

**Asian Development Bank
Cooperation Fund for the Water Sector
Pilot Demonstration Activity Request Form**

Activity Title: Adaptation and Verification of an Arsenic Mitigation Technology	
Proposer (Name, Div/Dept): Institute of Technology of Cambodia (ITC)	
Request Date: 20 May 2007	
Country: Cambodia	Region: Phnom Penh, Kandal, Preyveng, Kampong Cham
Activity Proposed Start Date: 1 st Feb 2008	Activity Proposed Duration: 11 months
Cost Estimate: US\$ 50,000	
Implementing Organization Contact: Dr. Davin Uy, director of research and development, ITC. Email: davinuy@itc.edu.kh	
Consultant Identified? YES	Consultant Contact: Millie Adam, International Technical Advisor, Centre for Affordable Water and Sanitation Technology (CAWST). Email: madam@kawst.org
ADB Activity Officer – name, position, division, telephone and email	

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Background and Rationale

Arsenic contamination is a significant threat to the drinking water safety in Cambodia, especially in the rural regions where hundreds of thousands of peoples rely primarily on groundwater for their drinking water needs. A recent study commissioned by the Ministry of Rural Development (MRD) and UNICEF to test 16,000+ tube well water for arsenic in 7 central provinces bordering the Mekong and the Bassac rivers (including Kandal, Kampong Cham, Kratie, Kampong Chhnang, Kampong Thom, Prey Veng and peri-urban Phnom Penh provinces) found that an estimated 320,000 people in 1600 villages are at risk. A study by the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) reported arsenic concentration as high as 1.3 mg/L, which is 130 times higher than the WHO recommendation of 0.01 mg/L, is found in the Mekong delta south of Phnom Penh (Buschmann et al., 2007). In late 2006, a knowledge, attitude, and practices (KAP) survey jointly conducted by the MRD, UNICEF and the Institute of Technology of Cambodia (ITC) found several suspected arsenicosis cases in the Kandal province. These cases of skin diseases and cancers were analyzed and confirmed by the Ministry of Health (MoH) to be arsenicosis (MRD and MoH, 2007).

Because arsenic contamination also affects many other countries in the world, including Bangladesh, India, Nepal, and Vietnam, learning from the mistakes in those countries, and adapting successful mitigation techniques from those countries to Cambodian context is a quick and effective strategy to combat the Cambodian arsenic crisis. Examples of such successfully implemented arsenic mitigation solutions include community-level piped water systems, rainwater harvesting, deep wells, switching to safe wells, and household arsenic removal filters (Ahmed et al., 2007).

Of these many different mitigation options, the Kanchan Arsenic Filter (KAF) developed at Massachusetts Institute of Technology (MIT) shows great promise to be suitable to the Cambodian socio-economics context. Developed based on 7 years of extensive inter-disciplinary laboratory and field studies in rural villages of Nepal, this low-cost household-level technology is constructed with simple materials such as gravel and iron nails, and requires neither external energy nor material input for its operation and maintenance. The filter can effectively remove arsenic and microbial contamination, and is highly recommended by the users for its ability to produce clear-looking and good-tasting water. Key stakeholders in Nepal such as UNICEF, UN-Habitat, the World Bank, and the National arsenic steering committee recognize the KAF as one of the best short-term mitigation options in Nepal, and have committed resources to scale-up its deployment. Of the 40,000 households affected by arsenic in the entire country, 7,000 already have filters, and another 5,000 will receive filters within the next 12 months. Furthermore, the KAF is currently being tested in Bangladesh under the Environmental Technology Verification (BETV) process to verify its performance and suitability for Bangladesh. Verification results are expected to be available by the end of 2008 (Ngai et al., 2006, 2007).

Although the KAF is proven to be highly successful in Nepal, it is still important to confirm the KAF performance in Cambodian before widely introducing the filter to the general public. Based on consultation with key stakeholders including the Ministry of Rural Development (MRD), it is agreed that a verification process consists of 3 phases be established to test the performance of the KAF (and potentially other technologies). The 3 phases are laboratory study, field technical research, and pilot demonstration.

The laboratory study phase has been successfully completed in 2006 by ITC with support from Centre for Affordable Water and Sanitation Technology (CAWST) and MIT. An 8-weeks laboratory study showed that the KAF consistently removes over 90% arsenic, total coliforms, and E. coli from arsenic-contaminated groundwater near Phnom Penh (Peang, 2006). Another laboratory study found that the formation of red rust using small nails is crucial to the filter performance (Uy et al., 2006).

The next step is to conduct an 8-months field technical research to evaluate the technical performance and limitations of the KAF under field conditions of rural Cambodia. If the performance is found to be satisfactory, a pilot demonstration project will subsequently be conducted to determine the applicability, long-term acceptability, and actual impact of using KAF in rural Cambodian communities. This proposal seeks funding to support these two sets of activities.

Objectives

There are two main objectives to this proposal. The first objective is to verify the performance and suitability of the KAF as an arsenic mitigation option for Cambodian context. This will be achieved by field technical research and pilot demonstration. A secondary objective is to extract the lessons learned in the KAF verification process to establish a general technology verification procedure, which may be used to evaluate other water treatment technologies in the future.

Institutional Management Arrangement and Qualifications

The project team consists of 4 key partner organizations. They include the Institute of Technology of Cambodia (ITC), Centre for Affordable Water and Sanitation Technology (CAWST), the Ministry of Rural Development (MRD), and Massachusetts Institute of Technology (MIT).

ITC is the top science and engineering university in Cambodia, with strong research capability in the water sector. CAWST is an internationally recognized technical consultant in household-level water treatment technologies for developing countries. MRD is responsible for the provision of water and sanitation services in rural Cambodia where arsenic is found. MIT is one of the paramount research universities in world, with deep experience in the development of rural water treatment technologies (such as the Kanchan Arsenic Filter) in developing countries.

The contact person of these organizations responsible for this project include:

Dr. Davin Uy, Director of Research and Development, ITC
Mr. Tommy Ngai, Research Associate, CAWST
Mr. Chreay Pom, Deputy Director, Department of Rural Health Care, MRD
Ms. Susan Murcott, Senior Lecturer, MIT

The qualification of each of these 4 coordinators is attached at the end of this document.

