

The Six Capitals in our Decision Making Framework

It's part of our
Blueprint for Yorkshire



YorkshireWater

Introduction

This document explains how we've embedded our Six Capitals concept into our new Decision Making Framework (DMF). The DMF is a cross-business process, underpinned with a suite of systems and software which integrates with many of our management systems and uses live data and cutting-edge analytical tools to improve how we manage our assets and investments, helping increase our customer service, efficiency and resilience. One component of the DMF is a Six Capitals impact assessment tool, which quantifies risk and value to optimise investment and management decisions about our assets and operations, to help us provide the greatest net benefit to our customers and wider society.

This document also presents some case studies to illustrate where the DMF has helped Yorkshire Water to optimise decision making, discusses what we've learned from developing and using the Six Capitals impact assessment tool so far, and sets out how we plan to continue to develop and use it in the future.

The Six Capitals

Financial accounting is one of the essential functions of nearly every organisation, allowing them to ensure that they have the necessary financial resources to continue operating. However, financial assets are not the only thing upon which an organisation depends. Physical resources, such as clean water, raw materials, energy and a skilled workforce; and non-physical resources such as reputation and knowledge, are equally vital to the continued existence of any organisation. However, these non-financial assets (both physical and non-physical) are rarely included in accounts and balance sheets. Similarly, an organisations' impacts, positive and negative, on these non-fixed assets are rarely captured by conventional accounting and reporting processes. This can lead to sub-optimal decisions which are contributing to local and global sustainability challenges.

In recognition of this issue, a new branch of accounting has emerged which identifies, measures, and reports on non-financial impacts and dependencies: often referred to as 'sustainability accounting'. At Yorkshire Water, we use a **Six Capitals framework** to shape our sustainability accounting activities. We have used the framework to [monitor and report on the impacts of our work](#), from [individual project level](#) up [to our full business plan](#); and to support our decision-making processes in many areas of the business, including land management, investment and asset maintenance.



FINANCIAL CAPITAL

Our financial health and efficiency.



HUMAN CAPITAL

Our workforce's capabilities and wellbeing.



MANUFACTURED CAPITAL

Our pipes, treatment works, offices and IT.



INTELLECTUAL CAPITAL

Our knowledge and processes.



NATURAL CAPITAL

The materials and services we rely on from the environment, especially water.



SOCIAL CAPITAL

Our relationships and customers' trust in us.

A key feature of the capitals approach is that non-financial impacts and dependencies can often be expressed in monetary terms, allowing different impact categories to be directly compared, providing greater insight into their magnitude and importance, and helping to identify opportunities to provide greater value for money for our customers and the communities we serve.

To learn more about the Six Capitals approach, visit [our capitals webpage](#) and take a look at our reports and case studies.

The DMF

The **Decision Making Framework (DMF)** has recently been developed, with its first use in our business planning for the next price review period: 'PR19' (2020 – 2025). It is now being further developed for use as part of 'business as usual' going forward. The DMF is both a cross-business process and an enabling suite of IT systems: an innovative set of processes and tools which help us to make the most efficient expenditure decisions to deliver service and benefit to our customers. To learn more about the DMF, see chapter 9 (p57) of our [PR19 Business Plan Submission Document](#).

The DMF includes a world-leading approach to the application of Six Capitals assessments across all schemes within our asset portfolio, rather than being limited to specific 'one off' scheme considerations. This is achieved within the DMF using the Six Capitals impact assessment tool, which optimises investment and management decisions about our asset portfolio and operations to provide the greatest net benefit across the capitals.

The Six Capitals in the DMF

Underpinning the DMF is our **Service Measure and Valuation Framework (SMF)**. This identifies the reasons we need to invest and the value of doing so. Once we have determined what our business needs are, and modelled the range of possible solutions to these needs, the SMF breaks down the outcomes of chosen solutions into different annual 'service measures', which are expressed as units per year, such as the number of internal sewer flooding incidents, or the length of rivers improved in km. Each unit of measure is valued against a series of metrics relating to the capitals. This allows us to link expenditure to service and understand the benefits of our programme at a much more detailed level.

The metrics used to value the changes in service measures were derived by a multi-disciplinary working group comprising colleagues from Yorkshire Water teams (Regulation, Sustainability, and Business Risk and Investment) and external experts from consultancies AECOM and SEAMS. The group reviewed peer-reviewed evidence and Yorkshire Water's process and project data, and selected the most appropriate valuation method for each metric. Methods used included benefit transfer, Yorkshire Water's bespoke willingness-to-pay studies (with triangulation), and avoided cost calculations.

