in this second year counting on an increased number of internal human resources and intensifying collaborations with other groups of Politecnico di Milano.

The Chair has given primary attention to **teaching and education**. Besides the MSc courses on access to energy and global development issues, one of the main recent achievements has been the implementation of a new Interdoctoral PhD School course in collaboration with UNIDO. The increased number of students attending the courses and the positive outcomes have confirmed the relevance of energy for development within Politecnico di Milano and the growing interest of new generation for methodologies and contents able to face current challenges with a multidisciplinary approach, merging technical with social, economic, political aspects.

Research has continued the lines of previous years on sustainable strategy planning for improving access to energy, monitoring and evaluation analyses and long-term impact assessment of energy project and systems. In the last year the group has also focused the research on the definition and validation of comprehensive sustainability evaluation models.

Acknowledging the complementarity of all actors and the need for **effective partnerships**, the Chair has enforced its role in the existing and running collaborations: two projects with universities in DCs granted by the European Commission and one education programme in Tanzania financed by the Italian Government have started. The Chair has also started **joint researches with international organizations and public institution**, as the International Energy Agency and the Italian Ministry of Foreign Affairs. In this partners' framework, the role of the Chair has been oriented towards innovative solution, by improving methodologies and assessing most appropriate technologies for specific contexts, with the overall objective to improve the effectiveness of strategies for development.

2. Activities:

Overview of activities undertaken by the Chair during the reporting period

a) Education/Training/Research

(key education programmes and training delivered and research undertaken by the Chair during the reporting period, target group and geographical coverage)

i) Education (leading to certificate)

As already depicted in the Progress Report 2013, in light of the deep connection between energy and development, highlighted also by UNDP, the Chair has continued the implementation of the **track on Energy for the Development (MSc in Energy Engineering)**. Due to the complexity and multidisciplinary nature of the access to energy issue, the track aims to combine fundamental knowledge of engineering with a comprehensive approach to address global problems with integrated perspectives, in order to assess economic, environmental and social implications of technological solutions and energy strategies, while promoting local sustainability. The number of students (34 in the Academic Year 2012-2013 and 88 in 2013-2014) attending this MSc track confirms the high relevance of the theme and the increased attention that new generations are attributing to global challenges.

Courses currently offered at Politecnico di Milano, in cooperation with the Chair:

- Engineering and cooperation for development (8 ECTS)

MSc in Energy Engineering – Milano Bovisa

Academic Year 2013-2014

Course Program

The course aims at introducing students to the theme of development and cooperation as well to the role of scientific research and technology within the field. The main goals are: to provide methodological tools of cooperation and development in order to widen the vision for facing the social challenge, to couple the engineering vision with the whole set of human factors and the principles of ethics, to develop a system of instruments and values that can generate innovation and development in different contexts. Students are involved with a participative approach, analyzing real case proposed by NGOs and delivering a project on a case study.

- Energy for sustainable development (6 ECTS)

MSc in Environmental and Geomatic Engineering – Como

Academic Year 2013-2014

Course program

The course aims at introducing basic concepts about energy as a tool for sustainable development. In this perspective, it addresses the following issues: exergy and thermodynamic analysis, renewable and nonrenewable energy resources and conversion technologies, local and global emission, Life-Cycle Analysis and environmental impact. Emphasis is also made on political opportunities and legislation.

- Renewable Energies for Unleashing Sustainable Development in low and middle income economies

PhD School – Como, 24th-28th February 2014

Course program

The course has been assigned by the PhD School of Politecnico di Milano on a competitive base to the Department of Energy under the UNESCO Chair. In cooperation with UNIDO and with the support of Fondazione Cariplo, the course has seen the participation of 19 PhD candidates of several nationalities and coming from different disciplines, on multidisciplinary themes such as

