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A categorisation system for Australia's Integrated Urban Water Management plans

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ABSTRACT

Integrated Urban Water Management plans (IUWM plans) are the processes through which water utilities make and justify important water infrastructure decisions for particular regions. Currently, no widely accepted categorisation system exists, and it is therefore difficult to understand what types of plans exist and the differences among them. This is a barrier to collaboration between agencies, knowledge sharing, and continual improvement of IUWM plan processes. This study has involved in-depth analysis of IUWM plan case-studies to develop and trial a novel IUWM plan categorisation system. This system categorises IUWM plans using six scope descriptors that can shed light on their character and utility.

1. Introduction

1.1. Integrated Urban Water Management plans

Urban water management predominantly involves the provision of three services; water supply, sewerage, and drainage (Marlow et al., 2013). Water supply includes the provision of potable water, which is supplied to residential households for drinking, and in some cities, fit-for-purpose water which is supplied for non-drinking usage including toilet flushing, laundry, and irrigation (Ferguson et al., 2013). Sewerage includes the collection, treatment, and disposal of residential and industrial wastewater (Fam et al., 2014). Drainage includes the management of local scale urban stormwater collection and transfer, large scale flooding infrastructure, and the management of waterways or water bodies (Fryd et al., 2012). Within the traditional water management paradigm each of these three services is managed separately, with different infrastructure, managers, processes, and plans (Anderson and Iyaduri, 2003); (Mukheibir et al., 2014); (Makropoulos et al., 2008).

Integrated Urban Water Management (IUWM) is a concept that is gaining popularity in some areas of the world (Closas et al., 2012) (Global Water Partnership, 2012), particularly within Australia (Mitchell, 2006) (Ferguson et al., 2013); (Mukheibir et al., 2014); . IUWM processes consider water supply, sewerage, and drainage simultaneously, through an integrated planning process. There are many similar terms that have been created to define concepts similar to IUWM, including Integrated Water Resource Management, Total Water Management, and Integrated Water Cycle Management (Furlong et al., 2015). In a broad sense, all of these terms advocate that water managers should holistically consider impacts across all water services to achieve the best outcomes for the community. Therefore, in regards to their base ideology, these terms are interchangeable (Furlong et al., 2015).

IUWM plans (can also be referred to as “IUWM strategies”) (Furlong et al., 2017a) are the integrated decision making process through which some Australian water utilities plan the future infrastructure augmentations for one or more water service (water supply, sewerage, and drainage) for a defined region (Furlong et al., 2016a). These regions are delineated by either natural catchment boundaries or artificial governmental boundaries (Warner et al., 2008). They can be as large as an entire region or city, or as small as a small town or suburb. IUWM plans involve making predictions about how a region will change with respect to population growth, urban development, and climate over a period of time, generally between 5 and 50 years (DSE, 2005); (Melbourne water utilities, 2006); (Jefferies and Duffy, 2011); (CSIRO, 2010).

IUWM plans are created for a variety of reasons and to suit a large variety of contexts, and there are various methods and processes that water utilities have at their disposal (Furlong et al., 2016a); (Furlong et al., 2016c). Practitioners decide which methods are most appropriate depending on the geography, demographics, stakeholders, the strategic aims, available resources,

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and previous planning and decision-making processes (Hering et al., 2015).

1.2. The need for a categorisation system

Currently, it can be very difficult for scholars and practitioners to understand what types of IUWM plans exist, and the differences between them (Anderson and Iyaduri, 2003). This can be challenging because of the diversity and complexity of IUWM plans which consider a broad range of contexts, scales, intended outcomes, number of services, and vastly different geographic areas and population (Hering et al., 2015). There is also wide variation in existing water infrastructure, governance structures, and public expectations (Wilson et al., 2013); (O'Halloran et al., 2012); (Overman et al., 2015). Hence valid comparisons between differing IUWM plans can be difficult, and processes from one IUWM plan may not be appropriate for another (Furlong et al., 2016c).

