



Name of the author: Carla Sydney Stone

Company: International Development & Technical Assistance, LLC
Address: P. O. Box 7696
Postcode/Town: Newark, DE 19711
Country: USA
Email: carla.s.stone@comcast.net



Name of the author: Jill L. Elkins

Company: Management & Training Corporation
Address: 500 N. Marketplace Dr.
Postcode/Town: Centerville, UT 84014
Country: USA
Email: jill.elkins@mtctrains.com

SHARING THE WATER, SHARING THE RESPONSIBILITY: REDUCING COSTS THROUGH REGIONAL STANDARDIZED EMPLOYEE CERTIFICATION AND TRAINING

ABSTRACT

ACWUA members share a variety of waterways from small aquifers or streams located between two countries to oceans bordering over a dozen countries. The World Bank estimates that Transboundary basin management is required for 60 percent of the region's water flowing across international borders.¹ During the next 10 years, ACWUA countries, investors, and donors will spend billions of dollars to construct water and sanitation infrastructure. Much of this money will be wasted if facilities are not operated and maintained properly. This is an environmental and water supply problem for the country where poor performance occurs. Pollution into common waterways or excessive draw downs from shared aquifers also results in higher costs to a neighboring country. Trained water / wastewater operators are key to the successful delivery of water and sanitation. A multilateral, cooperative plan for the training of these operators is the single most cost effective mechanism for ensuring that each ACWUA country is a partner, not a polluter. This paper will demonstrate how the US regulation of operator certification and training has resulted in significant cost savings and improvements in the environment.² It will build on ACWUA's previous work on operation and maintenance,³ and show how incorporating MTC's training design principles⁴, dramatically increases the chances that investments in training will result in improved performance and cost savings.

SHARED WATER

The Middle East and North Africa (MENA) is the world's most arid region and calculations are that that by 2050, the region's per capita water availability will decline by half.⁵ The World Bank also estimates that Transboundary basin management is required for 60 percent of the region's already scarce water flowing across international borders. Examples of shared water in the MENA region include the Arabian Gulf; Euphrates-Tigris basin; the Mediterranean basin; the Red Sea, Dead Sea and Jordan River basin; North Western Sahara Aquifer System; and the Nile River basin. The water environment is characterized by competing and intersecting interests. Each one of these watersheds has a unique set of geological, demographic, economic and political characteristics that affect how these waters are utilized and shared. Just as policymakers need to regard the waters entering and leaving their countries as part of a regional subsystem, so must they see the citizens of countries next to their borders as stakeholders to their water resources. Their contribution to regional urbanization or industrial development places additional pressure on the quality and supply of coastal waters and shared aquifers. These additional stakeholders have the ability to affect the sustainability of the country's water environment.

Arguments over water have been taking place in the Middle East as long as people have lived in the region. For just as long, many countries have worked closely to share the allocation of scarce water resources. The first known international water treaty dates to 2,500 BCE when the two Mesopotamian city-states of Lagash and Umma wrote an agreement ending a water dispute along the Tigris River.⁶ They understood that any impairment of a shared water resource by one country affects all other countries that share this resource.⁷ As early as 1970 BCE, the Code of Hammurabi⁸ listed a number of laws pertaining to the responsibilities of the owners of irrigation and dams. One might even say that he was the first advocate for preventive maintenance and operation training standards in the water and sanitation sector.

Fragmented water and sanitation operational standards and enforcement policies and the lack of international treaties impede the ability of all countries in the region to benefit equally from the tremendous water and sanitation expertise in the region. Even where international treaties have been signed, in the case of transboundary conflicts over water, international laws and conventions are not enforceable unless the treaty has been ratified by the countries who are indeed signatories to the agreement. For example, the Convention on the Law of the Non-Navigational Uses of International Watercourses was adopted by the General Assembly of the United Nations in 1997 yet is still not in force.⁹

Although the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes has 26 signatories and 38 parties, and has been in force since 1996, even this convention does not specifically recognize the crucial role of personnel in the operation of water and sanitation infrastructure, nor does it establish standards for training.¹⁰ Former Russian President Mikhail Gorbachev says...it is the lack of suitable international legal framework for resolving the global water crisis that presents such a huge stumbling block to the solution of this problem.¹¹ It is up to the members of the Arab Countries Water Utilities Association to lead the rest of the world in developing a requirement for the training and certification of operators to set the foundation for sustainability of the region's water environment.

