IAH Congress 2019, Report by Philip Maher, EPA

The 46th International Association of Hydrogeologists (IAH) Congress was held in Malaga, Spain from 23 to 27 September 2019. The location for the week was the Trade Fairs and Congress Centre, an impressive modern conference centre, located on the outskirts of Malaga. The overall theme of the congress was "Groundwater Management and Governance: Coping with Water Scarcity", and there were ten sub-topics under this main theme that the talks and field trips would cover over the week. There were 12 Plenary sessions, typically of 30 minutes duration, over 380 Parallel sessions, of 15 minutes duration, and 325 posters presented at the congress, as well as administrative meetings for different IAH commissions and chapters, and a choice of eight different filed trips. So, the days were long but very enjoyable. The full agenda and links to presentations are available on line at https://iah2019.adabyron.uma.es/event/1/timetable/?print=1&view=standard. I've picked out a few of my highlights in this article.

Figure 1: Trade Fairs and Congress Centre, Malaga

John Cherry

The legendary John Cherry gave a couple of interesting talks on Monday. He, of course, is co-author (with Alan Freeze) of the well-known hydrogeology text book *Groundwater*. Their book was first published in the 1970s and John is still very enthusiastic about hydrogeology education. He spoke about a new project which he and a number of other distinguished academics are working on called *The Groundwater Project*. The project involves the delivery of online, free of charge educational materials focused on groundwater science and engineering. The first phase is the publication of an online textbook called the *Groundwater eBook*, which will include over 100 groundwater related subjects, including an introduction to groundwater for non-specialists. I think this latter resource would be useful to those of us who work with people that don't have a groundwater background but are interested in an overview of the basics. There will also be educational materials which can be used by teachers or anyone who needs to deliver groundwater training. Keep an eye on their website (http://gw-project.org/) as in early to mid-2020, chapters will start to be available.

In another talk later in the day, John spoke about his work in the area of groundwater contamination assessment and trying to bring multiport samplers into wider usage among the groundwater community. To this end, he and colleagues have developed a cheaper, 'DIY' sampling system constructed from generally available PVC pipes and fittings. More details can be found here

(https://g360group.org/home/highlights/technologies/multilevel-monitoring-systems). It was his view that hydrogeologists need to understand vertical profiles better. There may be some sites in Ireland where this technology could be tested or applied, for example, to assess how nitrate concentrations differ with depth in an aquifer used for public water supply.

Urban Groundwater

On Tuesday, Helen Fallas of the British Geological Survey (BGS) spoke on the topic of Urban Groundwater and provided an interesting talk on the role of groundwater in urban planning and policy development. City planning worldwide remains largely two dimensional and lacks any substantial subsurface planning. A programme (http://sub-urban.squarespace.com/) was developed with this in mind whereby hydrogeologists were embedded into the planning agencies of three European cities (Rotterdam, Glasgow and Oslo) to promote knowledge exchange and to develop an awareness of groundwater in city planning. Helen spoke about how these exchanges need time and that it took several years to establish good knowledge transfer. Another point she made was that cities lack groundwater monitoring networks for planning needs and that these should be developed. For me, this talk addressed the wider question of "how do we make hydrogeology relevant and make people in other disciplines think about and understand it". This talk highlighted that it takes effort and significant time to achieve a groundwater knowledge transfer in an organisation. Embedding someone is a good option in my view and should be considered where there is a lack of groundwater knowledge, or a desire to improve groundwater knowledge across an organisation.

Field Trip

On Wednesday, I took part in a field trip around the Guadalhorce river basin, which is the catchment that surrounds Malaga. The field trip involved visiting several rivers, reservoirs and aquifers (carbonate, detrital and gypsum) in the catchment in the context of water supply to the city of Malaga and the local agricultural industries. It was a very interesting tour around the local area and gave a real feel for the landscape, geology, water and land use in the region.

Figure 2: IAH Field Trip around the Guadalhorce river basin.

