

INFRASTRUCTURE PROJECTS' IMPACT ON SUSTAINABLE DEVELOPMENT– CASE STUDY OF A WATER-UTILITY COMPANY

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Abstract

Achievement of the United Nations' 2030 Global Goals for Sustainability (United Nations, 2015) is of paramount importance. However, for engineers and project managers to take meaningful action, they need to be provided with the practical tools, processes and leadership to turn grand rhetoric into viable engineering solutions. Linking infrastructure project sustainability performance to Sustainable Development Goals (SDG) targets is problematic. This paper builds on the previous development of a innovative Infrastructure Project Transformation Process Model, called the 'Infrastructure SDG Impact-Value Chain'(IVC) (Mansell et al., 2019b) to link tactical-level project delivery with global-level strategic SDG impacts. It uses a case study of a water utility company to demonstrate how the IVC process model can integrate the 'Triple Bottom Line' to ensure balanced definition of success across economic, environmental and social thematic areas. The results led to a proposed methodology for project leaders to align stakeholders on a common definition of project success during the design phase. It includes selection of longer-term outcomes and strategic SDG impacts – which it is suggested are improved definitions of project success. The practical application is significant since, with improved linkage of tactical delivery to strategic SDG impacts, improved investments decisions will be made, and systemic level lessons can be applied to increase the likelihood of success in achieving the SDG 2030 targets.

Keywords: *UN SDG; Sustainable Development; Outcomes-Impact; Infrastructure Projects; Project Success*

1. Introduction

The construction industry has a major role in achieving a measurable impact against the SDG 2030 targets. The estimated USD \$94 trillion (Global Infrastructure Hub, 2018) of investment in infrastructure projects that is required globally by 2040, represents a massive opportunity to stimulate economic prosperity, reduce poverty and raise standards in health, education and gender equality. However, the linking of infrastructure project success to SDG targets is problematic as a recent Institution of Civil Engineers' survey (Mansell, 2018) demonstrated: while the appetite for SDG reporting at project level is very strong (87%), especially by millennials, only a third of the 325 survey respondents assessed current tools as 'fit for purpose'. The research study identified four Critical Success Factors (CSF) for Measuring Projects' SDG Impacts:

- CSF #1: Strategic Success Definition. Clear understanding of project success – is it about time, cost and scope (doing the projects right) or, is it about outcomes and strategic impacts (doing the right projects), or a balance of both?
- CSF #2: Holistic Performance Measurement tools. The need for tools that could measure traditional outputs of time, cost and scope, as well as more opaque successes, such as outcomes, benefits and impacts.
- CSF #3: Aligned Business Priorities. Balancing competing business priorities, that were perceived to weight 'profit' too heavily against 'people' and 'planet', otherwise known as the 'Triple Bottom Line' (Elkington, 1994).
- CSF #4: Strong Leadership. The need for leaders who can galvanise and motivate their teams, capturing their 'heads and hearts' to drive forward changed behaviours.

The shortcomings of not having the four CSFs in place, which was the main finding from the survey, represents both a theoretical knowledge gap, and for the practitioner, it results in weaker investment decisions since SDG lessons are not being learned from project delivery successes and failures. The problem is complex and multi-faceted in nature, at both the project and organisational levels. At its core, the most important issue is to understand what defines project success. Too often this has been done by measuring the project management processes of delivering a project to time, cost and scope (and quality), otherwise known as the ‘iron triangle’. But for linkage to the SDGs, there needs to be a broadening of the success definition to become more holistic. To do so, requires a refresh of underpinning theories, specifically in regard to sustainable development.

