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Stormwater Research

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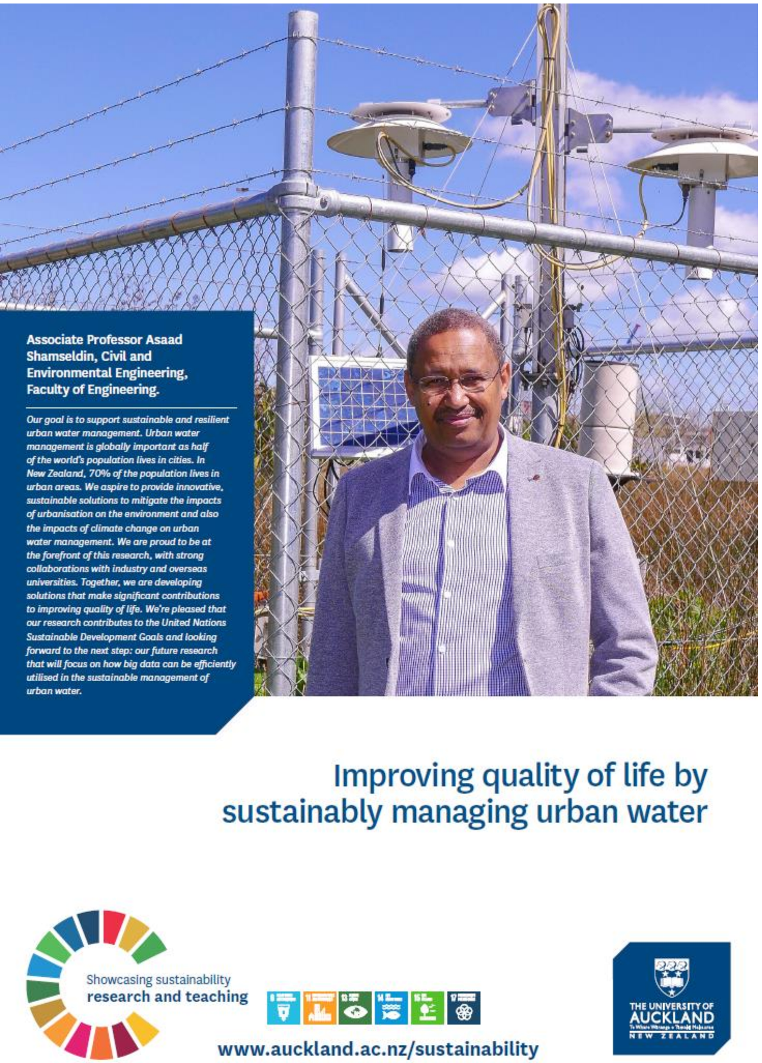
Urban water management



- Sustainable and resilient urban Water management
- Contribute to UN sustainable development goals