FUNDING WATER AND SANITATION SERVICES

The sum of money being directed into water and sanitation improvements by major international financing institutions and donors is staggering. For example, the current active World Bank water and sanitation services portfolio is \$10.7 billion (60 percent for water supply and 40 percent for

sanitation).¹² In fiscal 2009, the United States Government spent \$774 million on water and sanitation assistance to 62 countries, of which \$191 million, or 32% was delivered to countries in the Middle East.¹³ In 2006, The Asian Development Bank (ADB) commenced the Water Financing Program (WFP) to double investments in the sector by 2010. The WFP committed to devoting 25% of ADB's investment portfolio (\$9.93 billion in 2010¹⁴) to water projects.¹⁵ In the year 2008-2009, the Kuwait Fund for Arab Economic Development advanced new loans of \$ 44.7 million for water supply and sewerage projects (6.57% of disbursements). (p.21) Over the years, The Kuwait Fund has loaned over \$1.390 billion for this sector, or 9.6% of its total loan portfolio. (page 72).¹⁶

Water and sanitation financing needs to compete with other programs such as improving maternal health, reducing child mortality, combating malaria and tuberculosis, or increasing literacy. At the same time, the lack of water and sanitation is, in itself, the major cause of much of each of these problems. The supply of energy and water services is also interwoven. Energy is essential to the supply of drinking water and irrigation because electricity is needed to operate wells and run water treatment plants, pump stations, and other parts of the water distribution system for use by customers. Conversely, water is also needed to generate and supply electricity and other forms of energy. While we are familiar with the large cooling towers associated with conventional coal or oil fired electricity generation, water also is used for alternative electricity sources such as hydropower. Thus increasing improvements in the operation of power plants and water treatment plants reduces the environmental impact of both water treatment and power generation.

Building additional physical infrastructure without equal attention to building the human infrastructure necessary to operate and maintain them is a recipe for waste. In Lebanon, the media reported recently¹⁷ that government built plants financed by European Investment Bank lie idle due to “high operating costs, insufficient support infrastructure and a lack of awareness”. Additional plants built by USAID, NGOs and private businesses do not function due to “rising maintenance costs and the reduced capability of municipalities to meet these demands”.¹⁸

The Asian Development Bank recommends: “The most cost-effective and sustainable way to meet burgeoning clean water needs, especially for those who do not have access to the same, is to maximize the capacity of existing water supply infrastructure by increasing efficiency rather than encouraging new construction. Making water supply systems more efficient can also help control costs, improve service delivery, and expand access without incurring prohibitive costs”.¹⁹

To meet these needs, especially in the near future, MENA nations should require operator (worker or technician) training and certification. This is crucial as the operators are the people who are directly responsible for the operation of a water treatment plant, distribution system or wastewater treatment plant. Trained operators perform the actual “hands on” work in the plant, not the engineers. This is especially important since the water and sanitation sector is facing a shortage of engineers.²⁰

The question can be asked: Why Should ACWUA work to have the member countries pass legislation requiring training and certification? Regulations perform five important functions.²¹

- They provide consistency in face of political and economic change - This protects operators and the public from political pressure. This is especially important during times of economic constraints when it can be tempting to cut costs, even if doing so would result in a risk to public health.

- Regulations require compliance and penalize non-compliance- Penalties such as fines or loss of operating permits are power incentives for compliance with environmental regulations.
- Regulations give direction to the industry - They construct a framework within which managers, operators and those who provide training may function.
- Standardized protocols assure that all plants operate at the same standard of care – Plants located in different jurisdictions are required to follow the same practices.
- Regulations set personnel competency standards - Clear, measurable operator or plant competency standards allow little room for error.

Simply replacing broken plants is not a sustainable solution. Rather, countries will need to develop a systematic approach to water and sanitation supply services that links good governance, technical competence and human capacity building. They will need to mediate among competing agricultural, industrial and domestic interests for water and sanitation while developing a regulatory regime to enforce standards of good practice and encourage regional cooperation.

WATER AND SANITATION OPERATOR TRAINING: ENVIRONMENTAL IMPROVEMENT IN DELAWARE, USA

The State of Delaware was one of the last states in the entire country to open an environmental training center – and it showed. The state had difficulty meeting the requirements of the US Clean Water Act. Municipalities and industrial companies committed numerous violations of water discharge permits. A study conducted by Delaware’s largest newspaper, The News Journal, uncovered 1,892 violations in the 18 months between January, 1994 and June 30, 1996.²²

Operator training and certification works.

