

## **Breaking barriers and building bridges through networks: An innovative educational approach for sustainability**

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Worldwide, innovation in education is highly perceived as an effectual approach to promote awareness for sustainability. International organizations interested in education, research and training support projects seeking modernization of Higher Education (HE) and put much emphasis on developing new curricula, teaching methods or materials to respond to current needs. Building ties and promoting cooperation between institutions around the world through Universities and academic arenas are central in innovative educational approaches. This paper reflects on one of such projects; the Center for Natural Resources and Development (CNRD) which aims at supporting achieving the Millennium Development Goal (MDG) 7. Eleven University faculties in Brazil, Chile, Egypt, Germany, Indonesia, Jordan, Mexico, Mozambique, Nepal, and Vietnam form part of the CNRD, covering natural, engineering, and social sciences disciplines. To develop solutions for one of the most pressing problems of today; creating sustainable cities, students, teachers and researchers work together in a trans-disciplinary approach. The paper principally deals with the question of how international research and education networks can narrow the distance between countries and promote awareness of sustainability. It discusses approaches in joint education, using modern media and e-learning activities and their contribution to raise awareness of sustainability among young researchers.

Keywords: innovative educational approaches, center for natural resources and development, mdg7, sustainability

### **Introduction**

It is widely agreed that education in general and HE in particular is a vital vehicle for promoting awareness for sustainability. In accordance with the ambitions of the UN Decade of Education for Sustainable Development (2005-2014), academic institutions and University faculties are thereby anticipated to contribute to the empowerment of people of all ages to assume responsibility for creating a sustainable future (Axelsson, Sonesson & Wickenberg, 2008). And today, more than ever before, the responsibility of aligning HE towards meeting the challenge of global sustainability becomes the core of the Agendas of numerous academic institutions (Sibbel, 2009).

Steiner and Posch (2006) argued that teaching sustainability requires crossing borders not only between different disciplines but also between science and practice and advocated notions of inter-disciplinarity, trans-disciplinarity and self-regulated learning. We here further argue that breaking barriers amongst countries around the world and building ties between the North and South of the globe through cooperation of Universities and academic arenas in joint education and research and developing curricula with an intercultural orientation that respond to pressing needs can be an effectual approach to promote awareness of sustainability.

In this paper we reflect on one of the projects, which adopted such an approach: The CNRD. It addresses challenges for achieving MDG7 and focuses its activities on related issues to promote environmental sustainability. We examine here the approaches adopted by the CNRD through its network of 11 partner Universities from the North and South of the globe to support the role of HE in promoting awareness of sustainability.

The structure of this paper is divided into two main sections. Section (i) reviews literature on the important role of education and particularly HE in addressing the challenge of Sustainable Development (SD). It provides a historical review on the evolution of the concept of education to support SD since 1987 to date. It then provides an overview on significant Declarations related to sustainability within the HE area and their main objectives. Following this, it addresses the importance of adopting innovative educational approaches and innovation pedagogy to cope with the complexity and challenge of SD and highlights some of the significant principles underpinning the HE for Sustainability such as Curriculum Greening, Interdisciplinarity, Transdisciplinarity, Self-regulated Learning and University Networking. Section (ii) of this paper focuses on the CNRD project and illustrates the approach to create a University Network in research and teaching for sustainability using innovative character and practices.

### **Education for sustainability: A historical review**

Sustainability or SD is a dynamic and evolving concept with many dimensions and interpretations. Many authors consider SD to be a complex, contested and problematic term (McKeown, 2002; Summers & Childs, 2007). Despite the conflicting operational interpretations of the concept of sustainability or SD, the broadly agreed meaning of SD is set out in two widely used definitions. The first and well known one is the Brundtland definition: "*development which meets the needs of the present without compromising the ability of future generations to meet their own needs.*" (WCED, 1987) and the second is the World Conservation Union definition: "*improving the quality of life while living within the carrying capacity of supporting ecosystems*" (WCU, UNEP, & WWF, 1991). The concept at its heart can be considered as a redefinition of the goals of human activity away from purely economic and material 'progress' towards a recognition of the importance of wider human and environmental needs and constraints (Connelly, 2002). The former definitions embody a number of interrelated notions such as environmental protection, equity including both intra-generational equity and inter-generational equity, improving quality of life, participation by all groups in society and economic growth, which is not only a core component of the Brundtland Report but also subsequent International Declarations (Jacobs, 1995). The results of a recent study by Kilinc and Aydin (2011) on how stakeholders in the education sector view SD, apart from the three well known trio of environmental, economic and social aspects, showed a variety of ideas about SD that could be collected under headings such as environment, technology, society, economy, politics, energy, and education. The current paradigm of SD establishes linkages between poverty alleviation, human rights, peace and security, cultural diversity, biodiversity, food security, clean water, and sanitation, renewable energy, the preservation of the environment, and the sustainable use of natural resources (Kilinc & Aydin, 2011). Education can play an essential role in addressing this challenge and contributing to the exerted

efforts to achieve progress on the trajectory of sustainability. People around the world recognize that current economic development trends are not sustainable and that public awareness, education, and training are key to moving society toward sustainability (UNESCO, 2006). It is important at the outset to distinguish between two terms; Education about Sustainable Development and Education for Sustainable Development. The first is an awareness lesson or theoretical discussion, while the second is the use of education as a tool to achieve sustainability (UNESCO, 2006). The latter is our focus in this paper.

