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# Sustainability, information needs and organisational change in UK water and sewerage companies

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**Abstract:**
Computer-based decision and information support tools (DISTs) have potentially important roles to play in the embedding of sustainability appraisal processes into the planning and operation of water utilities. This paper reports on preliminary outcomes from research employing a particular model of sustainability, the Five Capitals model, to identify and facilitate the exploitation of opportunities for improved incorporation of sustainability appraisal into business process and practice within a major UK water and sewerage company (WaSC). In particular, the aims of this paper are to characterise and critically assess WaSC decision and information support needs by interpreting the findings of having applied the Five Capitals model. Five Capitals sustainability principles were applied as a questioning framework in a series of focus groups within the asset delivery business unit of the WaSC. The approach enabled the researcher to create a shared comprehension of sustainability, whilst mapping the perspectives of the business unit as to the form and efficacy of current sustainability appraisal activities. From the results of the focus group the researcher was able to identify key information support needs and to develop a set of sustainability key performance indicators with WaSC staff to service these needs. The results of the focus groups demonstrated that there was no need for computerised decision support, and that the primary role for information support was twofold – (i) to capture data to provide a basis, in the medium-long term, for improved organisational learning about the sustainability performance of different treatment and distribution assets, and; (ii) to capture data to provide a basis, over the short-medium term, for influencing the decisions made by companies contracted to design and build new treatment and distribution assets for the WaSC. These needs contrast against the standard view of the role of decision support as automating certain aspects of human decision-making.

***Keywords**:* sustainability appraisal; water utilities; decision and information support tools; organisational change

## 1. INTRODUCTION

The ambitions of sustainability and sustainable development have been argued as being central to the management and delivery of water and sewerage services (Foxon *et al.* 2002). In England Wales these services are delivered by a set of fully privatised and regulated water companies – water and sewerage companies (WaSCs) and water only companies (WoCs) (see section 2 for more information). The economic regulator for water companies in England Wales, OFWAT (www.ofwat.gov.uk), has been slow to define its position on sustainability, leaving UK WaSCs with the challenge of identifying an appropriate sustainability framework and values, and to develop and embed the corresponding business processes to improve their sustainability performance.

A wide range of computer based decision and information support tools (DISTs) (McIntosh *et al.* 2008, Diez and McIntosh, 2010) are available to assist in the incorporation of sustainability appraisal as criteria or considerations in organisational strategic planning or operational business processes e.g. life cycle assessment, GIS, integrated assessment models, multi-criteria optimization / decision analysis tools. DISTs may play various roles from the problematic vision of DISTs taking over / automating certain aspects of human decision-making processes, through to playing more limited life-span aides to learning during change processes (McCown 2002). Quite how WaSCs in England and Wales will engage with, and potentially adopt and use DISTs in the context of embedding sustainability is not yet clear, nor is it clear how English and Welsh WaSCs will engage with and embed sustainability systemically.

The main aim of this paper is to identify a set of learning points for the DIST development community generally about the role of DISTs and about the process of developing them. This will be achieved by interpreting the findings of research to identify, pilot and evaluate opportunities for embedding sustainability appraisal into the asset delivery function of a major UK WaSC (see section 2 for a description of UK WaSCs).

Many factors have been identified which inhibit or promote the adoption of new behaviors or technologies, and in doing so enable business change. Models of organisational change identify the requirement for a shared vision or understanding of needs to occur before change processes can begin (Jick, Kanter et al. 1992; Kotter 1996; Lueke 2003), and in turn articulate such visions as being the products of pressure for change (Cooper and Zmud 1990; Jick, Kanter et al. 1992; Van De Ven and Poole 1995; Kotter 1996; Weick and Quinn 1999; Rogers 2003). The Technology Acceptance Model (TAM) shows that perceived complexity and compatibility are the most significant drivers for individual adoption of new technologies (Venkatesh and Bala 2008). With regards the adoption of information systems, Burton and Swanson (1994) have shown that such technologies can come with significant knock-on effects to surrounding business processes, whilst van de Ven (1986) has argued that new innovations may create the additional work through the need to establish new inter-departmental coalitions and resource (re-) allocations.