Project Plan

	<u>Field technical research</u>	<u>Pilot demonstration study</u>
Lead organizations	<ul style="list-style-type: none"> • Institute of Technology of Cambodia (ITC) • Ministry of Rural Development (MRD) 	<ul style="list-style-type: none"> • Ministry of Rural Development (MRD) • Institute of Technology of Cambodia (ITC) •
Support organizations	<ul style="list-style-type: none"> • Provincial Department of Rural Development (PDRD) • Centre for Affordable Water and Sanitation Technology (CAWST) • Massachusetts Institute of Technology (MIT) 	<ul style="list-style-type: none"> • Provincial Department of Rural Development (PDRD) • Centre for Affordable Water and Sanitation Technology (CAWST) • Massachusetts Institute of Technology (MIT)
Time and duration	<ul style="list-style-type: none"> • 8 months, from February 2008 to September 2008 	<ul style="list-style-type: none"> • 6 months, from July 2008 to December 2008
Location of work	<ul style="list-style-type: none"> • One community near Phnom Penh (possibly in Kandal) where water is contaminated by arsenic, and other water quality parameters is representative of general conditions encountered in Cambodia • The community should have good road access, and is cooperative to the research study 	<ul style="list-style-type: none"> • 3 communities where the geology, environment, and water quality are different, but representative of Cambodia. • The communities should be chosen based on the greatest need and demand for household arsenic mitigation technologies. Tentative sites include Kandal, Preyveng, and Kampong Chan • The exact sites will be chosen later, after consultation with MRD and PDRD
Scope of work	<ul style="list-style-type: none"> • 5 different filter configurations, (2 of each, 10 filters in total) will be installed and monitored weekly for 30 weeks to evaluate technical performance 	<ul style="list-style-type: none"> • 20 filters will be installed in each of the 3 communities, and visited monthly for 6 months, to assess technical performance and social acceptance
Description of activities	<ul style="list-style-type: none"> • Based on laboratory research findings, literature review, and discussion with other researchers, 5 different filter configurations have been identified and will be tested in the field. These filters represent different aeration and rusting mechanisms that will shed light into the arsenic removal process suitable for Cambodian context • Filters will be constructed and installed by competently 	<ul style="list-style-type: none"> • The best filter configurations as determined in the field technical research will be installed in each of the 3 communities. • Arsenic awareness raising, health education campaign, and community consultation will be conducted in each of the 3 communities. • Filters will be installed in the homes of people who express

	<p>trained technicians, under the supervision of ITC, CAWST, and MIT.</p> <ul style="list-style-type: none"> • A local villager will be hired to pour 40 L of water into each of the filter daily. ITC and MRD staff will visit the filters weekly to assess the filter performance and to record any problems. Photos will be taken. Water before and after filtration will be collected and brought back to ITC laboratory immediately to be tested. • Water quality parameters to be tested include arsenic, iron, manganese, lead, phosphate, nitrate, turbidity, pH, dissolved oxygen, total coliform, and E coli. Parameters may be reduced if found irrelevant, or added if found necessary. • At this stage, the filtered water is not intended to be consumed by the villagers. • Water quality testing results will be stored in a database, and analyzed to determine the best filter configuration. • Data will be made available to all interested parties for review and comments • A mid-term review meeting will be held to evaluate the research data, modify/adapt the filter to improve its performance, and to revise strategies as needed • A final meeting will be held to evaluate the field research project, to disseminate the findings, and to prepare for next steps 	<p>a demand to get a filter and are willing to contribute by cash or in-kind, as in a demand-responsive model.</p> <ul style="list-style-type: none"> • Filter households will receive instructions on proper operation and maintenance, as well as health and hygiene practices. • Households will use the filter according to their needs, and will drink from the filter. • MRD and ITC staff will visit the filters once a month to inspect the filters, talk to the users, reinforce proper operation and maintenance procedure, and to record any problems. Logs will be kept for each filter visit. • Two in-depth assessments will be conducted - First assessment at 2-3 months after filter installation, second at 4-5 months after installation. The assessment will be consists of technical and social components. • For technical performance, raw and filtered water will be tested at ITC laboratory. Parameters to be tested will be determined from the results of field technical research. Tentatively, the parameters may include arsenic, iron, phosphate, turbidity, pH, and E coli. • For social assessment, interview to users (using a pre-tested questionnaire) and focus group meetings will be conducted to evaluate user acceptance, rate of sustained use, perceived benefits, perceived costs and barriers, proper use, and other relevant factors concerning sustainability • Data will be compiled, analyzed, and made available to interested parties for review and comments • A final meeting will be held to disseminate research findings, and to coordinate the next steps. • Lessons learned in the field research and pilot demonstration studies will be used to prepare a technology verification guidance manual
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Expected outputs	<ul style="list-style-type: none"> • Install 10 filters in a village near Phnom Penh • Prepare a monitoring and evaluation plan • Compile all water quality and testing data into a database accessible to concerned stakeholders • Produce a technical document explaining the research methodology and findings • Prepare meeting minutes, including a list of participants and their comments, for both the start-up meeting and the mid-term review meeting • Disseminate research findings to concerned stakeholders 	<ul style="list-style-type: none"> • Install 60 filters in 3 communities • Training of technicians on filter construction, installation, and maintenance • Prepare a technical monitoring plan • Prepare a social assessment questionnaire • Prepare a project evaluation plan • Monthly filter visit logs • Compile all research data into a database accessible to concerned stakeholders • Prepare a final report summarizing the research activities and outcomes • Produce technical documents (i.e. journal papers) explaining the research methodology and findings • Prepare meeting minutes, including a list of participants and their comments, for both the start-up meeting and the project completion meeting • Prepare a technology verification guidance manual, using the KAF verification process as a “test drive”, explaining how to develop a general verification process for other similar water treatment techniques
Expected outcomes	<ul style="list-style-type: none"> • Optimize a filter design suitable for Cambodia, using sustainable development principles, taking into account local water quality and socio-economics conditions • Build capacity at ITC and MRD on water treatment research, monitoring, and technology verification process • Gain confidence among concerned stakeholders on the filter performance • Increase interest and knowledge in arsenic mitigation among existing and new stakeholders 	<ul style="list-style-type: none"> • Determine the applicability, social acceptance and long-term usage of KAF in 3 different communities representative of Cambodian context • Raise public awareness on arsenic, water and health in 3 communities • Build capacity at ITC and MRD to coordinate arsenic mitigation efforts among key stakeholders • Advance the country’s knowledge and experience on technology verification • Gain confidence among concerned stakeholders on the filter performance • Increase interest and knowledge in arsenic mitigation among existing and new stakeholders

		<ul style="list-style-type: none"> • If the KAF performance is verified, then CAWST will incorporate KAF materials in its regular training activities in Cambodia and in the region, teaching local organizations, private sector, and government on proper construction and installation of the filters
Measurable performance indicators	<ul style="list-style-type: none"> • Number of filters installed • Number of water samples tested • Concentration of contaminants in the water samples • Amount and quality of data compiled in the database • Number of participants in the project start-up meeting and mid-term review meeting • Number and quality of technical research documents 	<ul style="list-style-type: none"> • Number and quality of filters installed • Number of filter users • Number of water samples collected and tested • % of filters meeting Cambodia arsenic guidelines • Number of people received orientation on arsenic, water, health, and filter operation & maintenance • % of filter users satisfied with filter performance • % of households using the filters daily (sustained use) • % of filter users using the filter correctly • Amount and quality of data compiled in the database • Number of participants in the project start-up meeting and final project dissemination meeting • Number and quality of technical research documents • Quality and usefulness of technology verification guidance manual • Up-scaling potential of the filter in different regions of Cambodia and nearby countries • Number of organizations interested to implement the filter
Stakeholder participation: <i>ITC</i>	<ul style="list-style-type: none"> • Overall research management of the project • Keep accounting records according to ADB regulations • Prepare filter monitoring and evaluation plan • Lead water sampling, testing, data compilation, analysis, and report preparation activities • Purchase all necessary water testing supplies • Conduct water testing using standard analytical methods • Compile all data into a database accessible to concerned stakeholders 	<ul style="list-style-type: none"> • Overall co-management of project with MRD • Keep accounting records according to ADB regulations • Prepare a technical monitoring plan • Prepare a social assessment questionnaire • Prepare monthly filter visit forms and logs • Prepare project evaluation plan in collaboration with MRD • Assist MRD to conduct filter installation, follow-up monitoring, data collection and analysis, and project evaluation activities