Capital		Example Valuations
Natural		Crops and livestock Global climate Air quality recreation
Social		Physical activity Quality of place Trust
Human		Employment Health & Safety Local economy
Intellectual		Skills Intellectual property
Financial and Manufactured		Delivery costs Private costs of failure Private benefits / income

Worked example: bathing water quality

The service measure ‘deterioration in bathing water quality’ is measured as the number of bathing waters deteriorating in classification on the Environment Agency’s scale (Excellent, Good, Sufficient, Poor): for example, a drop in status from ‘Good’ to ‘Sufficient’. The values used to determine the cost of a deterioration in status of one bathing water in a given year are:

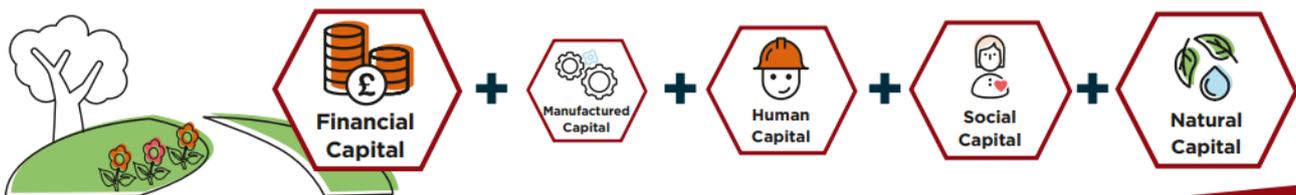
Capital	Impact category	Impact definition	Cost
Natural capital	Recreation	Value of lost recreation opportunities.	£734,979.00
	Non-use value	The value people place on natural resources continuing to exist, or being available to others – even when they don’t use them themselves.	£341,240.25
Human capital	Local economy	The value of the deterioration in classification to businesses.	£221,465.72
Financial and manufactured capital	Private costs of failure	The cost to Yorkshire Water of dealing with the consequences of the deterioration (e.g. investigation of the cause, loss of reputation), excluding the cost of remediating it.	£26,331.81
Total			£1,324,016.78

In this way, we can understand how changes in our service position impact each capital. By monetising all costs and benefits, using a ‘common currency’ for all Six Capitals, we can calculate the total net benefit of a given scheme or programme. For example, the diagram below shows the difference in total capital benefit between an engineering led and environmental solution to address a flooding problem. It conveys the additional benefit of investment in the resilient sustainable option, when all the wider benefits to natural, social and human capital are included in the valuation.

Assigning Benefits



Assigning Benefits



Increasing Resilience

NB. In this diagram, Intellectual Capital is included under Human Capital

Case study: Hull flood alleviation

Much of the City of Hull and the surrounding area sits below sea level and has some of the highest flood risk outside London. Following the extreme storms of 2007, thousands of people and properties felt the impacts of widespread flooding. We have been working with the local authorities and the Environment Agency to develop a multi-agency response, forming the Living With Water Partnership. The Living With Water Partnership has consulted widely to develop a shared vision for the area that is prioritising sustainable solutions that work in harmony with the environment and provide benefits to local residents, such as 'blue-green' spaces which soak up water like sponges, then release it slowly, reducing the pressure on storm drains and sewers.

As part of our recent price review business planning, Yorkshire Water worked with Arup to identify areas across Hull and Haltemprice where there were opportunities for the cost-effective provision of these blue-green spaces. The chosen solutions included:

- Permeable paving
- Swales
- Detention basins
- Planters on verges, roadsides and streets



The net financial cost of these solutions over 10 years will be £9.7 million (as part of a wider programme of investment in Hull, totalling £30 million). However, monetisation of the non-financial benefits of the solutions (reductions in internal and external flooding, and the provision of green space) in the DMF showed that they added up to £46.4 million over the same period: giving a **total net benefit across the six capitals of £36.7 million**.

The majority of this net benefit accrues to society, rather than being reflected on Yorkshire Water's financial balance sheet. This demonstrates the power of the six capitals approach to quantify true value, but illustrates an important point: those who fund solutions may not be their direct beneficiaries. As a company providing a public service, sustainable solutions align with our values, but may still prove difficult to implement due to financial constraints. To overcome these constraints, we seek innovative financing models and partnerships which can help to unlock funding for sustainable solutions with higher capital costs and longer term benefits.

Case study: Water recycling

We know how important it is not to waste water, and our customers have told us that this is a high priority area for them. As part of our strategy to use water more efficiently we are committed to reducing the water we waste through our water and wastewater treatment processes.

Not all raw water entering our water treatment works is processed into high quality drinking water: a proportion is used in the treatment process as 'wash-water' and is often discharged via sewer to our wastewater treatment works. Our commitment in PR19 is to increase the volume of water recycled at our treatment works and final effluent used in commercial applications by 6.29 million litres per day by 2025. We will do this by returning water to the beginning of the process to be re-used, and by working with large industrial water users to investigate where we can supply sub-potable water for uses such as cooling or open space irrigation. By doing this, we reduce the amount of water we take from the environment, lower energy costs and reduce the demand on our wastewater network and treatment sites.