The combined implications of these findings are that to change WaSC business processes to incorporate sustainability appraisal with appropriate decision or information support tools, (i) a clear, shared vision is needed; (ii) that existing processes and DISTs should be utilized wherever possible, and; (iii) that the scale and scope of process change should be commensurate with the level of buy-in to the vision. The research reported here followed these principles by seeking first to generate a shared vision and to utilise existing DISTs rather than to push complicated or completely novel tools.

## 2. RESEARCH CONTEXT

This project was undertaken by invitation from a major English and Welsh WaSC with a desire to better embed sustainability appraisal into its asset delivery processes (see below for a description). The nature of the intervention and tools/processes to be identified were not specified in the project brief requiring the researcher to identify the opportunities for incorporating sustainability appraisal. To identify these opportunities the research needed to (i) examine to what extent sustainability was already incorporated in current activities, avoid duplication of process, familiarize the researcher with the existing process, and identify potential gaps in current sustainability appraisal; (ii) appraise the business buy-in for the sustainability project and evaluate the impacts of sustainability appraisal related changes on the business, and; (iii) marry business need and project opportunities to maximize the potential for adoption.

The principle functions of a WaSC in England and Wales are the treatment and distribution of potable water and the safe removal and disposal of sewage (domestic, commercial and municipal). UK WaSC's are regulated through the activities of three bodies - Ofwat, who

ensure WaSCs do not abuse their natural monopoly positions over service users; the Drinking Water Inspectorate (DWI) who perform potable water compliance testing to ensure distributed water achieves the necessary quality standards, and; the Environment Agency (EA) who regulate both raw water abstractions and treated sewage discharges.

Each WaSC has a large and complicated system of network and treatment assets to replace, improve and maintain under its control (See figure 1). The Asset Delivery Unit (ADU) in the WaSC considered here is responsible for the delivery of solutions to business risks, typically through the replacement of built assets. ADU is divided into five areas referred to as investment Streams. Four of these Streams relate directly to asset infrastructure types - 'Reservoirs' are reservoir related assets; 'Networks' are typically pipe infrastructure for the transmission of potable water and sewage; 'Medium Treatment' is infrastructure used to change the chemical or physical properties of sewage, sludge or water for drinking, and; 'Other Installations' are assets such as pumping stations and those related to telemetry. 'Large Schemes' differs from the other streams as it is determined by project cost, and can refer to any project that resolves a risk at a cost of greater than ten million pounds. Each ADU Stream has a Stream Manager (SM) who is responsible for the delivery of a stream of solutions to risks. To achieve this, each stream has a team of Project Managers (PMs) who are responsible for managing the resolution of a number of business risks. PMs liaise with partner organizations selected for their skills in design and construction of the solution infrastructure, and commission new assets for delivery from these partner organisations.

## 3. METHOD OUTLINE

Four steps were undertaken to identify, pilot and evaluate sustainability appraisal changes within ADU as described below. This paper will focus mainly on steps 2 - 4.

Step 1. Selection of a relevant sustainability framework to apply to the activities of a WaSC. This step ensured that a coherent, relevant and comprehensive understanding of sustainability was selected to form the conceptual basis for the research.

Step 2. Mapping of business processes that influence the management of aspects of sustainability (from the selected sustainability framework). This step enabled the identification of aspects of sustainability which are perceived as less well managed by the business, and where changes to ADU present an opportunity to influence the performance of the business against the aspect identified.

Step 3. Identifying opportunities for improvements in sustainability performance as a consequence of changing ADU processes and practices. This step allowed the researcher to marry the adoption of managing an aspect of sustainability with a desired improvement identified by the WaSC.

Step 4. Converting research findings into a business change through which the WaSC is better able to appraise and influence sustainability performance. This step was important as the WaSC is early in the adoption process, and as such has identified the need to generate a convincing business case for the incorporation of sustainability appraisal.

## 4. RESULTS

### 4.1 Step 1. Selection of a relevant sustainability framework

The full results for this step will not be presented in detail here. However, briefly, the framework that was selected was the 'Five Capitals' model developed by Forum for the Future (2009). The framework was selected from a literature review of potential frameworks primarily for its breadth of coverage, and for the relevance of the sustainability

dimensions covered to the business of a WaSC. The model was developed for use by organizations wishing to embody sustainability in their practices and processes.