	<ul style="list-style-type: none"> • Produce technical documents explaining the research methodology and findings • Schedule internal management meetings • Prepare meeting minutes 	<ul style="list-style-type: none"> • Compile all research data into a database accessible to concerned stakeholders • Prepare a final project completion report summarizing research activities and outcome • Produce technical documents (i.e. journal papers) explaining the research methodology and findings
Stakeholder participation: <i>National-level MRD</i>	<ul style="list-style-type: none"> • Communicate and coordinate with other governmental ministries and stakeholders through the monthly watsan meetings and other avenues • Coordinate with ITC to host start-up meeting and mid-term review meeting • Prepare communications materials to explain project progress and outcomes • Collaborate with PDRD to assist ITC to conduct filter installation, monitoring, and troubleshooting • Collaborate with ITC to keep records on technology verification process 	<ul style="list-style-type: none"> • Overall co-management of project with ITC • Communicate and coordinate with other governmental ministries and stakeholders through the monthly watsan meetings and other avenues • Coordinate with ITC to host start-up meeting and final project completion meeting • Schedule internal management meetings • Prepare meeting minutes • Lead community awareness and monthly household follow-up activities, with support from ITC and PDRD • Keep records on technology verification process, and prepare a technology verification manual, with support from ITC and CAWST • Assist ITC to prepare final project completion report
Stakeholder participation: <i>PDRD</i>	<ul style="list-style-type: none"> • Assist national-level MRD and ITC to conduct filter installation, monitoring, and troubleshooting • Assist national-level MRD to provide guidance on field site selection • Facilitate communications with local authorities • Mobilize local resources to support project activities 	<ul style="list-style-type: none"> • Assist national-level MRD to conduct community awareness, follow-up monitoring, and project evaluation activities • Assist national-level MRD to provide guidance on field site selection • Facilitate communications with local authorities • Mobilize local resources to support project activities
Stakeholder participation: <i>CAWST</i>	<ul style="list-style-type: none"> • Liaison between ADB and project partners • Provide technical assistance on filter construction, testing and verification process • Deliver necessary education and specialized training 	<ul style="list-style-type: none"> • Liaison between ADB and project partners • Provide technical assistance on filter construction, testing and verification process • Deliver necessary education and specialized training to

Cost Estimate – Field Technical Research

FIELD RESEARCH	Units	Unit cost	Total
<i>Civil Works</i>			
Construction of 10 filters, including material, tools, labour, transportation, and installation, in-kind contribution	10	0	0
<i>Equipment and Supplies</i>			
Water testing, including arsenic, iron, manganese, lead, phosphate, nitrate, pH, turbidity, total coliform, and E. coli., US\$300 for 10 filters per week for 30 weeks.	30	300	9000
Computer at ITC for data storage and analysis, US\$1200	1	1200	1200
Research report preparation US\$200	1	200	200
<i>Training, Workshops, Seminars, Public Campaigns</i>			
Start-up coordination meeting and workshop, 2hr, 15 participants, including preparation, room, and other logistics, in-kind contribution	1	0	0
Mid-term review meeting, 2hr, 15 participants, US\$200, including preparation, room, and other logistics	1	200	200
<i>Specialists Services</i>			
Traveling cost of CAWST consultant, US\$2500	1	2500	2500
Salary for CAWST consultant, US\$5000 per month for 1 month	1	5000	5000
<i>Project Management</i>			
Coordination and administration by ITC, US\$100 per month for 8 months	8	100	800
Coordination and administration by MRD, US\$100 per month for 8 months	8	100	800
Coordination and administration by CAWST and MIT, in-kind	8	0	0
Salary for ITC research team members, US\$500 per month for 8 months	8	500	4000
Salary for MRD staff members, US\$250 per month for 8 month	8	250	2000
Salary for village helper, US\$50 per month for 8 months	8	50	400
Travel expenses to field research site, ITC, US\$150 per month, 8 months	8	150	1200
Travel expenses to field research site, MRD, US\$150 per month, 8 months	8	150	1200
Total			28500

Cost Estimate – Pilot Demonstration Study

PILOT DEMONSTRATION	Units	Unit cost	Total
<i>Civil Works</i>			
Construction of 60 filters, US\$60 each, including material, tools, labour, transportation, and installation	60	60	3600
<i>Equipment and Supplies</i>			
Water testing, including arsenic, iron, phosphate, turbidity, pH, and E. coli., US\$2500 for 60 filters per round for 2 rounds	2	2500	5000
Social perception questionnaire preparation and pre-test, US\$200	1	200	200
Research reports preparation US\$200	1	200	200
Technology verification process guidance manual preparation, US\$400	1	400	400
Project completion report preparation, US\$200	1	200	200
<i>Training, Workshops, Seminars, Public Campaigns</i>			
Community awareness and education workshops, 4hr, 40 participants per community, US\$300 per community, 3 communities in total	3	300	900
Start-up coordination meeting and workshop, 2 hr, 15 participants, US\$200, including preparation, room, and other logistics	1	200	200
Overall project final meeting, 4 hr, 30 participants (some from PDRD), US\$800, including preparation, room, travel, and other logistics	1	800	800
<i>Specialists Services</i>			
Traveling cost of CAWST consultant, US\$2500	1	2500	2500
Salary for CAWST consultant, US\$5000 per month for 0.5 month	0.5	5000	2500
<i>Project Management</i>			
Coordination and administration by ITC, US\$100 per month for 4 months	4	100	400
Coordination and administration by MRD, US\$100 per month for 4 months	4	100	400
Coordination and administration by CAWST and MIT, in-kind	4	0	0
Salary for ITC staff members, US\$500 per month for 4 months	4	500	2000
Salary for MRD staff members, US\$250 per month for 4 months	4	250	1000
Travel expenses to field research site, ITC, US\$150 per month, 4 months	4	150	600
Travel expenses to field research site, MRD, US\$150 per month, 4 months	4	150	600
Total			21500

Total Budget Requested from ADB = US\$ 28,500 + US\$ 21,500 = US\$ 50,000

Key Features of this Proposal:

Innovativeness

- This project will transfer a successfully researched and implemented arsenic mitigation technology from Nepal to a new country - Cambodia, and to evaluate its applicability to mitigate the Cambodian arsenic crisis.
- The KAF itself is an innovative technology designed by MIT researchers based on sustainable development principles, with strong emphasis on local self-reliant and capacity building.

Replicability (actual)

- This is a comprehensive field research and pilot demonstration project, with broad-based support from government representatives and other stakeholders.

Replicability (potential)

- A well researched and adapted KAF can potentially be applied to serve hundreds of thousand of people affected by arsenic in Cambodia, and probably a lot more in the neighbouring countries

Lessons Learned

- There will be start-up meetings, mid-term review meetings, and project completion meetings to consult with stakeholders, to share lessons learned and to revise/modify strategies.
- A guidance manual on technology verification process will be produced based on lessons learned in the verification of the KAF

Pro-Poor

- The KAF technology is a pro-poor technology because it is manufactured by locally trained technicians using locally available materials. This manufacturing process not only stimulates the local economy, but also builds management and entrepreneurial capacity among locals.

Participatory and Gender Sensitive

- Filters will be installed at households based on a demand-responsive approach. Household owners can choose to obtain filters by their free, informed choice, and will contribute cash or in-kind labour towards the cost of the filters.
- We will invite both men and women villagers to attend the community health awareness campaign, and train both men and women household members on proper filter usage and maintenance.

