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Louati, Moez; Ferras, David; Arega, Feleke
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HYDRO-ENVIRONMENTAL EDUCATION IN AFRICA

BY MOEZ LOUATI, DAVID FERRAS & FELEKE AREGA

This article shares an opinion on how the ambitions and needs of African young Hydro-environmental professionals and students, particularly training and higher-level education, can be achieved under the umbrella of IAHR. With deep affinity for Africa and yet different backgrounds, the authors blend their standpoints concerning education, professional development and capacity building in hydro-environment engineering and research.

Common denominator throughout the diverse African countries is the pursuit of higher education, not only outside Africa but also within the continent. This has become one of the top priorities and ambitions for African students who are aware of the advantage in pursuing higher education, training and learning from other countries experience. Tunisia is a good case study to illustrate the trends in education, and the ambitions that African youths, students and young professionals are following, as well as the challenges faced in Africa. A recently published report^[2] provides information about the experience of sub-Saharan students in Tunisia. In fact, Tunisia has been attractive to foreign students since the 1970s, especially sub-Saharan students. At this moment, Tunisia has about 6250 foreign students (about 2% of the total number of students) in addition to a few thousand undertaking professional internships or training. Among these foreign students, about 75% (4560) are sub-Saharan students and the remaining 25% come mainly from the Maghreb. The main attractions for foreign students are that the quality of education, instruction in French or English, internationally recognized diplomas, shared religion and certain cultural practices, low living cost and ease in acquiring residency permit. However, Tunisia's proximity to the European continent and its lifestyle are elements that attract just as much, and possibly more so! In fact, for the vast majority of foreign students, studying there, Tunisia was their second or third choice. Europe remains their main destination (e.g. France, England, Belgium, Germany) followed by North America (Canada, United States) and then North Africa (e.g. Morocco). There are a number of reasons that drive the choice of Tunisia: the conditions for registration or obtaining visas in their first or second choice countries were not met, parents objected, the cost was too high, scholarships were not granted, etc. Certainly, local Tunisian students do not make exceptions in their choice of study and professional destination. Indeed,

IAHR visit to Kaseem Dam site- water intake, Ethiopia (2012). At the right IAHR President, Joseph Lee with Feleke Arega and representatives of the Local Organizing Committee of the 18th APD Congress.



upon completion of their degree in Tunisia, the majority of students (foreigners and locals) wish to continue their studies in another country (France and Canada being the most frequently cited), which seems to confirm that studies in Tunisia are a springboard towards a perceived "even better" elsewhere, the first step on the academic and professional path^[2].

In general, higher education studies and research in African countries are blooming. In Ethiopia, for instance, in 2018 more than 500 PhDs were awarded, while few years ago (in 2010) the number of awardees was only 21^[5]. In 2018, more than 3000 students were pursuing doctoral studies at local universities in Ethiopia. The majority (26.2%) studied natural sciences, followed by agricultural sciences (21.4%), social science (18%), engineering and technology (18%), medical and health sciences (6.9%), and humanities (8.7%). Nearly 80% of the PhD holders work in higher education while the rest are distributed in government offices (11.3%), private non-profit organizations (5.6%), and business enterprises (2.1%). The unemployment rate among PhD holders is 3%, not a negligible number. According to an interview published in IAHR Newsflash, 30 years ago only 3 universities provided civil engineering studies in Ethiopia, now there are more than 30 and have spread out through all the regions of Ethiopia. Hydro-environment research though still has to deal with many unknowns in Ethiopia and most

sub-Saharan countries, as many aspects of their problems and their potential solutions are site-specific.

Another common trend among students is their curriculum choice. The majority of African students choose to follow more engineering-oriented fields than literature and business. In fact, the majority of institutes in Tunisia (and in many other African countries) are in science and technology. The recent awareness of climate change and water scarcity^[1] mainly in Africa, but also worldwide, has increased the popularity of hydro-environmental profession. Such fields deal with complex systems and structures that emphasize the importance of multidisciplinary studies, with large data that require in-depth analysis and deep learning-hence artificial intelligence (AI) and data mining which are emerging fields of interest among science and engineering students. The quest for international higher education and training in hydro-environmental profession in Africa with a number of water challenges positions IAHR well for serving and empowering to the African hydro-environmentalists.

Some IAHR institute members contribute to this intercontinental mobility of students. An example of international mobility in higher education institutions is the International Hydraulic Engineering (IHE) Delft Institute for Water Education. According to a

IAHR Africa Ambassadors



Moez Louati obtained his B.Eng and MPhil degrees in Mechanical Engineering from the National School of Engineering of Sfax-Tunisia (ENIS), and received his PhD degree in civil engineering from the Hong Kong University of Science and Technology (HKUST).

Moez Louati left his home country Tunisia in 2011 to pursue his PhD study in Hong Kong. His travel was triggered only by the ambition to engage in higher education in a top international university with a system of education that encourages diversity, open minds, freedom of thinking, diverse campus facilities, and being well connected all over the world. If such a university and education system existed in Tunisia, Moez Louati may have never left.