The Five Capitals model defines five capital stocks and describes a number of principles to guide the management of these stocks – see Table 1. The model proposes that a sustainable organisation should seek to maintain and where possible enhance these stocks rather than deplete or degrade them.

**Table 1 The Five Capitals model**

| |
|---|
| Natural Capital the natural resources (energy and matter) and processes (direct and indirect) needed by organisations to produce their products and deliver their services. |
| Human Capital incorporates the health, knowledge, skills, intellectual outputs, motivation and capacity for relationships of the individual. |
| Social Capital is any value added to the activities and economic outputs of an organisation by human relationships, partnerships and co-operation. |
| Manufactured Capital is material goods and infrastructure owned, leased or controlled by an organisation that contributes to production or service provision. |
| Financial Capital, those assets of an organisation that exist in a form of currency that can be owned or traded, including (but not limited to) shares, bonds and banknotes. |

To ensure the identified framework could be easily interpreted when applied discussed with the business, the Project Steering Group agreed to adapt and simplify the language of the 'principles' (or rules) where necessary to guarantee the framework would be more easily comprehended across the business. A full description of the adapted 'principles' for successful management of each stock are given within Table 2 overleaf.

### 4.2 Step 2. Mapping of business processes that influence the management of aspects of sustainability

The following activities enabled the identification of sustainability principles that are perceived as less well managed by the business, and where the ADU has opportunity to influence the performance of the business against the principle.

Using the adapted five capitals from 'Step One' two focus groups were held with ADU Project Managers. The participants represented geographically separately managed areas of the WaSC covering both clean and waste water service provision. Participants were instructed that the meeting objective was 'to better understand where when and how sustainability is addressed by the business, specifically within investment delivery'.

Participants were presented with the Five Capitals sustainability principles and asked to read through each principle carefully. The author then asked the participants to respond to the following questions for each principle with regards the work of the ADU:

- How does Yorkshire Water as a business manage this sustainability principle?
- Do you believe this principle is effectively managed by the business?
- Can ADU influence the performance of this principle? If so, how?

Participants were asked to answer the questions with regards each of the life-cycle stages in asset delivery (investigation, design, construction, operation and decommissioning), in relation to the business units which have an impact on investment delivery (Human Resources, Program Planning, Supply Chain and Procurement) and in relation to the tools employed by the WaSC during asset delivery (company policy, asset standards, engineering specifications, key performance indicators, and cost models). Responses were categorized as principle perceived as 'undermanaged', 'requiring management', 'conditional' (undermanaged in some situations), 'effectively managed', 'did not know', or 'not relevant' (to the work of the water company). Results were reflected back to the respondents for further comments, to encourage participants to challenge or verify results.The researcher

then used the information gathered to identify those principles perceived as least well managed in investment delivery and under the direct control of ADU (see Table 2).