	<p>access to energy and sustainable development, interconnections among energy, environment and social aspects, appropriate technologies, energy strategies in developing countries and the links between energy, economy and policies. With the support of international experts, students have faced real case studies through project works.</p>
<p>ii) Training (short term)</p>	<p>In line with the strategy of the Chair, several lectures and courses have been organized, aiming at promoting a knowledge sharing network, through capacity building and dissemination towards different actors. Training were addressed to NGOs, Italian and foreign students.</p> <p><u>Training in collaboration with Universities</u></p> <ul style="list-style-type: none"> • Laboratory of International Cooperation, Department of Architecture and Urban Studies (DASU), Politecnico di Milano, November 2013 – May 2014 Post Graduate Program “Coopera(c)tion – Knowledge and Skills for Sustainable Cities in the Global South” <i>The course offers to new generation of experts the chance to acquire skills and knowledge that will help them to develop an integrated and multidisciplinary approach to planning, design and management of urban settlements and territories in contexts with a high level of social, economic, territorial, and landscape vulnerability. The Chair contributed to the course with two lectures on access to energy and appropriate technologies.</i> • International Master Program in Cooperation and Development, IUSS Pavia, 19th December 2013 Seminar “Global Energy Challenges and Sustainable Development: Scenarios and Strategies” <i>The seminar has introduced the issue of implementation of energy strategies. A particular focus was addressed to renewable energy technologies, access to electricity in lower economies and the evaluation of impact of cooperation projects.</i> • Department of Design, Politecnico di Milano, 1st April 2014 Lecturers at the open Seminar on “Design of Renewable and Distributed Sustainable Energy Systems for All” <i>The seminar was part of the course System Design for Sustainability. The activity comes from an increasing collaboration between the Chair and the Design School, where joint cooperation projects with African universities have been in place.</i> <p><u>Training in collaboration with International Organizations</u></p> <ul style="list-style-type: none"> • Camera Tuniso-Italiana di Commercio e Industria (CTICI), October 2013 – January 2014 E-learning Course “Global energy scenarios and role of renewable energies in achieving Sustainable Development” <i>The course, providing an overview of the various aspects that characterize the global energetic issue, has focused on particular renewable sources of specific interest and on the concept of appropriate technology and distributed generation, to eventually examine the aspects related to the business models for the local energy development.</i> <p><u>Training in collaboration with Civil Society Organizations</u></p> <ul style="list-style-type: none"> • OIKOS, 8th April 2014 Lecture “Access to energy in low and middle income economies” <i>The lecture has dealt with the linkage between energy and development, access to energy in developing countries (current situation and future</i>

	<p><i>challenge), appropriate technologies for access to energy (home systems, distributed generation and mini-grid systems) and strategies for access to energy.</i></p>
<p>iii) Research</p>	<p>The activities of the Chair are in line with the vision of the Research Group Blaise Pascal Lab of the Department of Energy: the Group aims at contributing to the shift toward more sustainable and equitable energy systems, able to meet the needs of global development. The mission of the research is to identify, formulate, implement and validate innovative, rigorous but creative methodologies for improving energy access and for the impact evaluation of energy systems, in order to meet the demanding constraints of economic, environmental and social sustainability.</p> <p><u>Research activity is mainly divided in the following lines:</u></p> <ul style="list-style-type: none"> • Sustainable Strategies planning for improving access to energy: <ul style="list-style-type: none"> ○ Needs-Resource match: needs assessment and resources analysis; ○ Energy demand side planning in relation to the local contexts; ○ Analysis of the current rural households energy solutions in developing countries; ○ Optimization of energy conversion technologies in rural areas; ○ Development and implementation of energy planning methods for off-grid and on-grid distributed generation; ○ Design models for off-grid energy systems for rural electrification (such as photovoltaic stand-alone systems and solar pumping systems); ○ Multi-criteria, multi-objective and multi-stakeholders evaluation and decision-making for selection of strategies in DCs; ○ Appropriate technologies and their integration in small scale grid based on renewable sources; • Monitoring & Evaluation analysis and long-term impact assessment of energy project and systems: <ul style="list-style-type: none"> ○ DAC-OECD Result Chain assessment for the project: from inputs to outcomes; ○ Evaluation of the Impact over the target community capitals (environmental, physical, financial, human and social) through participative, multi-criteria and multi-stakeholder frameworks; ○ Definition and implementation of a Performance Measurement System (PMS) for Cooperation Project in the Energy field based on the DAC-OECD 5 Criteria (Relevance, Efficiency, Effectiveness, Sustainability and Impact); • Definition and validation of comprehensive sustainability evaluation models: <ul style="list-style-type: none"> ○ Analysis of existing methods and frameworks assessing sustainability; ○ Definition of new methodologies aiming at evaluating the sustainability based on the economic, environmental, social and institutional dimensions. <p><u>The following PhD researches are now active:</u></p> <ul style="list-style-type: none"> • Optimization of energy systems in rural areas: distributed generation for rural electrification (Italian PhD student supervised by the Chair Holder) • Energy technologies for efficient cooking in DCs: Improved Cook Stoves, domestic and community biogas systems (PhD student from Cameroon supervised by the Chair Holder) • Rural Electrification: smart mini grids development and optimization (PhD student from Tanzania supervised by Prof Berizzi)

