

## Creating a Learning Organization to Promote Sustainable Water Resources Management in Ethiopia

Carol Atkinson-Palombo\*, PhD  
Department of Geography, University of Connecticut  
215 Glenbrook Road, Storrs, CT, 06269  
carol.atkinson-palombo@uconn.edu  
860-486-3023

Mekonnen Gebremichael, PhD  
Department of Civil & Environmental Engineering  
261 Glenbrook Road, Storrs, CT, 06269  
mekonnen@enr.uconn.edu  
860-486-2771

Keywords: higher-education partnerships, knowledge creation, dialogue, triple-loop learning, organizational theory

**Abstract:** Partnerships between universities have the tantalizing possibility of providing fresh pathways to more sustainable societies. Institutions in sub-Saharan Africa are new players in this emerging development paradigm, but after decades of underinvestment in higher education are arguably most in need of building capacity to address fragile and dynamic environmental and social conditions. This paper documents the early stages of an Ethiopia-United States partnership, funded by the United States Agency for International Development (USAID) and Higher Education for Development (HED), to build capacity in higher education institutions in Ethiopia, especially in the critical area of sustainable water resource management. We explain how the concept of sustainability was interwoven with theories about learning organizations, supplemented by in-depth dialogue with stakeholders to assess existing capacity and future needs, and used to inform a strategic plan. The literature highlighted the need for a learning organization: a place where people continuously expand their ability to generate the results they truly desire, where innovative and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together. In 2011, the partnership established the Ethiopian Institute for Water Resources (EIWR) with the vision that it will become a key innovator in sustainable water resources management in Ethiopia by integrating education, research, outreach and training. One important observation so far is that in order to create a more substantive engagement than was realized in the “technology transfer” policies that shaped past North-South relationships, partnerships need to be authentic and characterized by open dialogue, mutual respect, and shared learning. Another is that the opportunities for fieldwork in Ethiopia’s complex social and physical landscapes also have enormous potential to create deep and learning experiences for other students of sustainability, thereby building capacity not just in Ethiopia but across multiple geographies.

\* Corresponding author

*This study is made possible by the support of the American People through the United States Agency for International Development (USAID.) The contents of this journal article are the sole responsibility of the authors and do not necessarily reflect the views of Higher Education for Development, USAID or the United States Government.*

*The authors would like to thank Dr. Montague Demment, the Associate Vice President for International Development at the Association of Public and Land-grant Universities for reviewing and commenting upon this manuscript, and three anonymous reviewers for their helpful suggestions.*

## INTRODUCTION

In this paper we document the formation and early stages of a partnership between the University of Connecticut and Addis Ababa University, one that eventually expanded to include seven universities in the United States and Ethiopia and that focuses on building capacity in Ethiopian higher education institutions in the area of sustainable water resources management. Our overall goal in this paper is to illustrate how we have interwoven the concept of sustainability with theories about learning organizations to inform the mission, vision, values, and philosophy of our partnership. Following this introduction is a section in which we present background information about the evolution of the cohort of Higher Education Partnerships (HEPs) to which the Ethiopian partnership belongs. This is followed by a section in which we outline, in broad terms, water-related challenges facing Ethiopia, and our appraisal, gleaned through an in-depth needs assessment, of the capacity of existing institutions to address those challenges. Section four reviews selected literature that explains the connections between individual, community and organizational learning, and discusses how these are central to the idea promoted by Scott (2002) that sustainability is about building capacity to adapt to continuous social and environmental change. We then explain how we translated the conceptual ideas about sustainability and learning organizations into our initiative to “Build Ethiopia’s Water Future” by establishing a distinct organization, the Ethiopian Institute for Water Resources (EIWR). The paper concludes with some reflections on the first year of operation and key lessons learned. An important observation so far has been that in order to create a more substantive engagement than was realized in the technology transfer policies that shaped North-South relationships in the past, partnerships need to be characterized by open dialogue, mutual respect, and shared learning. Those values were explicitly embedded into the organizational culture of EIWR, transmitted to all stakeholders, and used to inspire the mission, vision, and activities of the organization. With this foundation of institution-building in place, we envisage that by creating deep and transformative learning experiences for everyone who engages with it the project has as much potential to build capacity in universities in the United States and beyond as in Ethiopia.

Crises such as the one that unfolded last year in the Horn of Africa underscore the urgent need for North-South partnerships to engage in collaborative thought and coordinated action. Another season of failed rains caused widespread drought. The ensuing food crisis affected an estimated 14 million people across Somalia, Ethiopia, and Kenya (UNOCHA and Allen 2011; Ford 2011; Wooldridge 2011). Armed conflict between rebel groups and the Somali Transitional Federal Government exacerbated an already delicate situation, and one million refugees are estimated to have fled from Somalia to neighboring Ethiopia and Kenya (UNOCHA 2011c). According to the UN High Commissioner for Refugees, many people are thought to have died while seeking safe harbor (Guatteres 2011). The exact number is unknown, but based on anecdotal evidence thought to be substantial. Humanitarian aid agencies such as *Médecins Sans Frontières* (Doctors Without Borders) reported high rates of mortality, especially among infants, in overcrowded and diseased encampments (MSF 2011; UNOCHA 2011a, 2011b). The overall mortality rate at the camps in Ethiopia has been estimated to be seven people out of 10,000 per day, over triple the rate of a normal crisis rate of two per day.

While some attribute the drought to an unusually strong La Niña (IRIN 2011; UNOCHA 2011b), others suggest that the hotter and drier growing conditions in sub-Saharan Africa

associated with global climate change have reduced the resiliency of communities to withstand fluctuations in annual precipitation (Hersh 2011). With malnutrition rates among children having reached 30% in parts of Kenya and Ethiopia and over 50% in southern Somalia, and millions at risk of contracting malaria and cholera, the crisis is unlikely to abate soon (Hersh 2011; Manson 2011). This tragedy demonstrates the profound vulnerability of people living in the world's least developed countries. A vicious cycle of resource scarcity, conflict, and poverty is intensified by greater exposure to natural hazards and human-induced global climate change, much of which is precipitated by consumption in the global North (Dixon et al. 2003; Collier et al. 2008; Devereaux and Edwards 2004; Busby 2007). The nature of global and institutional problems is so complex and intricately interdependent that societies everywhere are under pressure to develop their capacity to provide solutions (Devereaux and Edwards 2004).