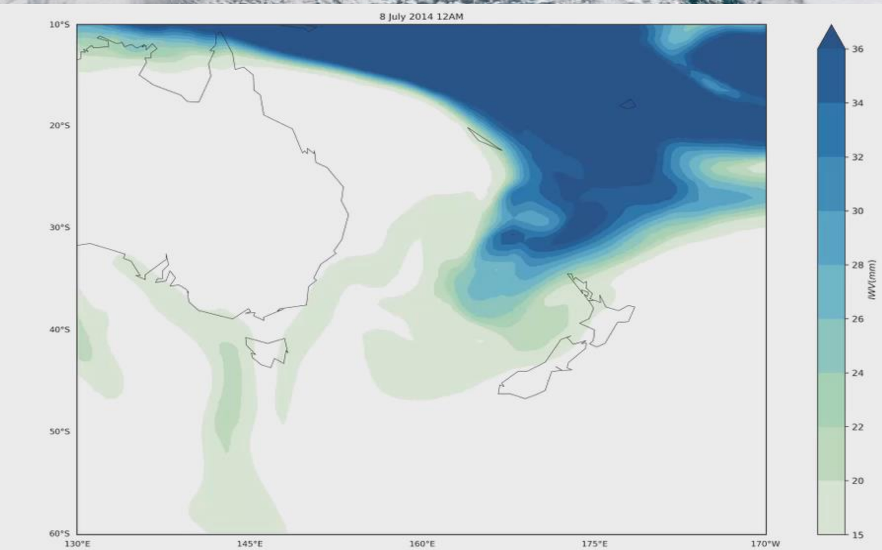
Multi-scale research

- Large Scale
- Catchment scale
- Site scale

❖ Understanding the Current climate

Atmospheric/Sky Rivers in New Zealand

- Atmospheric Rivers (Ars) can contribute to 50-86% of annual rainfall totals depending on the location and season
- ARs are linked 50 – 90% extreme rainfall events depending on the location and season



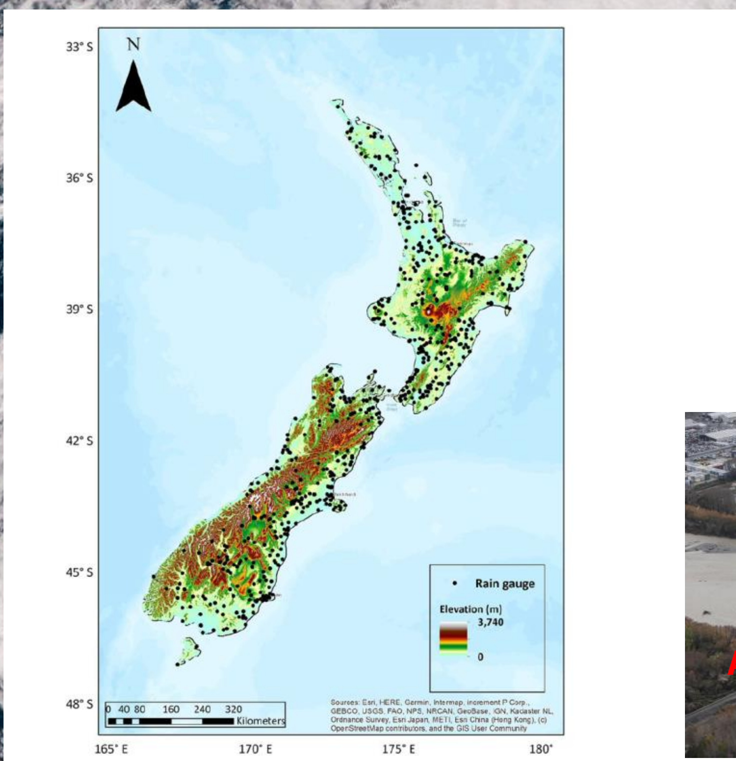
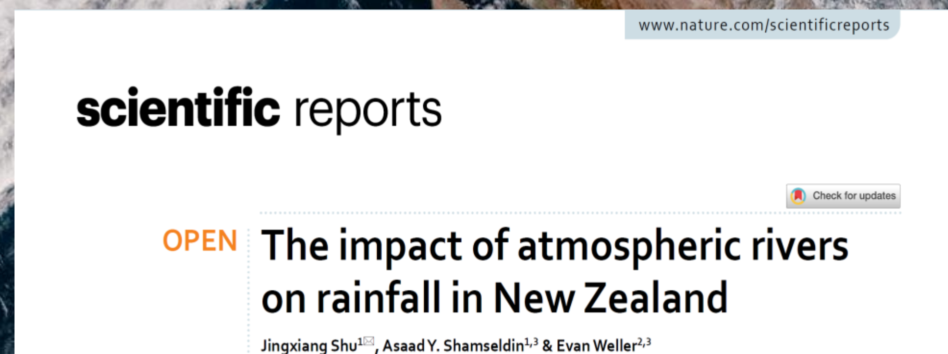


Figure 5. A map of New Zealand showing the location of 654 rain gauges.