b) Conferences/Meetings

(key conferences and meetings organized by the Chair or to which its Chairholder contributed)

i) Key conferences and workshops hosted by the Chair

International conference organized in cooperation with ENEL Foundation

“International Cooperation for Sustainable Energy Strategies, Energy Access and Nexus with Water, Food and Land” Milan, 4-6 December 2013

Politecnico di Milano, the Chair and Enel Foundation jointly organized this international conference to serve as high level platform for networking and scientific exchange in the field. The conference aimed at establishing an effective network of experts working worldwide in the field of international cooperation: international organizations as World Bank Group, International Energy Agency, International Institute for Applied Systems Analysis, Food and Agricultural Organization, International Atomic Energy Agency attended the event.

Indeed energy is nowadays considered an essential element for the promotion of global strategies that can meet the four main dimensions of sustainability: economic, environmental, social and institutional. In the perspective of an integrated approach to resource management, energy is closely linked to other resources, in particular water and food. Availability and security of water, energy and food can be achieved through an integrated approach. The conference represented a high level opportunity to discuss on these topics. During the conference a web based community implemented by Politecnico di Milano was created, giving the opportunity to start a knowledge-sharing platform within the community of experts who attended the conference; access is also available after registration at the following link: <http://beep.metid.polimi.it>, requiring registration for the “UNESCO Chair e4sd Platform”.

ii) Other conferences/organizational activities undertaken by the Chairholder

Fondazione Eni Enrico Mattei, Milan, 6th December 2013

“Feeding the plant – Energy for Africa”

The Chair participated to the event as part of the roundtable discussion, where J.D. Sachs, director of the Earth Institute at Columbia University, presented a lecture on sustainable development.

iii) A selection of conference presentations by the Chairholder and other colleagues

South East European (SEE) Regional Forum of UNESCO Chairs, Istanbul, 12th-13th June 2013

The forum, organized by the UNESCO Venice Office and the Turkish National Commission, had the objective to identify and outline a shared regional roadmap and common vision of the role of UNESCO Chairs in the SEE area. This regional forum shared best practices and served as a platform to exchange information on science, culture and on global priorities.