During the period from 1987, the first endorsement of SD, to 1992 the UN Conference on Environment and Development, also known as the Earth Summit held in Rio de Janeiro, there was some interest in addressing the role of education to support SD. The Rio Earth Summit has been culminated by introducing Agenda 21 and reaching an agreement from all the delegates on it. Agenda 21 is an action plan for developing the planet sustainably through the twenty-first century. Within Agenda 21, initial thoughts concerning Education for Sustainable Development were captured, particularly in Chapter 36 "Promoting Education, Public Awareness, and Training" (UNCED, 1992). Traditionally, in formal education, studies of society, the economy and the environment are usually within separate disciplines with little regard for developing practical skills for practicing sustainability. For this reason, Agenda 21 called for a reorientation of education and new vision in order to respond to the complex challenge of SD (UNESCO, 2002). The Commission on Sustainable Development (CSD) was then created in December 1992 to ensure effective follow-up of UNCED and to monitor and report on implementation of the agreements at international, regional, national and local levels.

Following the Rio Earth Summit, the CSD appointed UNESCO to be its Task Manager for Chapter 36. UNESCO was to accelerate reforms of education and coordinate the activities of all stakeholders in education through a wide-ranging Work Program. Seven objectives of its Work Program can be identified as follows (UNESCO, 2002):

- *Clarify and communicate the concept and key messages of Education for Sustainable Development*
- *Review national education policies and reorient formal educational systems*
- *Incorporate education into national strategic and action plans for SD*
- *Educate to promote sustainable consumption and production patterns in all countries*
- *Promote investments in education*
- *Identify and share innovative practices*
- *Raise public awareness*

Over the decade between the UN Conference on Environment and Development in 1992 and the World Summit on Sustainable Development in 2002, several major groups have been contributed in implementing Chapter 36. Most noticeably are the UNESCO NGO Liaison Committee which represents about 350 professional NGOs in the field of education and the International Association of Universities, which have joined with UNESCO to form a Global Higher Education for Sustainability Partnership (UNESCO, 2002). In 2005, the international launching of the UN Decade of Education for Sustainable Development (DESD, 2005-2014) took place in New York, which offered an opportunity to rethink the manner in which the world approach global challenges. The basic vision of the Decade is of a world in which everyone has the opportunity to benefit from education and learn the values, behaviors and lifestyles required for a sustainable future and for positive societal transformation. DESD seeks to promote the meaningful development and implementation of ESD on all geographical scales (locally, nationally, regionally and internationally) with the involvement of a wide range of stakeholders (UNESCO, 2009).

**Higher Education as a catalyst to promote awareness for sustainability**

Several International Conferences and Declarations have emphasized the importance of Education for Sustainability in the area of HE and University studies. Many institutions of HE attempt to become more sustainable by signing these Declarations. A good review on some of the significant Declarations related to sustainability in HE can be found in Wright (2002) and, Ciurana and Filho (2006). A chronological summary of them is shown in Table 1.

Table 1. Chronology of Some of the Significant Declarations and Actions Related to Sustainability in Higher Education. Source: authors based on (Ciurana & Filho, 2006; Wright, 2002)

Year	Declaration
1972	The Stockholm Declaration on the Human Environment
1977	The Tbilisi Declaration
1990	The Talloires Declaration
1991	The Halifax Declaration
1992	Agenda 21, Chapter 36: Promoting Education, Public Awareness and Training - UNCED
1993	<ul style="list-style-type: none"> <li>• Ninth International Association of Universities Round Table: The Kyoto Declaration</li> <li>• Association of Commonwealth Universities' 15<sup>th</sup> Quinquennial Conference: Swansea Declaration</li> </ul>
1994	CRE Copernicus Charter
1997	International Conference on Environment and Society – Education and Public Awareness for Sustainability: Declaration of Thessaloniki
1999	The Bologna agreements
2002	World Summit on Sustainable Development (Rio + 10) of Johannesburg
2004	The organization University Leaders for a Sustainable Future (ULSF)
2005	The UN Decade of Education for Sustainable Development (DESD, 2005-2014), New York

