

11^e Conférence internationale

LYON 2023

— L'eau dans la ville | Urban water

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L'eau dans la ville | Urban water

Low-cost sensor networks to quantify the dynamic of sediment yields in peri-urban areas



Supervisors - Australia:

Dr. Kathryn Russell

Prof. Tim Fletcher



WATERWAY ECOSYSTEM
RESEARCH GROUP

M.Sc. Paulo Vitor R. M. da Silva

06/07/2023



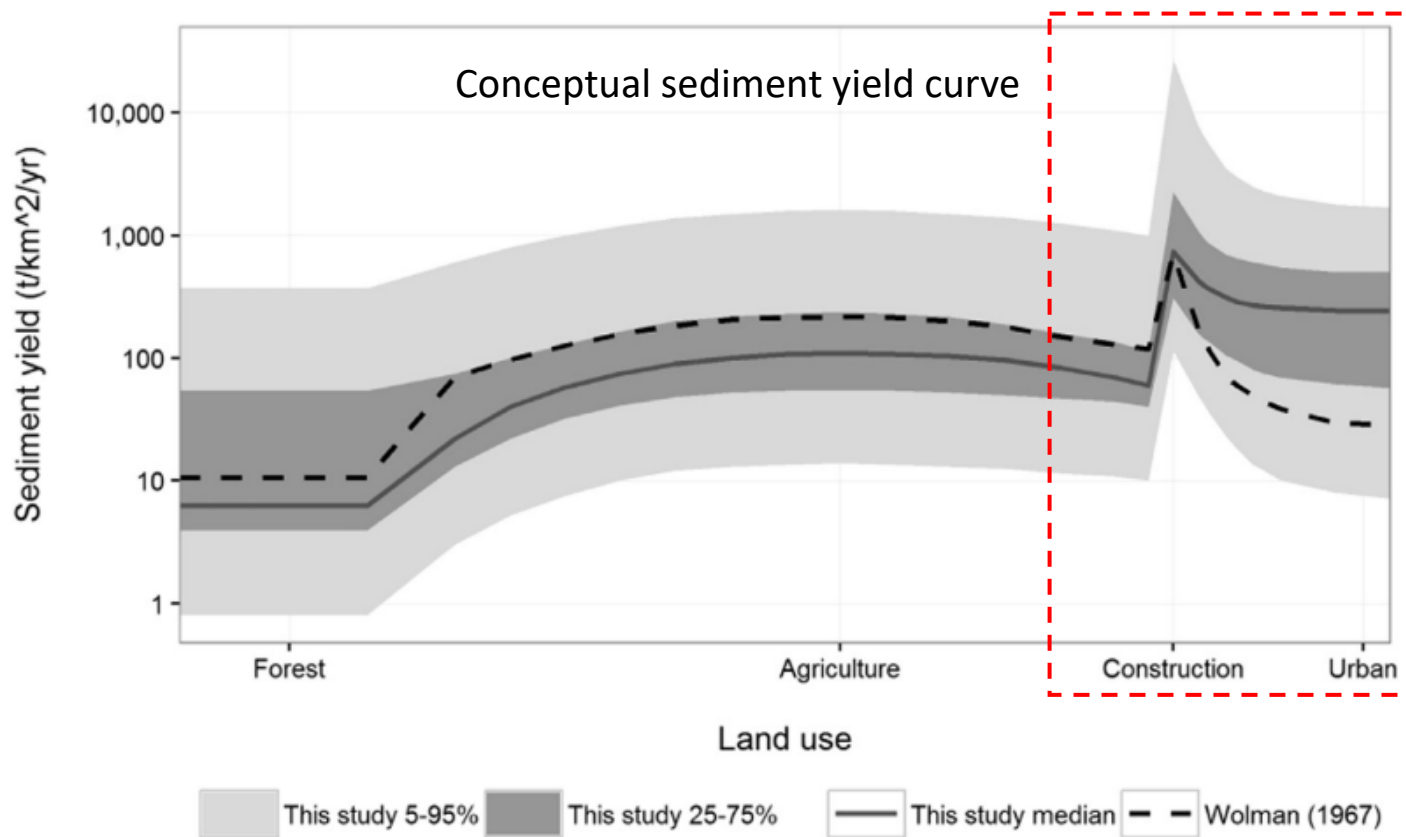
Supervisors - France:

Prof. Frédéric Cherqui

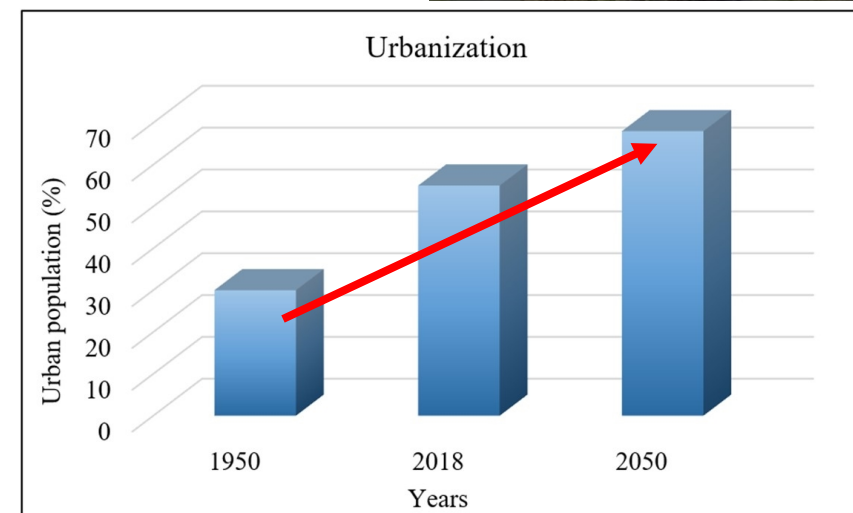
Prof. Oldrich Navratil

Prof. Etienne Cossart

Motivation



Russell et al. (2017)



United Nations et al. (2019)