Operations Support

- Arsenic is recently found in the Tonle Sap region, in which ADB is currently funding a water and sanitation program. This KAF verification project will directly benefit the Tonle Sap region by providing much needed evidence to show the applicability of KAF.

Technically Strong

- This research project will be managed by competent and experienced team members including ITC, CAWST, MIT, and MRD. ITC is the top engineering and science university in Cambodia, with deep research capacity. CAWST is an internationally recognized consultant in household-level water and sanitation technologies promotion. MIT is the original developer of the KAF, and has many years of experience in combining sustainable development principles to rural water supply. MRD is the government agency responsible for rural water supply in Cambodia. Together, this team can effectively manage this project.

Consistent with the ADB Water Policy

- The main theme of ADB's Cambodian Water Policy is poverty reduction. This project directly targets this theme. Access to safe drinking water can reduce the incidence of diseases, lower medical expenses, increase school attendance, improve worker productivity, and encourages social freedom and development.

Contributes to the Millennium Development Goals

- This project directly addresses one of the sub-goals of the MDG – to halve the proportion of the world's population without access to improved water and sanitation.
- In addition, adequate access to water and sanitation services can contribute to a number of other MDG goals, such as poverty alleviation and universal primary education (WHO/UNICEF, 2005).

Conclusions:

This research project is timely and crucial as it can fill two important gaps in the delivery of safe water services in rural Cambodia. At this moment, arsenic is found in Cambodia, but proven mitigation options are lacking. Rather than spending lots of resources and time to “re-invent the wheel”, it is more practical and effective to adapt proven mitigation options from neighbouring countries. In addition, there is a strong demand among technology promoters, government ministries and donors to develop a technology verification process in the country. This project will be an excellent learning opportunity to use the KAF verification process as “test drive”, of which lessons learned will be incorporated into the development of a technology verification guidance manual.

Reference:

Buschmann, J., Berg, M., Stengel, C., Sampson, M.L. (2007) Arsenic and manganese contamination of drinking water resources in Cambodia: coincidence of risk areas with low relief topography. *Environmental Science and Technology* 41(7):2146-2152

Ahmed, M.F., Ahuja, S., Alauddin, M., Hug, S.J., Lloyd, J.R., Pfaff, A., Pichler, T., Saltikov, C., Stute, M., van Geen, A. (2006) Ensuring safe drinking water in Bangladesh. *Science* 314:1687-88. 15 December 2006.

MRD and MoH disseminating reports on Stakeholder meeting on “Dissemination arsenic contamination in groundwater sources and arsenic mitigation and case management of its toxic effect to human”. Phnom Penh, 23 February, 2007.

Ngai, T.K.K., Murcott, S., Shrestha, R.R., Dangol, B., Maharjan, M. (2006) Development and dissemination of Kanchan™ Arsenic Filter in rural Nepal. *Water Science & Technology: Water Supply* 6(3):137–146 © IWA Publishing 2006.

Ngai, T.K.K., Murcott, S., Shrestha, R.R., Dangol, B., Maharjan, M. (2007) Design for Sustainable Development – Household Drinking Water Filter for Arsenic and Pathogen Treatment in Nepal. *Journal of Environmental Science and Health, Part A*. Vol A42 No 12 pp 1-10 © Taylor and Frances Group 2007.

Peang, S. (2006) Arsenic removal from Cambodian ground water using Kanchan Filter. Report. Department of food and chemical engineering, Institute of Technology of Cambodia, Phnom Penh, Cambodia.

Uy, D., Hul, S., In, S. (2006) Test of the oxidation of the iron nails for using in the Kanchan Arsenic Filter. Scientific report. Institute of Technology of Cambodia, Phnom Penh, Cambodia.

WHO/UNICEF (2005) Water for life: making it happen. World Health Organization and United Nations Children’s Fund Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

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Profile:

Research and Development

ACADEMIC QUALIFICATION

- 1999-2003 **PhD.** in Food Industries and Biotechnology. Ecole Nationale Supérieure d'Agronomie et des Industries Alimentaire (ENSAIA), Institut National Polytechnique de Lorraine (INPL), Nancy, France. Degree received in September 2003.
- 1997-1998 **Master** in Food Processing and Biotechnology. ENSAIA, INPL, Nancy, France. Received the top score of thesis defend among the graduates. Degree received in September 1998.
- 1990-1995 **Engineer** in Food and Chemical Engineering. Outstanding student among the graduates. Institute of Technology of Cambodia, Phnom Penh, Cambodia. Degree received in September 1995.

EXPERIENCES

- Jan. 2004 to present **Director** of Research and Development at the Institute of Technology of Cambodia (ITC), Phnom Penh, Cambodia.
- Preparing, coordinating or/and establishing the research collaborations between ITC and the local partners (Enterprises, NGOs and Government Ministries), Regional and International Universities. Ex. projects concerning the water quality "assessment of the property of groundwater for the arsenic household water treatment support by WHO", "assessment of iron nails in Cambodia for preparing the arsenic KANCHAN Filter supported by CAWST" and "removal of E. coli from water by bacteriophage" supported by AUN-Seed/Net, JICA, Japan.
 - **Lecturer** of Biotechnology, Chemistry, Food Technology and Methods of Research.
 - **Reviewer** for Journal of "**Process Biochemistry**".
- Dec. 2002 - Jan. 2004 **Doctorate Post, Nancy, France:** Conducted a research for an European Project (EC n° QLK3-CT-2000-00497-VALPAN) for producing the amino acid Valine and vitamin B5. Participated in the congress "the club of biotechnology (ECRIN)" on "the molecular evolution and combined proteins" in Paris, France and in the European Congress on the amino acid and vitamin productions in Praha, Tcheque.

- 1999-2003 **In the frame of the PhD. course, Nancy, France:** Conducted the research on the physiology and the metabolism of *Corynebacterium glutamicum* for glutamate production: analysis of kinetics and metabolites, enzyme regulation, membrane function and optimization the process for improving the production.
- 1998-1999 **Lecturer** of Biochemistry, Biotechnology, Genetics and Food Quality Assurance. Institute of Technology of Cambodia, Phnom Penh, Cambodia.
 • **Consultant** for “Peanut Butter Craft Enterprise” for improving the qualities of Soya Milk for improving the nutritional and hygienic qualities and for Alcohol Production Factory (SKD), for optimizing the process for reducing the production cost.
- 1997-1998 **In the frame of Master course, Nancy, France:** Studied the courses of Food Processing, Biotechnology, Biochemistry, Microbiology, Molecular Biology, Cell Culture and Production, Unit Operation, Characterization of Recombinant Proteins. Conducted the research on the amino acids production by *Corynebacterium glutamicum* by fermentation.
- 1996-1997 **Lecturer** of Food Process, Food Quality Assurance, Microbiology and Practical Work of Chemistry. Institute of Technology of Cambodia, Phnom Penh, Cambodia. Conducted researches on Mushroom cultivation using rice straw as raw material and on Red Rice Wine production.
- 1995-1996
 • Participated in the training in Food Quality Assurance (HACCP: Hazard Analysis Critical Control Point) and Food Technology at **ENSAIA, INPL, Nancy, France.**
 • Had an internship in Technology of the Fabrication of alcoholic and non-alcoholic drinks at “Institut Français de Brasserie et Malterie (**IFBM), QualTech**”, **Nancy, France** and in fabrication of ice crème (**DANONE**), Chocolate and Coffee (**NESTLE**). **Madrid, Spain.**
- 1990-1995 **In the frame of Engineer:** Studied courses: Quality Assurance, Chemistry, Microbiology, Biochemistry, Food Conservation and Technology. Had a training course for 2 weeks on the analysis the quality of the Feed Products in Proconco, Vietnam.

