Structuring Integrated Asset Management in the Water Sector

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Background

The Natural Capital Declaration (NCD, UNEP 2012) requests companies to disclose the dependence and impact of their assets and services on the natural environment through transparent qualitative and quantitative reporting. Yet, limited work has been done the creation of methodologies devoted to reporting and accounting for the mutual relationships among built, financial and natural assets.

Such works would be great opportunities for innovation in the asset management of the UK water sector as they would provide a powerful tool for broadening its current narrow focus.

The paper briefly describes the traditional asset management planning and practice of the UK water sector and introduces a structured approach for accounting for both natural and built assets in strategic decision making.

Traditional Asset Management in the UK water sector

The Institute of Asset Management (IAM) is describes Asset Management as “the coordinated activity of an organisation to realise values from assets” (ISO 55000:2014). Based on standardised principles and definitions, the water sector has created frameworks underpinned by systems thinking, to secure the provision of qualitative services to their customers and assets’ viability. The boundaries of these systems are drawn around the physical asset systems, treating the wider environment is treated as an externality.

Nonetheless, services in the water sector depend heavily also on natural assets (e.g. water, soil). Recent policy demands for sustainability incentives (OFWAT 2015) stress the growing case for understanding the dependencies that water industries have on natural assets, the risks and opportunities associated with this relationship and their real value and for adopting more integrated approaches (UKWIR, 2014).

Focus and Scale shifting

An essential step towards accounting for natural capital is to broaden the boundaries and the scope of asset management. Thus, water industry should move from the narrow asset system focus to a spatial unit of analysis; that of the catchment. In physical geography terms, the catchment is the natural boundaries wherein the water-related ecosystem functions take place. Such a regional territory consists of a number of natural, semi-natural and artificial landscapes, composed of a mosaic of interacting ecosystems (or subsets) (Figure 1). To achieve an integrated approach, the specific characteristics of the distinct subsets comprising the catchment and their interactions should be identified and thoroughly studied.

Integrated Asset Management: a structured approach

The concept of ‘Industrial Ecology’ represents an analogy between natural ecosystems and the industrial system. It consists a framework towards practical sustainability (Erkman, 2003) and is a systemic, comprehensive, integrated view of the components of the industrial economy and their relationship with the biosphere. Its basic methodological concept is the ‘industrial metabolism’, which is a descriptive and analytical methodology based on the principle of the conservation of mass. In the form of regional flow analysis, industrial metabolism appears to be a potentially crucial tool for development planners (Erkman 2003).

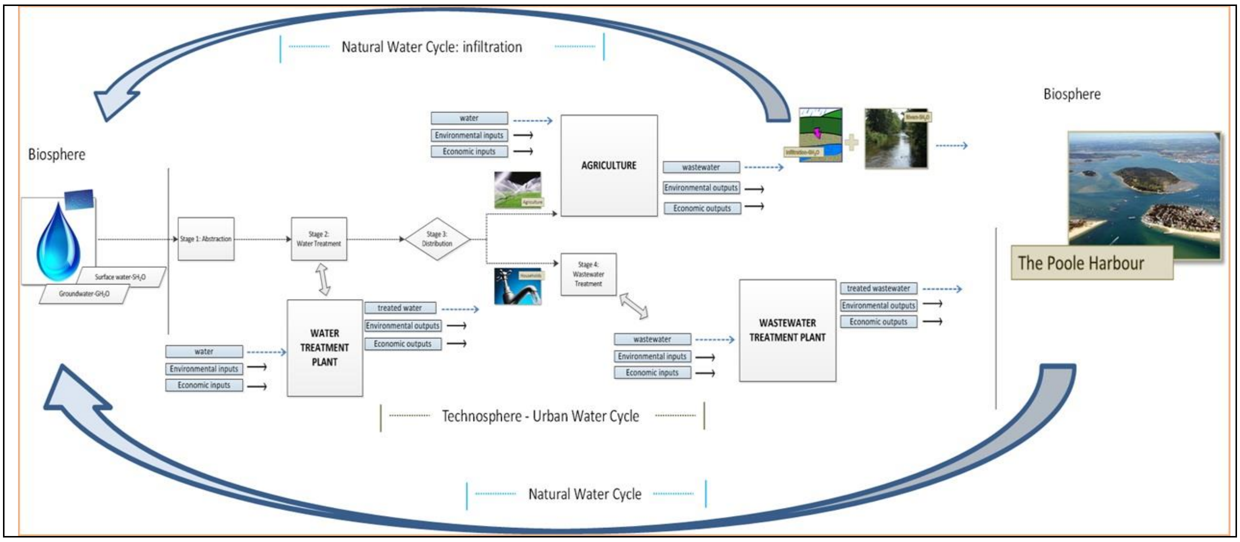

Figure 1: An exemplar catchment represented as a modified flow chart.