Delaware Technical & Community College seized the opportunity to provide training services with the help of Delaware Department of Natural Resources and Environmental Control and other agencies. Delaware Tech received \$497,000 from the United States Environmental Protection Agency through Delaware’s Department of Natural Resources Water Quality Division to help establish an Environmental Training Center. This money was used to reconstruct and rebuild the College’s Industrial Training and Education Building in Georgetown, Delaware. Jerry Williams, the Center chairman worked with state and federal agencies, private companies and public utilities, legislators and regulators to develop training programs applicable to plant operators. Delaware’s Environmental Training Center offering wastewater operator training opened in 1996. By 1998, companies, and municipalities with discharge permits had reduced their violations by 90%. During this time period, only 172 violations were incurred.²³

Today, the Environmental Training Center has a budget well in excess of one million dollars derived from tuition and contracts for services, and attracts operators from the region. This program has grown from a small certification program, to include certification, continuing education, recertification and a college degree granting curriculum. The Environmental Training Center has trained over 22,000 water and wastewater operators in the US and internationally.²⁴ Delaware has since held a seven year record: no significant water or wastewater incidents. Improvements continued In 2007, US Environmental Protection Agency awarded one of the major municipal treatment plants in Delaware, the 1st place award in the Large Advanced Treatment Plants category of the Clean Water Act Recognition Award for Operations and Maintenance Excellence and in 2008 the EPA's Region III first Environmental Achievement award for governmental agencies.

Experience in Delaware shows that water and wastewater operator training, subsequent certification by the State’s environmental agency, and certification requirements for increased training results in:

- decreased equipment downtime;
- fewer discharges;
- fewer regulatory infractions, or fines;
- less frequent equipment replacement.

This translates into decreased costs and increased reliability of service. Operator certification also improves worker professionalism and pride, while creating opportunities for workers to advance in their chosen career and to receive salary increases. This is education for sustainable development.

ACWUA' S ROLE

In 2008, The Arab Countries Water Utilities Association presented its first Standards of Operation and Maintenance Conference in the Arab Region. At this conference, Eng. Khaldoun Al Khashman the Secretary General of the Ministry of Water and Irrigation emphasized that Standards of Operation and Maintenance of water and wastewater systems are “essential in improving the efficiency and effectiveness of the water utility operations which:

- include clear instructions and guidance on what is required to be done, when and why;
- act as risk management measures which will reflect positively on delivering the service to consumers;
- act as a base for job descriptions, and set training guidelines. Accordingly, the efficiency and skills of the operating workers will improve.”²⁵

ACWUA’s mission includes the “collaboration with municipalities, city councils and water authorities, as well as non-governmental and community-based organizations on both the national and international levels, and the promotion certification and accreditation among water and wastewater professionals and utilities respectively”.²⁶

The Strategic Action Plan for the Rehabilitation and Protection of the Black Sea is a model for the development of a regional system in the Middle East. The Strategic Plan outlines an ambitious program for the regulation of point sources. Section 35 requires signatories to undertake action in the following areas:

- Harmonization of water quality objectives based on water uses (drinking water, bathing water, aquaculture, ports etc.
- Harmonization of procedures used for monitoring the actual discharge of effluent at point sources.
- Adoption and implementation in accordance with its own legal system, the laws and mechanisms required for regulating discharges from point sources using licensing and the polluter pays principle.
- Adoption and implementation in accordance with its own legal system, efficient enforcement mechanisms.
- Ensure that the national agencies responsible for licensing, monitoring and enforcement are adequately staffed and that the necessary resources are available to them. Where necessary, *training courses at local agencies will be organized.*
- Introduction of policies whereby polluter pays for compliance, including encouraging the use of environmentally friendly production processes or other innovative processes which reduce inputs of pollutants.²⁷

ACWUA's leadership in the regional certification and training of water and sanitation operators will be critical to establishing a multi-water basin system of standards that will remove uncertainty and provide stability for utilities, personnel, financing authorities, international donors, and equipment manufacturers. The citizens of these countries will know that they have the assurance of reliable sources of clean water and sanitation services, no matter where they travel within the region.

EFFECTIVE TRAINING FOR SUSTAINABILITY: MANAGEMENT & TRAINING CORPORATION (MTC)

Billions of dollars are invested annually in training in the context of global development programs.²⁸ The World Bank estimates that, through its client governments, it alone finances training at an annual average of US\$720 million.²⁹ Bilateral donors add money for training to this base, and, especially in middle and upper income countries, corporations and governments, using their own budgets, fund training. Just as water and sanitation infrastructure requires well trained operators to maintain and run these facilities, so does training require well designed programs delivered by qualified providers. The key to economic security in the 21st century is preparation that ensures workers are ready for new jobs, new skill requirements, and continuous learning.