English and French.

FOREIGN LANGUAGES

Experience in **Word, Excel, PowerPoint** and **KaleidaGraph.**

COMPUTER

Available upon request.

REFERENCES

Publications

Uy, D., Delaunay, S., Germain, P., Engasser, J.M., Goergen, J.L. Dynamics of glutamate synthesis and excretion fluxes in batch and continuous cultures of temperature triggered *Corynebacterium glutamicum*. **Bioprocess Biosyst Eng.** 2005, 27, 153-162.

Stansen, C., **Uy, D.,** Delaunay, E., Lothar, Goergen, J.L., V.F., Wendisch. Characterization of a *Corynebacterium glutamicum* lactate utilization operon induced during temperature triggered glutamate production. **Applied and Environmental Microbiology**, 2005, 71, 5920-5928.

Uy, D., Delaunay, S., Germain, P., Engasser, J.M., Goergen, J.L. Instability of glutamate production by *Corynebacterium glutamicum* 2262 in continuous culture using the temperature-triggered process. **Journal of Biotechnology**, 2003, 104, 173-184.

Leyval D., **Uy D.,** Delaunay S., Goergen J.L., Engasser J.M. Characterisation of the enzyme activities involved in the valine biosynthetic pathway in a valine-producing strain of *Corynebacterium glutamicum*. **Journal of Biotechnology**, 2003, 104, 141-252.

Uy D., Delaunay S., Baucher M.F., Engasser J.M. et Goergen J.L. A method for the determination of pyruvate carboxylase activity during the glutamic acid fermentation with *Corynebacterium glutamicum*. **Journal of Microbiological Methods**, 1999, 39, 91-96.

Delaunay, S., **Uy, D.,** Baucher, M.F., Engasser, J.M., Guyonvarch, A., Goergen, J.L. Importance of phosphoenolpyruvate carboxylase of *Corynebacterium glutamicum* during the temperature triggered glutamic fermentation. **Metabolic Engineering**, 1999, 1, 334-343.

Delaunay, S., Lapujade, P., **Uy, D.,** Oriol E., Mailly E., Engasser, J.M., Goergen J.L. Glutamate production by *Corynebacterium glutamicum*: processes comparison and modeling. 2nd European Congress on Chemical Engineering, Montpellier (France), Octobre 1999. **Récents Progrès en Génie des Procédés**, 1999, 13, 295-302.

Uy, D., Delaunay, S., Germain, P., Engasser, J.M., Goergen, J.L. Metabolisme de *Corynebacterium glutamicum* en réacteur continu à différentes températures. **Récents Progrès en Génies des Procédés**, 2001, 15, 319-326.

Posters and Proceedings

Uy D., In S., Phoeurng S. Systems of Arsenic mitigation in Cambodia. Workshop on technology for removing chemical and biological contaminants from water. **AUN-Seed/Net, JICA, Japan, February, 2007.**

Uy D., Srey M., Phoeurng S. Hassan M.N., Thompson T., Fredericks D. Comparison of the Arsenic concentration in the open-well and tube-well groundwater in Cambodia. Proceeding : **AUN-Seed/Net, JICA, Philippines, 2006.**

Uy D., Srey M., Phoeurng S., Chunhieng T., Hassan M.N., Thompson T., Fredericks D. Assessment of groundwater condition and suitability for household treatment to remove arsenic. Workshop on household water treatment and safe storage, **Siemreap, Cambodia, 10-12 October, 2006.**

Uy D., Srey M., In S., Hul S., Phoeurng S. Situation of the arsenic in the groundwater and the arsenic household treatment. Workshop on Environmental Engineering, **AUN-Seed/Net, JICA, Phnom Penh, Cambodia, November, 22-23, 2006.**

Uy D., Srey M., In S., Hul S., Phoeurng S. Arsenic in groundwater in Cambodia and methods for arsenic mitigation. **Scientific and Engineering Aluminus International Conference, Phnom Penh, Cambodia, December 22-23, 2006.**

Delaunay S., **Uy D.**, Baucher M.F., Engasser J.M., Guyonvarch A., Goergen J.L. Importance of phosphoenolpyruvate carboxylase of *Corynebacterium glutamicum* during the glutamic acid fermentation. **Metabolic Engineering II, Elmaü (Allemagne), October 1998.**

Uy D., Delaunay S., Germain P., Engasser J.M., Goergen J.L. Le rapport (acides gras saturés / acides gras insaturés) comme outil de production de glutamate par *Corynebacterium glutamicum*. **AGORAL (A27), 2001, Massy, France.**

Uy, D., Delaunay, S., Germain, P., Engasser, J.M., Goergen, J.L. Metabolisme de *Corynebacterium glutamicum* en réacteur continu à différentes températures. **GFGP, 2001 Nancy, France.**

Uy D., To K.A., Boudrant J., Guédon E. Delaunay S., Goergen J.L. Etude cinétique de la production de glutamate par *Corynebacterium glutamicum* 2262 sur un milieu à base de manioc. **Séminaire Régional, Tunis, Tunisie, 2006.**

CURRICULUM VITAE
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87 Dalmatian Crescent,
Scarborough, Toronto, Ontario M1C 4W8
CANADA
Tel: +1-416-284-6185
Email: tommy.ngai@alum.mit.edu

Education

Apr06-present **University of Cambridge** Cambridge, England
PhD student, Civil and Environmental Engineering - Sustainable Development
Research area: Applying sustainable development concepts to characterize the dissemination of household-level water treatment systems in developing countries

Sep01-Jun02 **Massachusetts Institute of Technology** Cambridge, USA
Master of Engineering, Civil and Environmental Engineering
Thesis: Arsenic speciation and evaluation of an adsorption media in Rupandehi and Nawalparasi districts of Nepal

Sep97-May01 **University of Toronto** Toronto, Canada
Bachelor of Applied Science, Chemical and Environmental Engineering
Thesis: Improved pumping in hot water flushing groundwater remediation
Senior year project: Arsenic Removal Tech for Groundwater in Bangladesh