Some of these Declarations made reference to sustainability in an indirect way such as Stockholm Declaration of 1972, while others suggested a radical change in the performance and the way of thinking of Universities and academic institutions to prove their commitments to sustainability. The first Declaration of the latter category is *the Tbilisi Declaration*, which was the result of the world's first intergovernmental Conference on Environmental Education and was organized by UNESCO and UNEP in Tbilisi, Georgia. It implored HE to consider environmental

and sustainability concerns within the framework of general University business and recognized requirements amongst faculty, students and support staff for the development of sustainability initiatives (UNESCO, 1978). On a different scale, *the Talloires Declaration* was the first statement made by University administrators of a commitment to sustainability in HE. The signatories of this Declaration have increased from 20 in 1990 to 429 according to the recent updated list of signatory institutions in October 2010 (ULSF, 2010). University leaders agreed that they must initiate and support mobilization of internal and external resources so that their institutions respond to the sustainability challenge and adopted a 10 Point Action Plan to achieve the Declaration's goals (Shriberg & Tallent, 2003). Following the Tbilisi and Tallories Declarations, various Conferences are held and resulted in a number of Declarations, which emphasize the significant role Universities can play in promoting awareness for sustainability, as shown above in Table (1). Generally, they affirmed the crucial need to reorient university curricula towards a holistic and interdisciplinary approach in education and involve all stakeholders in moving towards a more environmentally sustainable future. However, it is worth mentioning that signing Declarations by some academic institutions does not necessarily mean that they work towards sustainability on the ground, and as Walton (2000) argued, endorsing a Declaration is no longer adequate evidence of a commitment towards becoming more sustainable. Teaching towards sustainability in Universities is not only a Declaration of good purposes and a budget item, but the beginning of a long process that involves a change in the epistemological, political and social conceptions of all university members (Ciurana & Filho, 2006).

#### **Innovation in Education: A paradigm shift**

As mentioned earlier in this paper, conventional educational processes are perceived to be of very limited use when addressing the complex challenge of sustainability. Traditional education has not provided the training for graduates to work towards radical solutions to the new and complex world problems emerging. These problems are multi-dimensional and cannot be addressed by a specific application of conventional scientific, economic or social theory (Sibbel, 2009). Therefore, adopting innovative educational approaches and innovation pedagogy is indispensable to cope with the complexity of the concept. Innovation pedagogy aims to contribute to the development of student's innovation competencies<sup>1</sup>. Innovation pedagogy is a learning approach that defines in a new way how knowledge is assimilated, produced and used in a manner that can create innovations. Innovations are seen as an integral part of the process of constantly improving know-how as well as generating new ideas and practices applicable in working life (Lehto, Kairisto-Mertanen & Penttila, 2011). The cornerstones of innovation pedagogy are interdisciplinary operations, research and development, curricula and internationalization in addition to entrepreneurship and service activities (Kettunen, 2009) cited in (Lehto, Kairisto-Mertanen & Penttila, 2011). Innovation pedagogy moves further from traditional theoretical learning to application of learned skills to practical development challenges, which requires innovative teaching and learning methods.

A paradigm shift in the future of Sustainability Education requires change in values and perceptions from theory to practice, from disciplinary to interdisciplinary, from reform to revolution and from adaptation to transformation (Moore, 2005). A review of literature on innovative educational approaches and best practices in promoting Education for SD in HE institutions indicates several initiatives of transformation towards more sustainable practices in Universities. In this broader sense, HE encompasses several areas; undergraduate education, postgraduate education, research, University life and awareness raising for the public (Ferrer-Balas, 2004). A good assembly of this literature can be found in the special issue of the *Journal of Cleaner Production*<sup>1</sup> {Vol. 14 (9-11)} along with the special issue of the *International Journal of Sustainability* in

Higher Education {Vol. 5 (1)}. For example Jua´rez-Na´jera, Dieleman and Turpin-Marion, (2006) highlighted the importance of training educators to educate in a more holistic, integrative fashion to engage their students in new ways of learning that rely upon system thinking, participatory planning and SD within interactive, real world learning contexts. Furthermore, Steiner and Posch (2006) have described in their paper an innovative educational approach, which offers real world case studies that provide interdisciplinary points of view, trans-disciplinary problem solving processes and self regulated learning. They argued that “*With the traditional single disciplinary approach to teaching knowledge in isolated university courses it is not possible to capture the complex nature of the concept of sustainability and its implications. Hence, a paradigm shift towards a holistic view involving systems thinking is needed.....This approach facilitates real, cross-disciplinary thinking, translating, reconciling, and integrating disparate discourses, traditions, and methodologies.*”(2006, p.759)

In this part we highlight some of the new approaches for the University systems to incorporate SD into all facets of its activities, such as *Curriculum Greening, Interdisciplinarity, Transdisciplinarity, Self-regulated Learning and University Networking*, with focus on the outcomes of Steiner and Posch (2006) and Lozano (2006), as follows:*Curriculum Greening* “Greening the Curriculum” is a growing trend in HE today which aims at the preparation of professionals and citizens capable of meeting the challenge of converging global environmental problems through increasing levels of “ecological literacy” or “environmental literacy”. Several Universities who show commitments towards sustainability support promote the practice of integrating ecological literacy, or sustainability issues into existing courses across the curriculum (Katherine, 2008).

### ***Inter-disciplinarity***

The traditional single disciplinary approach is no longer appropriate to address the complexity imbedded in the concept of SD. Therefore, a paradigm shift towards a holistic view involving cooperation between various disciplines is needed, where a common methodological approach and theoretical fundament is looked for, as a synthesis of the participating disciplines (Lozano, 2006). The borders between the humanities, natural sciences and social sciences are crossed in order to solve a common research goal. Interdisciplinary teaching does not focus primarily on detailed factual knowledge rather it focuses upon the development of core competences for solving different kinds of problems (Steiner & Posch, 2006; Warburton, 2003).