Sustainability has emerged as a promising way to approach society's most pressing challenges (Clark and Dickson 2003; Komiyama and Takeuchi 2006). While the exact definition of sustainability has been the subject of intense debate over the past few years, two elucidations, one by Scott (2002) and another by Barr (2003), are particularly useful in considering crises in developing countries. Scott (2002) has suggested that sustainability is less about an end goal and more about creating capacity for people to adapt continuously to changing environmental and societal conditions. Barr has described sustainability as a call for change from our current trajectory, essentially a call to action (Barr 2003). Scholars have debated how best to promote progressive change, focusing on the education of students of sustainability and the target populations that they intend to serve. Most sustainability scholars agree that students need to employ interdisciplinary approaches, value cooperative group learning, consider stakeholder perspectives and engage in systems thinking (see for example Barth et al. 2007; Wiek et al. 2011 and the extensive references therein). The overarching goal for the academic community is to produce scholars who can become agents of change able to understand complex problems and inclined to resolve them through social action (Rowe 2007). Often separate from this conversation have been discussions about the wide range of learning systems that have been implemented in rural and development studies, including extension programs, community learning, empowerment, capacity-building, knowledge management and social learning (Coudel et al. 2011). What these separate conversations have in common is the assumption that as we move toward sustainability we need to create knowledge through the shared learning experience. knowledge creation and shared learning both within academic settings and across the communities in which they work are of paramount importance in the move toward sustainability.

Many leading organizations, including the World Bank and OECD, now emphasize the idea of building knowledge societies as pivotal to development (World Bank 1999; OECD 2000). The term, knowledge society, was first used by the European Commission in 1996 (European Commission 1996), and suggests that instead of acquiring static knowledge, actors need to develop a permanent capacity to acquire new knowledge to adapt (Foray 2004). Such an end goal challenges existing education and training systems because actors have to learn continuously (UNESCO 2005). Many education systems tend to focus on transferring knowledge or skills rather than on teaching people how to generate the knowledge that they will need to devise their own problem-solving systems (Argyris and Schon, 1978). Rural communities in developing countries with complex and rapidly changing physical and social landscapes—such as those repeatedly affected by drought in the Horn of Africa—are arguably where skills of this

nature are most needed. Yet it is a cruel irony that there is an inverse relationship between the size of the development challenges facing African nations and the capacity of their university systems to meet them (Ramphele 2003). Teferra and Altbach (2004) lament that many of African's institutions of higher learning are among the least prepared for the persistent and unfolding challenges of sustainable development.

At least part of the limited capacity in African universities can be attributed to an intentional strategy by international agencies and African organizations: during the 1980s and 1990s they prioritized basic education and other sectors rather than higher-education because influential World Bank reports suggested that university education had a limited capacity to alleviate poverty (Psacharopoulos 1994). Thinking about the importance of higher education to development has now come full circle, and higher education is once again recognized as a crucial component of African development (Glasson et al. 2010; Kimenyi 2011; Teferra and Altbach 2004). Higher education partnerships (HEPs), defined as “cooperative agreements between a higher education institution and another distinct organization to coordinate activities, share resources, or divide responsibilities related to a specific project or goal” (Kinser and Green 2009 p. 4), are now being implemented to generate the much-needed capacity in African universities to address critical issues (Koehn and Demment 2010).

## AFRICA-US HIGHER-EDUCATION PARTNERSHIPS

The Ethiopia-US partnership that we describe in this paper was created in response to a call for planning proposals issued in 2008 by United States Agency for International Development (USAID) and Higher Education in Development (HED) (Alemneh 2008). This, in turn, was prompted by an initiative led by the Association of Public and Land-Grant Universities (APLU) to consider how best to strengthen African higher education's capacity to educate and solve problems relevant to national and regional development (APLU 2007). APLU's original objective was to facilitate deeper and more effective partnerships between African and US institutions of higher education to address areas crucial to development, including science and technology, health and education, engineering, and the environment and natural resources. Many HEPs have been created in other parts of the world, inspired by the possibility that universities could become agents for change and therefore hubs for development (Hansen and Lehmann 2006). In a background paper that sets out the thinking behind the formation of higher education partnerships (HEPs), Koehn and Demment (2010) argue that HEPs offer Africa's leaders a mechanism for mobilizing additional human and financial resources and a proven pathway to successful and sustainable development initiatives. Accordingly, the joint USAID/HED initiative speaks to action at the forefront of development practice—the emphasis on partnerships between higher education institutions in both the global North and South to create new ways to catalyze the transition towards more sustainable societies.

The planning proposal submitted in February 2009 was funded by USAID/HED, and an intensive needs assessment was undertaken in summer 2009. In the following section we discuss Ethiopia's water related challenges and how we assessed the capacity of higher education to meet those challenges.

## ETHIOPIA'S WATER-RELATED CHALLENGES AND ADAPTIVE CAPACITY

### *Water-related challenges*

The scale of the development challenge in Ethiopia is monumental, especially considering that one in four Ethiopians of a population of over 80 million, live on less than a dollar a day. Almost all major development problems in Ethiopia relate to water, including food insecurity, low economic development, recurrent droughts, disastrous floods, poor health conditions, and low energy production. The Ethiopian economy and its food production are heavily dependent on rainfall, which exhibits monsoonal characteristics (Beltrando and Camberlin 1993; Camberlin 1995). The bulk of annual rainfall occurs within three summer months, usually June, July, and August (Camberlin and Philippon 2002; Segele and Lamb 2005). Those with water storage facilities can practice irrigation that supports two to three crop cycles; but many communities lack even basic structures to store excess rainfall for use during the non-rainy period, which limits them to one growing season a year. This leads to low levels of economic development and food insecurity, which has been exacerbated by decades of rapid population growth.