III Congress CUCS (Coordinamento Universitario per la Cooperazione allo Sviluppo, University Coordination for Development Cooperation), Torino, 20th September 2013

Panel “Partnership system between universities and NGOs” - Lecture “Beyond Traditional Education in Engineering: a Systemic Approach Open to Field Activity. The Case of Energy Engineering at Polimi”

Contents available on <http://www.cucstorino2013.it>

Global Dimension in Engineering Education (GDEE), Cambridge, 24th September 2013

“1st European award for best practice for the integration of SHD (Sustainable Human Development) into technology and engineering education”

Air Exchange Thermal Assembly (ARETHA), Auditorium Depuratore di Nosedo, 23th October 2013

“ARETHA – The project and first results”

The World Academy Of Sciences (TWAS), Trieste, 8th-13th December 2013

“Workshop on Innovative Energy Policies for Sustainable Development”

The workshop brought together young scientists from developing countries who are active in areas of energy research, science diplomacy ambassadors from developing countries with experience in framing policy discussions and energy experts. Through an interactive approach, the workshop led to develop ‘best practice’ policies of relevance in the energy sector for developing countries.

c) Interuniversity Exchanges/Partnerships

(principal exchanges/partnerships between the Chair and other institutions including UNESCO Chairs/UNITWIN Networks)

- Italian Ministry of Foreign Affairs – Direzione Generale Cooperazione allo Sviluppo (DGCS)
- World Bank Group (WB)
- International Energy Agency (IEA)
- The World Academy of Sciences (TWAS)
- Italian network of UNESCO Chairs
- UNESCO Chair in Hydrological Change and Water Resources Management, RWTH Aachen
- Chaire UNESCO en alimentations du monde, Centre international d'enseignement supérieur en sciences agronomiques, Montpellier SupAgro
- Tempus partners:
 - RWTH Aachen University
 - The American University in Cairo, Egypt
 - Alexandria University, Egypt
 - Ministry of Higher Education, Egypt
 - SEKEM Development Foundation
 - Aswan University, Egypt
 - Heliopolis University, Egypt
 - Zagazig University, Egypt
 - Cairo University, Egypt
 - Heliopolis University, Egypt
 - Bibliotheca Alexandria
 - Technical University of Graz
 - Montpellier SupAgro
 - Fondazione Politecnico di Milano
- Edulink partners:
 - Jimma University, Ethiopia
 - Dar Es Salaam Institute of Technology, Tanzania
 - Technical University of Kenya
 - Technical University of Mombasa, Kenya
- TELMS partners:
 - Dar es Salaam Institute of technology
 - Mbeya Institute of Science and Technology
 - Arusha Technical College
- Framework agreement:
 - Catholic University of Bamada, Cameroon
- Existing relationship for previous projects/activities:
 - Ramakumar Research Group, Canada
 - NTNU Trondheim, Norway
 - University of Cairo, Egypt
 - University of Sfax, Tunisia
 - University of Hassan II, Morocco
 - University of Saint Joseph, Lebanon
 - University of Aleppo, Syria
 - Technical University of Delft
- CUCS Network - Formal Protocol signed by 28 Rectors of Italian Universities on Cooperation and Development coordinated by Politecnico di Milano

d) Publications/Multimedia Materials

(major publications and teaching/learning materials)

<i>Please tick relevant fields of output and indicate volume of output:</i>		[tick]	[no.]
Books		<input type="checkbox"/>	
Books (edited)		<input checked="" type="checkbox"/>	1
Books (chapters)		<input checked="" type="checkbox"/>	7
Monographs		<input type="checkbox"/>	
Research Reports		<input type="checkbox"/>	
Journal Articles (refereed)		<input checked="" type="checkbox"/>	1
Conference Proceedings		<input type="checkbox"/>	
Occasional Papers		<input checked="" type="checkbox"/>	2
Teaching/Learning Materials		<input checked="" type="checkbox"/>	1
Multimedia Materials (CD-Rom)		<input type="checkbox"/>	
Multimedia Materials (Video)		<input type="checkbox"/>	
Multimedia Materials (Other)		<input type="checkbox"/>	

Give details of major publications and materials including full citations.