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OPEN The impact of atmospheric rivers on rainfall in New Zealand

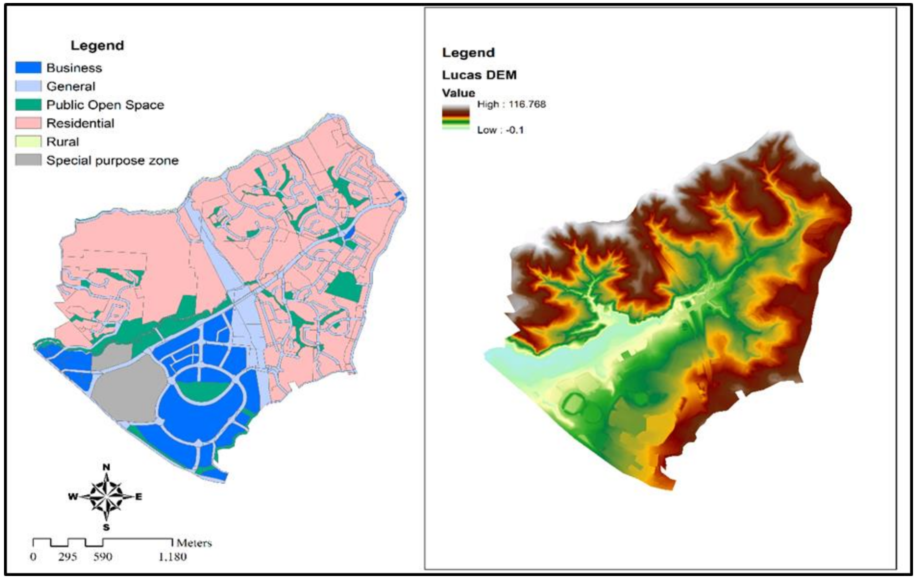
Jingxiang Shu[1], Asaad Y. Shamseldin[1,3] & Evan Weller[2,3]

Incorporating wider infrastructure disruption in urban flooding resilience investments

- **Work Package 1: Resilience to urban flooding incorporating the flood disruptions to the transport system and lifelines utilities**
  - Development of framework to quantify urban flooding resilience incorporating the flood disruptions
- **Work Package 2: Case study and application of the framework for Quantification of urban flooding resilience**
  - A number of rainfall storm scenarios will be used generate the flooding scenarios
  - Selection of a case study in Auckland after consultation with Auckland Council
- **Work Package 3: Flood mitigation strategies to improve flood resilience**
  - Development of flood mitigation strategies to improve the flood resilience and recommendations

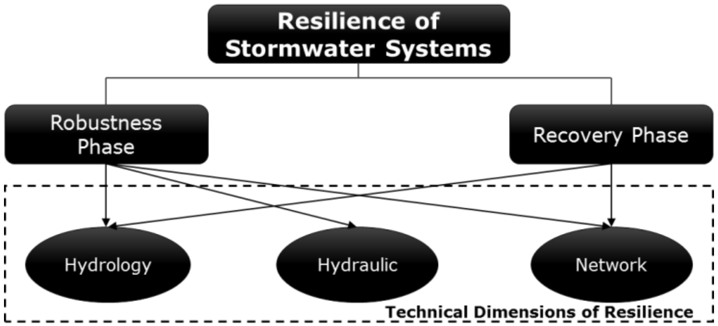
Adaptation to climate change of urban stormwater management