Awards

- 2007 Received Mondialogo Engineering Award (Euro 5,000) for arsenic mitigation support in Cambodia
- 2007 Received Thomas Hogg Overseas Fellowship (CAD\$10K) for academic excellence
- 2007 Received awards from the Ford of Britain Trust, Clare Hall College, and Cambridge Trust to support PhD research activities (total about US\$30K)
- 2006 Received Cambridge Commonwealth Trust PhD scholarship (GBP40,000)
- 2006 Finalist in Grainger Challenge for *Kanchan*TM Arsenic Filter (KAF) development
- 2006 2nd prize in St. Andrews Prize for the Environment (US\$10K) for the development and dissemination of the KAF
- 2006 Top ten finalist at 4th World Water Forum Kyoto Water Prize
- 2005 Won the Wall Street Journal's 2005 Technology Innovation Awards Competition Environment Category for the *Kanchan*TM Arsenic Filter design.
- 2005 Awarded US\$70K by the Simavi Foundation, US\$20K at the World Bank Nepal DM Competition, US\$10K at the US Environmental Protection Agency P3 Competition, and US\$6K from the United Nations Habitat program to implement the *Kanchan*TM Arsenic Filter Project Scale-up in Nepal
- 2003 Won the World Bank Development Marketplace Global Competition Award (US\$115K) for the *Kanchan*TM Arsenic Filter design and implementation scheme
- 2002 Won the Lemelson International Technology Award (US\$10K) at the MIT IDEAS Competition for my innovative arsenic and pathogens household-level drinking water filter design (*Kanchan*TM Arsenic Filter).
- 2001 Won the Social Awareness Award and the EWB International Awareness Award (\$1K) at the Ontario Engineering Competition for my arsenic removal design project
- 98-01 Received the Constant temperature control Ltd. scholarship, the Ardagh scholarship, and the Ransom scholarship for ranking 1st out of 70+ Chemical Engineering students in my class
- 1997 Received the Walter Scott Guest memorial scholarship, the Chem. Eng. entrance scholarship and the Governor General's award for academic excellence

Skills

Language: Fluent English and Chinese, some Nepali and Japanese
Computer: MS Excel, Access, various computer programming and modeling programs
Technical: Analytical chemistry lab techniques (e.g. AAS, GC/MS, water testing)
Certification: Engineer-In-Training (USA)

Professional Experience

May 05 – present **Research Associate**
Center for Affordable Water and Sanitation Technology (CAWST) Calgary, Canada

- Performed research to support CAWST's strategic planning and curriculum development
- Prepared technical documents, training modules and tools to disseminate household water treatment and sanitation information
- Traveled to various South Asian countries to support technicians, government officials, community motivators, and health workers on their water and sanitation programs
- Networked with Asian, American, and European research institutions to coordinate water treatment research activities

Sep 02 – May 06 **Lecturer & Research Affiliate**
MIT Department of Civil and Environmental Engineering Cambridge, MA, USA

- Assisted supervision of MIT Master of Engineering students to evaluate water treatment techniques in developing countries using sustainable developing principles
- Supervised 4 Nepali university students to conduct technical research on KAF
- Wrote successful funding proposals to the World Bank, Simavi Foundation, USEPA, World Water Forum, and St. Andrews Prize for the Environment.
- Presented research results in numerous national and international seminars and conferences

Jan 04 – May 06 **Project Manager/ Researcher**
Environment and Public Health Organization (ENPHO) Kathmandu, Nepal

- Managed a team of 10 staff to implement project activities to disseminate KAF in Nepal
- Prepared training and communications materials, and monitoring & evaluation plan.
- Conducted training workshops to teach local entrepreneurs how to build filters
- Negotiated and optimized the filter supply scheme to realize 10% savings
- Coordinated a village micro-financing system to provide filter loans to villagers
- Compiled and analyzed field data to improve project effectiveness

Jan 03 - Oct 03 **Project Engineer**
Sanborn Head & Associates Concord, NH, USA

- Designed a groundwater remediation system including initial concepts, engineering calculations, process drawings, and final equipment specifications
- Setup a computer model to determine necessary groundwater drainage for a proposed landfill
- Assessed health risk to future residents for a contaminated brown-field redevelopment plan
- Conducted indoor air experiments to determine toxins exposure from household products

Public Presentations/ Guest Lecture

Dec 9, 06 Jessore, Bangladesh
“Arsenic Mitigation Development and Implementation in Nepal”
Sustainable Arsenic Mitigation under Integrated Local Government System in Jessore Project -
Special Presentation, hosted by the Japanese International Cooperation Agency and the Bangladesh
Local Government Division.

Nov 30-Dec 1, 06 Kathmandu, Nepal
“Findings on Arsenic Mitigation Technologies Testing and Evaluation in Nepal”
Workshop on the Role of Environmental Performance Verification for Safe Water in Nepal, hosted by the Ontario Centre for Environmental Technology Advancement. Kathmandu, Nepal

Sep 10-14, 06 Beijing, China
“Development and Dissemination of Kanchan™ Arsenic Filter in Rural Nepal”
International Water Association 5th World Water Congress, Beijing, China

May 8-9, 06 St. Andrews, Scotland
“Development and Dissemination of Kanchan™ Arsenic Filter in Rural Nepal”
St. Andrews Prize for the Environment Competition, hosted by the University of St. Andrews

Feb 24, 06 Phnom Penh, Cambodia
“Arsenic Mitigation Options for Development Countries”
Technical Consultative Group Meeting on Arsenic in Cambodia, hosted by the Ministry of Rural Development

May 29-Jun 2, 05 Bangkok, Thailand
“Kanchan™ Arsenic Filter (KAF) – Research and Implementation of an Appropriate Drinking Water Solution for Rural Nepal”
World Health Organization International Network to Promote Household Water Treatment and Safe Storage and 2005 International Symposium on Household Water Management, hosted by the Asian Institute of Technology

Mar 4, 05 Kathmandu, Nepal
“Arsenic Mitigation Options & the Kanchan™ Arsenic Filter Project”
Nepal National Arsenic Steering Committee 3rd monthly meeting special presentation, hosted by the Dept of Water Supply and Sewerage

Jan 25, 05 Kathmandu, Nepal
“Kanchan™ Arsenic Filter – Research, Implementation, and Evaluation”
Geologic Controls of Arsenic Contamination of Groundwater in the Terai Region of Nepal, hosted by the US Geological Survey South Asia Arsenic Project

Nov 22-26, 04 Taiyuan, China
“An Overview of Safe Water Supply Options: Experiences of the MIT Nepal Water Project”
Inter-Regional Conference on Water Quality – Arsenic Mitigation, hosted by UNICEF

Nov 20-21, 04 Yokohama, Japan
“Kanchan™ Arsenic Filter (KAF) – The Development of an Appropriate Drinking Water Solution for Rural Nepal”
The 9th Forum on Arsenic Contamination of Groundwater in Asia, hosted by the Asia Arsenic Network (AAN) & Research Group for Applied Geology (RGAG)

Nov 8-11, 04 Santiago, Chile
“The Implementation of Kanchan™ Arsenic Filter in Rural Nepal”.
International Conference on the Evaluation and Management of Drinking Water Sources Contaminated with Arsenic. Hosted by the University of Chile.

Jul 14-18, 02 San Diego, CA, USA
“Phase I Evaluation of Seven Arsenic Remediation Technologies in Nepal”.
Fifth International Conference on Arsenic Exposure and Health Effects. Hosted by the University of Colorado. San Diego, CA, USA

May 29-31, 02 Manchester, NH, USA

“New Technologies for Arsenic Contaminated Drinking Water Remediation”.

Arsenic in New England: A Multi-Disciplinary Scientific Conference. Hosted by the University of New Hampshire

Publications and Reports

Ngai, T.K.K., Murcott, S., Shrestha, R.R., Dangol, B., Maharjan, M. Design for Sustainable Development – Household Drinking Water Filter for Arsenic and Pathogen Treatment in Nepal. *Journal of Environmental Science and Health, Part A*. Vol A42 No 12 pp1879-1888, 2007.