Appropriate Training Framework

MTC has studied and assisted in the design and implementation of Technical and Vocational Educational and Training Systems (TVET) in multiple countries including, Jordan, the West Bank, Iraq, Tunisia, Southern Sudan, Mongolia, Indonesia and China.³⁰ MTC's findings apply to the development of a Middle East regional certification and training system for operators. MTC's approach can be used by ACWUA members to develop a framework that meets the following requirements:

- **Relevant**- training that meets the needs of the labor market and their employers (i.e., demand driven). In the case of the water and sanitation sector, the training must recognize that it must prepare operators to work in a regional water environment with the possibility that they may seek jobs in neighboring countries. The ultimate goal of the training is to prepare participants for work as licensed operators who can work in any country throughout the region.
- **Flexible** – a structural ability of the training system to adapt quickly to changing circumstances and market needs, including technology developments, skills obsolescence, international conventions and agreements, regulations, and social conditions.
- **Effective and efficient** – monitoring of training outputs especially in terms of quality and adherence to the international standards is needed. Comprehensive and continuous teacher training and curricula development is included with practical application of workshop exercises in the field at industry locations.
- **Accessible** – training must be available to the diverse population that lives in the region. Alternate training locations and delivery methods (at the treatment facility, in a training center, or on-line) must be available to reach potential students.
- **Sustainable** – financially secure and technically competent through linkages to the government regulators, certification bodies, academic institutions, professional organizations, NGOs, and industry it serves.

Who should provide the training?

Non Government Organizations (NGOs) or institutions, such as ACWUA utilizing the expertise of specialized training providers such as MTC should provide the operator training, not the equipment vendors. Although equipment vendors do provide initial training, they provide training only for

their particular equipment, not the total system. The NGOs, not bound by marketing constraints, serve a larger constituency. They are able to provide training for a wide range of systems supplied by a variety of vendors. This caution does not apply to the major multidisciplinary engineering firms, especially those headquartered in an ACWUA member country with deep ties to countries throughout the Middle East. Particularly valuable are those firms that are able to provide integrated solutions to the problems of water supply and sewerage, energy efficiency and power supply.

NGO training guarantees operator training program sustainability. As operators leave their jobs over the course of several years, either because of retirement or career changes, their replacements will need to be trained. Vendors may not be available to supply the training because their training contracts have expired; they have left the market; the equipment they are currently manufacturing does not match the original specifications of that sold some years before; or training does not provide enough, if any, income for the company. Operator training should never be subject to the vagaries of market conditions.

Linking Training, Certificates, and Jobs

In a rapidly changing world, certificates are an effective way to link employers, government regulators and educators with operators to communicate about skill needs, training, and opportunities, particularly in high-growth occupations.³¹ These will be especially valuable as the Middle East builds or renovates large numbers of water and sanitation plants and when faced with staffing them with qualified employees.

Quality Training: Understanding the Context

Effective training requires an understanding of the context that gives rise to the perceived need for training and in which training will be deployed. There are many benefits of a trained workforce in a water or wastewater facility. Operations personnel who understand the technology involved throughout a facility will perform their work confidently and with a higher degree of competency. Certified career operators with a career path in an industry are more committed to the job. Most importantly, trained personnel are better able to recognize changing conditions, take corrective action, and reduce non-compliance and the possibility of fines. The water or wastewater facility benefits from trained personnel. Properly operated and maintained equipment suffers less downtime for repair, saving money. Properly operated and maintained equipment has a longer operational longevity. It does not need to be replaced as often, saving money. Finally, trained personnel reduce non-compliance frequency and thus reduce potential fines, saving money. Once all ACWUA member countries provide operator training and certification, there will be no incentive for any one country to pollute. Indeed, in the United States, some states compete to be thought of as the most “environmentally friendly” state in a region. However, training is the appropriate response only to gaps in skills and knowledge implicated in job or organizational performance. If the performance problem stems from other causes, training will not touch the problem.³² Successful operator training takes into account the organizational and external factors that affect job performance and plan for them accordingly.

The MTC Training Design Model³³

Good training must be comprehensively designed with participation of stakeholders, including the beneficiaries and local staff.

