# CAMBODIA WORKSHOP RESOLUTIONS

**AASSA REGIONAL WORKSHOP on**

***"SUSTAINABLE DEVELOPMENT Goal of Water and Sanitation after MDGs"***

**Phnom Penh, Cambodia, 12 February, 2014**

Jointly Organized by:
Association of Academies and Societies of Sciences in Asia (AASSA) and Korean Academy of Science and Technology (KAST)

Supported by:
IAP – the global network of science academies, Scientists and Engineers Without Borders (SEWB) and Sharing Community of Science and Technology (SCOST)

## INTRODUCTION

AASSA Regional Workshop on 'Sustainable Development Goal of Water and Sanitation after MDGs' was held at the National Polytechnic Institute of Cambodia (NPIC), Phnom Penh, Cambodia on 12th February, 2014.

At 2000 Summit Meeting in New York, UN set up the Millennium Development Goals (MDGs). It includes 50% reduction of the people who suffered from improper water and sanitation by the year of 2015. Fortunately the original goal of water connections by 2015 was achieved in 2010, but approximately 1.9 billion people still depends on unsafe water quality. UN prepares a new set of goals to water and sanitation by 2030. Without a proper sanitation, quality of life as well as the quality of drinking water cannot be secured. Further, we may not have healthy food for our family. Ultimately, we need a holistic approach with green concept to reduce the risks in our society. In order to meet the urgent goal of water supply, technologies based on people's need not high technologies have to be applied. In this regard, technologies suitable in Asia should be studied and effectively disseminated through various organizations and exchange programs.

The aim of this regional workshop was to increase the relationship among Asian countries for the purpose of providing safe and stable water supply and sanitation for healthy society. In order to discuss and promote these important issues, AASSA and KAST jointly organized this regional workshop.

In the keynote speech given by the KAST President, Prof. Sung Hyun Park, importance of Asia as a rising world was emphasized. He also proposed 'Asian Union' comprising ASEAN + three countries (China, Japan, and Korea) and ASIASTAT which is similar to EUROSTAT for sustainable development of this region.

It is recommended that the Asian countries concerning about the importance of water supply and sanitation for their people, should try every effort to solve the water shortage and wastewater treatment through proper water resources management. In this regard, AASSA provided a practical platform for exchange knowledge and technologies among Asian countries. It was significantly encouraging that China and Korea formulate overseas cooperation through their agencies

In this workshop, there were three sessions of (1) General Perspectives, (2) Purification Technology and Sanitation, and (3) Arsenic Poisoning. Summary of presentations is as below.

# SUMMARY OF THREE SESSIONS OF 11 PRESENTATIONS

***[Session 1: General Perspectives]***

Chair: Hang-Sik Shin (Fellow, KAST / Professor Emeritus, KAIST)

**Presenters and the title of presentations:**

1. Euiso Choi (Director, Innovative Water Center)
   *Introduction of Eco Solution of Unsewered Areas*
2. Leonard Q. Liongson (Member, NAST PHL)
   *Overview of Water Supply and Sanitation-Philippines : Challenge and Strategies*
3. Min Yang (Deputy Director, Research Center for Eco-environmental Science, CAS)
   *CAS-TWAS Center of Excellence for Water and Environment; A Platform for Developing World.*
4. Jakyum Kim (Consultant, K-Water)
   *Overseas Business of K-Water on Water Management*
5. Surendra Raj Kafle (Vice-Chancellor, Nepal Academy Science and Technology)
   *Water Supply and Sanitation in Nepal*

**Summary of Conclusion and Recommendations (in the order of presentation):**

**1. Prof. Choi** introduced the situation of water resources at unsewered areas in Cambodia. Although the country has abundant water resources, uneven distribution of precipitation and vulnerable exposed condition to pollution necessitate proper measures to supply safe water as well provide improved sanitation for wastewater. As the director of iWc, he introduced demonstrative and educational facilities, such as eco-toilet, eco-rock filter system, eco recycling system, and eco floating cleaning system. The proposed decentralized systems could be made and operated easily for rural residents. It seems essential for the government to pay more attention to people's right to enjoy healthy environment by supporting finances, establishing legislative system, and educational programs.

**2. Prof. Liongson** presented general information on water supply and sanitation in Philippines. It was emphasized that septage collection and treatment should be properly done at faster rate for water resources conservation. He also introduced programs and projects on Integrated Water Resources Management (IWRM) and Water Supply and Sanitation (WARYSAN).

