Editorial

Incorporating water resources in integrated urban and regional planning

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Editorial

Understanding the relationships between water and the landscapes, communities, and jurisdictions through which it flows has become an increasingly urgent task for science over recent years. The vital role played by water in both urban and rural economies, its function in supporting ecosystem services, the consequences of excess or deficit, and our increasing awareness of the aquatic environment’s influence on quality of life all evidence the importance of refining our knowledge of the inter-dependencies between hydrological processes and social systems. At this resolution (catchments, regions, etc.), the importance of integrating land and water planning and the need for collaboration of multiple stakeholders are a genuinely holistic and interdisciplinary undertaking; providing opportunities for researchers from the natural and social sciences to generate insights which utilise understandings of fundamental processes and phenomena to inform and shape policy, planning, design and interventions. This is a relatively young but fast-growing area of science with theory and normative prescription in areas such as catchment management and water sensitive urban design driving a burgeoning science agenda. This Special Issue of the Journal of Hydrology showcases a suite of contributions from primarily developed countries around the globe which revel in this agenda. Our authors report work which tackles head-on the complexity and multi-dimensional nature of the problems and witnesses a growing confidence amongst the research community in crossing disciplinary and professional boundaries.

The utilisation of vegetation, soils, and landscapes to manage hydrological flows whilst simultaneously improving the quality of urban environments is attracting much interest from city planners keen to improve both the quality and functionality of urban green spaces. Such Green Infrastructure (GI) comprises patchworks or corridors of natural areas that provide habitat, flood protection, cleaner air, and cleaner water. Looking towards more formal integration of GI components in urban development planning, Young et al refine a typology of urban GI derived from case studies in the USA and New Zealand, the use of which is intended to support cities in determining the maturity of GI provision and support decisions on improving and extending GI services.

City planners right across the globe are also beginning to implement water sensitive urban design practices such as pervious pavements, green roofs, swales, infiltration ditches etc. However, the cumulative impact of such novel urban water management interventions on the temporal and spatial features of city scale hydrological flows is poorly understood. Rodriguez et al examine this challenge through the application of a distributed hydrological model to a case study catchment in Nantes, France. In doing so they expose some thought-provoking contrasts between the relative influence of water sensitive urban design on flows at plot, street, neighbourhood, and catchment scale. In a similar vein, Loperfido et al report some improvement in water quality from a comparison of catchment scale applications of distributed stormwater best management practices in the Chesapeake Bay watershed, USA. To achieve even better results, they advocate suburban development that integrates planning
of stormwater management with protected riparian buffers and forest land cover. This approach has the added benefit of delivering on multiple purposes: aesthetic value and green-space, community gathering points, and wildlife habitat, in addition to hydrologic stormwater treatment.

Contemporary urban water environments are the concern of a widening array of legislated and informal stakeholders, each with a distinctive perspective and inventory of desired management outcomes. Several of our contributors explore new approaches to facilitating dialogue between such eclectic gatherings of voices. Facilitating meaningful dialogue between stakeholders relies on data about both existing conditions and scenario informed futures being accessible. Walker et al report the development and testing of a low resolution model for just such an application. Using an urban diffuse pollution problem from Leeds in the UK to illustrate their approach, they clearly demonstrate that thoughtful model design and shrewd facilitation can benefit seemingly complicated multi-actor governance arrangements. Creating appropriate policy responses to expanding human activities that impact on water resources is a challenge where there is sparse on-the-ground effects-based data in less densely monitored regions. Sterling et al. used Geographic Information Systems (GIS) with easier-to-collect and more available exposure-based variables to model the link between stressors and impacts to aquatic systems in Nova Scotia, Canada. This new framework for high-level watershed assessments serves as an example of the benefits of collaborative arrangements and new technologies.

As illustrated by other authors, multiple actors play a role in river management and restoration. In Westling et al., the perceptions of local residents following river restoration in the north of England were examined. Identification of both tangible (e.g. riparian vegetation) and more intangible (i.e. scenic beauty and change in landscape) elements provided insight into human-landscape relationships. This is not the first article which points to the importance of achieving both ecological and social benefits from improved stream management, but it also highlights that such benefits are best attained through consensus among stakeholders.

Open and transparent deliberation about how to integrate urban and regional planning with water planning is required by the EU Water Framework Directive. Yet an underlying theme raised by authors of this special issue is the subordination of water planning to land development. Smith et al. report that the roles and responsibilities of public agencies at various scales in a Scottish case study were interpreted and affected by political mandates that give priority to economic growth. They suggest that constrained deliberation about limits to growth in the built environment is leading to lack of integration between water management and land use planning with potential to undermine the River Basin Management Plan framework and its objectives. More optimistic is Asefa et al.’s account of the case of Tampa Bay Water, USA, where the groundwater utilisation rate has been reduced to half in a decade. Integration of a diverse and regionally interconnected water supply system managed with sophisticated modelling has resulted in recovery of land and wetland water levels to meet the region’s growing water demands while satisfying other competing objectives.
The lack of integration of planning processes, especially in countries susceptible to highly variable rainfall or drought, such as Mediterranean Spain, has resulted, not in insufficient quantity to cover demand, but ironically, in overcapacity for certain sectors. March et al.’s paper describes the shift to desalination as an alternative to development of other water supply options in the country’s prioritisation of water for urban and tourism development. With desalination plants laying idle, they caution about preparing water plans strongly based on just one source of supply, ignoring more integrative views that might meet a wider range of needs, such as including agriculture. The contrast between times of plenty and times of scarcity also informs the contribution from Rijke et al. who demonstrate how applying existing frameworks to a different purpose can result in new ways of thinking about management opportunities. Extending the multi-layered safety (MLS) approach for managing flood risk to use in management of drought in Australia, they posit that there are benefits through better protection against water shortages through for example, diversification of water supplies, prevention of damage such as through water use efficiencies, and preparedness through, amongst other things, innovative water technologies.

Finally, the role of the community in effecting change in water quality is highlighted as an outcome of Green/Nehls et al. research. Their study of the impact of cigarette butt litter in Berlin shows a significant threat to urban water resources. They suggest that raising public awareness of the toxic nature of cigarette butt waste and its effect on the environment and drinking water quality would be more effective than intensified street sweeping efforts and installation of additional ash trays in urban areas.

A variety of research communities have responded to our call for papers and, whilst we were aware that the call would attract a strong and diverse stable of submissions, we have been particularly impressed by the extent to which the research and practitioner communities are co-producing knowledge, critically comparing understandings, and iteratively designing and testing interventions. Despite these encouraging signs, it would be erroneous to characterise the field as ‘mature’ or even ‘established’. We would also note that the unheard voices from the developing world may reflect a problem with conceptualisation in the English language rather than progress in the field in these countries. Many of the analyses reported in the pages of this issue only allow cautious diagnosis and prognosis and sometimes raise as many questions as they answer. They also, however, evidence substantive engagement with numerous innovative approaches to water management, anticipating a future where the configurational and functional detail of our urban structures and spaces are shaped by a sensitivity to water movement and quality.

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