His first interaction with IAHR was his participation in the JFK paper competition in the IAHR congress in Chengdu 2013 and it was the best professional and academic experience he ever had up to that moment. IAHR provided him with the experience to challenge himself and set his path to success in the academic stream, and with the opportunity to form relationships and friendships with his peers and leading members of his research community. Currently, Moez Louati is a Research Assistant Professor in HKUST. He is a member of IAHR, serves as a member of the editorial board of the *Journal of Hydraulic Research (JHR-IAHR)*, and is the chair of the working group on Transient Flows.



David Ferras obtained his PhD in the framework of a joint doctoral initiative between the Instituto Superior Técnico de Lisboa (IST) and the Ecole Polytechnique Fédérale de Lausanne (EPFL). During his research he focused on experimental and numerical

analyses of Fluid-Structure Interaction during hydraulic transients. Currently he holds a position of lecturer/researcher at the IHE-Delft in the department of Environmental Engineering and Water Technology in the area of Water Transport and Distribution. During his PhD David Ferras had the chance to participate in the 3rd IAHR Europe Congress in Porto (2014) and the 36th IAHR World Congress in The Hague (2015). With the motivation to advocate for the experiences and benefits that the association brings to young professionals, David Ferras enjoys participating in any IAHR initiative in which he can bring his contribution. He is currently vice-chair of the IAHR-EPD committee, editor of the IAHR NewsFlash World and member of the working group on Transient Flows.



Dr Feleke Arega obtained his B.Sc. in Civil Engineering from Addis Ababa University (Ethiopia), M.Sc. in Water Resources and Environmental Engineering from Hohai University (P.R. China) and Ph.D from Hong Kong University (Hong Kong) in Water Quality

modeling. He worked as postdoc in University of California, Irvine, Research Associate at US EPA Ecosystems Research Division. He is a registered professional engineer and worked for Tetra Tech and Arcadis USA. Now he works for South Carolina Dept of Health and Environment Control. He was a key person that helped support the 2012 IAHR visit to Ethiopia.

comprehensive tracer study^[6] resulting from a survey of IHE Delft alumni on the relevance and impact of the education offered by the institute, the alumni from Africa are most positive about the impact of their professional activities on the development of their country/region, followed by alumni from Asia. Over 95% of the IHE Delft alumni return to their home country/region after graduation and over 87% remains active in the water sector for many years. As a result of this, there are a number of alumni developing their profession in important positions in their countries of origin. Most alumni are employed in the public sector, but there is a growing number of alumni working for private sector and international organizations. A comparison of the sectors showed a trend towards working on cross-sectoral water issues.

Having discussed the ambitions of African youths, the challenges they face and the trends in the education they are pursuing, and given the awareness of water scarcity in Africa and worldwide, it is of paramount importance to have a structure for capacity building and capacity development for Africa. In particular, there is a need for support by an international and diverse association that provides opportunities for water and environmental education to endow students and engineers with skills that allow them to face the challenges in Africa, and build bridges that would allow them to have easier access to their colleagues in the rest of the world.

The International Association for Hydro-Environment Engineering and Research is precisely what Africa needs! IAHR is probably the most international and diverse association in the field of water, hydraulics and environmental engineering. Being composed of four divisions, including an African division, IAHR is a worldwide independent organization of engineers and water specialists working in fields related to the hydro-environmental sciences and their practical application. The young professional networks (YPN) have successfully attracted students and junior engineers to engage in international events and networking. Moreover, IAHR has been a centre of attraction for students with their prestigious John F. Kennedy Student Paper Competition and the high-calibre Gerhard Jirka Summer School.

In fact, IAHR has already been supportive to Africa and its challenges. In the past eight years, IAHR has been reaching out to create a proactive engagement with Africa. In 2012, a delegation of representatives from the IAHR

China Chapter and the Hong Kong Chapter made a five-day visit to Addis Ababa University, Ethiopia. During the visit, areas of collaboration were discussed. This was followed by a Special Session on “Challenges and issues of water resources management in Africa” that took place during the 35th IAHR Congress, Chengdu, China. In 2015, IAHR’s Hydrolink published its first special issue on Africa (issue 2015-4). IAHR can be a conduit for pro-active interaction between Africa’s practicing hydraulic professionals, students and policy makers and the wider international hydraulic practice, expert knowledge and research community. The IAHR African division aims to galvanize the practice, education and research in hydraulic engineering in a more sustainable, efficient and reliable way so as to overcome existing challenges, promote growth and development in Africa. There are a number of actions that IAHR can initiate, take part or collaborate to their successful development, namely:

- Develop a data base of knowledge expert, educational opportunities, tools and resources tailored to the needs of African issues.
- Form new Young Professionals Networks in African countries and establish links with existing African professional networks in water engineering.
- A dedicated Africa summer school could be established, focusing on lectures and training devoted to African water and environmental cases studies.
- Expand IAHR presence in Africa by means of a new IAHR office that would take care of the administrative duties of the African regional division.
- Enhance meaningful collaboration with key stakeholders such as the water affair ministers.

IAHR, as a non-profit organization, can offer support to Africa by connecting students, professionals, education institutes and policy decision makers with experts and world leaders in the field of hydro-environment. In particular, African students and ambitious youth would have a golden chance to showcase their work, their ability and be in touch with top leading professionals and professors of highly ranked universities. ■

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