i) MSc Thesis

- Faldrini N., *Sizing of an hydroelectric plant in the Farahantasana locality*
The thesis work aimed at performing a preliminary sizing of a hydro power plant across the Ikopa river, in Madagascar. Main structures such as derivation and adduction channels have been studied and most suitable hydraulic turbine has been selected, on the basis of flow rate change along the year. An economic analysis has been performed, in order to estimate the final cost of electricity.
- Santachiara A., *Improved cooking stoves: state of the art, testing and case study of environmental impact for a development project in Malawi*
This thesis investigates the biomass utilization as energy source for cooking food using the improved stoves in order to increase access to energy in developing countries, since these appropriate technologies are considered intermediate technologies to achieve economic, social and environmental sustainability.
- Bonamini G., *Exergy and process analysis to assess primary energy resource consumption: a critical review*
Integrating thermodynamic and economic principles, thermoeconomic analysis has gained prominence for the analysis of primary natural resources consumption of goods and services. This thesis is a critical review of different state of the art of thermoeconomic analysis methodologies, showing advantages and drawbacks of each method, and applying all of these methods to a case study.
- Grisa F., *A comprehensive methodology for the alternative selection of energy technologies in rural areas*
This thesis focuses on the long-term impact evaluation of energy cooperation projects in rural areas by proposing a new comprehensive multi-criteria and multi-stakeholder methodology, which allows to evaluate projects by calculating changes of the different capitals of the target community.
- Brivio C., *Off-Main-Grid PV Systems: Appropriate Sizing Methodologies in Developing Countries*
This work investigates Off-Main-Grid photovoltaic systems for rural areas far from national grids, with particular attention to appropriate sizing methods for stand-alone PV systems and PV micro-grids.
- Di Turi E., *Evolution of carbon markets: CDM and VER as tools for supporting NGOs' energy projects in developing countries*
The main goals of the thesis are to provide an overview of the global carbon market in global efforts to address climate change, to describe and compare the most important currently available carbon offset standards (such as Clean Development Mechanisms, Gold Standard and

Voluntary Carbon Standard) and to show the role of NGOs in the carbon market.

- Pozzi F., *Micro-hydroelectric pumping plant as alternative storage system in rural areas: technical and economic feasibility analysis for the Yaho village (Burkina Faso)*
This work proposes the use of an alternative storage system to the traditional ones based on batteries, through the analysis of storage systems totally based on renewable energy sources (hydro and PV).
- Bernasconi D.M., Russotto M., *Sustainability Evaluation Model: a composite index to measure country sustainability*
The goal of the thesis is to provide a model for the evaluation of the sustainability of a country. The model consists of a composite index including 36 indicators and refers to the four main dimensions of sustainability: economic, social, environmental and institutional. The Mediterranean area, a context characterized by different socio-political scenarios, has been selected to calibrate the proposed index.

ii) Publications

- E. Colombo, S. Bologna, D. Masera (eds.), *Renewable Energy for Unleashing Sustainable Development*, DOI: 10.1007/978-3-319-00284-2_1, ISBN 978-3-319-00284-2
Springer International Publishing Switzerland 2014
The book is intended as a contribution towards a more inclusive sustainable future, by conceptualizing energy as key element of development. By describing technical, economic and policy conditions necessary for the successful deployment of renewable energy, it provides recommendations for unleashing, in developing countries, a sustainable development based on more equitable distribution of resources.
- G. Cassetti, E. Colombo, "Minimization Of Local Impact Of Energy Systems Through Exergy Analysis", *Energy Conversion and Management*. 2013;76(0):874-82, 2013
- E. Colombo, T. Scandroglio "Povertà Energetica In Europa: Dimensione E Scenari Di Un Diritto Negato", *Oxygen*, Nr 10/2013, pp. 110-121, 2013, Codice Edizioni
- E. Colombo, L. Mattarolo "Access To Energy And Food: From Competition To Cooperation", *Tempi – Extra Expo*, nr.9/2012 pp. 54-57, 2013

e) Cooperation with UNESCO Headquarters, Field Offices

For the last year the collaboration with the UNESCO Venice Office has been strengthened. The Chair was also invited to the 'South East European Regional Forum of UNESCO Chairs', held in Istanbul in June 2013 to share perspective, challenges and role that the Chair is experiencing with a focus on the European and Mediterranean regions.

f) Other

(any other activities to report)

1. PROJECT

The Chair aims at promoting international university partnership with developing and emerging countries, supporting the upgrading of higher education in the target countries, promoting joint research and staff exchange. Currently the most effective collaborations have been in place with the MENA Region and with some Sub-Saharan Countries. Indeed Politecnico di Milano, under the flag of UNESCO Chair, is coordinating the following projects.