The intra-annual variability of Ethiopia's climate is among the most extreme in the world. This causes large hydrologic variability and frequent droughts and floods, which often lead to famine and disaster (Jury 2011). The Ethiopian population is made even more vulnerable by the lack of structural and non-structural water regulating and storage mechanisms (Mattsson and Rapp 1991; Maxwell 2002; Verdin et al. 2005). The correlation between rainfall variability and gross domestic product in Ethiopia is striking (Arndt et al. 2011; Conway and Schipper 2011). A report by the World Bank estimates that Ethiopia's inability to tackle hydrologic variability will cause a 38% decline in GDP and a projected 25% increase in poverty for 2003-2015 (Grey and Sadoff 2005). Ethiopia has also been characterized as one of the countries that is most vulnerable to the impacts of climate change (Adger and Vincent 2005; UNFCCC 2008). When the onset of the monsoon is delayed and the rainfall volume falls below normal levels, large segments of the population are forced to rely on food assistance for survival. When the entire Horn of Africa is affected, as was the case in 2011, drought and famine can easily spiral into widespread dislocation, armed conflict, and outbreaks of disease.

Ethiopia has one of Africa's lowest rates of access to water supply and sanitation. Less than a quarter of the population has access to safe water, and only 11% has access to sanitation (WHO and UNICEF 2006). Ethiopia's Millennium Development Goals (MDGs) for improved water and sanitation access are 70% and 56%, respectively, and Ethiopia has a long way to go to meet these goals (WHO and UNICEF 2006). Major health problems in Ethiopia directly relate to rainfall and other components of the water cycle. For example, infectious and vector-borne diseases such as malaria and schistosomiasis have been traced to environmental factors like precipitation, flooding, and humidity (Erko et al. 2002; Kloos 1985; Leshem et al. 2008). Malaria is prevalent in 75% of the country, putting over 50 million people at risk (Breman et al. 2004; Kovats et al. 2001; Mouchet et al. 1998), contributing to up to 20% of under-five deaths and, tragically, in epidemic years, mortality counts of up to 100,000 children are not uncommon (UNICEF 2011).

### *Needs Assessment to Determine Adaptive Capacity*

The strategic planning process took approximately six months and consisted of four primary activities: (1) assessment planning; (2) assessment visits and a stakeholder workshop; (3) assessment outcomes evaluation, and (4) strategic plan development. The primary goal of the needs assessment was to evaluate the existing capacity of the partnering Ethiopian universities to conduct education, research and outreach in water resources fields. In the assessment planning phase, significant effort was put into developing specialized assessment tools appropriate for the wide range of participants to be interviewed—that is, the tools used to interview a professor from an Ethiopian university were considerably different than those used to interview a representative from an Ethiopian Ministry or from the private sector. The needs assessment process involved visits or interviews with a large number of participants from a wide variety of relevant agencies in Ethiopia and the US. For the Ethiopian agencies, a team of six personnel from the University of Connecticut traveled to Ethiopia for a planned two-week assessment visit that included an assessment workshop. Team members met with a wide variety of agents in the water sector, including the Minister for Water Resources, the General Manager of Federal Waterworks Enterprise, the Advisor on Water Resources, and upper administration and faculty from Ethiopian Universities. The University of Connecticut team also met with representatives from the international water resources community and the private sector in the US. This was valuable in providing an understanding of how the partnership would articulate with existing initiatives being undertaken by local, national, and global stakeholders from governments, non-governmental organizations (NGOs), academic institutions, and the private sector.

To summarize: the needs assessment revealed that in order to develop and manage existing water resources in a sustainable manner, we needed knowledge about water availability, water quality, water demand in various sectors, and the impacts of water resource projects on health and the environment. Sustainable water resources development and management is dependent on the capacity to generate new knowledge and/or develop new applications based on existing knowledge through higher education and research. Achieving these goals would require new technologies for data collection, a highly trained workforce, and institutionalized higher education and research in sustainable water resources, all of which are currently lacking in Ethiopia and elsewhere in Africa.

## LITERATURE REVIEW

Following the needs assessment, the partners devised a 10-year strategic plan to build capacity in Ethiopian higher education, which was subsequently recommended for funding. A two-year contract between the principal partners (the University of Connecticut and Addis Ababa University) and USAID/HED was signed at the end of 2010, and the partnership was officially launched at a workshop at the United Nations in Addis Ababa in January 2011 (Hailu et al. 2011). We relied on a wide range of literature to guide our process of creating the strategic plan for the HEP. Below we present below selected works from that literature, highlighting the following: types of learning, learning and the knowledge society, organizational learning, learning organizations, and development initiatives intended to promote learning. To this we have added a brief discussion of scholarship on dialogue to reflect the central role that this concept has played and will continue to play in all partnership interactions. The section

concludes with a summary of what we took from the literature about the philosophical foundation upon which a North-South HEP needs to be built.

### *Types of Learning*

While there are many ways to classify learning, this literature review focuses on distinctions drawn between “incremental learning”, “reframing”, and “transformational learning” (Argyris and Schon 1978, 1996; Bateson 1972; Senge 1990). Incremental learning refers to learning new skills and capabilities through incremental improvement, doing something better without examining or challenging underlying beliefs and assumptions. Reframing occurs by fundamentally reshaping the underlying patterns of our thinking and behavior so we are capable of doing different things. Transformational learning involves a shift in our context or point of view about oneself, the foundation for profound change, individual cultivation, and radical innovation (Peschl 2007). Peschl describes the goal of transformational learning as “empowering people to transform who they are and reinvent themselves by helping them to see how their frames of reference, thinking, and behavior produce unintended consequences... to surface and question the way they have framed their points of view about themselves, others, or their circumstances with the idea of creating a fundamental shift” (p. 22).