### ***Trans-disciplinarity***

Trans-disciplinarity literally means beyond the disciplines. While the principle of inter-disciplinarity calls for cooperation across different subjects and disciplines, trans-disciplinarity involves intense interaction between academics and practitioners in order to promote a mutual learning process between them (Steiner & Posch, 2006). It is not possible to effectively research or teach sustainable development of society without interacting with society. Therefore, Trans-disciplinary education encourages the involvement of different stakeholders including users, problem owners and clients in the learning process (Lozano, 2006).

### ***Self-regulated Learning***

The term self-regulated learning became popular in the 1980s because it emphasized the emerging autonomy and responsibility of students to take charge of their own learning. As a general

term, it considered research on cognitive strategies, meta-cognition, and motivation in one coherent construct that emphasized the interplay among these forces (Paris & Winograd, 2001; Zimmerman, 1990). Within this approach, the students and not the professors have the most active role. They are required to find the relevant information for themselves. The role of professors is mainly confined to being facilitators. It focuses on thinking that involves the whole spectrum of activity, from analysis and synthesis to arriving at conclusions, encourages the use of a broad range of knowledge, skills and abilities as well as the development of critical thinking (Steiner & Posch, 2006).

### ***University networking***

“Networks” becomes a key term in literature addressing HE efforts for Sustainability. The growth of International University alliances/associations/consortia has been increased on a rapid pace. Zha (2010) argued *"under globalization, as the world becomes increasingly interconnected, Universities in different parts of the world need to be closely linked, as the rhetoric suggests, in order to benefit both education and research"*. A good example of networks can be found in Hansen and Lehmann (2006), where the authors reflected on two programs within Aalborg University - Denmark through international networking to build capacity in education and research regarding environment and development and financed by the Danish International Development Assistance (DANIDA). The authors of this paper are describing the CNRD project as an example of the success of networks in narrowing the distance between the North and the South of the globe.

### **The CNRD: concept, network and objectives**

The Center for Natural Resources and Development – CNRD – comprises of overall 11 Universities in 10 countries, in Chile, Brazil, Mexico, Egypt, Jordan, Germany, Indonesia, Nepal, Mozambique and Vietnam<sup>2</sup>, as shown in Figure (1). It is one of five competence centers within the program “Higher Education Excellence in Development Cooperation – exceed”<sup>3</sup> financed by the Federal Ministry for Economic Cooperation and Development (BMZ) of the German government. The program was launched to support German Higher Education Institutions together with their partners in developing countries to contribute to the realization of the Millennium Development Goals (MDGs).

The MDGs of the United Nations address key topics of development such as poverty reduction and safe food supplies, social and cultural development, access to basic resources and shelter. In order to achieve the MDGs by 2015, it is required to coordinate action between a multitude of stakeholders at local, national, and international level from different sectors and from different types of institutions (governmental, private, civil society) (UNDP, 2006). Universities play an important role in reaching the MDGs since they educate young professionals in various disciplines and elaborate solutions and innovations related to technological, economic, social, political, and environmental aspects of development. In order to reach the MDGs Universities of the North and the South need to join forces and act together as experience and knowledge are scattered and the potential synergies of cooperation are obvious. An interdisciplinary approach is most promising to tackle concrete problems related to the MDGs by developing adequate and locally appropriate solutions (DAAD, 2010).