Tempus IV TEMPUS-530611-2012-IT-JPCR

GIEP - Green Innovation and Entrepreneurship Programme

The project aims at making Sustainable Development and Green Economy the new entrepreneurial frontier and business in Egypt. The objective of the project consist in developing a joint/double MSc program on "Green Innovation and Entrepreneurship" with the cooperation of 3 European universities

and 5 Egyptian Universities.

The project started in October 2012 and is developed on a timeframe of 36 months. All the planned activities are, at this stage of the project, in line with the proposal and successfully carried out. The main commitment has been the main effort has been devoted to the development of the new MSc program on Green Innovation and Entrepreneurship within the Egyptian Universities. Based on the results obtained by the Market Needs Analysis, each university has presented the Curriculum and Syllabus, starting from the framework described in the proposal and developing one or more tracks (Green Technologies, Entrepreneurship, Sustainable Cities, Sustainable Communities), according to the own needs and in line with the strategy of the institution.

Tempus IV TEMPUS-544397-2013-IT-JPHES

TriNex – Knowledge Triangle Platform for the Water Energy Food Nexus

The general objective of the project is to make Water, Energy and Food Nexus (WEF Nexus) the next research, education and innovation frontier for sustainable resource management and development within the framework of green economy in Egypt. The project aims at improving the role of universities in the Egyptian society by developing a national strategy and a university platform to promote the WEF-Nexus and the related synergy between Research, Education and Innovation (Knowledge-Triangle).

ACP-EU Co-operation Programme in Higher Education EDULINK II – EuropeAid/132023/D/ACT/ACTPS ENERGISE - Enlarged Network in Education and Research for a Growing Impact of Sustainable Energy Engineering on Local Development

The project has the objective to develop high quality, market-driven curricula in Energy Engineering focused on sustainability, innovative technologies and modern renewable energies relevant to the energy asset within the countries of Ethiopia, Kenya and Tanzania. The project involves 4 local universities and counts on the cooperation of local enterprises, NGOs, ministerial department and rural agencies working at different level on access to energy. The first step of the project is to develop a comprehensive assessment report of the actual Curricula condition; in particular, the following aspects are analyzed: available energy-related Curricula, actual competences and skills of the teaching staff, specific requirements for laboratories upgrading, a list of topics that need to be locally improved through specific trainings, and a synthesis of opinions, suggestions and feedbacks from stakeholders.

Development Cooperation Program Technical Education and Labour Market Support (TELMS) - CONTRACT NO PA/015/2013/2014

Capacity Building and Training Service between Dar Es Salaam Institute of Technology and Politecnico di Milano

Starting from an official request from the Government of the United Republic of Tanzania asking for support to the Technical Education Sector, the Italian Government approved and supported the implementation of a programme focused on Higher Education. This International Tender on capacity building in Tanzania is founded by the Italian Cooperation – Italian Ministry of Foreign Affairs, Direzione Generale Cooperazione allo Sviluppo (DGCS).

The specific objectives of this Capacity Building project are: to improve the teaching abilities of faculty staff members and to strengthen the institutional capacity of the involved Tanzanian HEIs. In particular, the research areas involved are: Mechatronics, Electronics and ICT, Telecommunications, Civil engineering for Building, Chemical engineering for mining and the administrative area. Essential elements to the project are the training sessions, both planned in Italy and in Tanzania, and a virtual platform, for long term cooperation.