He calls transformational learning an “episto-existential” process that produces profound change on various levels, and emphasizes the importance of a receptive attitude, suspension, openness, deep knowing in allowing this process to unfold. This resonates with the suggestion by Sipos et al (2007) that sustainability education should involve the head, hands, and heart.

### *Development, Learning the ‘Knowledge Society’*

The promotion of a knowledge society has become a dominant theme in development thinking (Foray, 2004). International institutions such as the World Bank and OECD have come to the conclusion that development is the ability of societies to build a permanent capacity for acquiring new knowledge and to adapt (OECD 2000; WorldBank 1999). In sharp contrast to the first and second industrial revolutions, where the individual was more or less “dissolved” by automation, the role of the individual (and in particular his or her knowledge and personality) has become much more important in today’s knowledge-based society/economy (Peschl 2007). Differentiating between various types of learning has therefore become central to development thinking.

Philosophers have grappled with the question of what is meant by individual cultivation and suggested that more advanced forms of learning go beyond the classical transfer model. That is to say, the understanding of learning as a process of transferring more or less stable chunks of knowledge from one brain to another is replaced by a more dynamic perspective; learning is framed as a continuous and active process of adaptation and construction in which knowledge is developed in permanent interaction between the cognitive system and its environment. Knowledge is not passively mapped into the brain but actively constructed by perceiving, acting, and interacting with the environmental structures. Many development efforts are targeted at building individual and/or organizational/institutional capacity (Coudel et al. 2011). It is important to note, however, that discussions about the links between learning and the

knowledge society extend far beyond the realm of development thinking and, as the following section will show, have been prominent themes in business management in developed countries.

### *Organizational Learning*

Clearly learning starts with individuals, but individual learning does not necessarily lead to organizational learning (Ikehara, 1999). The ground-breaking work of Argyris and Schon provided some important insights into how learning at the individual level connects to organizational capacity (Argyris 1993; Argyris and Schon 1978, 1996). Their inquiry is notable for the way in which it broke with traditions that saw technical progress as a pathway to innovation; they focused instead on understanding how organizational learning occurred. They defined two levels of learning that enable different types of change: single-loop learning and double-loop learning. Single-loop learning occurs within a group when new knowledge is acquired and transformed by a collective interaction process with the aim of improving efficiency. However, 'defensive' routines (in which people seek to avoid altering existing practices) may also emerge to maintain status quo. In double-loop learning, new knowledge is used to gain a new perception of issues and problems, leading to a new way of solving them. When double-loop learning occurs, group values are changed and new routines emerge.

More recently, a few authors have developed the concept of triple loop learning (Foldy and Creed 1999; Nielsen 1993; Romme and Witteloostuijn 1999) to explain the learning dynamics that occur when a new collective structure emerges within a changing environment. These learning dynamics appear to arise mainly in non-hierarchical or non-stable organizations such as multi-stakeholder initiatives. In these non-stable structures, actors have to 'learn to learn' together, and to define collective rules that give life to a new structure. Overall, it is evident that organizational learning is not simply the sum of individual learning processes but instead something that requires interaction among individuals in the organization and interactions between the organization and its contexts.

### *Learning Organizations*

A learning organization is one where "people continuously expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together" (Senge 1990 p. 3). Pedler et al (1991) elaborated that a learning organization should consciously and intentionally facilitate individual learning in order to continuously transform the entire organization and its contexts. The highest stage of learning in an organization includes the ability to adapt to the environment, to learn from their people, and to contribute to the wider community or context of which they are part. Following an in-depth examination of the literature on organizational learning, Wang and Ahmed (2003) found that in order to be learning organizations, institutions had to move beyond single and double-loop learning (which simply ask what is wrong and focus on how to correct and prevent errors) into triple-loop learning, which constantly questions existing products, processes and systems by strategically asking where the organization should stand in the future marketplace.

### *Development Initiatives Focused on Learning*

A recent literature review of approaches to learning in rural and development studies which used action learning theory as a standpoint from which to understand the diversity of learning systems identified five approaches: (1) extension, (2) community learning; (3) organizational capacity building, (4) empowerment, and (5) social learning (Coudel et al. 2011). One of the most interesting aspects of this research was the way in which these learning systems were situated according to objective, level and type of learning. The main conclusions drawn from that research were that extension and organizational capacity building, which are mainly focused on single-loop learning, are operational approaches that are favored by international institutions. In contrast, community learning approaches focus on relations and values to enable interesting local alternative systems to be envisaged by encouraging double-loop learning, and these approaches are often favored by NGOs. Empowerment, defined as the gaining of individual rights, describes the capacity to act within a given environment, and is also a double-loop learning process. Social learning, on the other hand, underlines the importance of being aware of the learning process, enabling better governance by local actors through a triple-loop learning process.

### *Dialogue*

Conversations, used in this context as a technical process of exchanging information and defined as the means by which people share and often develop what they know, have been described as the most important work in the new economy. Some people see conversations as so important to the production of knowledge that they have gone so far as to conceive of organizations themselves as networks of conversation (Nonaka 1994; Isaacs; Brown and Duguid 1991; Easterby-Smith 1997; Tsoukas 2009). Dialogue is a discipline of collective thinking and inquiry, a process for transforming the quality of conversation, and in particular, the thinking that lies beneath it (Tsoukas 2009). The basic premise is that people operate most often within shared, living fields of assumptions and constructed embodied meaning that are often fragmented, incoherent and partial. Once people acknowledge the nature of these fields and how they are informed, they open themselves up to the possibility of new insights and to transformation of behaviors. This leads to new possibilities for coordinated action when results from different people reach a shared agreement and create an “action plan” (Welp et al. 2006). Dialogue, defined as a sustained collective inquiry into the processes, assumptions, and certainties that compose everyday experience, can produce an environment where people are consciously participating in the creation of shared meaning, irrespective of the composition and experiences of the participants.