**Table 1 Adapted Five Capitals framework and principles**

The perception of the management of each of the Five Capitals by Yorkshire Water's Asset Delivery Unit across 6 aspects of asset delivery - *'Investigating Risk'; 'Design'; 'Construction'; 'Operation'; 'Decomissioning'* and *'Post project evaluating, monitoring and learning'*.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A | Principle perceived as undermanaged by YW | | | | | | | |
| B | Principle requiring management (but no additional coments or discussions) | | | | | | | |
| C | Conditional- Perecption of management efficacy dependent on interpretation/application of the principle | | | | | | | |
| D | Principle perceived as effectively managed by YW | | | | | | | |
| E | Respondents did not know | | | | | | | |
| F | Principle deemed irrelevant to the process | | | | | | | |
| % | percentage identified as undermanaged (columns A + B) of total comments (SUM A:F) >65% were highlighted for stream managers attention | % | F | E | D | C | B | A |
| **Natural Capital** | | | | | | | | |
| NC. 1 | Protect/improve habitat, biodiversity and ecosystem function. | 54 | 0 | 0 | 3 | 2 | 2 | 5 |
| NC. 2 | Reduce emissions of substances to a concentration that can easily be assimilated by natural systems: a. chemical concentrations and nutrient loads; b. GHG , Ozone depleting substance; c. etc | 83 | 0 | 2 | 0 | 0 | 1 | 9 |
| NC. 3 | Reduce dependency on materials that are naturally scarce. | 83 | 2 | 0 | 0 | 0 | 1 | 9 |
| NC. 4 | Reduce use of virgin materials and resources | 83 | 2 | 0 | 0 | 0 | 1 | 9 |
| NC. 5 | Reduce dependency on and accumulation of man made substances that may prove harmful to ecosystem or human health substitute all with substances that can be easily assimilated broken down by natural systems. | 91 | 0 | 0 | 0 | 0 | 6 | 4 |
| NC. 6 | Use renewable resources only from well-managed and restorative eco-systems. | 89 | 1 | 0 | 0 | 0 | 2 | 6 |
| NC. 7 | Reduction/elimination of waste | 67 | 0 | 0 | 3 | 0 | 4 | 4 |
| NC. 8 | Increase/full recycling of resources | 100 | 0 | 0 | 0 | 0 | 4 | 6 |
| NC. 9 | Reduce/eliminate dependency in the use of fossil fuels (thereby increasing use of renewable energy resources). | 82 | 1 | 0 | 1 | 0 | 1 | 8 |
| NC. 10 | Reduce energy demand | 58 | 0 | 0 | 5 | 0 | 2 | 5 |
| **Human Capital** | | | | | | | | |
| HC. 1 | Ensure adequate Health and Safety standards are met | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| HC. 2 | Respect human rights throughout their operations and geographical regions | 9 | 0 | 0 | 10 | 0 | 0 | 1 |
| HC. 3 | Respect human values and their different cultural contexts | 11 | 0 | 0 | 8 | 0 | 0 | 1 |
| HC. 4 | Give employees (where possible) access to training and education | 10 | 0 | 0 | 9 | 0 | 0 | 1 |
| HC. 5 | Educate and promote for higher standards of health and support mental wellbeing. | 11 | 0 | 0 | 8 | 0 | 0 | 1 |
| HC. 6 | Provide a reasonable living wage and fair remuneration for employees and business partners. | 11 | 0 | 0 | 8 | 0 | 0 | 1 |
| HC. 7 | Allow for and enhance recreation time and support individuals' active involvement in society. | 11 | 0 | 0 | 8 | 0 | 0 | 1 |
| HC. 8 | Ensure supply chain partners apply the same principles to fulfilling employee needs. | 89 | 0 | 1 | 0 | 0 | 0 | 8 |
| HC. 9 | Create opportunities for varied and satisfying work. | 25 | 0 | 0 | 6 | 0 | 0 | 2 |
| **Social Capital** | | | | | | | | |
| SC. 1 | Source materials ethically and treat suppliers, customers and citizens fairly. | 44 | 1 | 0 | 1 | 2 | 4 | 0 |
| SC. 2 | Reduce emissions of persistent compounds that are harmful to ecosystem or human health. | 55 | 0 | 0 | 0 | 4 | 6 | 0 |
| SC. 3 | Respect and comply with local, national and international law. | 55 | 0 | 0 | 4 | 0 | 6 | 0 |
| SC. 4 | Provide a supportive family friendly labour policy. | 55 | 0 | 0 | 4 | 0 | 6 | 0 |
| SC. 5 | Prompt and full payment of taxes and support of social infrastructure. | 55 | 0 | 0 | 4 | 0 | 6 | 0 |
| SC. 6 | Minimise of the negative social impacts of products and services or maximisation of the positive | 43 | 1 | 0 | 3 | 0 | 2 | 1 |
| SC. 7 | Support the development of the community in which the organisation operates, including economic opportunities). | 86 | 0 | 0 | 0 | 0 | 6 | 0 |
| SC. 8 | Assess the wider economic impacts of the organisations activities, products and services on society e.g. in creating wealth in the communities in which the organisation operates | 86 | 0 | 0 | 0 | 0 | 4 | 2 |
| SC. 9 | Encourage and engage in transparent consultation and communication with relevant internal and external stakeholders, | 60 | 0 | 0 | 3 | 0 | 4 | 2 |
| SC. 10 | Fulfil commitments made with suppliers, customers/citizens and regulators. | 45 | 0 | 0 | 5 | 0 | 5 | 0 |
| SC. 11 | Effective Communication throughout the organisation , reflecting shared Values and objectives | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **Infrastructure Capital** | | | | | | | | |
| IC. 1 | Ensure that systems, processes and infrastructure performance is maintained under a robust set of future operating scenarios. | 70 | 0 | 0 | 1 | 2 | 5 | 2 |
| IC. 2 | Seek to maximise the flexibility and adaptability of infrastructure to respond to diverse set of future operating scenarios. | 70 | 1 | 0 | 1 | 1 | 4 | 3 |
| IC. 3 | Develop infrastructure that facilitates ease of maintenance: a. Design for disassembly ; b. Modular designs (to minimise potential negative opex spend) | 22 | 2 | 0 | 5 | 0 | 2 | |
| IC. 4 | Have sought to reduce or eliminate waste and emissions in production systems. | 70 | 1 | 0 | 2 | 0 | 3 | 4 |
| IC. 5 | Where appropriate replace products for service contracts. | 67 | 2 | 0 | 1 | 0 | 3 | 3 |
| IC. 6 | Optimisation of infrastructure/technologies and processes in a way that uses resources most efficiently. | 70 | 1 | 0 | 1 | 1 | 4 | 3 |
| IC. 7 | Optimise the recycling of resources. | 70 | 1 | 0 | 2 | 0 | 4 | 3 |
| IC. 8 | Identifying and utilising synergistic production systems where one organisation's waste streams are another's resources. | 91 | 1 | 0 | 0 | 0 | 3 | 7 |
| IC. 9 | Seek improvements and innovation in the design of product systems (eco-efficiency and eco-innovation). | 88 | 1 | 0 | 0 | 0 | 4 | 3 |
| IC. 10 | Apply sustainable construction techniques when looking at new infrastructure. | 67 | 1 | 0 | 2 | 0 | 4 | 2 |
| **Financial Capital** | | | | | | | | |
| FC. 1 | Employ prudent financial management | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| FC. 2 | Efficient use of financial resources (reducing and minimising costs) | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| FC. 3 | Management of financial risk (over both short and long term) | 0 | 0 | 0 | 7 | 5 | 0 | 0 |
| FC. 4 | Internalise environmental and social costs and assign an economic value to them. | 8 | 0 | 0 | 0 | 11 | 0 | 1 |
| FC. 5 | Effective total costs under a robust set of future scenarios e.g. : a. Unit running costs; b. Unit capital costs; c. Remediation costs of infrastructure; d. Internal manpower costs; e. External services costs ratio; f. Imported (raw and treated) water costs ratio; g. Energy costs ratio h. etc. | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| FC. 6 | Effective management of financial risk exposure. | 0 | 0 | 0 | 7 | 5 | 0 | 0 |
| FC. 7 | Timely fulfilment of contracts | 0 | 0 | 0 | 12 | 0 | 0 | 0 |

