BRIEFING DOCUMENT: Benin Program

A multifaceted, collaborative project focused on improvement, protection and management of critical groundwater resources in Benin, West Africa, with emphasis on: (i) enabling the population of Benin to develop sustainable water resources, (ii) development of water management infrastructure in Benin, and (iii) testing of methodologies for use in other developing nations.

BACKGROUND / ACCOMPLISHMENTS:

1997: • **Notre Dame (UND)** invited to become partner in water development in Benin.

1998: • Notre Dame, the **Universite d'Abomey-Calavi** (**UAC**, the national university in Benin) and **Centre Afrika Obota** (**CAO**, an NGO in Benin) form partnership.

1999 • **Student participation** in **groundwater research** initiated.

2000: • First project-based **groundwater well** is drilled in Houmbo, Benin.
• First sampling of **regional groundwater**

2002: • First **Masters thesis** completed at Notre Dame on Benin program

2003: • First summer in which **U.S. undergraduates** assist in field research.
• Dr. Silliman teaches **course on statistics** at UAC to Benin **graduate students**.

2004: • **Dr. Boukari** (UAC) visits UND and contributes to course on groundwater hydrology.
• Population-based, groundwater program initiated in **Adourekomén**, Benin.

2005: • **Drs. Boukari** and Silliman join UND students on Haiti service project.
• UND/UAC students **live in Adourekomén** for 8 weeks for first time.
• **Data recorded by villagers** transferred from Adourekomén to UND and UAC

2006: • Dr. Silliman teaches course in **groundwater modeling** (3rd course overall).
• **Joint (UND / UAC) research-project** initiated on **salt-water intrusion**.
• **Anthropologist** joins UND/UAC students working in Adourekomén.
• **Uranium** research program initiated.

2007: • **Drilling project** initiated with government and NGO partners.
• Village-level **training / monitoring program completed / assessed**.
• **First Ph.D. completed** based on Benin program.

2008: • **Program "badged" as United Nations International Year of Planet Earth Project**
• **Field characterization of swamps and Lake Nokoue** initiated.

2009: • **First phase drilling** program completed – 15 wells installed
• **Second phase drilling** program initiated – 17 well goal.
• **Cotonou Well Protection** program becomes central focus of collaboration.

2010: • **Adourekoman latrine/hygiene effort** advanced through two student trips to Benin / Adourekoman with U.S. / Benin student teams equal partners.
• **Field Characterization:** Electrical resistivity and Geoprobe efforts along coast plus Lake Nokoue.

PROGRAM OBJECTIVES (broadly defined):

A. *Build Infrastructure for Groundwater Resources* Improve infrastructure in Benin related to development, protection, and management of groundwater: this includes drilling wells, improving the capabilities of Benin professionals, educating local populations, developing collaborations among U.S. and Benin students, and pursuing technical/sociological advances.

B. *Leverage Results for Broad Impact* The challenges addressed and techniques utilized in this program are chosen and assessed so as to provide solutions applicable both in Benin and, through publication and/or direct collaboration with other partners, in other regions of the developing world.

C. *Technical / Sociological Strategy* Four strategies are employed: (i) augment technical expertise among Benin professionals and students, (ii) establish baselines on water use, water quality, and development / management practices, (iii) establish technical and sociological capacity within both government agencies and the local villages to monitor/manage water sources, and (iv) build international understanding among both Beninese and U.S. students (K-12 through university level educational efforts) so as to increase understanding and future opportunities for international collaboration.

D. *Student Exposure* Based on the educational mission of the University of Notre Dame, this program is designed to provide undergraduate and graduate students at Notre Dame with opportunities to experience life in Western Africa and to work hand-in-hand with peers from the national university, water professionals, and the local population in Benin.

IMPACT ON UND STUDENTS:

As noted, providing Notre Dame students with an opportunity to experience life (both personal and professional) in Benin is a key objective of this program. As evidence of the impact to date on the Notre Dame students, the following brief quotes are provided:

- *I now realize that technical knowledge must be expressed in way that takes into careful consideration all those involved in order to yield the most beneficial solution. With this comes an understanding that strong leadership in engineering also means encouraging local ownership and responsibility rather than overbearing control.*
- *. . . this project has taught me about leading by example simply through doing. I have spoken with many other students who are amazed that I am working on this project.*
- *I think all of us here have risen to meet them (the challenges of working in Benin) as individuals with ever growing leadership and at the same time, one of the greatest foundations of teamwork I have ever experienced . . . The idea of a socially conscious leader has changed for me; I have seen the beauty and community that has arisen from uncompromised love and generosity in even the most challenging settings.*
- *I feel the experience will leave each one of us with a heightened social consciousness that will guide the paths we take and direct our actions. It will influence not only our priorities and interactions, but how we raise our children.*

FUTURE VISION: The Next Decade

Based on our experience over the past decade, our vision for the future of this program involves extension through a number of avenues. This vision is shared by our sponsors and by the United Nations International Year of Planet Earth initiative. The components of this vision include:

Technology Transfer: Local populations have taken ownership of monitoring water quality in their wells. As a result, DGEau (the government water agency) has expressed interest in leading the expansion of this project to other villages. In support of this initiative, UND and UAC will provide training of DGEau personnel and initial (permanent) equipment necessary for this transfer.

Salt-Water Intrusion: The largest city in Benin (Cotonou) has a water supply that is under threat from salt-water intrusion. Extension of field and modeling efforts by UND and UAC will address this threat through modeling and field studies designed to document current contamination and provide scientific basis for future management of the wells used to supply Cotonou's water.

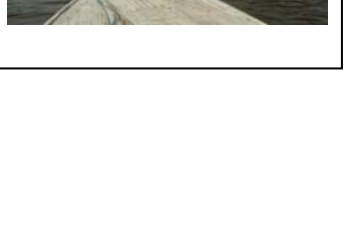
Latrines / Well Protection: In rural Benin, current land-use practices often result in contamination of groundwater. Technical (latrines) / sociological (hygiene training) methods are being developed to address this long-term threat, thus providing a structure with which the population can manage land-use practices to protect their water resource.

Well Drilling: Notre Dame and its partners will pursue the second phase of the drilling effort (in the Mono region). This effort requires detailed technical and sociological preparation of the individual villages to assure adequate local preparation and buy-in. UND, DGEau, CAO, and our partners are taking the lead in advancing these technical and sociological requirements.

Lac Nokoue: Notre Dame is leading a partnership of faculty from the U.S. and Benin in studying the extraordinary and challenging water resource system present in Lac Nokoue, a large lake situated immediately north of Cotonou, Benin. Planned studies include hydrologic, biologic and sociologic assessment of this rich aquatic environment.

K-12 Education: Educational efforts will continue with the goal of developing understanding, mutual respect, and an environmental ethic among primary school students in the U.S. and Benin.

Graduate Program in Groundwater: Experience has shown that UND and its partners bring unique combinations of talents to inform and educate the next generation of water professionals in Western Africa. This has led to the creation of a PhD program, based at UAC, in groundwater hydrology, development and management. This new graduate program provides opportunities to: (i) build broader scientific expertise in this region of the developing world, (ii) provide opportunities to identify the best students from West Africa for further education in U.S. or European graduate programs, (iii) provide opportunities for students from the U.S. to earn a graduate diploma through class and research experiences in Benin, and (iv) establish life-long, international, professional relationships.



Interdisciplinary: The program is collaborating with the Ford Family Program, the Eck Institute, and the Kellogg Institute at Notre Dame to build true interdisciplinary interest in development issues in Benin. Multiple major proposals have been written in support of this effort.