1.1 Sustainable Development Goals

The United Nations’ ‘Transforming Our World’ report (United Nations, 2015) was adopted by 193 states at the United Nations General Assembly. This has provided a globally agreed sustainable development framework consisting of 17 goals (Figure 1) and 169 targets to be achieved by 2030. But progress towards the 2030 targets is perilously slow, especially for the most disadvantaged and marginalised groups (United Nations, 2018). While there have been some significant advances since the Rio Summit (1992 and the ‘+20’ in 2012) and the Kyoto Protocol (2005), such as the transformational technologies for battery-powered cars and renewable energy, even a rise of 1.5°C now appears to be inevitable (UN IPCC, 2018). This temperature rise would potentially wipe out almost all of the world’s coral with hundreds of millions of people potentially killed from the effects of drought and coastal flooding, while the threat of starvation will likely trigger unprecedented mass migration (UN IPCC, 2018).



Figure 1: The United Nations 17 Sustainable Development Goals (full details can be accessed at <https://sustainabledevelopment.un.org/>). [Usage of graphic agreed by UN]

The delivery targets are understandably ambitious and needed a reporting framework that would drive meaningful and verifiable progress towards the 2030 targets. In 2017, the UN’s Inter-agency Expert Group on Targets and Indicators for Sustainable Development designed a mechanism that linked goals, targets and indicators across the geographic and governance boundaries at national, regional and global levels (IAEG-SDGs, 2017). Within this framework, shown in Figure 2, the Expert Group designed thematic areas that could also be used at the sub-national level, but because the targets and indicators were originally designed to be used at

global, regional and national level, they had reduced applicability at organisational or project levels. Simply stated, ‘one size does not fit all’. This provides a significant challenge because most of the investment needed (USD \$94 trillion) to respond to the global goals (Global Infrastructure Hub, 2018) is delivered through the business sector, typically through infrastructure projects, which contribute to the systems and services that can positively impact health, wealth and inequalities.

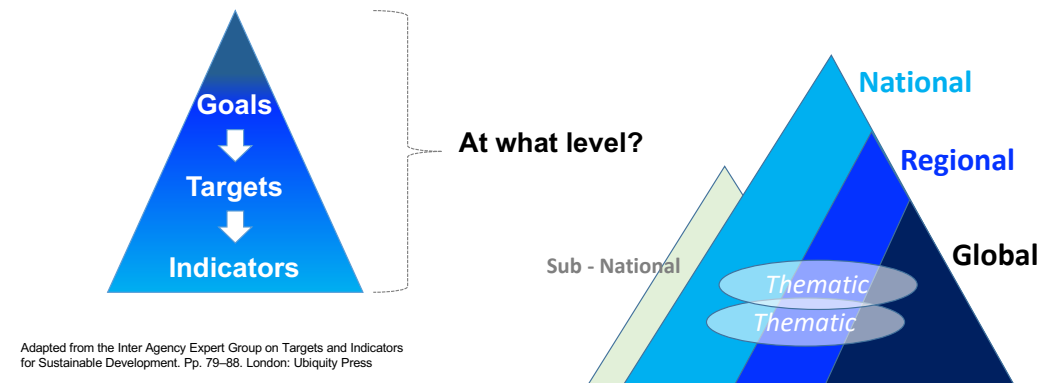


Figure 2: The SDG Targets and Indicators' Framework designed by the UN IAEG-SDGs (2017)

As stated earlier, the SDGs consist of 17 major goals and 169 concrete targets and because some of the targets are not expressed as concrete numbers, the UN also developed a framework of 232 indicators for monitoring and reviewing the targets. Research into the use of the SDG framework (Mansell *et al.*, 2019a) on infrastructure projects has identified that the targets (N = 169) and indicators (N = 232) are too numerous and complicated and therefore unfortunately they are rarely used by engineering practitioners. The research concluded that a new way was needed to reduce the scientific and statistical complexity of the SDG measurement framework. The starting point for this approach, was to evaluate their usability and applicability at the project level on a sector-by-sector basis. For example, in the infrastructure sector, recent analysis (UNOPS, 2018) indicates that 81% of the SDG targets are influenced by infrastructure investment projects. However, ‘influence’ is a comparatively weak word without specifying ‘attribution’ (i.e. directly impacting with verifiable evidence) or ‘contribution’ (i.e. linkage presumed but without evidence), and therefore, despite the positive conclusion from the UNOPS’s analysis (2018), further research is needed to identify which of the SDG targets can be used at project level. This provides a fifth CSF:

Additional Critical Success Factor for Measuring Projects’ SDG Impacts (#5): Prioritisation of (a limited) number of SDG targets relevant to the infrastructure project.