- Specify training objectives and arrangements to measure whether they are met
- Assess training needs
- Specify the criteria for selecting participants
- Develop the curricula, pedagogy and training materials
- Select delivery mode, deliver training and measure outcomes

- Arrange follow up to the training

Training Objectives. Workforce training is expected to improve the performance of individuals or groups to meet specific work objectives. Accountability for training starts with the clear specification of the training objectives and decisions about how and when to measure the outcomes.

Assess Training Needs. Training is only effective when it addresses the specific needs and circumstances of target individuals or organizations. One of the primary reasons that training fails is that training content does not properly address those gaps in skills and knowledge that compromise individual or organizational performance. The skills needed to perform a job may be misidentified—for example, when they reflect what vocational teachers know how to teach, not employers' skill needs. Or the skills and knowledge possessed by job candidates or staff may be inadequately assessed. Unfortunately, the training arms of international donors do not systematically conduct training needs assessments, often because those financing the training do not pay for assessments.

Select Participants. For training to contribute to development objectives, it has to involve the right people, and the right combination of people, in any given classroom. Training participants are more likely to be selected in a highly targeted way when the training is embedded in a project or program. Usually trainees should have similar levels of experience and expertise in order to facilitate learning. If ACWUA and the relevant government agencies and certification board determine that all operational personnel will be required to attend and pass certification training, with engineers and supervisors continuing on to higher levels of training, then classes should be scheduled so that foremen and engineers do not attend the same section with employees they supervise.

Develop Curricula, Pedagogy, and Materials. There is not a single “best” way to design a training course. The curriculum and learning methods have to be matched to the objectives of the training and the characteristics of the participants. For operator training, the most successful programs are those that employ repetition of material through pre-tests, reading assignments, homework exercises, quizzes, in-class problem solving, lecture, field trips and multimedia. Individual and group exercises combined with the assortment of learning methods allow the participants, as well as the instructor, to monitor learning progress and make corrections when necessary.

Delivery Mode. Can the content be covered using e-learning or distance learning, or is face-to-face, classroom-based learning necessary? Collecting participants in a central location for face-to-face training is usually expensive. However, with e-learning or distance learning, participants are less likely to stay involved in the training. MTC Works, MTC's innovative workforce development program, designed and operated a Mobile Training Van to assist employers in providing training on-site at their facilities. The van was equipped with 10 computers, internet access, handicap access and other features for mobile training. This mode of delivering the training saved money without sacrificing effectiveness. For the operator training, instructors may need to travel to individual facilities to conduct classes, particularly since the most effective training is conducted on a weekly basis for a few hours of concentrated learning. While at the facility, they may also venture into the plant for observational training with their participants. A mobile unit allows on-site, convenient and affordable training.

Follow up to training. Training organizations usually fail to anticipate the need for, or to arrange for, post-training support, often because those hiring them define a training organization's responsibilities as beginning and ending with the provision of training. However, the international literature confirms that in most cases follow up is necessary to ensure appropriate application of the

learning acquired during training. Learning, particularly of skills, is far less likely to be retained and implemented if it is not reinforced by follow-up support once trainees return to the workplace. Where follow-up support is not given, short-term learning gains often do not translate into sustainable behavioral change—participants may not be sure how to apply the learning or need encouragement to do so. For operator certification training, this is not as much of an issue as yearly continuous education credits is normally required for operators to maintain their licenses.

According to Andrew Natsios, the former U.S. Agency for International Development (USAID) Administrator, and MTC Board of Directors member:

“Effective training prepares participants to be workers in a modern economic system. It gives them the skills they need to function successfully in their chosen profession today, and enables them to be life-long learners, able to respond to the challenges of an increasingly integrated global economy. Management & Training Corporation’s training methodology provides participants with a firm technical foundation as well as preparing them to assume responsible positions of community leadership. MTC’s international training is:

- *Demand driven: developed with the close collaboration of the businesses, communities and countries it serves;*
- *Flexible: responds to changing technologies, markets and regulatory or political environments;*
- *Effective: incorporates continuous improvement practices based on a robust monitoring and evaluation program to insure high quality.*
- *Linked: develops strong partnerships with stakeholders and employs a “train the trainer” approach so that training becomes embedded in the community”*

Effective training requires a systematic measurement of results

The point of training is not just training, but improving the performance of an individual or a group. In operator certification training, participants are required to pass Board of Certification examinations before being licensed. In Delaware, students must take and pass all in-class tests with a minimum grade before being allowed to sit for the state exam. Close collaboration between the training center, regulators and the industry means that the training center receives constant feedback as to the efficacy of its training.