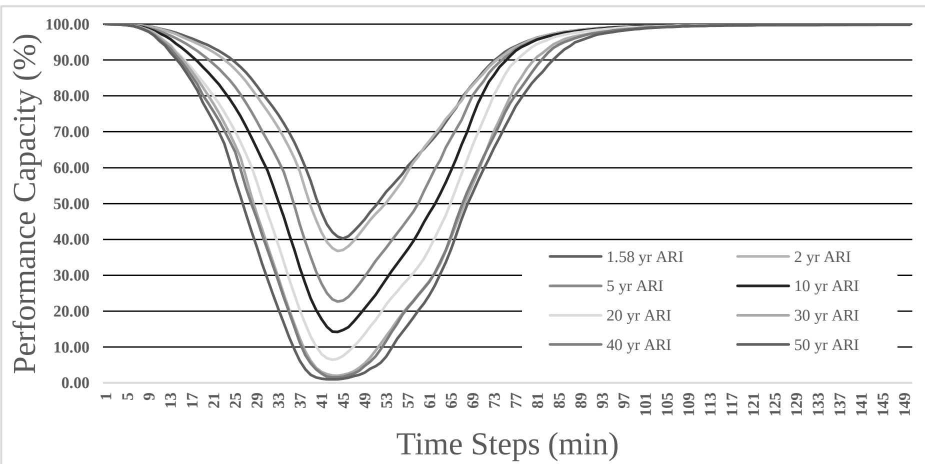
Case Study: Lucas Creek, Auckland, New Zealand



- Catchment area: 626.35 ha
- Urbanization level: 55% (opportunity)
- Mean annual rainfall:1104 to 1155 mm
- Mean annual potential evapotranspiration: 848 to 1017 mm
- Converting impervious area to green infrastructure and modifying design parameters of green infrastructure provide an effective way to adapt for climate change

Framework to quantify the technical resilience of urban stormwater infrastructure to flooding and other hazards





Result: *Benchmark stormwater network resilience and assess resilience interventions*

Springer Link

Published: 07 November 2019

Quantification of the hydraulic dimension of stormwater management system resilience to flooding

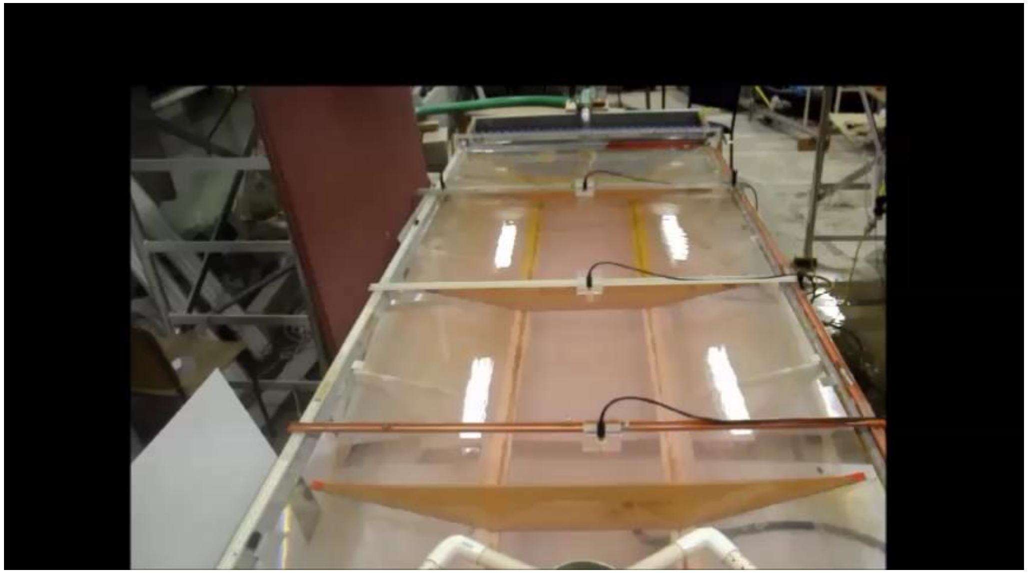
Nariman Valizadeh, Asaad Y. Shamseldin & Liam Wotherspoon

Water Resources Management 33, 4417–4429(2019) | Cite this article

121 Accesses | 0 Altmetric | Metrics

- Resilience under climate change

Optimization of Storm-water retention Pond Design under climate change



- Sediment control resulting from earthwork activities
- Performance is very sensitive to the temperature difference between the inflow and the pond
- Evaluate the performance under climate change