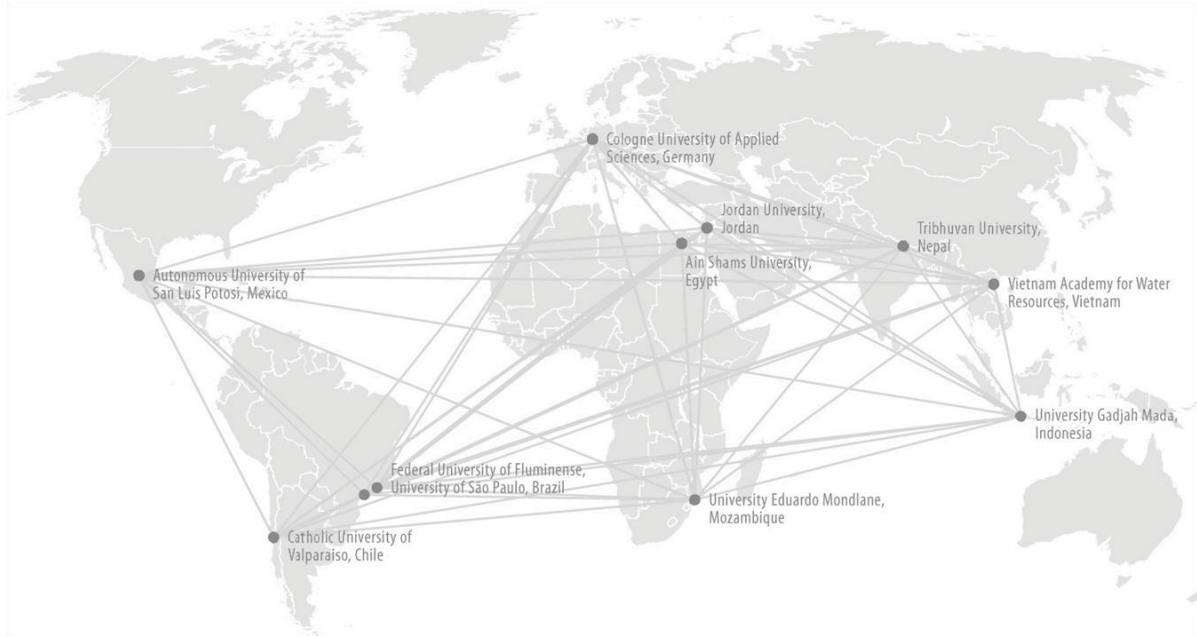


Figure 1. CNRD network, showing the universities involved. Source: (CNRD 2010)

The CNRD is focusing its work on MDG 7, “environmental sustainability”, addressing issues of access to safe water, sanitation, renewable resources, energy efficiency, and livelihoods of the poor. While all partners offer various activities on education and research related to MDG 7 issues, each partner has a different focus, providing for an excellent base to profit from networking and cooperation for students, researchers, and lecturers. The partner institutions of CNRD cover Engineering as well as Natural and Social Sciences (see Table 2). The individual partner institution benefits from the knowledge and research of the others by involving colleagues from different scientific background but dealing with the same subject in their students’ education. Among the main objectives are education and research, interdisciplinary and international education and research on the MDGs as well as issues of relevance to development cooperation policy. This is done jointly by Universities of the North (Germany) and the South (in this program exclusively developing countries) to strengthen North-South – as well as South-South – cooperation in HE and research. The expected outcome is a worldwide network of postgraduate courses related to MDG7, the management of natural resources and development with an interdisciplinary and intercultural orientation.



Table 2. List of the CNRD University Partners and MSc Programs (CNRD 2011)

Country	University	Faculty	MSc Program
Brazil	University of São Paulo	School of Engineering	Graduate Program in Hydraulics and Sanitary Engineering
Brazil	Universidade Federal of Fluminense	Institute of Geoscience	Masters Program in Geography
Chile	Pontifical Catholic University of Valparaíso	Faculty of Agronomy	Master in Agroproduction
Egypt	Ain Shams University	Faculty of Engineering	Urban Planning and Environmental Science and Building Technology - MSc
Germany	Cologne University of Applied Sciences	Institute for Technology and Resources Management in the Tropics and Subtropics	Technology and Resources Management in the Tropics and Subtropics
Jordan	University of Jordan	Water and Environmental Research and Studies Centre	Integrated Water Resources Management
Indonesia	Gadjah Mada University	Faculty of Geography	Planning and Management of Coastal Area and Watershed - MSc
Mexico	Autonomous University of San Luis Potosí	Agenda Ambiental	Multidisciplinary Postgraduate Program in Environmental Sciences - MSc
Mozambique	Eduardo Mondlane University	Faculty of Engineering/Faculty of Geography	Physical Geography, Environment and Spatial Planning (planned to start in 2012)
Nepal	Tribhuvan University	Institute of Engineering	Masters Program in Risk Management and Development Studies
Vietnam	Vietnam Academy for Water Resources	Centre for Training and International Cooperation	Technology and Resources Management in the Tropics and Subtropics

***CNRD approach in teaching***

In teaching and research CNRD pursues a trans-disciplinary approach which is necessary for understanding and solving problems occurring in complex systems defined through the interactions of the natural resources base with human activities. One major objective of CNRD is to develop joint teaching materials related to MDG7 on bi- or multilateral base. Cooperation is narrowed down to MSC and PhD level, as these allow for more flexibility in syllabus compared to BSc level. Within the MS. programs involved the material jointly elaborated provides the stu-

dents a deeper insight in case studies worldwide. Working in multi-national groups - in the field or virtually - on practical case studies, real-world problems broadens the horizon of the students and equips them for working in multidisciplinary and international surrounding. It is intended that the final result of such group work is one single report elaborated jointly. Supervision is done by lecturers from all participating universities, preferably from different faculties to foster interdisciplinary education. This way capacity building of not only students but also of the teachers is promoted. At the same time the students get sensitized for different ways of teaching, e.g. because problem-based learning might be popular in some countries while in others frontal teaching still is prominent. CNRD enables lecturer exchange between the different partner Universities, with several benefits. Next to the positive impact on the personal qualification of the lecturer, it promotes the intercultural and interdisciplinary dialogue and supports partners in offering more comprehensive Masters Courses, thus adding specific competencies that are missing. With this activity, South-North and South-South exchange and cooperation are supported.

The first step for successful master programs is to prepare convincing curricula and attract high quality students. To do so, sufficiently staffed and experienced management as well as excellent lecturers' capacities are needed to teach and guide students adequately. This capacity building of teaching staff has a high priority and is done e.g. through workshops about e-learning or meetings to revise the curricula involved in CNRD.