Stages of Urban Development

Road & drain
construction

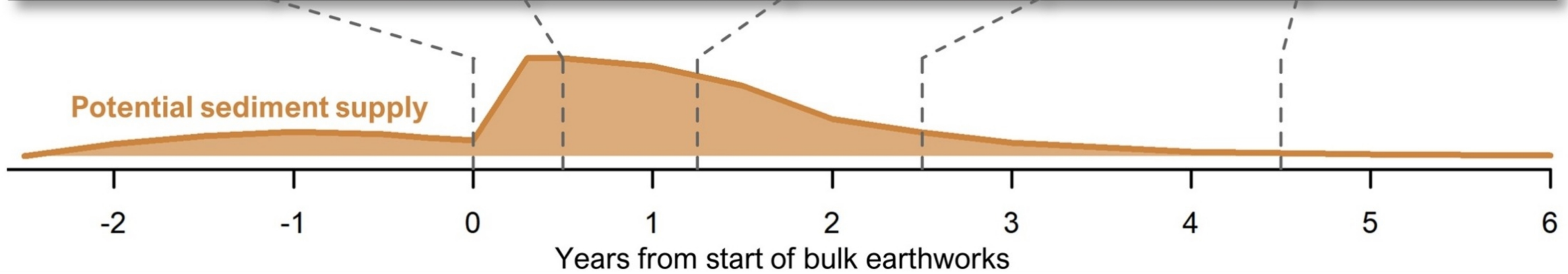
House
construction

Landscaping

Mature urban