### *Sustainability Education*

Reflections on sustainability education in the developed world have uncovered several important insights. This is a rich and rapidly-expanding field of inquiry, and our comments here are limited to a few brief highlights. Students very quickly become disenfranchised if the process of sustainability education does not prepare them how to engage in complex issues and become problem solvers and change agents (Burns 2011). Competencies therefore need to include equipping students with the skills to effect social change (Wiek et al. 2011; Frisk and Larson 2011). Teaching sustainability will require relying less on information transmission and more on

transformational learning in community contexts (Burns 2011; Cress 2004). Action-learning, a form of experiential learning in which students are asked to question their assumptions and apply new knowledge and skills to diverse situations (Siopos et al. 2007), when combined with systems thinking and stakeholder engagement, focuses on what may happen in the future rather than what has occurred in the past, and can facilitate students' development as sustainability change agents. Project-based learning (PBL) is also thought to be a useful approach to empower students and typically involves the three components: (1) a driving question that organizes a long-term authentic investigation; (2) the production of tangible, meaningful products; and (3) collaboration with peers, teachers, and/or members of society (Barab and Luehmann 2003). These sentiments are echoed in many other studies of best practices in higher education that speak to the importance of direct experience, relationships, and dialogue in adult learning (Allen-Gill et al. 2005; Alvarez and Rogers 2006; Knowles 1970; Vela 1994). Taken together, these insights suggest that the most effective approaches to sustainability education are applied, field-based modes of work.

### *Summary*

After reviewing the literature on learning organizations, the project organizers understood that what was needed was the creation of an environment where people continuously expand their capacity to generate outcomes, and where people are continuously learning how to learn together. These values needed to be in the blood and bone of the partnership. The literature on approaches to learning in rural communities highlights that the overall objective of sustainability initiatives should be social learning. The discipline of dialogue is central to organizational learning because it holds promise as a means for promoting collective thinking and communication. When viewed together, the related bodies of literature illustrate the intricate connections between individual, community and organizational learning, knowledge-creation, and transformational learning. Both the collaborative aspect of knowledge-creation through dialogue and the fact that it emerges from deep "episto-existential" learning involving the head, heart, and hands (Siopos et al. 2007; Peschl 2007) illustrate the points of connection between transformational learning and sustainability education (Barr 2003; Scott 2002). An important central message from the literature on community learning is that while the impact of the learning system as a whole needs to be social learning, individual activities can focus on lower-orders of learning such as skills building. The same may be said of sustainability education in formal settings. Not every experience needs to be transformational—some activities can, for example, focus on technical skills. However, collaborations on real-world problems that involve communities, governmental and non-governmental stakeholders, and academics, faculty and students have the potential to build capacity within and across many different networks, which is the essence of knowledge creation (Hansen and Lehmann 2006; Nonaka 1994).

## CREATING A LEARNING INSTITUTION

The most important action item that emerged from our review of literature and in-depth dialogue with stakeholders about their existing and future requirements in the water sector was

the need to create a learning organization with a distinct organizational culture with the mission of becoming a key innovator in sustainable water resources management in Ethiopia. When partners reflected on the debates about dialogue and the importance of creating knowledge through shared meaning, they understood the importance of shared ownership and governance, a tone of mutual respect, shared learning, and open dialogue. These differentiated this partnership from the technology transfer exercises that emerged from development thinking in the past.

Accordingly, in 2011 the partnership embarked on the process of establishing the Ethiopian Institute for Water Resources (EIWR), focusing on four main objectives. The first objective was the development of graduate-level academic programs in water resources by introducing new curricula and developing new courses; these were designed to build the institutional and human capacity needed to address water resource challenges in Ethiopia and informed by pedagogical approaches keyed to best practices in sustainability education. The second objective was developing capacity of Ethiopian faculty and workforce through PhD and Master Studies by producing over 150 PhDs and 350 MScs in the water sector over the decade beginning in 2011. The third objective was to carry out demand-driven and applied research in areas of critical national need so as to properly integrate capacity development initiatives with national, sub-national, and sector priorities. The fourth objective was to provide an effective extension service consisting of a community-based outreach program and training program for practitioners to improve the relevance, dissemination and adoption of scientific research undertaken on water resources.

These objectives were carefully chosen to support the Ethiopian Government's strategy of Accelerated Sustainable Development and Eradication of Poverty, and to align closely with the mandates of many Government ministries, including Education, Water and Energy, and Agriculture and Rural Development. Articulating the objectives in this manner, we hope, infuses the values that we intend to cultivate into the organization from its inception.

## DISCUSSION, REFLECTION AND LESSONS LEARNED

Given that the project was crafted in response to a call for proposals by USAID and HED, it has been shaped by ideas at the intellectual frontier of development. One aspect of the call for proposals that is particularly useful in orienting the partnership to create a learning institution and to focus the goals and objectives of the activities is the way in which it required partners to identify and organize their initiatives around a problem model. This was done intentionally so that partnerships could focus their thinking on a key relevant development problem. Having the partnership organized around a specific problem allows the identity, activities, and approaches to be tied directly to that problem. According to APLU, this structure defines who the relevant participants should be, articulates what the logic of the activities should be, and ensures that there is an output that will have impact. Another important quality of the problem model concept is that it is not static. As the team learns more about the complexities of the problem, the model can be refined and that may bring new direction to the effort or bring new team members and new institutions into the partnership. Their participation may further refine the model. The basic idea is that the problem model will evolve with the partnership. Another advantage of the model is that in trying to address the problem, the team will undoubtedly run into constraints, many of which may be institutional. In this way the problem model concept then causes the project to take on an institutional transformational role. Problem

solving for development is not one of the great strengths of higher education institutions in Africa but many experts think that it ought to be. The need for teaching, research and outreach in Ethiopian higher education to address issues of national economic and social importance was reiterated time and time again in our needs assessment.