The MSc programs running under CNRD already have a clear orientation towards the themes of MDG 7. However, curriculum development, course revision and to some extent also adaptation during the course of the project will be done in order to incorporate specific aspects of relevance to environmental sustainability and MDG7, to incorporate the experience of other master programs of the network and to further internationalize the respective master courses.

A main focus lies on the development of joint teaching projects, involving lecturers and student groups from around 3-4 partner Universities. Those projects are based on a case study in one of the partner countries, on which the students will work together, supported by modern media such as videoconferences, chats, and virtual meetings. This blended learning concept requires a strong commitment from the lecturers involved; not only for the elaboration of the case study materials and data but also for scheduling, definition of learning outcomes and assessments.

To provide the basis for those activities an agreement on different basics is needed, such as:

- Elaborate teaching materials in language everybody speaks (usually English), what not the mother language for the majority of students;
- In bi –or multilateral teaching groups the lecturers need to agree on the grading, what comprises an understanding of the system itself and the content of the work;
- There's a need to find a joint "language", to be aware of the different scientific and cultural backgrounds which often include different terminologies.

This list is by incomplete but already gives a short overview about the difficulties everyone who is trying to work in international academic cooperation has to face, due to the high diversity in teaching forms, didactics, or expectations towards student and lecturer, etc.

### **The CNRD: Networking and sustainability**

Throughout the past decade (German) University research trends went towards specialization processes (DAAD, 2010) instead of tackling complex issues in interdisciplinary teams. This is difficult to comprehend since those seeking work on sustainability in a large scale must understand the world at large – and this includes those two thirds of the world's countries and their

populations, which do not count among the rich OECD nations. As Dirk Messner, director of the German Development Institute (DIE-GDI) states, it is “*easier to understand development regions if one cooperates “with” researchers from these countries instead of only researching “about” them* (DAAD, 2010).” Hauser-Schäublin (2010) even partly names neocolonialist contexts for the partly difficult interaction between Universities of the North and the South., for example in terms of the ambitions towards autonomous decision-taking. According to her the profit gained out of any cooperation is higher for the Euro-American researcher as for the “indigenous” one as his/her frame of action is more limited – what might be valued as reproduction of neocolonial conditions. On the one hand it is dangerous to blame all differences only on history; on the other hand one cannot neglect this as the consequence would be to accept the inequality in participation in international (natural) scientific community.

The CNRD relies upon already well established partnerships between the participating Universities; furthermore the relations will be strengthened through joint activities carried out during the project runtime. To achieve this, a multi-level approach is essential, comprising research and teaching. To create a network that is sustainable on the long run, beyond the funding phase of now five years, administrative aspects need to be taken into consideration as well. “*Establishing cooperation between Universities of the North and of the South seems to be complicated and tedious, if e.g. the whole administrative procedures are fulfilled*” (Hauser-Schäublin, 2010). As soon as this nucleus for academic cooperation is lifted to faculty or university levels often time consuming legal processes for mutual understandings have to be considered. This implies a comparison between the University systems, its teaching or grading, to create the technical base for academic cooperation and exchange. Offering international learning options for students can increase the attractiveness of any postgraduate course. Thus the question arises how far importing foreign educational models can be adapted to local academic culture, as Schreer (2007) poses for the Indonesian context. Unilateral activities without an equivalent does not make sense, for example only north-south student exchange (Hauser-Schäublin, 2010), however, often economic limitations might enforce unequal numbers of student or lecturer exchanges. During stays abroad lecturers (in this case Indonesia lecturers going to Germany and vice versa) also perceived differences in lecture methodology and infrastructure, such as in libraries (Schreer, 2007). This sounds obvious, however it needs to be recognized and included in any transdisciplinary and international university cooperation.

Having this in mind, the CNRD capacities regarding Masters and PhD programs, research and training will be systematically developed by all partners. It is of particular importance to foster the South-South cooperation, thus creating new synergies to gradually develop the network from a centre based constellation to a true network, opening up new opportunities to link them and to create true partnerships and a network that itself is sustainable.

### **CNRD’s innovative character and practices**

Various articles, mainly from anthropological sciences, describe the differences and even difficulties that can occur during North-South University cooperation in research and teaching. First, research in the sense of systematic procedures for producing previously unknown knowledge, “*implied a radical shift from the ideals of scholarship found in other literate traditions, which valorize the encyclopedic command of existing bodies of knowledge. The ideological and organizational features of this vision of knowledge were perhaps epitomized most clearly in the Humboldtian University concept* (Barth, 2002).” Thus, classical research was and still is characterized by Western or European attitudes. The globalized environment however requires a holistic perspective: international research teams capable of tackling these challenges from a number of angles.

Gehrke (2007) defines two basic elements governing the capacity to benefit from knowledge: the ability to acquire and to apply knowledge that already exists, and the ability to produce new knowledge. It is not enough to transfer knowledge from one country to another. As conclusion knowledge has to be imported and adapted to local requirements, global knowledge has to be “localized”. This is crucial for any further development, especially in the context of sustainability that implies the applied research towards the development of locally feasible and suitable solutions.