2. OTHER COLLABORATIONS

PMS4CP – Performance Measurement System for (Energy) Cooperation Projects

The general objective of this project, performed in collaboration with Enel Foundation, is to support policymakers (public and private stakeholders) by providing useful information on the impact of cooperation projects on sustainable development for better tailor future program in the energy field. The activities aim to identify, formulate and validate a Performance Measurement System (PMS) for cooperation projects in the energy field based on an assessment of the DAC-OECD five Criteria (relevance, effectiveness, efficiency, sustainability and impact) along the Results Chain (inputs, activities, outputs, outcomes and impact), and by adopting the Sustainable Livelihoods Framework for assessing the long-term impact of projects on the target community capitals through a multi-criteria and multi-stakeholders approach.

GDEE – Global Dimension in Engineering Education

Global Dimension in Engineering Education (GDEE) is a EuropeAid Project, entitled “Cross-cutting development education into technology studies” which aims to stimulate the introduction of education for development in European Universities. This project will impact positively on the attitudinal values and skills of students in relation to sustainable human development (SHD). This is being dealt with by integrating SHD as a cross-cutting issue in teaching activities through a two-fold strategy. Its first objective is to improve the competences of academics to enable them to introduce SHD into the curricula and facilitating the engagement of both staff and students in academic initiatives related to SHD.

The chair has contributed by writing a book chapter and producing a short online course on the topic “Professional and international perspectives of Engineering: the case of energy”.

3. ADVISORY

The activity of the Chair also includes advisory to NGOs and private companies. To improve the effectiveness and sustainability of cooperation projects, the Chair is convinced in the complementarity of all interested actors and in the need for partnership. The role of university focuses on research and is oriented towards innovative solution, by improving methodologies and assessing most appropriate technologies for specific contexts.

“Community empowerment for efficient production, use and access of renewable and sustainable energy in rural areas in Malawi” (COOPI).

The activities defined in the collaboration are the following

- Project evaluation: elaboration of the methodology, development of the M&E system and fields evaluations;
- Ecological study: environment cost benefit analysis, CO₂ reduction, RE promotion and trees planting;
- Financial study / viability: feasibility study for replication of the project at national level

Field experience with NGOs:

- LVIA (Kenya): design support tool development for solar pumping
- ACRA (Uganda): design support tool development for stand-alone PV

Joint Research and field experience with Academia:

- DIT (Tanzania): design support tool development for micro-hydro
- ATC (Tanzania): implementation of hydro-PV-wind micro-grid
- NTNU (Norway): voltage/frequency control for hybrid rural grids
- AUC (Egypt): desalination plant

4. WEBSITE

In line with the objective of the Chair to foster the activity of networking, a website has been created (www.unescochair-e4sd.polimi.it), to disseminate the results and have an interactive platform to support the joint activities of the community.

3. Future Plans and Development Prospects

Outline of action plan for the next biennium and short/medium and long-term development prospects.

Please do not hesitate to refer to difficulties that the Chair has experienced
(Not exceeding 300 words)

The Chair intends to continue and enforce the activity of knowledge sharing within the network that it has been created in the last years. The effort will be addressed to collaborations with academic institutions and international organizations, aiming at strengthen joint research projects.

The Mediterranean area and the MENA region represent a strategic area. The Chair will continue to address significant activities on these, as confirmed by the ongoing Tempus projects and on the new

initiative that has recently joined: MED Solution, Sustainable Development Solutions for the Mediterranean Region, part of the UN SDSN (Sustainable Development Solution Network).

Following the recent directive of Sustainable Development Goals and the inclusive paradigm of sustainability involving both North and South countries, the Chair also intends to address the issues of sustainable energy for all and access to energy, not only focusing on developing countries, but also on the emerging challenge of energy poverty in developed countries.

In long-term the idea the Chair will intent to work on the creation of a remote access system to the Library Network Platform of Politecnico di Milano and on an open knowledge system for free on line training to increase access to global scientific knowledge.