**3. Dr. Yang** introduced supporting program for developing countries through CAS-TWAS for knowledge exchange and technology transfer. In addition to training and educating graduate students as well as researchers from 20 Asian and African countries, the agency promote technology transfer to the developing countries. I was concluded that it is keen to cooperate with other agencies to realize Millennium Development Goals.

**4. Dr. Kim** introduced the overseas activity of Korea Water Resources Cooperation (K-Water) on water management. Under the catch-phrase of "Using water to make the world happier", K-Water develops its services in Asia and African areas. The company completed 36 ODA projects across 19 countries.

**5. Dr. Kafle** introduced water supply situation in Nepal. Retreated water is available to only 15% of the Nepalese. The government has formulated long- and mid-term plan with appropriate strategy for 2007-2020. The target is to provide 100% coverage of both water supply and sanitation by the year 2017.

Based on the presentations, it is recommended that the related countries are much concern about the importance of water supply and sanitation for their people and try every effort to solve the water shortage and wastewater treatment through proper water resources management. In this regards, AASSA could provide a practical platform for exchange knowledge and technologies among Asian countries. It was significantly encouraging that China and Korea formulate overseas cooperation through their agencies

***[Session 2 (Purification Technology and Sanitation)]***

Chair: Leonardo Q. Liongson (Member, NAST PHL / Professor, University of the Philippines)

**Presenters and the title of presentations:**

1. Jae-Yeon Jang (Professor, Ajou University)
   *The Impacts of Climate Changes on Water Sanitation*
2. Gwy-Am Shin (Professor, Ajou University)
   *Efficacy, Effectiveness, and Sustainability of Household Water Treatment Systems*
3. Jeyong Yoon (President Scientists ad Engineers without Borders/Professor, Seoul National University)
   *Membrane Technology as an Appropriate Technology*

**Summary of Conclusion and Recommendations:**

1. Climate change can have not only influences on water supply via the changes in precipitation, but also direct and indirect impacts on water-borne disease through various mechanisms such as the multiplication of pathogenic microorganisms due to temperature rise, and the entry of hazardous materials and pathogenic microorganisms into water supply sources due to floods (such as 2011 Thailand flooding and 2013 Philippines typhoon 'Haiyan' storm surge and other meteorological disasters which are predicted to occur with higher frequency under climate change.

2. In the attempt to prevent the spread of infectious diseases as a result of climate change factors such as temperature rise and meteorological disasters,, the developing nations of Asia should make efforts to improve the rate of development of safe water sources, and to expand sanitation facilities at the national level, including increasing people's awareness through health education related to climate change issues.

3. Based on Vision 2030 of WHO, in many cases, the conventional challenges (posed by impacts of population growth, urbanization and environmental deterioration) will be much greater than the challenge from climate change.

4. Household Treatment Systems (HWTs) are needed in order to provide access to improved and safe drinking water – especially for the 780 million people in the world who lack such facilities, which remain even after or beyond the attainment of the MDG to halve the proportion of people without sustainable access to safe drinking water.

5. HWTs are classified into chlorine-based disinfectants, solar disinfection (SODIS), chemical coagulation/flocculation, and filtration-based HWTs.

6. As they apply to HWTs, Efficacy (the potential of an agent in an ideal condition) and Effectiveness (the actual effect of an agent under real-world condition) are not the same in general, based on comparison of efficacy data measured in the laboratory and effectiveness data obtained in field studies. Sustainability is the ability to keep in existence over a long period.

7. No HWT is perfect: HWTs with high efficacy and effectiveness usually showed low sustainability; on the other hand, HWTs with high sustainability tend to be moderate in efficacy and effectiveness.

8. Membrane Technology is generally known as not to be suitable as an Appropriate Technology

(AT) because of the knowledge and perception that Membrane Technology has a high cost and complexity of maintenance (large scale, centralized, capital-intensive, high performed), whereas AT is small scale, decentralized, labor-intensive and environmental.

9. A proposal for developing countries is given: a Forward Osmosis Technology (a Membrane Technology) as an Appropriate Technology with a low-cost draw solution (about $40, 2 sets) using carbohydrate (rice) and amylase (saliva) to produce maltose on the draw side, which increases surface molecular concentration at the membrane and leads to higher osmotic pressure and higher permeate flux from feed side to draw side.

10. Although seemingly varied in topics at first reading, the three (3) presentations in Session 2 can be connected by the observation and implication that the effort for improved water sanitation under the challenge of climate change, beyond the attainment of the MDGs, can be best undertaken through better understanding and working knowledge of the efficacy, effectiveness and sustainability of the various kinds of HWTs (chlorine-based disinfectants, solar disinfection (SODIS), chemical coagulation/flocculation, and filtration-based HWTs); in addition to the HWTs, the viable option of Forward Membrane Technology as an Appropriate Technology is also proposed for developing countries towards same goal beyond the MDG goal attainment.