Flood Risk Mitigation Using Artificial Groundwater Recharge

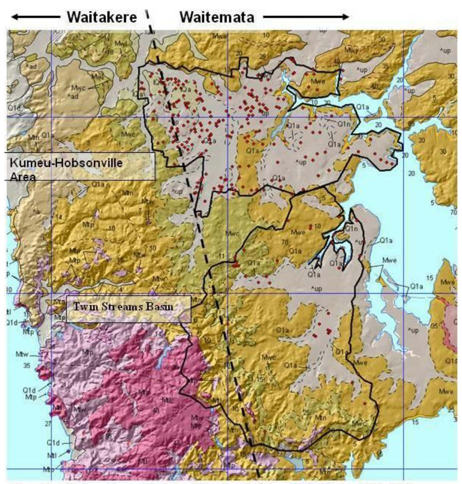
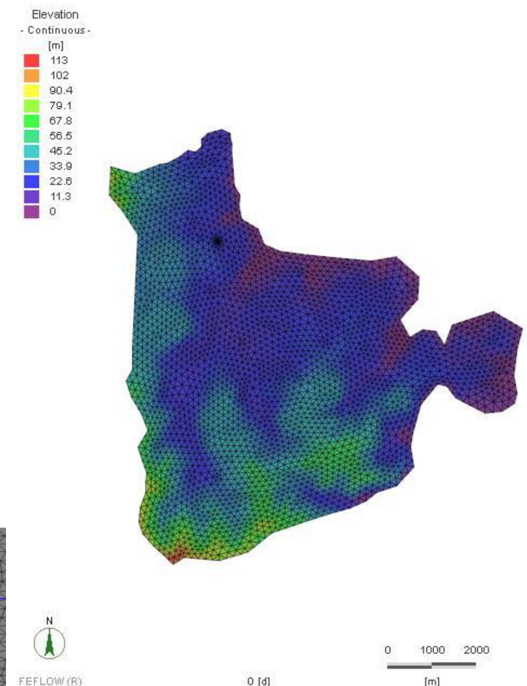
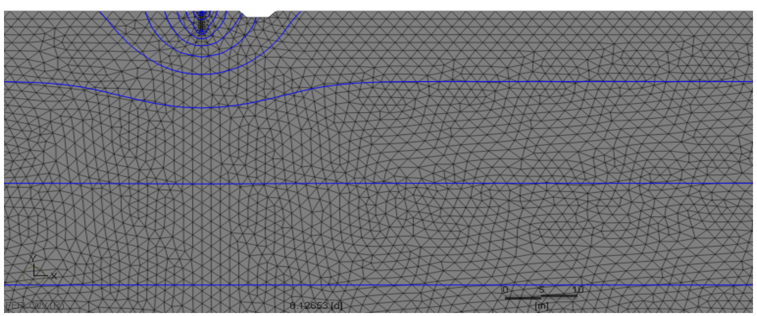


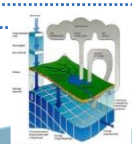
Figure 4. Geology Map and Registered Bore Locations from QMAP (Source: GNS, 2009).





Better understanding of device hydrology Measuring and Modelling Evapotranspiration in Raingarden

● What is the most reliable quantification method for estimating evapotranspiration in rain garden basins?

	Water balance method	● Analyse the rain garden actual evapotranspiration variation on daily and seasonally scales; ● Determine the main environmental factors which impact the actual evapotranspiration combining with single correlation analysis and multivariate regression analysis.
	Energy balance method	● Taking the observed energy components as foundation(Rn,LE,H,G), detects the energy distribution in this ecological system, including comparison between day and night, daily variation process, monthly variation process, seasonal variation process, Bowen ratio variation, and how environmental factors impact energy distributions.
	Classical predictive equations	● Apply different classical predictive equations (agriculture based) for calculating evapotranspiration in the rain garden, and compare all the results.
	MIKE SHE model	● Apply MIKE SHE model to simulate the hydrologic process in the rain garden; after model calibration and validation, take the long-term forecast (different scenarios).Make recommendations on application of MIKE SHE with special focus on evapotranspiration

Green roof: University of Auckland

- Constructed in 2006
- Unique opportunity to study long term performance of green roofs

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Thank You