MEASURING TRAINING: THE MTC JOB CORPS TRAINING ACHIEVEMENT RECORD (TAR)³⁴

Job Corps is a voluntary, primarily residential career training program for 16 to 24 year old students. The U.S. Department of Labor administers the program to meet educational and career technical training needs of economically disadvantaged youth. Established in 1964 as part of President Lyndon B. Johnson’s *War on Poverty*, Job Corps to date has trained and educated more than two million young people. The national program currently serves nearly 65,000 young Americans each year³⁵. MTC is the largest and highest performing Job Corps contractor with the U.S. Department of Labor. MTC manages and operates multiple Job Corps centers in 17 states, as well as several contracts for recruitment and placement of students across the U.S. MTC trains over 13,000 students daily at the centers it operates. Job Corps³⁶ is not only the most successful program with the at-risk student population, but it also is very cost effective; studies have proven it has had a minimum positive \$2 return for every \$1 spent³⁷. The Job Corps program is a comprehensive program model that can be readily adapted or replicated to meet the demands of countries around the world. MTC has modified and utilized elements of their successful Job Corps programs for

several international domains. Research demonstrates that both skills training and comprehensive workforce development programs have improved labor market outcomes for youth in developing countries.

Job Corps vocational training includes a Training Achievement Record (TAR) to measure and validate the ability of the student to perform and complete all of the skill sets necessary for success on the job. The curricula (shown below) for a construction/plumbing trainee, illustrates the successful training model presented in this paper. The actual TAR includes each of the elements of the training program, from defining objectives to measuring outcomes. The training fits within an industry standard, enabling the participant to sit for and pass national certification examinations. It prepares the students for a job immediately after the training is completed because the training has been designed to meet both labor and employer requirements. Student progress after leaving the training program is tracked for one year.

Construction Career Pathway
Plumbing

The Job Corps Plumbing career training program takes 8 to 12 months to complete and requires training in the following subject areas:

- Introduction to the plumbing profession
- Plumbing safety and tools
- Plastic and copper pipe and fittings
- Installation and testing DWV piping
- Installing roof, floor, and area drains
- Basic electricity for plumbing
- Sizing water supply piping
- Servicing fixtures, valves, and faucets
- Installing and testing water supply piping
- Installing fixtures, valves, faucets, and water heaters
- Sewage pumps and sump pumps
- Introduction to plumbing math and drawings
- Servicing piping, fixtures, and appliances
- Hangers, supports, structural penetrations, and fire stoppings
- Locating buried sewer and water lines (optional)
- Swimming pools and hot tubs (optional)
- Plumbing for mobile homes and mobile home parks (optional)
- Introduction to drain, waste and vent (DWV) systems, and water distribution systems

Certification:

Students who complete a Job Corps training program are eligible to receive a nationally recognized certificate of completion.

- Construction Safety & Health OSHA 10-Hour Training
- NOCER Core Curriculum Completion (for center-operated programs)
- NOCER Level 1 Plumbing Completion (for center-operated programs)
- NOCER Green Certificate of Completion (for center-operated programs)

Steps to certification:

Before completing a Plumbing training program, students should:

- Have the basic math and reading skills necessary to perform the job.
- Complete the core curriculum and pass all written and performance tests.

Average length of training:
8 to 12 months

The salary range for various careers in Plumbing is:
\$37,000 to \$61,000/year

Green Training

 Job Corps students who enter the Plumbing career technical trade will also train in a variety of green subject areas to prepare for successful careers in the new green economy. Students will develop knowledge and skills in the following green technology and industry practices

- Introduction to Environmental Awareness and Green Building
- Reject, Reduce, Reuse, Recycle
- Alternative materials
- Treatment of hand tools and equipment for sustainability
- Waste management
- Water- and energy-efficient fixtures
- Use of crimper

CONCLUSION

The member countries of the Arab Countries Water Utilities Association are characterized by very scarce water resources, and cross border rivers, lakes, and coastlines. These areas have been subjected to rapid industrialization, urbanization, overuse of fossil water for agriculture, and, a legacy of fragmented environmental policy and infrastructure neglect. Highly skilled and motivated workers are the key to high quality water operations. The creation of a regionally accepted standard for the certification and training of water and sanitation operators will result in benefits to

the treatment plants, the workforce, the environment and the water and sanitation service user. By working to develop a regionally accepted framework for the training and certification of water and sanitation operators, ACWUA will improve cooperation among water and service providers who share a single water source, improve the environment since there will no longer be any incentive to pollute, and improve the reliability of water and sanitation services across the region. The key to accomplishing this goal is to provide an effective training program that is:

- Demand driven: developed with the close collaboration of the businesses, communities and countries it serves;
- Flexible: responds to changing technologies, markets and regulatory or political environments;
- Effective: incorporates continuous improvement practices based on a robust monitoring and evaluation program to insure high quality.
- Linked: develops strong partnerships with stakeholders and employs a “train the trainer” approach so that training becomes embedded in the community.