To enable scholars and practitioners to be involved in the continual improvement of IUWM planning processes they must first understand and be able to demonstrate how various IUWM plans relate to one another in terms of process and function. An IUWM plan categorisation system would allow practitioners to determine which previous IUWM plans, or which aspects of a previous IUWM plans, are relevant to consider when creating new IUWM plans. A categorisation system is vital to enable collaboration and knowledge sharing. During an extensive literature review, we did not uncover any categorisation systems that either describe the differences or enable comparisons between IUWM plans.

This study will attempt to fill this gap by taking some preliminary steps towards the development of an IUWM plan categorisation system, which can be built upon and improved. The system would allow water practitioners and scholars to identify previous strategies and particular aspects, methods, and processes that may be relevant in the creation of future plans.

To ensure that any categorisation system can be accepted by the industry it must avoid any perception of judgement, as this could be perceived to create a risk of reputational damage to an individual or organisation. To prevent any negative perceptions, this study will use a description of the scope of the IUWM plans as the basis for the proposed categorisation system. By describing the scope of a plan, one cannot judge the effectiveness of that plan, but rather only the intended processes and outcomes.

2. Method

The research involved several steps. Primarily the process has involved an extensive literature review to develop scope descriptors, which formed the basis of the categorisation system, consultation with industry experts to refine and verify the system, and then exploration of this system through analysis of nine IUWM plan descriptive case studies, as shown in Fig. 1.

As no IUWM plan categorisation systems have been identified, a literature review was required in order to understand previous efforts to develop non-water related strategy categorisation systems. The majority of the relevant literature regarding strategy categorisation is related to the field of "corporate environmental strategies." A corporate environmental strategy is a plan developed by a large company to address environmental issue or objectives of the company. Many of these examples came from the car-industry from companies wanting to reduce environmental damage caused by production (Díaz-Garrido et al., 2016). Many categorisation systems were found, some referring to themselves as taxonomies or typologies, and enabled us to develop an understanding of what would be required in an IUWM plan categorisation system. However, we quickly determined that no system existed which would meet the requirements for IUWM plans.

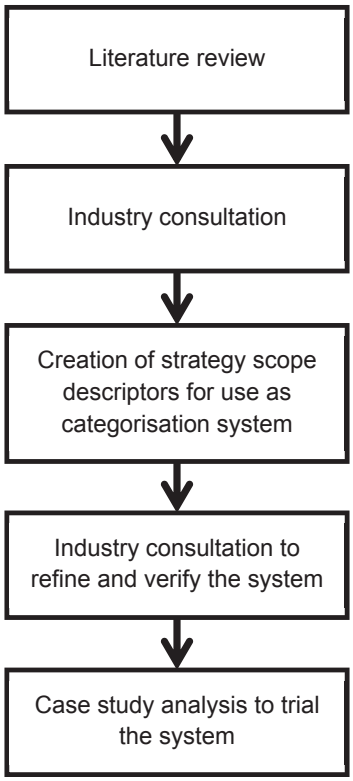

Fig. 1. Method for this study.

To ensure the thoroughness of this literature review, the following terms were searched in both the Scopus and Google Scholar academic databases; strategy categories, strategy categorisation, environmental strategy categories, environmental strategy categorisation, strategy typology, environmental strategy typology, strategy taxonomy, and environmental strategy taxonomy. The categorisation systems, typologies, and taxonomies were then critically assessed to determine what, if any aspects could form the basis of scope descriptors for use as an IUWM plan categorisation system.

Following the literature review, we developed a draft set of strategy scope descriptors to be used as an IUWM plan categorisation system. When selecting scope descriptors, the following criteria were considered:

- Perception of negativity; if a scope descriptor could be perceived as "good" or "bad" then it would not be included.
- Ease of use; it is important to have a categorisation system based on factors that are quick and easy to determine, understand and measure.
- Relevance; each scope descriptor must be a relevant indicator.
- Objectivity; wherever possible it is important to have scope descriptors that are objectively determined.

We collected feedback on draft categorisation system and identify IUWM plan case studies, and detailed information on IUWM plan case studies. In total, 34 experts representing six distinct sectors of the water sector were consulted with, as shown in Fig. 2.

In order be able to test and verify the categorisation system, the research undertook a qualitative multiple case study approach (Yin, 2009). Nine case studies were selected to trial the system in a broad

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