Initiatives designed to build capacity reflect the important guiding principles of ownership, advocacy and outreach, the creation of knowledge centers, and partnership brokering. For example, a basic but philosophically important component of the strategic plan was an in-depth needs assessment conducted jointly by the partners in the United States and Ethiopia. Such assessments have become an integral part of the grassroots-driven philosophy of capacity building. The overarching vision of the project is to build capacity far beyond the universities by, for example, training and empowering community leaders. Advocacy and outreach are expressed in two sets of initiatives: one to engage university students in applied projects in local communities, and the other to have universities offer short-term technical training programs to practitioners. Knowledge centers will constitute not only the universities engaged in the project but also communities in which research has been undertaken. Forging partnerships between stakeholders is an essential ingredient to help promote the sustainability of the endeavor and the likelihood that the model can be exported to other settings. There is obviously much more that needs to be said and done about the curriculum development and core competencies, and that will be tackled in other papers in the future. This paper is limited only to the broad mission, vision and philosophies of the partnership.

What we would like to point out, though, is two of our main lessons learned so far. First is the need for a clear and consistent message about the function and goals of a learning institute that has emerged from stakeholder engagement. The second is that while this initiative on the surface appears to be about capacity-building in Ethiopia, HEPs such as the one described in this paper provide much wider-ranging potential to build capacity than is evident from considering them within the context of development studies literature. It is well understood that capacity-building takes place in the multiple scales, including at the individual, organizational, and societal levels, all of which are interlinked and interdependent. We argue that this project should be viewed not only as being about building capacity in Ethiopia but also as building capacity in the United States in the realm of development thinking. In this way, projects such as these have a much broader geographic impact.

Rowe (2007) noted that while most higher education institutions in the United States include somewhere in their mission statements goals for preparing students to help create a better society, this idea is often not fully implemented. She goes on to implore us to “imagine what might happen if students were regularly assigned actual sustainability problems that were brought to higher education by cities, business, nonprofit organizations, and other institutions” (Rowe 2007 p. 324). Transnational HEPs such as the one that we have created in Ethiopia have the potential to provide opportunities for US-based students to collaborate with stakeholders in Ethiopia on real, critically-important social problems and undergo the type of deep and transformative triple-loop learning that sustainability education demands. HEPs therefore have the potential to build capacity across geographies, which are precisely the type of linkages that are needed to building the new knowledge that we need to tackle challenges that emerge from and impact our intricately connected global social and environmental systems.

The Ethiopia-US partnership is a very new undertaking. The contract with USAID was signed in January 2011, and the first cohort of students began their studies in May 2011. That being said, some important milestones have already been reached compared to the targets that were set by USAID/HED. First of all, the partnership was able to obtain additional funding from the Ethiopian Ministry of Education to triple the number of students from the original target. Second, when the first cohort of PhD students graduates, this will double the number of PhD holders in the water sector in the entire country. Extensive evaluation of the project and its impacts will be undertaken in due course, and is beyond the scope of this paper. However, early signs of the potential success of this approach are encouraging. At the official inauguration of the Ethiopian Institute of Water Resources in Addis Ababa in February 2012, Dr. Gebise Ejeta, a United States Science Envoy to President Obama remarked that in his thirty five years of development experience he had never seen such a potentially impactful capacity-building project (University of Connecticut, 2012). He encouraged the team to share their approach with the broader community. This process of shared learning begins with our explication of the underlying philosophy about the partnership and what we hope to achieve. More specific outcomes will be the topic of future papers.

## References

- Adger, W. N., and K. Vincent. 2005. Uncertainty in adaptive capacity. *Comptes Rendus Geoscience* 337 (4):399-410.
- Alemneh, T. *Request for Applications: Africa-U.S. Higher Education Initiative Planning Grants*. Higher Education for Development 2008 [cited].
- Allen-Gill, S., L. Walker, G. Thomas, T. Shevory, and E. Shapiro. 2005. Forming a community partnership to enhance education in sustainability. 6 4:392-402.
- Alvarez, A., and J. Rogers. 2006. Going "out there": Learning about sustainability in place. *International Journal of Sustainability in Higher Education* 7 (2):176-188.
- APLU. *Africa-U.S. Higher Education Initiative* 2007 [cited 30 December 2011]. Available from <http://www.aplu.org/page.aspx?pid=1117>.
- Argyris, C. 1993. *Knowledge for Action: A Guide to Overcoming Barriers to Organizational Change*.
- Argyris, C., and D. A. Schon. 1978. *Organizational Learning: A Theory of Action Perspective*. New York, NY: Addison-Wesley.
- . 1996. *Organizational Learning II: Theory, Method and Practice*. Reading, MA: Addison-Wesley.
- Arndt, C., S. Robinson, and D. Willenbockel. 2011. Ethiopia's growth prospects in a changing climate: A stochastic general equilibrium approach. *Global Environmental Change-Human and Policy Dimensions* 21 (2):701-710.
- Barab, S. A., and A. L. Luehmann. 2003. Building sustainable science curriculum: Acknowledging and accommodating local adaptation. *Wiley Periodical Inc Science Education* 87:454-467.
- Barr, S. 2003. Strategies for Sustainability: Citizens and responsible environmental behavior. *Area: Royal Geographical Society* 35 (3):227-240.
- Barth, M., J. Godemann, M. Ricekman, and U. Stoltenberg. 2007. Developing key competencies for sustainable development in higher education. *International Journal of Sustainability in Higher Education* 8 (4):416-430.
- Bateson, G. 1972. *Steps to an Ecology of Mind*. New York, NY: Ballantine.
- Beltrando, G., and P. Camberlin. 1993. Interannual Variability of Rainfall in the Eastern Horn of Africa and Indicators of Atmospheric Circulation. *International Journal of Climatology* 13 (5):533-546.
- Breman, J. G., M. S. Alilio, and A. Mills. 2004. Conquering the intolerable burden of malaria: What's new, what's needed: A summary. *American Journal of Tropical Medicine and Hygiene* 71 (2):1-15.
- Brown, J. S., and P. Duguid. 1991. Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning and Innovation. *Organization Science* 2 (1):40-57.
- Burns, H. 2011. Teaching for Transformation: (Re)Designing sustainability courses based on ecological principles. *Journal of Sustainability Education* 2.
- Busby, J. W. 2007. *Climate Change and National Security: An Agenda for Action*. Washington, D.C.: Council on Foreign Relations.