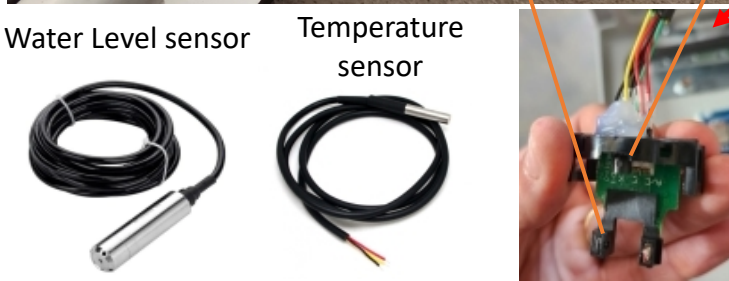
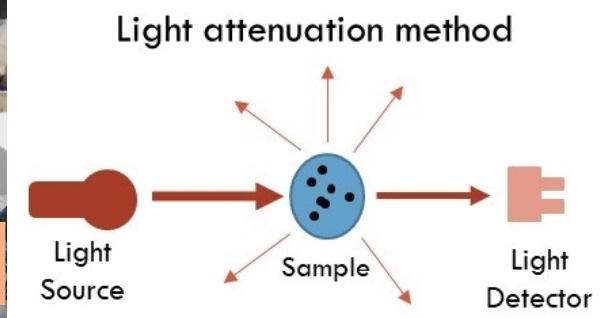
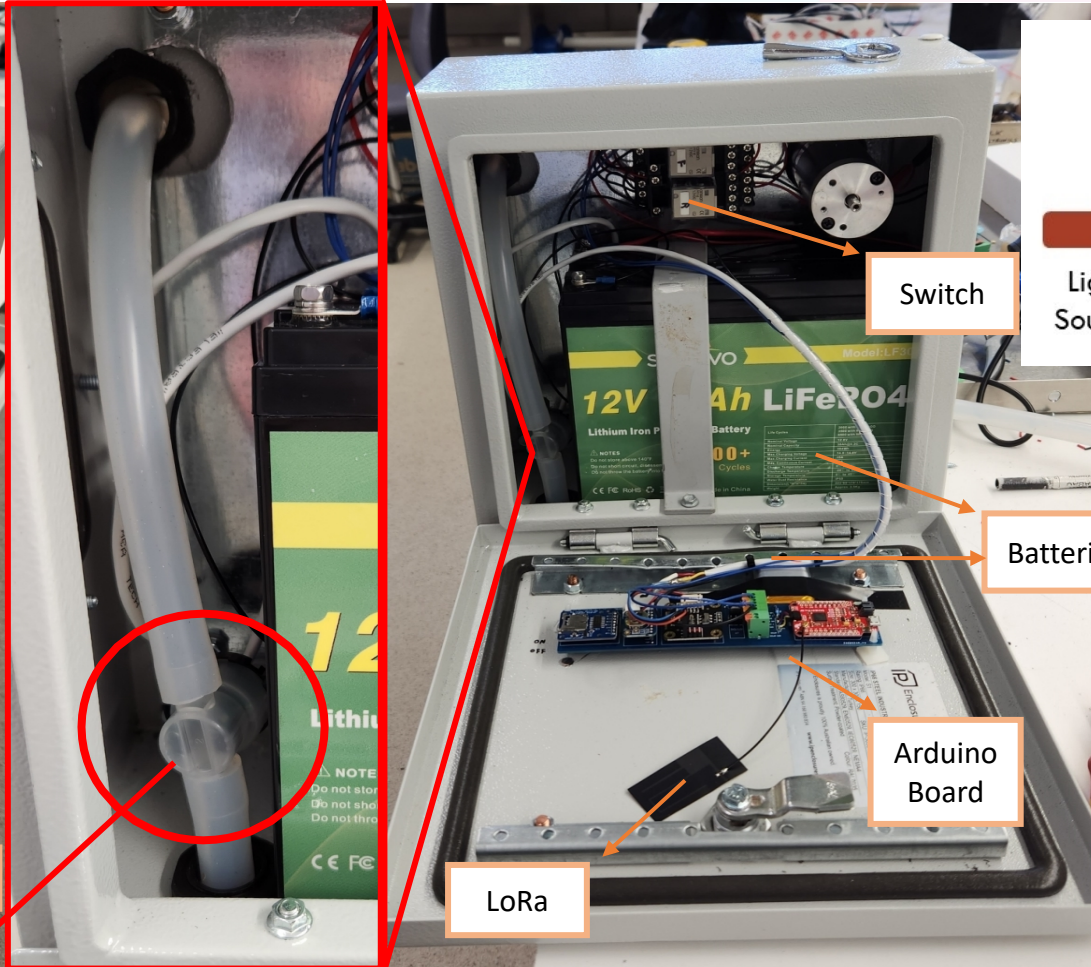
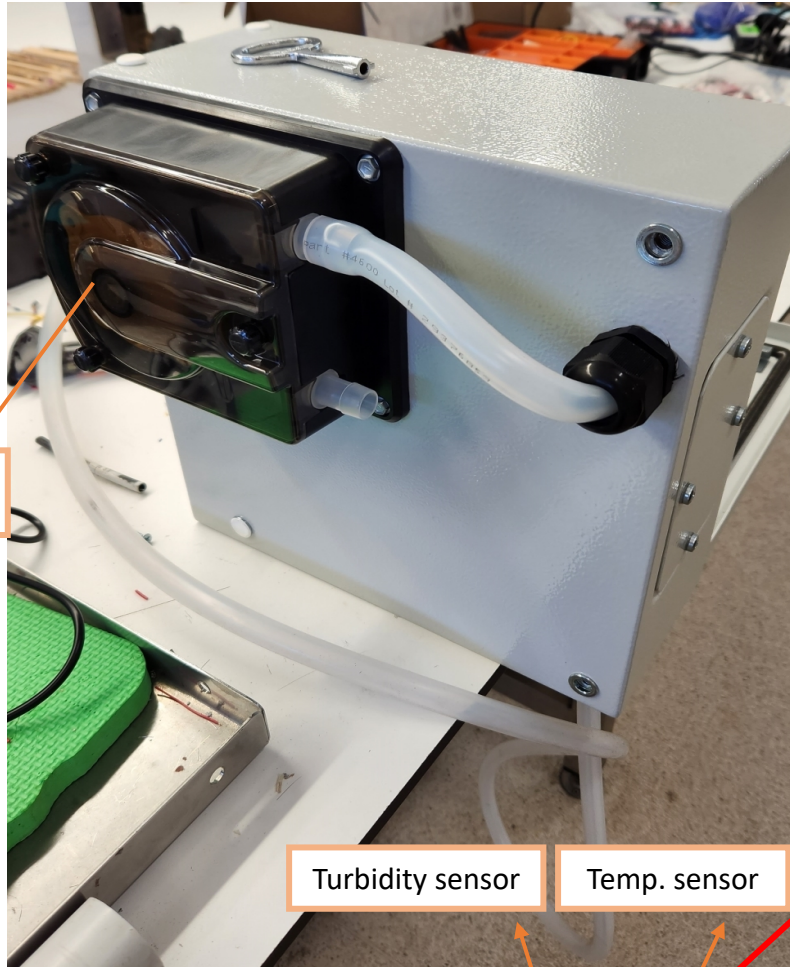
Site preparation