### 4.3 Step 3: Identifying opportunities for improvements in sustainability performance as a consequence of changing ADU processes and practices.

Taking those principles perceived as being less well managed (those with orange highlighted % undermanaged figures in Table 2), a series of interviews was held with the Stream Delivery Managers (SDM). The objective was to identify priority sustainability principles for the ADU business unit, and to reveal the perceived business benefits from improved incorporation of the identified principles into process and practice.

SDM interviews were held on a one to one basis and each interview was allocated 1 hour. Each SDM interviewee was given a description of the process undertaken so far and presented with a list of asset investment classes (investment streams) that corresponded to the asset investment distinctions used by the business. To ensure that the interview captured relevant and informed information on specific investment streams, interviewees identified the stream in which they had most experience and were instructed to proceed with the interview from the perspective of activities carried out within this stream.

The Five Capitals principles were presented to the managers, with principles that had been identified as less well managed by the focus group and under the influence of ADU highlighted in red. The managers were then asked to review all the principles, placing a mark alongside each principle that they believed their stream had a significant impact upon. The interviewees were then asked to identify from the marked principles those which they believe their stream should prioritize (See Figure 1 – stream 'selected principles'). The researcher then requested the participants to review their selection using two adoption criteria – (1) those principles which would be easiest to make strong performance improvements against, and; (2) those principles which are most likely to result in business benefits and therefore likely to be adopted. Finally, interviewees were asked to select one principle, to improve the sustainability impacts of the asset stream and to describe investment stream improvements they aspired to by adopting the sustainability principle for the stream (See Figure 1 - 'stream priority indicators').