***[Session 3: Arsenic Poisoning]***

Chair: Gwy-Am Shin (Professor, Ajou University)

**Presenters and the title of presentations:**

1. Ruiping Liu (Research Center for Eco-Environmental Science, Chinese Academy of Science)
   *Novel adsorbent of ferric and manganese binary oxide (FMBO) for arsenic removal*
2. Seingheng Hul (Professor, Institute of Technology of Cambodia)
   *Drinking water source identification for people living in arsenic affected community of Preaek Traeng Village, Samrong Thum Commune, KeinSvay District, Kandal Province*
3. Chea Eliyan (Professor, Royal University Phnom Penh)
   *Arsenic exposure population study in Kandal, Prey Veng and Kampong Cham*

**Summary of Conclusion and Recommendations:**

1. In the first presentation, Dr. Liu reported that ferric and manganese binary oxide (FMBO) had high capacity to remove arsenic in water based on both lab- and pilot-scale studies. Also, with incorporation of in-situ regeneration methods, the authors suggested that their technology is "an innovative technology for arsenic removal with a high efficacy but a low cost" for both small and large-scale treatment plants.

2. In the second presentation, Dr. Hul presented the test results of arsenic levels in wells from different regions of Cambodia and also the survey results of alternative sources of drinking water in those arsenic-affected communities. He founded that most of the wells tested was contaminated with arsenic – sometimes with very high concentration (>450 ppb) and, surprisingly, people had limited knowledge on the level of arsenic in their drinking water and even the health effect of arsenic.

3. In the third presentation, Dr. Eliyan presented the current status of water usage as well as the current knowledge on arsenic in three provinces of Cambodia in order to estimate the magnitude of exposed population. She founded that rainwater is the most widely used source of drinking water followed by bought water and tube well water and majority of people interviewed were aware of arsenic in tube well water (which is somewhat contradictory to that of Dr. Hul's study). Also, she reported that about 6.3 % (37,620 people) of the three provinces were exposed to >50 ppb of arsenic (the Cambodian standard of arsenic).

4. As a conclusion of first presentation, the authors of the first presentation claimed that "this technology is highly efficient, cost-effective, easy-to-handle, with good feasibility in developing countries". However, some participants in the workshop – especially from Cambodia – were concerned about the availability (and the cost) of the key material (FMBO) in developing countries, which makes the substantiality of this technology in developing countries somewhat questionable.

5. As a recommendation of the second presentation, the authors of the second presentation stated that "water from wells should not be the option" for drinking water and "education on arsenic should be provided to the residents to give them more understanding on bad impact from its pollution". There was a consensus among workshop participants on more survey in other regions of Cambodia (perhaps on a national-level survey) and more widespread implementation of appropriate technologies for arsenic removal is necessary.

6. On third presentation, many workshop participants showed a serious concern over the Cambodian standard of arsenic (50 ppb), which appears to be too high. Also, several participants recommended more thorough risk assessment on the arsenic exposure through

groundwater in Cambodia. In addition, there was a concern over one of the recommendations from Dr. Eliyan's study - "surface water as an alternative water source." Due to the lack of wastewater treatment systems and seemingly shallow water table in Cambodia, there could be a different type of health concern (human pathogens) when surface water is used as a source of drinking water.

21 February, 2014

Summarized by Hang-Sik Shin

Leonardo Q. Liongson

Gwy-Am Shin

# RESOLUTIONS

1. Asian countries should more concern about the importance of water supply and sanitation for their people and try every effort to improve the water safety and wastewater control through proper water resources management and treatment.

2. AASSA provided a practical platform for the exchange of knowledge and technologies among countries. It was encouraged that China and Korea formulate overseas cooperation through their international cooperation agencies.

3. The effort for improved water sanitation under the challenge of climate change, beyond the attainment of the MDGs, can be best undertaken through better understanding and working knowledge of the efficacy, effectiveness and sustainability of the various kinds of Appropriate Technology for developing countries toward same objectives beyond the MDG goal attainment.

4. As there could be a different type of health concern except arsenic when surface water is used as a source of drinking water, it is necessary to tackle with other possible contaminants.

5. It is recommended that more survey on a national-level survey and more widespread implementation of appropriate technologies for arsenic removal is necessary.