The problem of identifying suitable SDG measurement is compounded at the indicator level, where a further 232 measurement metrics reside. For example, the UK’s Office for National Statistics (ONS) online portal, responsible for reporting UK’s progress against global SDG indicator measurement, shows that in April 2019 they only had data for 173 of the 232 indicators, with 69 being without data (ONS, 2019). The ONS’ challenge of collating reporting evidence for the 232 indicators was further corroborated by recent analysis (Mansell *et al.*, 2019a) of the viability of using each of 232 indicators for infrastructure project-level measurement of success. The analysis, based on inductive reasoning using the project success framework proposed by Peter Morris (2013) and Cooke-Davies (2007) and then analysed against the Cost-Benefit measurement framework from the HMT Green & Orange Books (HM Treasury, 2013) and the World Bank Monitoring, Reporting, Evaluation and Learning methodology (Dudwick, *et al.*, 2006), highlighted there were only a small number of indicators

(N = 28; 12%) relevant to engineering projects. Of these, only 8% (N = 20) have close alignment with the engineering projects, and 4% (N = 8) have marginal relevance, as shown in Figure 3 below. This analysis highlighted a ‘gap’ of not having suitable indicators below the SDG target level that could be used on infrastructure projects.

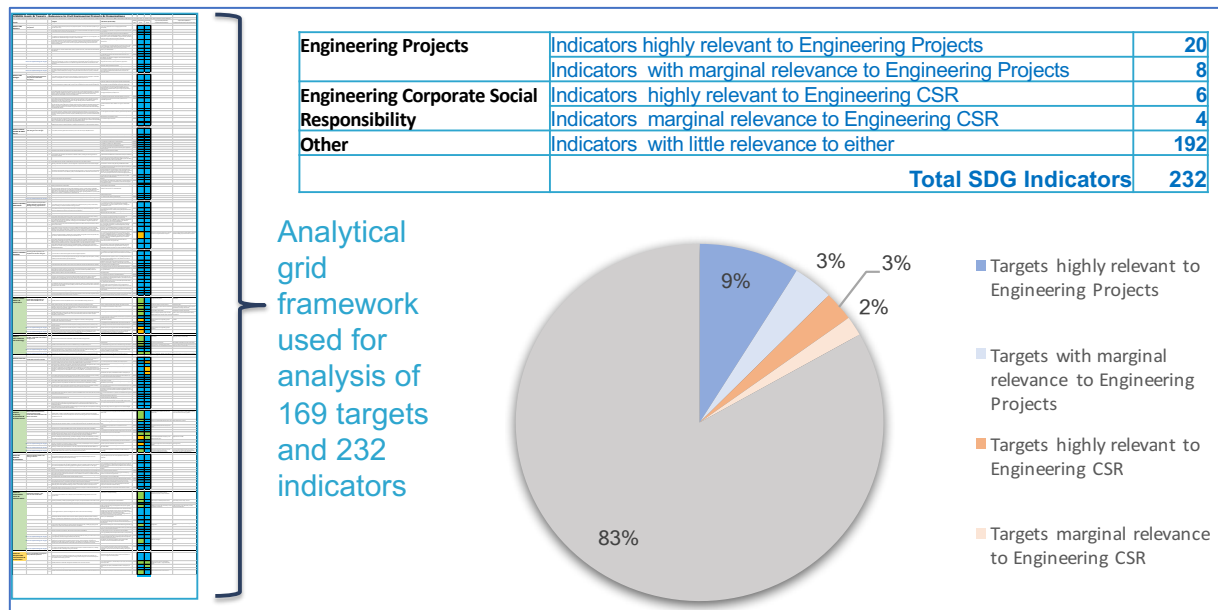


Figure 3: Analysis of the SDG Targets and Indicators' measurability

The results from the research into the SDG indicators highlights a sixth CSF:

Additional Critical Success Factor for Measuring Projects' SDG Impacts (#6): Selection of (a limited) set of specific infrastructure indicators (not SDG indicators) relevant for infrastructure projects.

1.2 Project Success

Before sharing the new process model, it is important to reflect on the different ways of defining project success, particularly since its relevance is linked to two of the original critical success factors: Critical Success Factor #1, Strategic Success Definition; and Critical Success Factor #3, Aligned Business Priorities. While project success is a heavily researched field of study within the field of project management (see for example the work of Thiry, 2004; Müller and Jugdev, 2012), the quantitative analysis of success criteria and their alignment to outputs or outcomes, is less evident. For example, Michael Thiry (2004) highlights that “*too many critical success factors are related to inputs and management processes and not enough on outcomes*”. This is further supported by those (Morris, 2013; Cooke-Davies, 2007) who identify two primary levels of success criteria: project management success – was the project done right? Secondly, project success – was the right project done? To explain the difference, it is helpful to go back to basics – that projects are temporary organisations that have a well-recognised development process, referred to as the project life cycle (Morris, 2017). To achieve its ‘ends’ (post project), the project management team harnesses the ‘ways’ of tools and techniques, and employs practices, processes and procedures, by ‘means’ of a group of skilled individuals. Together the ends, ways and means form a distinct body of knowledge, such as the APM’s and PMI’s Body of Knowledge. There is, however, a fundamental problem that, as a discipline,

project management too often defines success by the best use of these practices, instead of what its impact is on producing outcomes of real value (Morris, 2017). This is important to resolve because of the huge investment across all projects to effect successful change, especially when related to strategic SDG impacts. The two fundamental parts of defining project success are shown in Figure 4 below. The first question is focused on the delivery phases and is tactical in nature, while the second seeks to define the longer-term outcomes and impacts, that are more strategic in orientation.