### 4.4 Step 4: Converting research findings into a business change through which the WaSC will be better able to appraise and influence sustainability performance

To enable the research to propose a means of improving the incorporation of sustainability appraisal into investment delivery that was both sensitive to the WaSC's requirement for change, and which exploited synergies with the internally recognised opportunities for change, the following activities were undertaken. The Project Steering Group requested that the research carried out under steps 1-3 be converted into a set a Key Performance Indicators (KPIs). Consequently potential indicators from the literature review carried out under step 1 were compiled in a spreadsheet, loosely sorted by relevance against capital and principle. The spreadsheet was used to help identify means by which the WaSC could turn stream sustainability objectives into measurable indicators and begin the process of enabling the ADU to manage sustainability performance.

The spreadsheet information was then used in a series of meetings with the WaSC Environmental Strategy Team, the manager responsible for 'Reporting' and an employee charged with developing KPMs (Key Performance Measures – contractually binding measures to assess how well delivery partners are performing, as opposed to KPIs which have no contractual status) for ADU for the next 5 years. The meetings provided the researcher with a number of necessary factors to incorporate into the set of proposed sustainability KPIs. In recognition of tightening UK regulatory requirements for reporting and improving WaSC carbon emissions, the Environment Strategy Team felt strongly that the addition of carbon should be a priority data point to evaluate asset investment performance. In order to increase the potential for adoption the Reporting Manager stated it was necessary that proposed indicators should rely solely on data already captured by the business or contractually demanded during asset investment.

The researcher used this information to develop the proposed sustainability KPIs for ADU within the WaSC – see Figure 1.

