

Preface

How hydrologists helped respond to the SARS-CoV-2 pandemic

So much of the conversation in the past two years has been about COVID-19 so it seems somewhat trite to present a special issue on work that was undertaken in response to the pandemic. How does one journal issue do justice to the work? Wastewater-based epidemiology is the common thread that runs through this special issue of *Journal of Hydrology (New Zealand)*, and all five papers deal with the key hydrological concerns of space and time.

There are a range of spatial scales addressed in the papers, from the individual building scale to the cargo ship (Coxon *et al.*, 'Exploring opportunities for sewage testing on cargo ships as a tool to screen seafarers for COVID-19'), subcatchment to sewershed (Nicoll *et al.*, 'Neighbourhood-scale wastewater-based epidemiology for COVID-19'), and city to national (Gilpin *et al.*, 'A pilot study of wastewater monitoring for SARS-CoV-2 in New Zealand' and Trowsdale *et al.*, 'Establishing New Zealand's national pathogen surveillance system using wastewater-based epidemiology'); and all the papers make use of the international literature to provide context for what is a global pandemic.

Disaggregation of space into discrete units for study is familiar in the environmental sciences and will come as no surprise to the readership of the *Journal*. A sharp focus on limited aspects of a complex whole works to produce legible environments that are susceptible to careful measurement and calculation. From here, a high degree of schematic knowledge can be developed that enables control and manipulation to achieve desired goals. The danger, of course, is that these abstractions and simplifications are disciplined by a small number of objectives and while the focus provides useful information it comes with the heuristic inherent in every myopic view of 'not being able to see the forest for the trees'.

In the work presented there were tensions over temporal scales too, most vividly observed in attempts to bring together datasets that have been collected for different purposes to generate additional knowledge to the wastewater analysis. Mobility is the most rapid it has ever been, with aeroplanes used to move people (and viruses) between countries at speed. Ideas spread even faster, circumnavigating the globe at the push of a button. Marrying such information with environmental water samples collected on a daily or weekly basis is problematic. Repurposing data also raises important ethical questions of ownership, confidentiality and responsibility that need to be asked to ensure what we scientists do is both good and right (Price and Trowsdale, 'The ethics of wastewater surveillance for public health').

When reading the body of work as a whole our attention might turn to the connectedness of scale across and between the issues that are addressed. The cargo ship, for example, becomes part of the city in which it docks. The city is nested within a nation, and the nation and its people part of the global village. Water, of course, is a great integrator as it flows across time and space to disrupt the neat boundaries imposed by people on the earth. Indeed, water itself has a history (Linton, 2010) and it is this history, or at least the historical signature of place and bodies, that enables the application of wastewater-based epidemiology in the fight against the spread of the virus.

Throughout the pandemic there has been a shared desire to help in some way beat the virus, but many of us did not know how. Hydrologists have a long history of dealing with flows of water, pollution and public health and brought these together to assist. Out of this was born an immediate focus on wastewater-based epidemiology to aid our response to the unfolding pandemic. To many of us it felt as though the clock stood still at times during the pandemic as we retreated from social interaction and hibernated in our homes in lockdown. But the pandemic didn't sleep, and the response moved quickly and urgently as the situation evolved. As we go to press with this special issue it seems almost out of date before it has been published. But in times like these it is often useful to take the time to pause and reflect on work that was undertaken, teams that were formed and lessons that were learned so that the knowledge is captured and recorded instead of being lost to history. It has not escaped attention of the authors of this special issue that much of the work that has been done and the datasets that have been collected are applicable to the future screening of pathogens of importance. Furthermore, there is major change afoot in the management of water nationally, and careful documentation will surely help preserve institutional knowledge as the water industry adapts.

As we move beyond the immediate urgency of the COVID-19 pandemic and take heed of the lessons contained within, it is our expectation that the discourse will turn to reflect on how the connectedness of the globe, our relationships with flora and fauna (including microbes), our technology and our institutions are intrinsically linked in space and time to the situation that unfolded. What is clear is that as hydrologists contribute to the knowledge, care, protection and management of water, they will continue to have a pivotal role in the conversation.

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