- Camberlin, P. 1995. June-September Rainfall in North-Eastern Africa and Atmospheric Signals over the Tropics-A Zonal Perspective. *International Journal of Climatology* 15 (7):773-783.
- Camberlin, P., and N. Philippon. 2002. The East African March-May rainy season: Associated atmospheric dynamics and predictability over the 1968-97 period. *Journal of Climate* 15 (9):1002-1019.
- Clark, W. C., and N. M. Dickson. 2003. Sustainability science: The emerging research program. *Proceedings of the National Academy of Sciences of the United States of America* 100 (14):8059-8061.
- Collier, P., G. Conway, and A. Venables. 2008. Climate Change and Africa. *Oxford Review of Economic Policy* 24 (2):337-353.
- Conway, D., and E. L. F. Schipper. 2011. Adaptation to climate change in Africa: Challenges and opportunities identified from Ethiopia. *Global Environmental Change-Human and Policy Dimensions* 21 (1):227-237.
- Coudel, E., J. P. Tonneau, and H. Rey-Valette. 2011. Diverse approaches to learning in rural and development studies: review of the literature from the perspective of action learning. *Knowledge Management Research & Practice* 9 (2):120-135.
- Cress, C. 2004. Critical thinking development in service-learning activities: pedagogical implications for critical being and action. *Inquiry: Critical Thinking Across the Disciplines* 23:87-93.
- Devereaux, S., and J. Edwards. 2004. Climate Change and Food Security. *Institute of Development Studies Bulletin* 35 (3):22-30.
- Dixon, R. K., J. Smith, and S. Guill. 2003. Life on the Edge: Vulnerability and adaptation of African ecosystems to global climate change. *Mitigation and Adaptation Strategies for Global Change* 8 (2):93-113.
- Easterby Smith, M. 1997. Disciplines of organizational learning: Contributions and critiques. *Human Relations* 50 (9):1085-1113.
- Erko, B., G. Medhin, N. Berhe, F. Abebe, T. Gebre-Michael, and S. G. Gundersen. 2002. Epidemiological studies on intestinal schistosomiasis in Wondo Genet, southern Ethiopia. *Ethiopian Medical Journal* 40 (1):29-39.
- European Commission. 1996. Towards a Cognitive Society. Brussels, Belgium: European Commission.
- Foldy, E. G., and D. Creed. 1999. Action learning, fragmentation, and the integration of single-, double-, and triple-loop change. *Journal of Applied Behavioral Science* 35 (2):207-227.
- Foray, D. 2004. *The Economics of Knowledge*. Cambridge, MA: MIT Press.
- Ford, E. 2011. Somalia famine: US pledges a further \$28m in aid. *Guardian*, 21 July 2011.
- Frisk, E., and K. L. Larson. 2011. Educating for Sustainability: Competencies & Practices for Transformative Action. *Journal of Sustainability Education* 2.
- Glasson, G. E., N. Mhango, A. Phiri, and M. Lanier. 2010. Sustainability Science Education in Africa: Negotiating indigenous ways of living with nature in the third space. *International Journal of Science Education* 32 (1):125-141.
- Grey, D., and C. Sadoff. 2005. Water Resources, Growth and Development. In *Prepared for the Panel of Finance Ministers, the UN Commission for Sustainable Development*: World Bank.
- Guatteres, A. 2011. UNHCR chief urges more help for drought-hit Somalis. *Terra Daily*, 8 July 2011.

- Hailu, D., C. Atkinson-Palombo, and M. Gebremichael. 2011. Kick-off Workshop: Ethiopia Insitute for Water Resources. Addis Ababa, Ethiopia: EIWR.
- Hansen, J. A., and M. Lehmann. 2006. Agents of change: universities as development hubs. *Journal of Cleaner Production* 14 (9-11):820-829.
- Hersh, J. 2011. East Africa Famine Threatens Regional Stability, USAID Chief Says *Huffington Post*, 13 July 2011.
- IRIN. 2011. Too soon to blame climate change for drought. 12 July 2011.
- Isaacs, W. N. Taking Flight: Dialogue, Collective Thinking, and Organizational Learning. Cambridge, MA: Center for Organizational Learning, MIT.
- Jury, M. R. 2011. Meteorological scenario of Ethiopian floods in 2006-2007. *Theoretical and Applied Climatology* 104 (1-2):209-219.
- Kimenyi, M. S. 2011. Contribution of Higher Education to Economic Development: A Survey of International Evidence. *Journal of African Economies* 20:III14-III49.
- Kinser, K., and M. Green. 2009. The Power of Partnerships: A Transatlantic Dialogue. Washington, D.C.: American Council on Education.
- Kloos, H. 1985. Water-Resources Development and Schistosomiasis Ecology in the Awash Valley, Ethiopia. *Social Science & Medicine* 20 (6):609-625.
- Knowles, M. 1970. *The modern practice of adult education: An autobiographical journey*. New York, N.Y.: Association Press.
- Koehn, P. H., and M. W. Demment. 2010. Higher Education and Sustainable Development in Africa: Why Partner Transnationally? In *Ministerial Conference on Higher Education in Agriculture in Africa*. Kampala, Uganda.
- Komiyama, H., and K. Takeuchi. 2006. Sustainability science: building a new discipline. *Sustainability Science* 1 (1):1-6.
- Kovats, R. S., D. H. Campbell-Lendrum, A. J. McMichael, A. Woodward, and J. S. Cox. 2001. Early effects of climate change: do they include changes in vector-borne disease? *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences* 356 (1411):1057-1068.
- Leshem, E., Y. Maor, E. Meltzer, M. Assous, and E. Schwartz. 2008. Acute Schistosomiasis Outbreak: Clinical Features and Economic Impact. *Clinical Infectious Diseases* 47 (12):1499-1506.
- Manson, K. 2011. UN Declares famine in rebel-held Somalia. *Financial Times*, 20 July 2011.
- Mattsson, J. O., and A. Rapp. 1991. The Recent Droughts in Western Ethiopia and Sudan in a Climatic Context. *Ambio* 20 (5):172-175.
- Maxwell, D. 2002. Why do famines persist? A brief review of Ethiopia 1999-2000. *Ids Bulletin-Institute of Development Studies* 33 (4):48-+.
- Mouchet, J., S. Manguin, J. Sircoulon, S. Laventure, O. Faye, A. W. Onapa, P. Carnevale, J. Julvez, and D. Fontenille. 1998. Evolution of malaria in Africa for the past 40 years: Impact of climatic and human factors. *Journal of the American Mosquito Control Association* 14 (2):121-130.
- MSF. 2011. No More Delays or Restrictions For Somalis Needing Aid and Refuge. Nairobi, Kenya: Medicins San Frontieres.
- Nielsen, R. 1993. Woolman's 'I am We' triple loop action learning: origin and application in organization ethics. *Journal of Applied Behavioral Science* 29 (1):117-138.
- Nonaka, I. 1994. A Dynamic Theory of Organizational Knowledge Creation. *Organization Science* 5 (1):14-37.