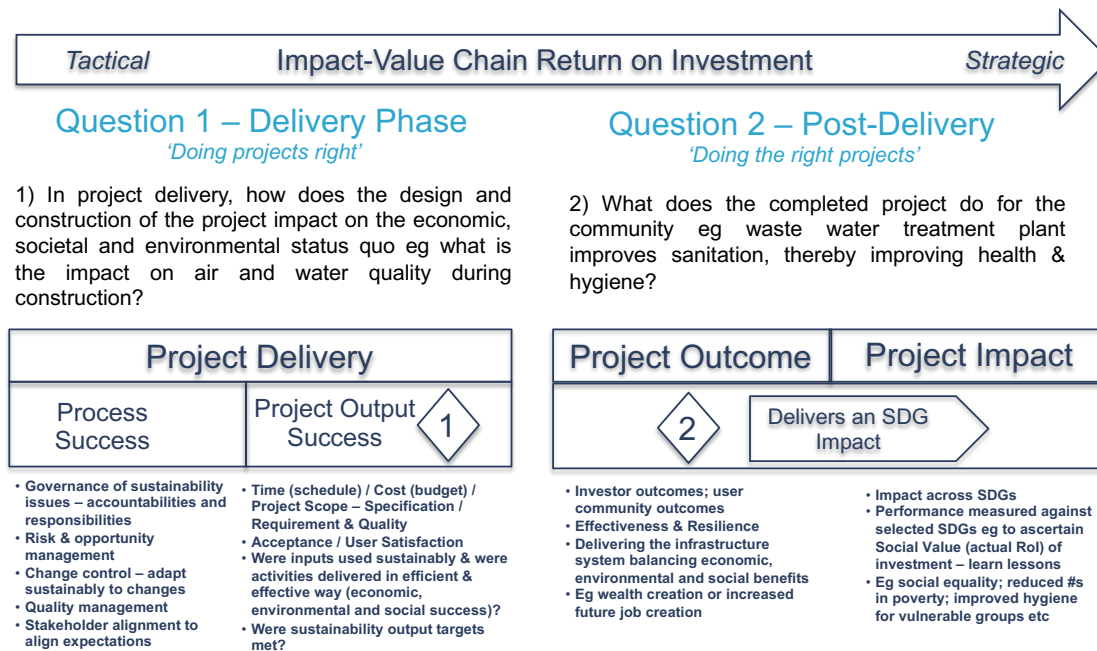


Figure 4: Framework for sustainability and project success reporting. The two core sustainable development questions at project level.

1.3 Infrastructure SDG Impact-Value Chain (IVC) process model

Having defined the different ways of classifying project success, a new SDG project transformation process model was developed for the infrastructure sector (Mansell et al., 2019b). It provides the 'lens', called the *SDG Infrastructure Impact-Value Chain* (IVC), to analyse whether there is evidence of a 'golden thread' between best practice sustainability reporting frameworks at project level, with those at strategic-level SDG impacts. The IVC model (Figure 5) is based on four underpinning theoretical models including: 1) The Theory of Change (Weiss, 1995; Stein and Valters, 2012); 2) Creating Shared Value (Porter, 1985, 2011); 3) Infrastructure Systems approach (Hall et al., 2016; Thacker and Hall, 2018); and, 4) the Triple Bottom Line (Elkington, 1994, 2013, 2018; Griggs et al., 2013). The last of these, the TBL, provided the link to SDGs through a more holistic 'systems approach' to address infrastructure sustainability in the SDG context. The IVC provides a new holistic method to potentially improve sustainability on projects and programmes by guiding decision-makers in their investment choices through confidence that they link to specific SDG targets.