Ngai, T.K.K., Murcott, S., Shrestha, R.R., Dangol, B., Maharjan, M. Development and Dissemination of *Kanchan*TM Arsenic Filter in Rural Nepal. *Water Science & Technology: Water Supply* Vol 6 No 3 pp 137–146 © IWA Publishing 2006

Ngai, T.; Dangol, B.; Murcott, S.; Shrestha, R.R. *Kanchan*TM Arsenic Filter – A Simple Solution for Arsenic Problem. Massachusetts Institute of Technology (MIT) and Environment and Public Health Organization (ENPHO). Kathmandu, Nepal. ISBN: 99946-34-22-4. First edition. April 2005. Second edition. January 2006.

Ngai, T., Murcott, S., and Shrestha, R. “*Kanchan*TM Arsenic Filter (KAF) – Research and Implementation of an Appropriate Drinking Water Solution for Rural Nepal.” Paper to the 9th Forum on Arsenic Contamination of Groundwater in Asia, Asia Arsenic Network and Research Group of Applied Geology. Japan. November 20-21, 2004.

Ngai, T., Murcott, S., Shrestha, R. “*Kanchan*TM Arsenic Filter (KAF) – Research and Implementation of an Appropriate Drinking Water Solution for Rural Nepal.” Paper to the International Symposium and Workshop on “Technology to Overcome the Pressures of a Changing Earth: In search of a New Intermediate Technology for the Local Community” Kyoto Institute for Eco-sound Social Systems (KIESS), Kyoto, Japan, November 14-16, 2004

Ngai, T.K.K., Murcott, S, Shrestha, R. “*Kanchan*TM Arsenic Filter (KAF) – Research and Implementation of an Appropriate Drinking Water Solution for Rural Nepal.” Paper to the International Conference on the Evaluation and Management of Drinking Water Sources Contaminated with Arsenic. University of Chile, Santiago, Chile, November 8-11, 2004

Ngai, T., Walewijk, S. “Arsenic Biosand Filter Project: Design of an Appropriate Household Drinking Water Filter for Rural Nepal”. Final report to Environment and Public Health Organization and Rural Water Supply and Sanitation Support Programme, Nepal. July 2003

Ngai, T. “Arsenic Speciation and Evaluation of an Adsorption Media in Rupandehi and Nawalparasi Districts of Nepal”. Massachusetts Institute of Technology Master of Engineering Thesis. June 2002

Mr. CHREAY POM

PERSONAL DETAIL

Date of Birth 15 March 1975

Marital Single

Address House # 371, Street 271, Sangkat Teuk Thla, Khan Ruesey Kao, Phnom Penh, Cambodia

Nationality Cambodian

Professional Qualification Master Degree of Rural Development Management: Graduate School, Khon Kaen University, Thailand, 2002

Languages Khmer (Mother Language)
English (6.5 IELTS Academic)
French and Thai (Notional)

Computer Proficiency MS-DOS, Windows and Office 2003, MS Project

Contact Phone : (855)012 897 731
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PROFESSIONAL SKILLS

- ❖ **Programme/Project Management:** Launching trend-setting programmes/project, resources mobilization, partnership building, planning/implementation/monitoring and evaluation of project/programmes in such areas as integrated multi-sectoral development, training and advocacy towards self-reliance and community-based development
- ❖ **Statistical Analysis:** Survey design, data collection, data management and reporting
- ❖ **Social Research:** Planning, conduct and analysis of focus group discussion, in-depth interview and action research
- ❖ **Formulation of Guideline and Strategy:** Formulation of training guideline, strategy on participatory, community-based approach.

ACADEMIC BACKGROUND

2001-2002 Master of Rural Development Management, Graduate School, Khon Kaen University, Thailand

- ❖ Independence Study: The Effectiveness Management of Tambon Administrative Organization on Rural Infrastructure Development in Thailand (Decentralization).

1994-1998 Bachelor Degree of Forestry, Royal University of Agriculture, Faculty of Forestry, Phnom Penh, Cambodia

- ❖ Independence Study: Contribution to the Study of Soil in the Premises of Royal University of Agriculture for Including Tree Plantation

EMPLOYMENT EXPERIENCE

June 2005 – Present Deputy Director, Department of Rural Health Care, Ministry of Rural Development

- ❖ Project management on sanitation improvement
- ❖ Survey on rural water use and sanitation
- ❖ Formulation of guideline, training module, strategy and policy

April, 2003 – May 2005 Head of Research Office, Department of Training and Research, Ministry of Rural Development

- ❖ Conduct a study towards formulating local development process strategy
- ❖ Conduct training to provincial and community

December, 2002 - Present Provincial Project Manager for Northeast Village Development Project, WB, Ministry of Rural Development

- ❖ Supervision of project implementation management, planning, and programming, administrative and logistic support to field teams, community mobilization, training and community education
- ❖ Monitoring and evaluation

January, 1999 – October, 2001 Executive Assistant to the Senior Minister and Minister, Ministry of Rural Development

- ❖ Office management, assisted the minister for policy development, liaising with NGOs,
- ❖ Monitoring and evaluating project/program

January, 1998 – December, 1998 Lecturer of Prek Leap Agricultural School, Ministry of Agriculture, Forestry and Fishery

- ❖ Developed a curriculum and delivered lecture, cooperated with NGOs

TRAINING/ WORKSHOP/CONFERENCE/FORUM

India	ECOSAN
Thailand	World Toilet Forum
Pakistan	SACOSAN
Sweden	ECOSAN
Vietnam	UNICEF, Water, Environment and Sanitation study visit
February, 2004 – April, 2004	Zero-Emission Type Agriculture & Environmental System for Rural Area, Hokkaido, Japan
June, 2001 – September, 2001	Professional Proposal Writing Australian Center for Education, Phnom Penh, Cambodia
April, 2001 – June, 2002	IELTS Preparation Course, Australian Center for Education, Phnom Penh, Cambodia

January, 2001 – March, 2001	Advance English Course, Australian Center for Education, Phnom Penh, Cambodia
January, 2001 – February, 2001	Intensive Preparation for IELTS, Australian Center for Education, Phnom Penh, Cambodia
January, 2000 – June, 2000	English for Academic Purposes, Australian Center for Education, Phnom Penh, Cambodia
December, 2000	Management of Project Implementation, VBNK
September, 1998 – November, 1998	Tropical Dendrology and Methods of Plant Inventory, Royal University of Agriculture

RESEARCH WORKS

1. Arsenic: A survey of Knowledge, Attitudes, and Practices (KAP) in the Seven High Risk Provinces, Cambodia (English and Khmer)
2. The Effectiveness Management of Tambon Administrative Organization on Rural Infrastructure Development in Thailand, Decentralization. (English).
3. Contribution to the study of Soil in the Premises of Royal University of Agriculture for Including Tree Plantation. (in Khmer)
4. A Survey of Knowledge, Attitudes, and Practices (KAP) in the Seven High Risk Provinces