Synthesising tools from industrial ecology (e.g. material flows analysis, life cycle assessment) and water accounting, we have created the catchment metabolism methodology which is a structured approach for accounting for both environmental and economic flows within the spatial boundaries of a catchment (Figure 2).

The principles underpinning the methodology are summarised as follows:

- The Physical Input Output Table (PIOT) is used as the basic structure, which is an economic-ecologic accounting carried out by the principles of commodity science to determine the intersectoral flows between and within the biosphere and the technosphere.
- For the catchment under study the water-related actors and their activities are determined and mapped using a modified flow chart. The ecosystem is considered as a stakeholder.
- The data of the flow chart are transferred to the Catchment PIOT as the outputs of the processes occurring within the boundaries of the catchment.
- Each of the catchment's actors and activities are broken down into their sectors, so that the intersectoral flows are mapped in detail.

		Ecosystem Functions				Water Services					Agriculture							
		Water Cycle				Urban Water Cycle					Annual Cropping				Livestock			
		Atmosphere	Hydrosphere	Pedoshpere	Lithosphere	Abstraction	Water Treatment	Water Distribution	WasteWater Distribution	WasteWater Treatment	Watering#1	Harvest	Fertilising	Effluent	Watering#2	Feed	Effluent	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Atmosphere	1	X(1,1)				X (1,5)	X (1,6)	X (1,7)	X (1,8)	X (1,9)	X (1,10)	X (1,11)	X (1,12)	X (1,13)	X (1,14)	X (1,15)	X (1,16)	**X (1,n)**
Hydrosphere	2		x(2,2)				X (2,6)		X (2,8)		X (2,10)	X (2,11)					X (2,16)	**X (2,n)**
Pedoshpere	3	*aii* -nature to nature		X(3,3)		X (3,5)									*aij*-nature to technosphere			**X (3,n)**
Lithosphere	4				X(4,4)			X (4,7)	X (4,8)		X (4,10)		X (4,12)	X (4,13)				**X (4,n)**
Abstraction	5	X (5,1)		X (5,3)		X (5,5)	X (5,6)	X (5,7)				X (5,11)			X (5,14)			**X (5,n)**
Water Treatment	6	X (6,1)	X (6,2)	X (6,3)	aji -technosphere to nature							X (6,11)			X (6,14)			**X (6,n)**
Water Distribution	7	X (7,1)						X (7,7)	X (7,8)	X (7,9)	X (7,10)	X (7,11)	X (7,12)	X (7,13)	X (7,14)	X (7,15)	X (7,16)	**X (7,n)**
WasteWater Distribution	8	X (8,1)							X (8,8)	X (8,9)			X (8,12)	X (8,13)	X (8,14)			**X (8,n)**
WasteWater Treatment	9	X (9,1)						X (9,7)	X (9,8)	X (9,9)		X (9,11)	X (9,12)	X (9,13)	X (9,14)	X (9,15)		**X (9,n)**
Watering#1	10	X (10,1)	X (10,2)	X (10,3)		X (10,5)	X (10,6)	X (10,7)	X (10,8)	X (10,9)	X (10,10)	X (10,11)	X (10,12)	X (10,13)	X (10,14)			**X (10,n)**
Harvest	11	X (11,1)	X (11,2)	X (11,3)								X (11,11)		X (11,13)	X (11,14)		X (11,16)	**X (11,n)**
Fertilising	12	X (12,1)		X (12,3)											X (12,14)			**X (12,n)**
Effluent	13	X (13,1)	X (13,2)	X (13,3)				X (13,7)	X (13,8)	X (13,9)	X (13,10)	X (13,11)	X (13,12)	X (13,13)	X (13,14)	X (13,15)	X (13,16)	**X (13,n)**
Watering#2	14	X (14,1)	X (14,2)	X (14,3)		X (14,5)			X (14,8)					X (14,13)				**X (14,n)**
Feed	15	X (15,1)								*ajj*-technosphere to technosphere								**X (15,n)**
Effluent	16	X (16,1)	X (16,2)	X (17,2)											X (16,14)			**X (16,n)**
		X (n,1)	**X (n,2)**	**X (n,3)**	**X (n,4)**	**X (n,5)**	**X (n,6)**	**X (n,7)**	**X (n,8)**	**X (n,9)**	**X (n,10)**	**X (n,11)**	**X (n,12)**	**X (n,13)**	**X (n,14)**	**X (n,15)**	**X (n,16)**	

Figure 2: The Catchment Metabolism format for an exemplar catchment.

In practice

Making use of its simple format and clear underpinning rules, asset managers of the water sector can apply the Catchment Metabolism methodology for internal and external reporting and communication needs. It is a transparent and structured approach towards integrated solutions in the water sector.

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