Nowadays, in a world of growing interdependencies, internationalization also influences the HE system of a country. The nature of study and work rapidly takes on a global dimension. In the light of this development, people are needed who have the skills to operate successfully across cultural, political and linguistic boundaries (Widmer, 2007). International projects and joint teaching are possibilities to meet this demand and incorporate it into the academic field.

The 2008 “Inventory of innovative practices in Education for Sustainable Development” (GHK in association with Danish Technology Institute) on a European level defined five different types of innovation in Education for Sustainable Development: Innovation in the content, in the delivery method, in forging new partnerships and networks, at the institutional level and in addressing SD (Evers & Gerke, 2001). The CNRD first of all is innovative because of its partnership and network itself. These approaches to incorporate SD into different facets of University activities, comprise inter- as well as trans-disciplinarity. Sharing and creating new knowledge within a university network combining different scientific and cultural backgrounds is challenging but promising (Schlehe, 2008). This applies as well for the second innovative aspect, the delivery methods: the CNRD approach of participatory and interactive learning follows the aforementioned approach of Self-regulated Learning. This is done among others by multilateral student team projects and the use of, internet-based technology. Electronic communication platforms or blogs support the students in their group work. None of the instruments used is new itself, what makes it innovative is the use of a set of tools for the purpose of higher education in the context of environmental sustainability. According to Schlehe (2008) it is important to take into consideration “cultural and intercultural constellations”, more precisely the relations between the ones who produce the knowledge and the ones who impart it when having different backgrounds. As an ethnologist she suggests trans-cultural research relations by which a broader perspective can be gained. Schreer (2007) even puts into question if intercultural ability might be a key for more knowledge. This coincides with one main assumption of the CNRD that by bringing together scientists from different disciplines and with different cultural backgrounds research education in sustainability can be upgraded significantly. Within the CNRD so far scientists with background in natural, economic social and engineering sciences are collaborating. Practitioners from international agencies give consultancy to the CNRD as a whole but also to the different student projects to provide practical experience at the grass-roots level.

### **Lessons Learned**

Initially the CNRD started with a focus on aspects of environmental sustainability exclusively. After an initial phase of few months it became obvious that to successfully work on environmental sustainability in teaching the approach had to be broadened. To teach students of different cultural and scientific backgrounds successfully intercultural abilities are needed – both, for lecturers and students. Didactic concepts had to be re-defined in the CNRD context as the approaches differed as much as the cultural contexts of the universities. In curriculum development workshops on regional base the universities demands in teaching content but also concepts were discussed.

Table 3. CNRD activities in teaching and related challenges (CNRD 2011)

Tool	Initial expectations	Challenges	Support needed
Lecturer exchange	<ul style="list-style-type: none"> <li>Students get lectures from expert of certain topic, case studies from other country or continent</li> </ul>	<ul style="list-style-type: none"> <li>study habits and teaching methods might differ from the lecturer's own country</li> </ul>	<ul style="list-style-type: none"> <li>Lecturers need to be equipped with information and tools necessary to teach in different country</li> </ul>
Student exchange	<ul style="list-style-type: none"> <li>Student goes abroad to take classes or to carry out field research</li> <li>This way the student gains new knowledge and international experience</li> </ul>	<ul style="list-style-type: none"> <li>Students need to be equipped for living and studying abroad, challenge of living in different surrounding might be underestimated</li> </ul>	<ul style="list-style-type: none"> <li>Universities have to introduce credit transfer system</li> <li>Intercultural training for students before going abroad is recommendable</li> </ul>
joint development of teaching materials	<ul style="list-style-type: none"> <li>Different CNRD partner universities elaborate teaching material that is implemented in the partner's MSc courses</li> </ul>	<ul style="list-style-type: none"> <li>Universities need to agree on didactic approach (self-learning, blended learning, or other methods) and module size</li> <li>Involved lecturers need to waive copyright of own data included</li> <li>Need to provide full access to up-to-date literature to all partners</li> </ul>	<ul style="list-style-type: none"> <li>Need for expert support or training to elaborate didactically adequate materials</li> <li>Definition of binding framework for elaboration and application of course materials</li> </ul>
Joint student projects	<ul style="list-style-type: none"> <li>Groups of students of 2 or more partner universities work together on a case study, including field work</li> <li>One final report is developed jointly</li> </ul>	<ul style="list-style-type: none"> <li>Preparation phase and field trip has to match all academic calendars</li> <li>Student project has to be acknowledged as part of study program in all universities</li> <li>Students need to adapt their working and social habits to multicultural surrounding</li> </ul>	<ul style="list-style-type: none"> <li>Student groups should be equipped with tools for working in international context</li> <li>Universities need certain flexibility to include such activities in academic calendar</li> <li>(Web-based) tools to communicate between groups before and after field work should be provided</li> </ul>

The first workshop formed the base for the joint student projects in the CNRD, as one major outcome was the need to equip students not only with theoretical knowledge but rather with the abilities to solve environmental problems in teams. In September 2011 a project with students of architecture, urban planning, engineering, geography and social sciences from Indonesia, Nepal and Germany was carried out on the topic of “Climate Change Impacts on Urban Kathmandu”. During a group feedback process after the field work students named the group interaction as most valuable experience beside the newly gained scientific knowledge.