SUSAN MURCOTT

Senior Lecturer, Department of Civil and Environmental Engineering
Massachusetts Institute of Technology

murcott@mit.edu

Education	Massachusetts Institute of Technology S.M. Civil and Environmental Engineering B.S. Civil and Environmental Engineering Wellesley College B.A. English Literature	Cambridge, MA 1992 1990 1987																			
Areas of Specialization	* Expert in water and sanitation in developing countries * Household Drinking Water Treatment and Safe Storage – among the founders with 10 years experience in 8 developing countries – Asia, Africa, Latin America * 12 years practice in innovative wastewater treatment for megacities in developing countries – Brazil, China, Eastern Europe, Mexico * 15 years experience setting up field laboratories in developing countries * Design and sustainable development of engineering systems - teaching																				
Professional Experience	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td data-bbox="475 779 1133 905"> Massachusetts Institute of Technology <ul style="list-style-type: none"> • Teaching (see courses taught below). • Principal investigator of two ongoing HWTS projects in Nepal and Ghana </td> <td data-bbox="1141 779 1385 905" style="text-align: right; vertical-align: top;"> 1992-present </td> </tr> <tr> <td data-bbox="475 915 1133 1283"> Massachusetts Institute of Technology <ul style="list-style-type: none"> • Supervising and mentoring of Master of Engineering team and thesis projects on water and sanitation in developing countries, with major focus on household drinking water treatment and safe storage (HWTS). • Thesis projects: Nepal Water Project, (1999-2007); Ghana – Pure Home Water Project (2005-2007); Kenya Water Project (2004-2005); Dominican Republic and Peru (2003-2004); Nicaragua Potters for Peace Ceramic Water Filter Project (2002-2003); Haiti Household Water Treatment Project (2000 – 2001); Waterwater Treatment in Alfenas, Minas Gerais, Brazil (2001-2002); Wastewater Lagoons in Riviera de Sao Lourenco, Brasil (1999 – 2000); Wastewater Lagoons in Tatui, Brasil (1998-1999) ; Wastewater Treatment in Nigeria (1997 – 1998). </td> <td data-bbox="1141 915 1385 1283" style="text-align: right; vertical-align: top;"> 1997-present </td> </tr> <tr> <td colspan="2" data-bbox="475 1293 1133 1451"> Subjects taught at MIT: <ul style="list-style-type: none"> • Water and Sanitation Infrastructure in Developing Countries – graduate (11.479J/1.851J) • DLab III: Disseminating Innovations for the Common Good–undergraduate (SP 723) </td> <td data-bbox="1141 1293 1385 1451"></td> </tr> <tr> <td colspan="2" data-bbox="475 1461 1133 1514"> Subjects taught at Tufts University <ul style="list-style-type: none"> • Water and Sanitation Infrastructure in Developing Countries.” (0298-14) </td> <td data-bbox="1141 1461 1385 1514" style="text-align: right; vertical-align: top;"> Medford, MA </td> </tr> <tr> <td colspan="2" data-bbox="475 1524 1133 1650"> Subjects taught at Cambridge University <ul style="list-style-type: none"> • Design for Developing Countries (SP.753)(2003-2006) • Sustainable Development for Large Infrastructure Projects” (ESD E30) (2002-2006) </td> <td data-bbox="1141 1524 1385 1650" style="text-align: right; vertical-align: top;"> Cambridge, UK </td> </tr> <tr> <td colspan="2" data-bbox="475 1661 1133 1839"> Ecosystems Engineering Principal <ul style="list-style-type: none"> • This consulting company specializes in drinking water and municipal and industrial wastewater projects with emphasis on the use of sustainable, innovative and cost-effective technologies. • Field work in 20 developing and transition economy countries. </td> <td data-bbox="1141 1661 1385 1839" style="text-align: right; vertical-align: top;"> Marblehead, MA 1992-present </td> </tr> <tr> <td colspan="3" data-bbox="475 1850 1385 1896"> Arsenic in Drinking Water Remediation Conrad N. Hilton Foundation </td> </tr> </table>		Massachusetts Institute of Technology <ul style="list-style-type: none"> • Teaching (see courses taught below). • Principal investigator of two ongoing HWTS projects in Nepal and Ghana 	1992-present	Massachusetts Institute of Technology <ul style="list-style-type: none"> • Supervising and mentoring of Master of Engineering team and thesis projects on water and sanitation in developing countries, with major focus on household drinking water treatment and safe storage (HWTS). • Thesis projects: Nepal Water Project, (1999-2007); Ghana – Pure Home Water Project (2005-2007); Kenya Water Project (2004-2005); Dominican Republic and Peru (2003-2004); Nicaragua Potters for Peace Ceramic Water Filter Project (2002-2003); Haiti Household Water Treatment Project (2000 – 2001); Waterwater Treatment in Alfenas, Minas Gerais, Brazil (2001-2002); Wastewater Lagoons in Riviera de Sao Lourenco, Brasil (1999 – 2000); Wastewater Lagoons in Tatui, Brasil (1998-1999) ; Wastewater Treatment in Nigeria (1997 – 1998). 	1997-present	Subjects taught at MIT: <ul style="list-style-type: none"> • Water and Sanitation Infrastructure in Developing Countries – graduate (11.479J/1.851J) • DLab III: Disseminating Innovations for the Common Good–undergraduate (SP 723) 			Subjects taught at Tufts University <ul style="list-style-type: none"> • Water and Sanitation Infrastructure in Developing Countries.” (0298-14) 		Medford, MA	Subjects taught at Cambridge University <ul style="list-style-type: none"> • Design for Developing Countries (SP.753)(2003-2006) • Sustainable Development for Large Infrastructure Projects” (ESD E30) (2002-2006) 		Cambridge, UK	Ecosystems Engineering Principal <ul style="list-style-type: none"> • This consulting company specializes in drinking water and municipal and industrial wastewater projects with emphasis on the use of sustainable, innovative and cost-effective technologies. • Field work in 20 developing and transition economy countries. 		Marblehead, MA 1992-present	Arsenic in Drinking Water Remediation Conrad N. Hilton Foundation		
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Arsenic in Drinking Water Remediation Conrad N. Hilton Foundation																					

	<p>Consultant Aug 05-Jun 06</p> <ul style="list-style-type: none"> • Adviser on the global arsenic crisis, detailing opportunities for investment in NGOs and other organizations implementing solutions. <p>World Health Organization Co-Chair – Implementation Working Group International Network to Promote HWTS 2003 – present</p> <ul style="list-style-type: none"> • This public-private partnership, hosted by WHO, is a 5-year effort (2003-2008) to expand the influence of HWTS to help achieve the Millennium Development Goal of reducing by half the proportion of people in the world who lack access to drinking water.
<p>Representative Publication</p>	<p>Murcott, S. <i>Implementation, Critical Factors and Challenges to Scale-Up of Household Drinking Water Treatment and Safe Storage Systems</i>. Background Paper on HWTS for the Electronic Conference May 12 – 23, 2006 Hosted by US AID / Hygiene Improvement Project (HIP) http://hip.watsan.net</p>
<p>Honors and Awards</p>	<ul style="list-style-type: none"> • St. Andrews Prize for the Environment – 2nd Prize (May, 2006), Edinburgh, Scotland • Top Ten Finalist - Kyoto Prize – 4th World Water Forum – (2006), Mexico City • Wall Street Journal – Technology Innovation Award (Environment)(2005), N.Y., N.Y. • Winner - World Bank Nepal Development Marketplace Prize (2005) Kathmandu, Nepal for the KanchanTMArsenic Filter • Winner - World Bank Development Marketplace Prize (2003), Washington DC for the KanchanTMArsenic Filter • CEE Award for Outstanding Service to M.Eng Program (2003), MIT, Cambridge, MA. • Salzburg Seminar Fellow (1994, 1999), Salzburg, Austria • U.S. Patent No. 5,543,056 (August 6, 1996), Washington D.C • Peccei Award (1993), IIASA • The Dean A. Horn Award for Excellence in Marine Research - Sea Grant (1989), MIT, Cambridge, MA.