About the Author: Carla Sydney Stone

Ms. Carla Sydney Stone is the founder and principal of **International Development & Technical Assistance, LLC**, a firm that provides global consulting services to companies, non-governmental organizations, and government agencies. Ms. Stone has a proven ability to initiate and build international partnerships to achieve results. A mining engineer, with additional training and certificates in waste water operations, she also acts as a consultant to governments on the critical areas of environment, human capability, and resource management. She has considerable experience in developing, managing and implementing training programs and project management and public information programs for stakeholder support. In 2007, she was honored by the University of Agronomical Sciences and Veterinary Medicine of Bucharest, Romania, with an honorary doctor degree, its Gold Medal of Honor, and a special Commendation for her work in that country. She received these honors “as recognition of her remarkable contribution to the development of Romania-USA relationship in the domain of veterinary education and science.” Ms. Stone also has been honored by the US Small Business Administration with the “Exporter of the Year Award” and by Cankiri Karatekin University, Turkey.

About the Author: Jill L. Elkins

Ms. Jill L. Elkins is the Director of International Workforce Development for **Management & Training Corporation**. Ms. Elkins has over 28 years of experience in the development, design and implementation of creative and visionary education and technical/vocational training programs. She has expertise in designing public-private partnerships, innovative fee-for-service opportunities and private sector programs to augment funding. Ms. Elkins has excellent skills in assessing organization challenges and creating solutions. She has considerable experience in designing and implementing executive training and TVET programs in such countries as Iraq, Jordan, West Bank, Tunisia, Mongolia, China, Indonesia and Southern Sudan. Working closely with ministries, stakeholders and educational institutions, Ms. Elkins has been instrumental in influencing educational policies and procedures at the national level in several countries. In 2002 and again in 2005, she was awarded the U.S. National Advancement of the Workforce Profession award for contributions to the national workforce arena, by the National Association of Workforce Development Professionals. She has been invited to participate on multiple U.S., Department of

Labor technical workgroups and has presented concept papers and presentations in several national and international venues.

