People and Practices: Fostering transitions toward sustainability through transdisciplinary inquiry and individual, social and organisational learning

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I certify that the work in this thesis has not previously been submitted for a degree and nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and in the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signature of Student:

Date:

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To my utter astonishment…

To the supporters, mentors, supervisors, advocates and friends that have buffered me from my own insecurities, sat silently listening to the confused, messy process of clarifying my thoughts, picked me off the ground, dusted me off and gently shoved me back into the doctoral abyss … you believed in me until I finally grew enough, both professionally and personally, to believe in myself.

In light of this group of individuals who have provided the supportive structure for me to conduct this doctoral research, it would be foolish to suggest this thesis is the output of one researcher; it has in fact been the result of numerous personal and professional connections, conversations and relationships that have nurtured the concept for and validity of this thesis. There are so many that deserve acknowledgement, and while I doubt I will do you all justice, this is my humble attempt …

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RELEVANT PUBLICATIONS

Journal papers

1. Fam D., Mitchell C.A., & Abeysuriya K. (2013) 'Facilitating organisational learning to support decision making and planning for sustainability in the water sector, *Water Policy,* vol. 15, pp. 1094-1108

2. Fam D. & Mitchell C.A., (2013), 'Sustainable innovation in wastewater management: lessons for nutrient recovery and reuse', *Local Environment,* vol. 18, no. 7, pp. 769-780

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7. Fam D., Abeysuriya K., Mitchell C., Lopes A. & Smith T (submitted) 'Facilitating sustainable innovation by designing socio-technical experiments as social learning systems, *Journal of Cleaner Production*

8. Fam, D.M. & Lopes, A., (submitted), 'Toilets practices and system change: lessons from a transdisciplinary research project', *Journal of Design Research*

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27. Mitchell, C.A., Fam, D.M. & Cordell, D.J. (2011), 'Effectively managing the transition towards restorative futures in the sewage industry: a phosphorus case study' in Howe, C. and Mitchell, C. (eds), *Water Sensitive Cities*, IWA Publishing, UK, pp. 1-23.

28. Willetts J., Mitchell C.A., Abeysuriya K. & Fam D. (2012) Creative tensions: negotiating the multiple dimensions of a transdisciplinary doctorate, in Lee A. & Danby S. (eds) *Reshaping Doctoral Pedagogies*, Routledge

PAPERS THAT CONSTITUTE THIS THESIS BY PUBLICATION

This thesis is based on the following six papers which will be referred to in the text by Roman numerals:

Paper I:

Fam, D.M., Mellick-Lopes, A., Willetts, J.R. & Mitchell, C.A. (2009), 'The challenge of system change: an historical analysis of Sydney's sewer systems', *Design Philosophy Papers*, vol. 3/2009, pp. 1-14.

Paper II:

Fam, D.M., Mitchell, C.A., Abeysuriya, K.R. & Mellick-Lopes, A. (in-press) 'Emergence of decentralised water and sanitation systems in Melbourne, Australia, *International Journal of Water*

Paper III:

Fam D. & Mitchell C.A., (2013), 'Sustainable innovation in wastewater management: lessons for nutrient recovery and reuse', *Local Environment,* vol. 18, no. 7, pp. 769-780

Paper IV:

Fam D., Mitchell C.A., & Abeysuriya K. (2013) 'Social learning in planning for sustainability - an Australian perspective on trialling sustainable water services', *Water Policy,* vol. 15, pp. 1094-1108

Paper V:

Fam D., Lopes A. & Abeysuriya K. (submitted) 'Facilitating sustainable innovation by designing socio-technical experiments as social learning systems', *Journal of Cleaner Production*

Paper VI

Fam, D.M. & Lopes, A. (submitted), 'Toilets practices and system change: lessons from a transdisciplinary research project', *Journal of Design Research*

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ABSTRACT

The goal of this thesis is to take people and practices as the primary focus in analysing past and emerging case studies of transitions in sanitation. 'Transitions', as structural changes in the way societal systems operate, are increasingly acknowledged as necessary for meeting sustainability goals. Uncertainties such as rapid population growth, the emergence of new pollutants, changing hydrological conditions, climate change impacts, global economic instability and declining phosphorus reserves are driving innovation and transitions in sanitation.

Integral to the process of transitioning toward sustainability are 'people and practices' and yet the tendency of innovation scholars is to focus on technological factors and systems of supply. This ignores the importance of the human dimensions of technological change. In light of this knowledge gap, the objective of this thesis is to investigate how 'people and practices' are involved in technological change and in the emergence of sustainable systems of sanitation.

Practices in this thesis are discussed at the level of *using* novel technologies (implicating end-users) and the level of *planning, designing and managing* the installation of novel technologies (implicating project teams). Complementary to the overarching framework of transition management, this transdisciplinary perspective of 'practices' draws on literature from practice theory, social and organisational learning and communities of practice.

Six case studies of transitions in sanitation, over three cycles of research, provide insight into how transitions have *historically occurred, are occurring at present and might be more readily facilitated in the future.* The diverse range of cases span temporal (historical and real-time cases), geographic (local and international cases) and spatial (community and city scale cases) scales with a primary focus on the emergence of urine diversion (UD) in Sweden and Australia.

The sociological perspective adopted to study transitions in sanitation revealed the complex relationship between sanitation technologies, and the users/consumers and managers/providers of these systems. Contributions to new knowledge resulting from this research span praxis and methodology. This has included identification of principles for designing experiments to support social learning in transdisciplinary projects inclusive of end-users, processes for engaging end-users in adopting new

practices through social learning, and methods for translating individual learning into organisational learning and change by organisations trialling sustainable innovation. Methodological contributions include the identification and application of a cumulative staged approach to case study research on transitions and demonstration of the value and validity of qualitative social research in facilitating and supporting the emergence of new and fragile practices.