Table 3 contrasts the initial expectations towards the major activities in teaching with the actual challenges the CNRD is facing during implementation. A close look at the different teaching activities reveals three major challenges and related fields of action: (1) intercultural abilities any lecturer or student active in such international context should hold; (2) university administration constraints that don’t allow flexibility needed in international cooperation; and (3) need for training of the trainers (lecturers) in adequate didactic tools.

### **Concluding Remarks**

Knowledge in terms of publications, reports and patents is growing constantly. Nevertheless, worldwide knowledge production still is unevenly distributed (Hans-Dieter Evers & Gehrke, 2007) as many scientists in countries of the South do not have adequate access to international scientific community. According to the World Bank (1999) this knowledge gap even explains the income differences between developed and underdeveloped economies. It is therefore crucial to create conditions that diminish this gap. University networks where each partner is on par with the others can play a significant role in the production and equal distribution of knowledge.

Implementing international cooperation in the academic field may be a challenging task. But nevertheless, internationalization can be seen as an opportunity to strengthen a University’s position within the academic community and a means to achieve further academic capital (Widmer, 2007). To develop a network like the CNRD to such a state that the generated output in terms of education and research contributes to achieving environmental sustainability the network itself requires certain sustainability. Among others the CNRD also brings together architects, engineers and geographers working on the topic of urban management and sustainable livelihood of the poor, related to target “d” of the MDG7, “Achieve significant improvement in lives of at least 100 million slum dwellers, by 2020”. To achieve the MDGs dialogue is badly needed, between stakeholder groups, scientists and politicians, not only on country but international level. Establishing a scientific discussion and contributing in the development of teaching materials beyond national borders can contribute significantly. In addition to access to more and even higher quality data, Universities can benefit from this kind of collaboration that allows them to share information and best practices to educate their students in a better and more holistic way. Both authors believe that this approach of creating a network consisting of Universities of the North and South can contribute to both: sustainability in education and education in sustainability.

### **Notes**

1. Innovation competencies refer to knowledge, skills and attitudes needed for the innovation activities to be successful.
2. This special issue includes 33 articles. Authors of these articles are from institutions of higher education from Europe, Asia, Africa, Australia, South America, Central America and North America. Most of them report on their experiences in working within interdisciplinary teams

to re-focus education, research and outreach to help accelerate the rate at which educational institutions foster and underpin the values, knowledge and actions to help their students transform society from unsustainable to sustainable patterns.

3. See CNRD website: [www.cnr.info](http://www.cnr.info)
4. See program website: <http://www.daad.de/entwicklung/exceed/11572.en.html>

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### **Ağlar aracılığı ile köprüleri oluşturma ve engelleri ortadan kaldırma: Sürdürülebilirlik için yenilikçi, eğitsel bir yaklaşım**

Tüm dünyada eğitimde yenilik sürdürülebilirliğin farkındalığını arttırmak için etkili bir yaklaşım olarak algılanmaktadır. Eğitimle ilgilenen uluslararası organizasyonlar araştırma ve öğretimi destekleyen projeler Yüksek Eğitimin modernizasyonu arayışındadırlar ve mevcut ihtiyaçlara cevap verebilecek yeni müfredatların, öğretim yöntemlerinin ve materyallerinin geliştirilmesine önem vermektedirler. Üniversiteler ve akademik arenada aracılığı ile Enstitüler arasında Bağları kuvvetlendirme ve işbirliğini artırma yenilikçi eğitsel yaklaşımlar açısından merkezi bir rol oynamaktadır. Bu makale Milenyum Gelişim Hedefleri 7'nin başarısını desteklemeyi amaçlayan Doğal Kaynaklar ve Gelişim Merkezinin bir projesini yansıtmaktadır. Vietnam, Nepal, Mozambik, Meksika, Ürdün, Endonezya, Almanya, Mısır, Şili, Brezilya'daki on bir üniversitenin fakülteleri doğal, mühendislik sosyal bilim alanlarında içeren doğal kaynaklar ve gelişim merkezinin bir parçasını oluşturmaktadır. Günümüzün en baskın problem olan sürdürülebilir şehirlerin oluşturulmasında çözüm önerileri üretmeye yönelik olarak öğrenciler, öğretmenler ve araştırmacılar disiplinler arası geçiş yaklaşımı ile birlikte çalıştılar. Bu makale özellikle uluslararası araştırma ve eğitsel ağın ülkeler arasındaki mesafeyi nasıl daraltabileceğini devamlılığa ilişkin farkındalığın nasıl artırılabilceği ile ilgilenmektedir. Modern medya ve e-öğrenme etkinliklerini kullanarak genç araştırmacılar arenasında sürdürülebilirliğin farkındalığın artırılmasında eğitimde eklenmiş yaklaşımları tartışmaktadır.

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