- ¹The World Bank (2010) , Water, The Middle East and North Africa, <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTWAT/0,,contentMDK:21634952~menuPK:4708988~pagePK:210058~piPK:210062~theSitePK:4602123,00.html>, USA
- ² Stone, Carla Sydney, 2005, “Crossing Boundaries: The Importance of Regional Environmental Activities for Clean Water, Proceedings, Tenth BNAWQ Scientific and Practical Conference Water Quality Technologies And Management In Bulgaria, Bulgarian National Association of Water Quality, Bulgaria, p.52-59
- ³ ACWUA (2008) Standards of Operation and Maintenance Conference in the Arab Region, October 15-16, 2008, Jordan, p.1
- ⁴ Berryman, Sue, E., Natsios, Andrew, Elkins, Jill, Marquardt, Jane 2008,Critical Elements of International Workforce Training,USA
- ⁵ World Bank, MNA Water Resources Summary, 2010, http://siteresources.worldbank.org/INTWAT/Resources/4602114-1205507626699/MNA_WaterSummary_ENG.pdf, USA
- ⁶ Wolf, Aaron. T, 1999, “Water and Human Security” AVISO, Global Environmental Change and Human Security (GECHS) project, <http://www.gechs.org/aviso/03/>, Canada
- ⁷ Stone, Carla Sydney, 2005, Crossing Boundaries: The Importance of Regional Environmental Activities for Clean Water, Proceedings, Tenth BNAWQ Scientific and Practical Conference Water Quality Technologies And Management In Bulgaria, Bulgaria, p.52-59
- ⁸ Hooker, Richard, editor, 1999, Code of Hammurabi, translated by L.W. King, 1910, Washington State University, <http://www.wsu.edu/~dee/MESO/CODE.HTM> ,USA
- ⁹ United Nations, 2005, http://untreaty.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf, USA, p.1.
- ¹⁰ United Nations Economic Commission for Europe, 1992, <http://www.unece.org/env/water/pdf/watercon.pdf>,
- ¹¹ Gorbachev, Mikhail, <http://www.watertreaty.org/letter.php>, Geneva, Switzerland
- ¹² World Bank, 2010, <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTWAT/0,,contentMDK:21706928~menuPK:4602430~pagePK:148956~piPK:216618~theSitePK:4602123,00.html>, USA
- ¹³ US Department of State, Bureau of Oceans, Environment and Science, United States Senator Paul Simon Water for the Poor Act 5th Annual Report to Congress, 2010, Washington, D.C., USA, p. vii.
- ¹⁴ Asian Development Bank, 2009, Budget of the Asian Development Bank for 2010, <http://www.adb.org/Documents/Reports/Budget/2010/2010-budget.pdf>, Philippines, p.10
- ¹⁵ Asian Development Bank, 2010, Water Financing Program 2006-2010, <http://www.adb.org/water/wfp/default.asp> , Philippines
- ¹⁶ Kuwait Fund for Arab Economic Development, Annual Report 47, Feb. 22, 2010, Kuwait City, State of Kuwait, p.22 and p.72
- ¹⁷ Sikimic, Simona, 2010, Water waste Treatment Plants Sit Idle as Pollution Problems Mount, Daily Star, http://www.dailystar.com.lb/article.asp?edition_id=1&categ_id=1&article_id=119108#ixzz0zixJQRD0 , Lebanon
- ¹⁸ Ibid.
- ¹⁹ Asian Development Bank, 2010, Energy and Water Supply Services: Improving Efficiency Through Policy and Regulation, Law and Policy Brief Number 4, Philippines, p.6.
- ²⁰ UNESCO, 2010, Engineering: Issues, Challenges, and Opportunities for Development, France, p.285
- ²¹ Stone, Carla Sydney, 2004, “Your Wastewater is My Drinking Water, My Wastewater is Your Drinking Water: The importance of cross jurisdictional standards for operator training and certification as it affects the quality of coastal waters, inland seas, and rivers.”, Proceedings http://www.bnawq.org/images/c_stone.pdf, Bulgaria
- ²² Murray, Molly, “Waste discharge record improves”, The News Journal, October 4, 1999
- ²³ Murray, Molly, “Water discharge record improves”, The News Journal, October 4, 1999
- ²⁴ Williams, Jerry, 2010, Interview, USA
- ²⁵ ACWUA, 2008, Standards of Operation and Maintenance Conference in the Arab Region, <http://www.acwua.org/index.php?id=65>, Jordan, p.1-3
- ²⁶ ACWUA, 2009, Brochure "ACWUA - Arab Countries Water Utilities Association, Jordan, p.4
- ²⁷ Istanbul Commission, 1996, Strategic Action Plan for the Rehabilitation and Protection of the Black Sea, Istanbul, Turkey <http://www.blackseaweb.net/action/content.htm>
- ²⁸ Berryman, Sue, E., Natsios, Andrew, Elkins, Jill, Marquardt, Jane, 2008, Critical Elements of International Workforce Training, USA, p.1.
- ²⁹ World Bank, 2008, Using Training to Build Capacity for Development, Independent Evaluation Group, Washington, D.C., USA, p3

-
- ³⁰ Nink, Carl, 2006, Comparison of the Technical and Vocational Education and Training System in Palestine with Systems in Scotland, Jordan, and Tunisia, USA, p.1
- ³¹ Nink, Carl, 2004, MTC Institute, Industry-Recognized Certificate Programs and Job Corps: Working Toward a Skilled and Qualified Workforce, USA, p.1
- ³² Berryman, Sue, E., Natsios, Andrew, Elkins, Jill, Marquardt, Jane 2008, Management & Training Corporation, Critical Elements of International Workforce, USA, p.3
- ³³ Ibid.
- ³⁴ Management & Training Corporation, 2009, August 2009 / Construction / Plumbing 87502JA, USA
- ³⁵ Management & Training Corporation, Retrieved 2010, <http://www.mtctrains.com/job-corps/job-corps-overview>, USA
- ³⁶ Nink, Carl And Elkins, Jill, 2010, Job Corps: A Successful Workforce Program for International Consideration, USA, p.1
- ³⁷ McConnell, S., & Glazeman, S. (2001, June). National Job Corps study: The benefits and costs of Job Corps. Retrieved from Mathematica Policy Research, Inc.: http://www.mathematica-mpr.com/publications/PDFs/01-es_jcbenefit.pdf