For example, installing a water recycling system at Irton water treatment works means we will be more efficient with the water we have abstracted, reducing the volume we take from the river by up to 1.3 million litres a day. This scheme will also reduce the volume of water we send to the sewer network, reducing the risk of sewer flooding and pressure on wastewater treatment works at Whitby and Seamer. This in turn should reduce our future investment needs at these sites. Water recycling will allow us to carry out essential maintenance works at Irton, ensuring future resilience of water supply in the local area.

Using the DMF, we have calculated the total financial cost of water recycling at Irton as £1.2 million over 10 years, and the total **benefit to society** over the same period as £7.9 million: **a net benefit of £6.7 million.**

What we've learned: applying insights and embedding into business as usual

Our incorporation of Six Capitals assessments into the DMF is an innovation which has pushed the boundaries of how sustainability accounting is used in decision-making. The process of developing and using the SMF has given rise to learning which we are now applying as we continue to develop our sustainability accounting processes, and start the process of embedding the DMF and SMF into our 'business as usual' practices.

Successes

Wide ranging, multi-scale applications

The thorough peer-review process used to develop the Six Capitals metrics for the SMF have resulted in a large set of robust values which are now available for use in assessments of a variety of other projects, including recreation strategies, land management decisions, and circular economy developments.

Better understanding of wider impacts

Colleagues involved in asset design and maintenance and investment planning are now able to more clearly understand the wider implications of investment decisions, by observing the links between their decisions and the effects on the capitals as they use the DMF.

Evidencing investment in innovation

Investment in innovation projects may yield valuable results for efficiency, environmental improvement and social cohesion. However, these benefits are sometimes realised over long timescales, and are not represented on the balance sheet in traditional business cases. The metrics developed for the SMF are now being used to provide robust evidence for the long term benefits of innovative projects by presenting them as monetary values.

Embedding into business as usual

Keeping metrics up to date

The field of sustainability accounting and benefit valuation is rapidly developing, and our knowledge of best practice is constantly evolving as we (and others in the field) gain experience, new evidence emerges, and industry and policy standards are updated. The metrics used in the SMF will be reviewed on a regular basis in light of new information, by a working group comprised of colleagues from teams including Business Risk and Investment, Sustainability and Asset Management, and updated regularly (frequency to be confirmed but proposed annually). Where metrics have been derived from aggregate regional/national/global data, we will work to update these with more locally specific metrics where possible.

Continuous improvement

Yorkshire Water is currently implementing a transformation programme for our SAP system: the enterprise software used to manage many of our business processes. The DMF interfaces with SAP to pull in real time information about the performance of assets and projects, feeding back information on completed projects to review the effectiveness of the decision making processes, and improve future analysis.

Embedding into other business areas

Our ambition for sustainability accounting is to embed the use of Six Capitals assessments further throughout the business, ultimately making it a standard part of decision making at every level. This may be achieved using DMF systems, by using the SMF metrics outside the DMF's systems, or – more likely – a combination of approaches as appropriate to the application.

Challenges

Detailed solution modelling

Accurate and complete valuations of Six Capitals costs and benefits using the SMF depends on detailed information regarding service measures being entered during solution modelling. For colleagues who are less familiar with the SMF, including the information required for Six Capitals valuation has been challenging at times.

In response to this, a detailed review of key needs and solutions was undertaken prior to submission of our PR19 plan, with manual adjustments made where required. A thorough review of the input process is now underway, and a training programme on solution modelling and use of the SMF is being developed for propagation throughout the business.

In addition, the system is only able to choose from solutions which are entered (it does not generate new solutions), so we are also working to include a broader range of possible solutions and more innovative approaches.

Flexibility and usability

The DMF and SMF process and analyse large amounts of data, allowing us to optimise our entire plan against the Six Capitals. While this provides invaluable information and insight, it also results in a complex, resource heavy and lengthy process each time the models are run. Small changes in service measures and metrics which may occur during quality checking and review of data can result in long delays as the process is re-run. Each output also requires 'sense checking' to ensure that the correct constraints have been entered by users prior to optimisation.

When designing tools for six capitals assessments which have some degree of automation, there is a trade-off between accuracy and detail, and complexity and resource use. In the case of our SMF, the matrix of service measures and cost/benefit values underlying it is available in a separate spreadsheet format, which has meant that it can be used flexibly in other assessments outside the DMF, while maintaining alignment with the metrics used within it.

Separation of metrics

The standard output from the SMF allows Six Capitals costs/benefits to be viewed separately from totex (total expenditure). The cost of embodied carbon (the carbon emissions associated with the manufacture, transport, use, and end-of-life disposal of construction materials) is included within the totex figure and is time-consuming to disaggregate. While this is a valuable and powerful tool in ensuring the importance of embodied carbon is recognised and acted upon, carbon costs are frequently required when conducting Six Capitals assessments, and an option to easily view them separately from the other totex components would be useful. More broadly, viewing costs/benefits by capital, or by metric is also a complex process, which would benefit from streamlining.

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