Bulk earthworks

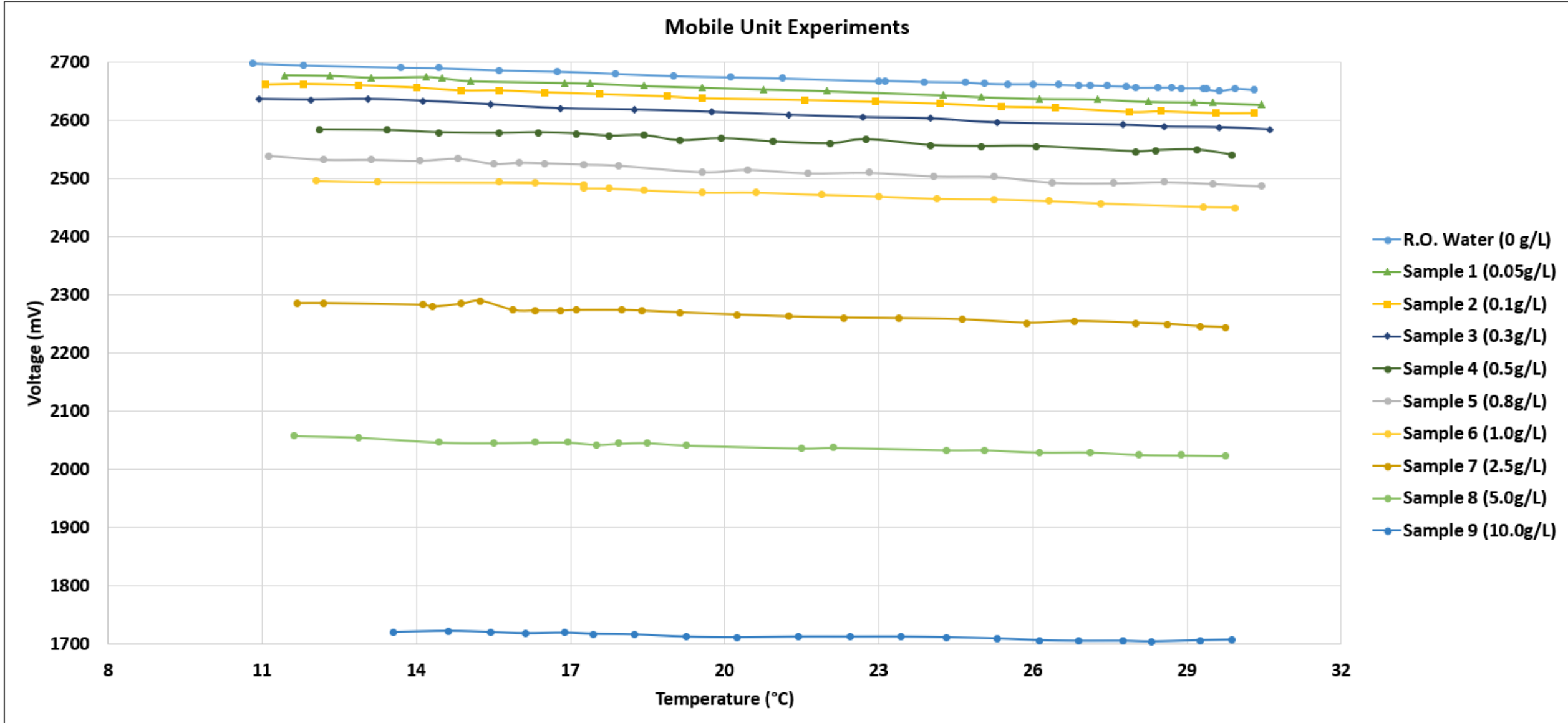


Russell, K. (2021)