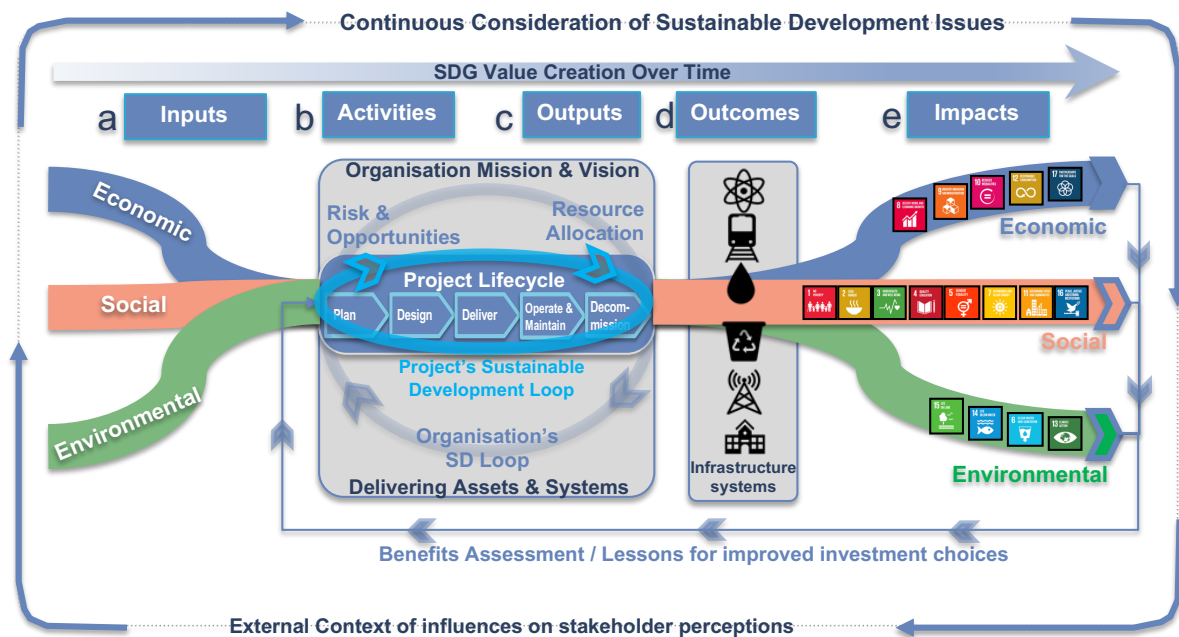


Figure 5: The Infrastructure SDG Transformation Process Model – The Impact-Value Chain (IVC). Adapted from ICAS/IIRC's 'The Sustainable Development Goals, integrated thinking and the integrated report' (Adams, 2017).

In practice, the golden thread (the TBL thematic of economic, social and environmental) shown in Figure 5, can be used to map the TBL against the five stages of the IVC as shown in Table 1 (with columns a-e also represented in Figure 5). The examples provided indicates that there are clear 'Theory of Change' patterns that build through the iterative stages and this can be linked directly to project and organisational level understanding of sustainability reporting.

	(a) Input	(b) Activity	(c) Output	(d) Outcome	(e) Impact
Economy	Finance / investment; insurance; risk contingency allocations; WLC analysis; stable government; non-corrupt financial context.	Job creation; income; wages; source, move & assemble materials; build iteratively through defined activities such as early earthworks; local & wider supply chain activity	Project completion to time/cost/scope – bridge, building, road etc; income; profit; taxes from in-project business; Net Present Value provides strong RoI against Whole Life Costs.	Economic growth enabled by completed assets as a system; more resilience; wealth creation; ownership; increased future investment and additional job creation.	SDGs 8, 9, 10, 12
Social	People; social networks; cultural and technical knowledge; listening & working with stakeholders.	Collaborative innovation; health & wellbeing; stakeholder engagement; skills and learning; working conditions; production activity; user engagement.	Asset's social utility; meeting stakeholders' objectives; individual and group learning; reinforced community stakeholder groups.	Infrastructure enabled change across health, education, etc., e.g. reduced mortality; gender equality; social equity; justice; post project knowledge sharing.	SDGs 1,2,3,4,5,7,11
Environment	Raw materials; land take; water; light; clean air; energy; planned land use; ecology ecosystem valuation assessment.	GHG emissions; pollution; noise and air quality; works' affects pre and during production eg waste management, nitrogen, carbon dioxide, acidification levels.	Managed effects on completion of asset; replanted trees etc; improved local area; no net loss on eco system footprint; short term environmental targets met.	Restored/ improved biodiversity and natural balance e.g. increased long-term positive effect on environment through improved sustainability.	SDGs 6,13,14,15

Table 1: IVC Table illustrating Golden Thread mapping of the TBL with the 5 stages of the IVC.

The data in Table 1 provides the conceptual basis for proposing that there is a golden thread that links tactical success during delivery, to the strategic success embodied in the post-project outcomes and SDG strategic impacts.

The next section uses a case study of a UK water utility company, Anglian Water, to demonstrate how the IVC process model can integrate the ‘Triple Bottom Line’ to ensure balanced definition of success across economic, environmental and social thematic. The emphasis is switched from ‘doing projects right’ to ‘doing the right projects’. This is an explicit part of the IVC model, ensuring that short-term project success measures are balanced with post-project longer-term outcomes and SDG strategic impact, which many (Morris, 2013; Cooke-Davies, 2002 and 2007) have suggested are improved definitions of project success.