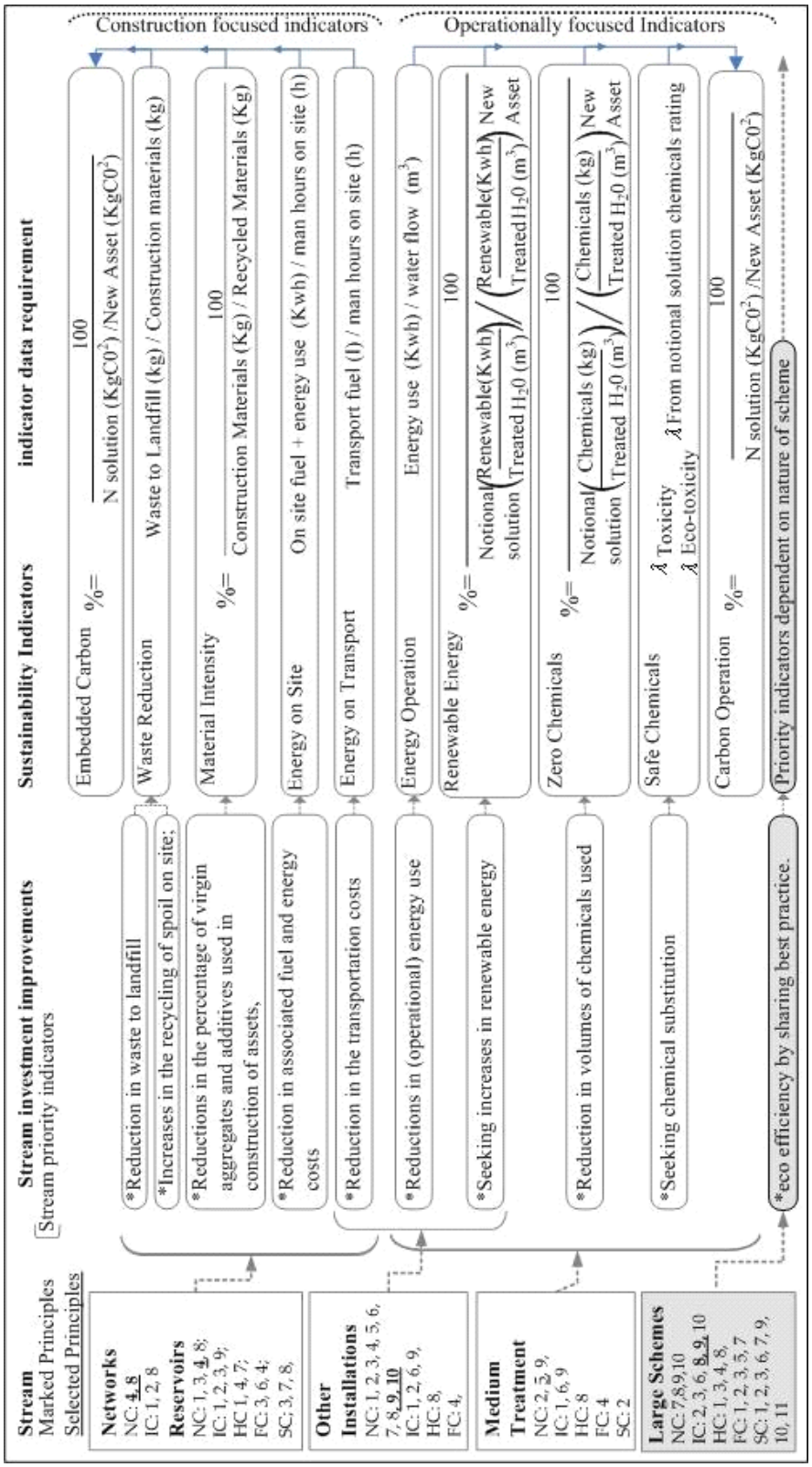


**Figure 1 Research findings and sustainability Key Performance Indicators**

## 5. DISCUSSION

The research reported here is interesting in the context of the development of computer-based DISTs for a number of reasons. The WaSC involved commissioned the research to potentially change and in doing so, improve their performance in a substantive area – appraising, selecting and delivering more sustainable asset investment options. The WaSC involved did not commission research to develop a DIST specifically. Rather, the options for changing the way in which asset investment and delivery activities are conducted and supported were left open and to be identified to best meet the nature of the demand for change. In this respect the research is an example of highly user-centred approach to developing DISTs and approaches in relation to, and in conjunction with, their accompanying business process and practice changes. Finally, having used an explicitly process-based research design the research, once completed, will provide a detailed, chronologically situated case-study about how different factors influence the adoption of sustainability appraisal into water utility asset investment and delivery.

So what can be learned for DIST development and use? Making improvements to an organisation in a contested area such as sustainability requires significant engagement with personnel to ensure (i) that a shared understanding is used to develop organisational changes, and decision or information support systems (processes and tools) from, and; (ii) that the way in which sustainability appraisal changes are made, and support systems developed, correspond to individually and collectively perceived performance deficiencies and opportunities for improvement. Such engagement cannot be done remotely for it requires that the researcher be embedded in the organisation concerned. Here, the researcher will occupy multiple roles including notably being a change agent, being a source of external and expert knowledge on sustainability, and being a sustainability champion.

Improving the way in which sustainability appraisal is undertaken by water utilities in relation to asset investment and delivery requires changing individual and collective (organisational) behaviours. Consequently the process is neither simple, nor necessarily quick. A lesson from the research reported here is that small changes may be required (like the development of KPIs to influence asset delivery partners) to demonstrate an overall positive impact before more widespread changes are considered. The role of making relatively small changes in the first place is an element of organisational learning – the WaSC concerned here has no prior experience of using a set of sustainability KPIs derived from a systemic sustainability framework to influence delivery partners. There is a need for learning about whether, which and how KPIs are effective in influencing partner behaviours through the course of piloting.

Reflecting on two opposing roles for decision support highlighted by McCown (2002) in the context of DSS – that they may be used to automate certain aspects of human decision-making processes, or may be used over the shorter-term to help learn about how to adapt to particular change drivers – the implications of the research reported here are that the information support needs identified are part of a medium term process of learning for the WaSC involved. Contrary to the idea that DSS are suitable for informing decisions in poorly structured problem areas, the incorporation of improved sustainability appraisal is not a process of making decisions about something to be managed, it is a process involving making decisions about how to manage. This is fundamentally a process of learning and quite sensibly, involves the organisation investing in and learning from a limited pilot rather than investing in the development of larger, more complicated means of decision or information support.

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