Mobile Monitoring Station



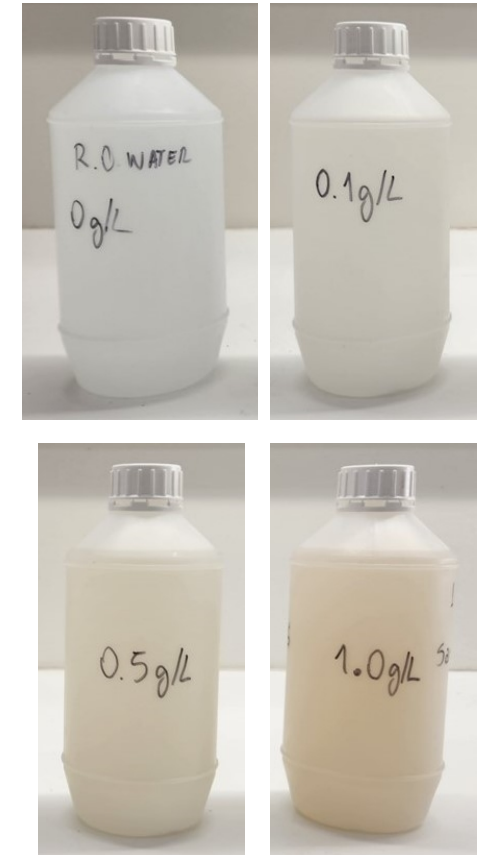
Laboratory Results



Lab Experiment - Calibration



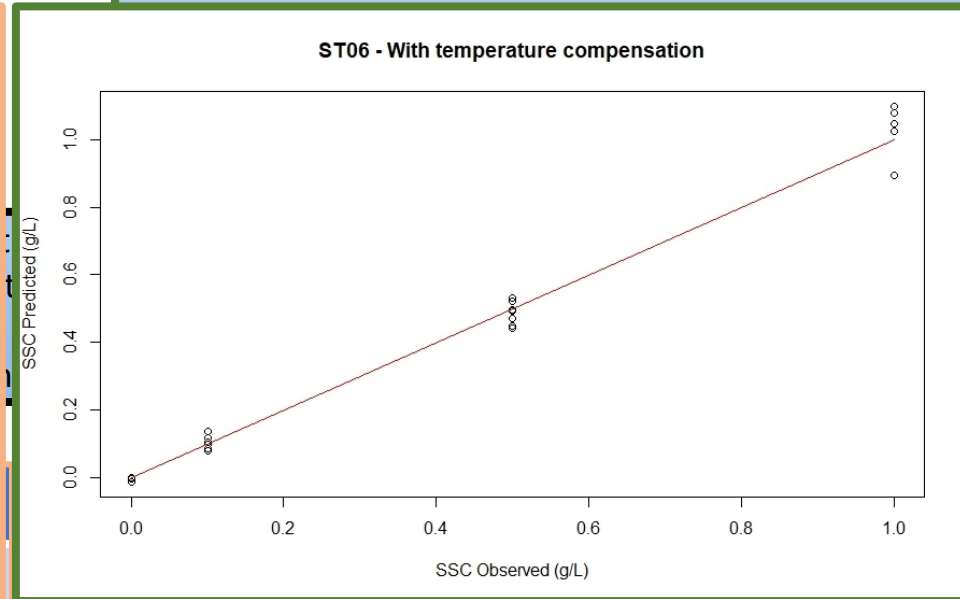
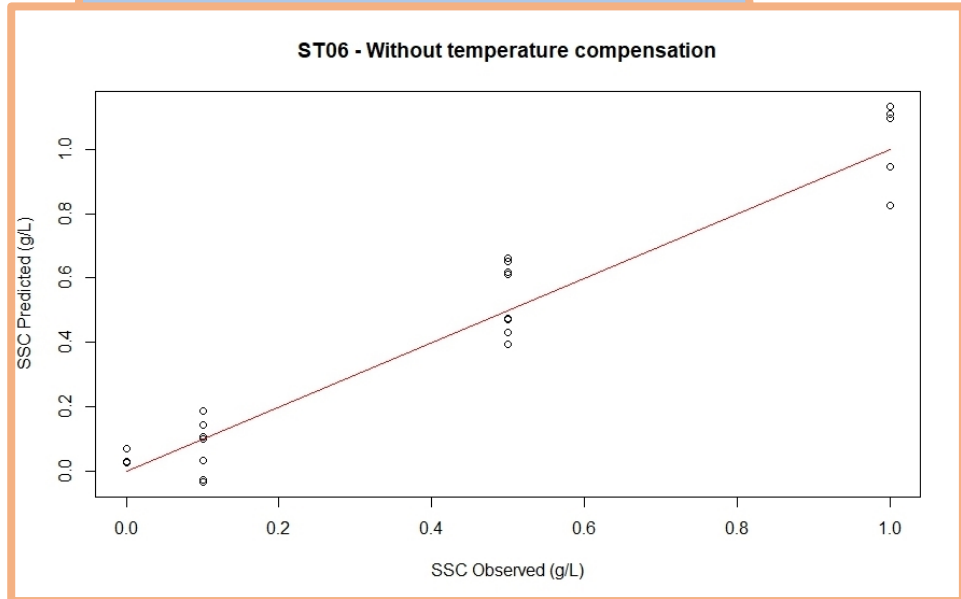
Samples