The geology and hydrogeology of the catchment was explored through several stops around the catchment. Three reservoirs were constructed in the 1960s to supply water to Malaga and the

agricultural users in the catchment. One of the reservoirs was inadvertently constructed over a gypsum aquifer and consequently, saline groundwater discharges from the gypsum into the dam. This has resulted in the salinity of the reservoir being very high. The saline water has to be blended with water from the other 'normal' reservoirs before being used. These reservoirs provide water to the city of Malaga and for irrigation of a large agricultural area of mainly olives, and also, more recently, avocadoes and mangoes. Overtime, the salinity of the groundwater in the irrigated areas has increased as a consequence of using the saline blended groundwater.

Figure 3: View of water supply reservoirs, Guadalhorce river basin, Malaga.

The other pressures within the catchment include over pumping of local aquifers by farmers for irrigation and pig farms. Pig farms are widespread in the catchment and spreading of pig slurry has led to nitrate issues in groundwater. The trip leader (Iñaki Vadillo Pérez of the Centre of Hydrogeology at the University of Malaga) has conducted hydrochemical investigations in the catchment using stable isotopes and emerging contaminants. This research is looking into management of surface water and groundwater resources for the region.

Figure 4: Encantada Dam near El Chorro, Malaga

I was told that 48% of groundwater bodies are at 'Poor' status in Spain. About 2% (by area) of groundwater bodies in Ireland are at 'Poor' status in comparison. Obviously, abstraction is a much bigger issue in a water scarce country like Spain, in comparison to Ireland. I was also struck by the fact that the 'story' of the catchment in Malaga was still at the investigation stage. The measures needed to improve the groundwater quality or engagement with farmers and other water users appeared to be in its infancy. The agricultural users were being provided with water at less than cost and the province had a legislative obligation to supply them with this water, which was, in turn, impacting groundwater in the lower catchment. As with many cases, degradation of the environment seemed to be second to the jobs, money and way of life that farming provided in the catchment and it seemed to me that more work is needed to balance both sides.

IAH Administrative Meetings

On Tuesday evening, the IAH General Assembly was held in the main auditorium. Some achievements of recent IAH work were highlighted, such as developing a new IAH website with added educational pages, increasing the membership to a record level of 4,400 and improving the *Hydrogeology Journal.* The IAH website (www.iah.org) contains a number of video and teaching materials, as well as a series of Strategic Overview Papers on a range of interesting groundwater subjects, which are well worth a read. The IAH has also been involved in international engagement, for example participating in the UN Water Partners meeting. It was also highlighted that World Water Day in March 2022 will have a groundwater theme, which gives us all an opportunity to increase awareness of and interest in the subject.

Figure 5: IAH Annual General Meeting

Also worth mentioning is the IAH Early Careers Hydrogeologists Network (ECHN). This network, as the name suggests, is involved in assisting groundwater scientists and engineers in the first ten years of their career. It's a helpful network to join and get involved with as it offers a number of useful benefits to members such as a mentorship scheme, job postings and training. You can find out more information on their website (https://echn.iah.org/). They are currently looking for people to be part of their steering committee and they're running a competition to give a Plenary talk at the next IAH Congress in Brazil, so click on the above link to get involved if you're interested.

The 2020 IAH Congress will be held in Sao Paulo, Brazil (http://www.iah2020.org/), and the following year in Belgium (https://belgium.iah.org/). If you are considering submitting an abstract, you can find out more information through the websites.

Conclusions

I would encourage anyone who gets the opportunity to attend an IAH Congress. Overall, I came away with an admiration and pride in those that work in groundwater. I learned that hydrogeologists are an inspirational bunch and look to change the world in positive ways, for example through work in the developing world and the Burdon Network; the IAH is truly a worldwide organisation, with over 80 countries represented at the Congress; hydrogeologists are applying new technology in interesting ways, such as remote sensing, data science, GIS and groundwater modelling; we are addressing major challenges to the environment such as climate change, radioactive contamination and water supply.

Finally, I would also like to mention the excellent talks and posters given by the Irish representatives at the Congress. I understand there were 10 people in attendance from Ireland. A number of people I met during the congress remarked to me about the quality of the presentations they saw from various Irish speakers, so well done to all.