- OECD. 2000. Knowledge Management in the Learning Society. Paris, France: OECD Publishing.
- Pedler, M., J. Burgoyne, and T. Boydell. 1991. *The Learning Company*. London, UK: McGraw Hill.
- Peschl, M. F. 2007. Triple-Loop Learning as Foundation for Profound Change, Individual Cultivation, and Radical Innovation Construction Processes beyond Scientific and Rational Knowledge. *Constructivist Foundations* 2 (2-3):136-145.
- Psacharopoulos, G. 1994. Returns to Investment in Education: A Global Update. *World Development* 22 (9):1325-1343.
- Ramphela, M. 2003. The University as an Actor in Development: New Perspectives and Demands. In *African Higher Education: Implications for Development*, edited by C. R. Doss, R. E. Evanson and N. L. Ruther. New Haven, CT: Yale Center for International and Area Studies.
- Romme, G., and V. Witteloostuijn. 1999. Circular organizing and triple loop learning. *Journal of Organizational Change Management* 12 (5):439-454.
- Rowe, D. 2007. Education for a Sustainable Future. *Science*, 20 July 2007, 323-324.
- Scott, W. 2002. Sustainability and Learning: What role for the curriculum? Bath, UK: Council for Environmental Education in association with the Center for Research in Education and the Environment, University of Bath.
- Segele, Z. T., and P. J. Lamb. 2005. Characterization and variability of Kiremt rainy season over Ethiopia. *Meteorology and Atmospheric Physics* 89 (1-4):153-180.
- Senge, P. 1990. *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York, NY: Doubleday.
- Siopos, Y., B. Battisti, and K. Grimm. 2007. Achieving transformative sustainability learning: Engaging head, hands, and heart. *International Journal of Sustainability in Higher Education* 9 (1):68-86.
- Teferra, D., and P. G. Altbach. 2004. African higher education: Challenges for the 21st century. *Higher Education* 47 (1):21-50.
- Tsoukas, H. 2009. A Dialogical Approach to the Creation of New Knowledge in Organizations. *Organization Science* 20 (6):941-957.
- UNESCO. 2005. Towards Knowledge Societies: UNESCO World Report. Paris: UNESCO.
- UNFCCC. *National Adaptation Programmes of Action (NAPAs)* 2008 [cited 30 December 2011]. Available from <http://unfccc.int/adaptation/napas/items/2679.php>.
- UNICEF. *Key Malaria Facts, Ethiopia* 2011 [cited 30 December 2011]. Available from <http://www.unicef.org/ethiopia/malaria.html>.
- University of Connecticut, 2012, Press Release, "UConn helps to Inaugurate Ethiopian Institute of Water Resources", published 27<sup>th</sup> February 2012.
- UNOCHA. 2011a. East African Drought Humanitarian Report Number 3. New York, NY: UN Office for the Coordination of Humanitarian Affairs (OCHA).
- . 2011b. Eastern Africa: Drought – Humanitarian Snapshot. Addis Ababa, Ethiopia: UN Office for the Coordination of Humanitarian Affairs (OCHA).
- . 2011c. One-third of Somalis Now Displaced. New York, NY: UN Office for the Coordination of Humanitarian Affairs (OCHA).
- UNOCHA, and P. Allen. 2011. Horn of Africa Drought. *Guardian*, 2 August 2011.
- Vela, J. 1994. *Learning to listen, learning to teach: The power of dialogue in educating adults*. San Francisco: Jossey-Bass.

- Verdin, J., C. Funk, G. Senay, and R. Choularton. 2005. Climate science and famine early warning. *Philosophical Transactions of the Royal Society B-Biological Sciences* 360 (1463):2155-2168.
- Wang, C. L., and P. K. Ahmed. 2003. Organisational Learning: A Critical Review. *The Learning Organisation* 10 (1):8-17.
- Welp, M., A. de la Vega-Leinert, S. Stoll-Kleemann, and C. C. Jaeger. 2006. Science-based stakeholder dialogues: Theories and tools. *Global Environmental Change-Human and Policy Dimensions* 16 (2):170-181.
- WHO, and UNICEF. 2006. Meeting the MDG Targets on Drinking Water and Sanitation: The Urban and Rural Challenge of the Decade. Geneva, Switzerland: World Health Organization and UNICEF.
- Wiek, A., L. Withycombe, and C. L. Redman. 2011. Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science* 6 (2):203-218.
- Wooldridge, M. 2011. Horn of Africa tested by severe drought. *BBC News*, 4 July 2011.
- World Bank. 1999. Knowledge for Development, World Development Report. Washington D.C.: World Bank.