Lab Experiment - Calibration

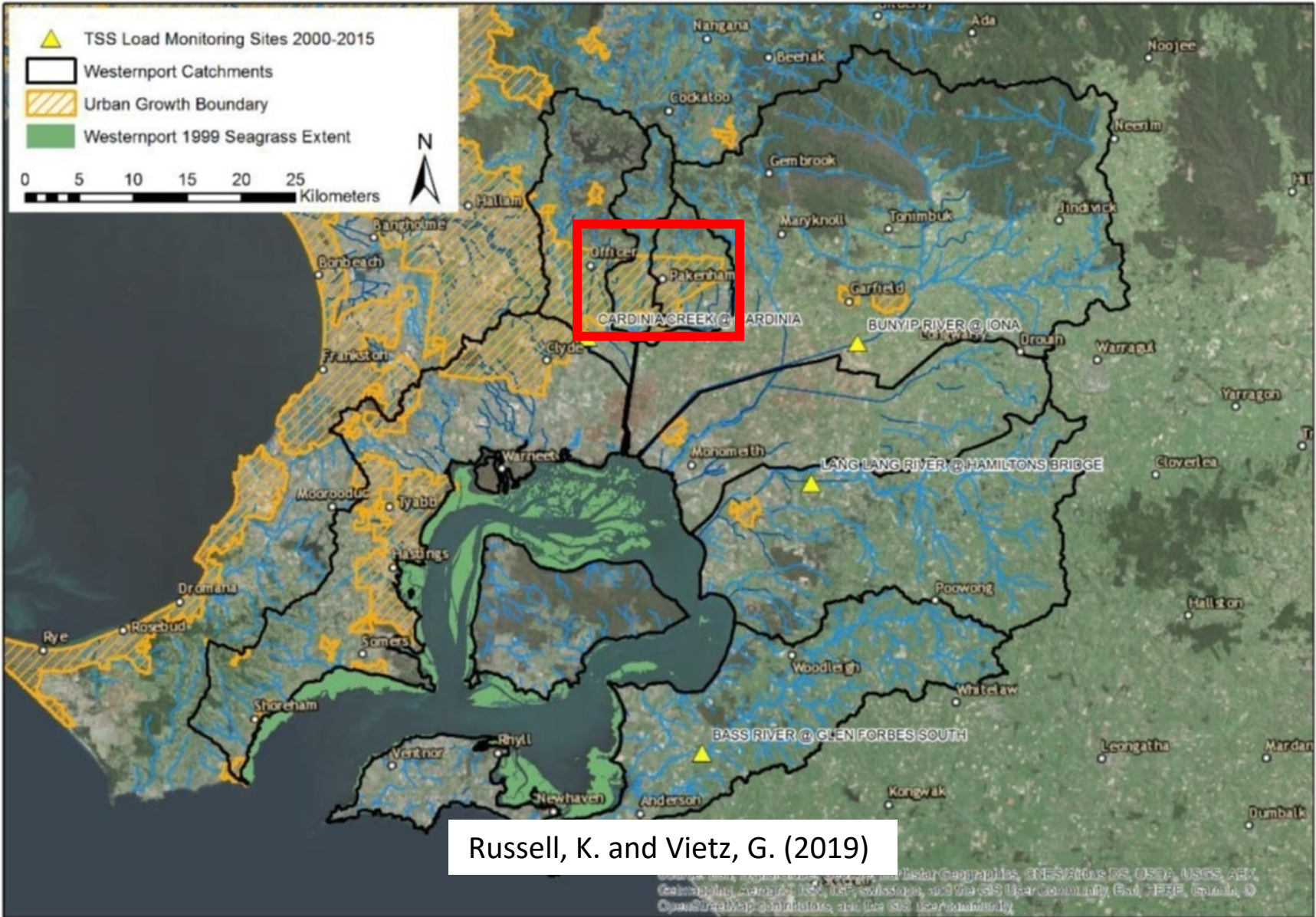
Without Temp. Compensation

With Temp. Compensation



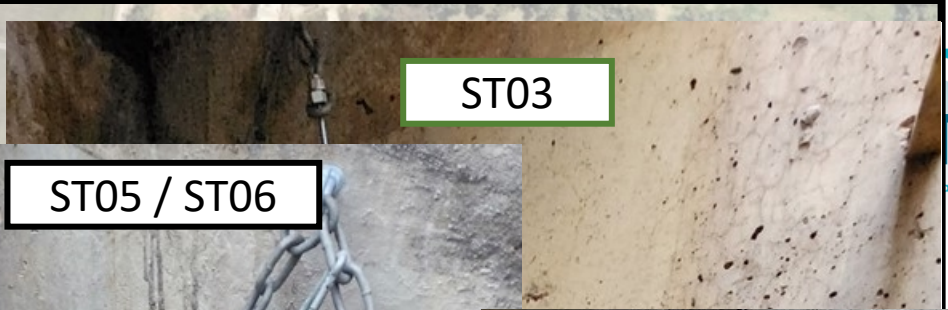
ST02	0.0854	0.0335	61%
ST03	0.1135	0.0429	62%
ST04	0.1075	0.0662	38%
ST05	0.0874	0.0297	66%
ST06	0.1092	0.0291	73%






Study Area



Russell, K. and Vietz, G. (2019)

Source: Data provided by the Victorian Government, Geospatial Information Systems, and the GIS User Community, Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS User Community



-  ST02
-  ST03
-  ST04
-  ST05
-  ST06

Concentration x Stages of Urban Development



Station – Sample #	SSC – Observed (g/L)	Stage of Urbanisation
ST02 – 01	0.5	Mature urban
ST02 – 02	0.4	
ST02 – 03	0.6	
ST01 – 01	2.2	House construction / Landscaping
ST01 – 02	2.3	
ST06 – 01	9.5	House construction
ST05 – 01	11.1	Road and drain construction
ST05 – 02	23.2	



Suspended Solids Concentration: Observed x Predicted

Station	Sample #	Date	Concentration – Observed (g/L)	Concentration – Predicted (g/L)	Error (%)
ST05	1	24/05/2023	11.1	8.5	23
ST01	1	8/06/2023	2.2	33.1	-1,382
ST01	2	8/06/2023	2.3	17.7	-670
ST02	1	8/06/2023	0.5	0.2	51
ST02	2	8/06/2023	0.4	0.5	-44
ST02	3	8/06/2023	0.6	0.8	-46
ST05	1	8/06/2023	23.2	8.4	64
ST06	1	8/06/2023	9.5	4.0	57

Conclusions / Expectations

- ✓ Powerful monitoring tool;
- ✓ Continuous monitoring of turbidity, suspended solids concentration (SSC), water elevation, and temperature;
- ✓ High ranges of turbidity (0 – 4000 FNU) and SSC (0-10 g/L);
- ✓ Temperature compensation and control of ambient light;
- ✓ Calibration;
- ✓ Early stages of urbanization can have a significant impact on sediment production compared to late stages of urbanization;
- ✓ Allows a better understanding of the main sources of suspended sediments and their spatial and temporal variability in peri-urban catchments.

Acknowledgments



WATERWAY ECOSYSTEM
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- Robert James
- Peter Poelsma

Thank you!



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