2. Methods

The research team’s method was based on using a case study investigation to test and validate the application of SDG measurement on infrastructure projects. The starting point, as shown in Figure 6, was to establish the parameters of the research, briefly outlining the SDGs and the challenge of measuring goals, targets and indicators at project level. It then evaluated the definition of project success and the difference between ‘doing projects right’ and ‘doing the right projects’. This led to the proposed Infrastructure SDG Transformation Process Model, called the ‘*Infrastructure SDG Impact-Value Chain*’ (IVC) (Mansell, 2019b), that links tactical-level project delivery with global-level strategic SDG impacts. In the process of this analysis, it identifies six ‘Critical Success Factors’ (CSF), that are evolved from the four CSF in the survey, each with its own underpinning question. These CSF questions are then tested against the case study of Anglian Water, a water utilities company that has started the process of embedding SDG reporting at both organisational and project levels. Finally, the results from the case study enable an approach to be defined, using the IVC, that could be used at the project design phase to align stakeholders on why/when/how/what SDG targets to measure.

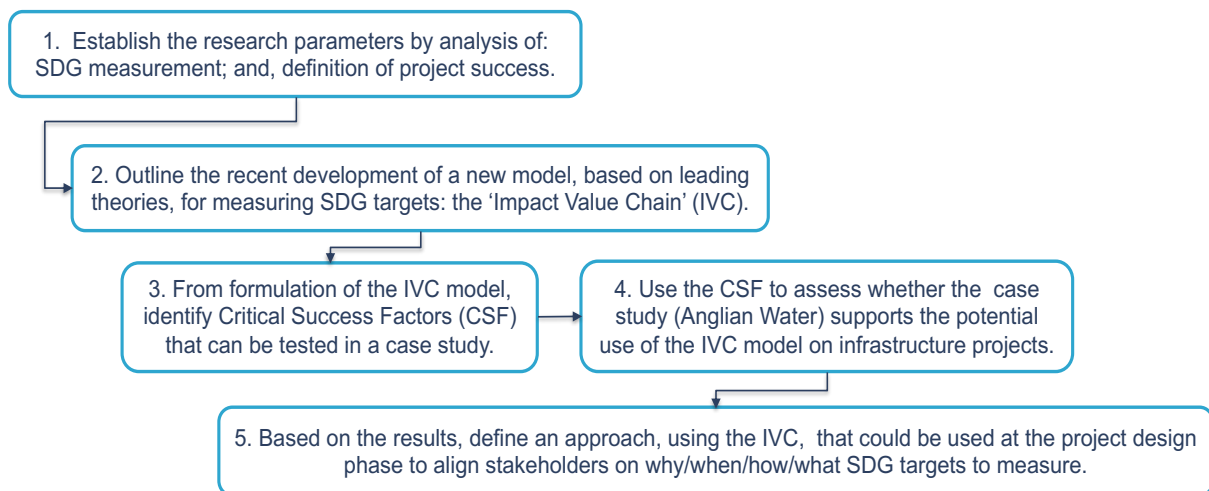


Figure 6: Research methodology employed.

As shown in steps three and four, the case study analytical approach was structured to investigate the four CSF’s that were identified from the survey (Mansell, 2018) and the two additional CSF’s that have been identified from the development of the IVC model (Mansell et al., 2019b), as shown in the composite CSF table below (Table 2).

Category		Critical Success Factors for SDG Measurement	Derivation
CSF Enablers	1	Strong Leadership. What is the role of leadership to champion the SDG impacts across the TBL?	From Engineers' survey (Mansell, 2018). Identified as #4 critical success factor.
	2	Clarity of IVC project success definition. Do businesses have a clear understanding of the need to separate definition of success between 'in-project' inputs/activities/outputs and 'post-project' outcomes and impact?	From Engineers' survey (Mansell, 2018). Identified as #1 critical success factor.
CSF for selection and reporting SDGs	3	Step 1 - Prioritising SDG goals aligned to Strategic Vision. Do businesses have a clearly defined strategy that can guide the prioritisation of SDG goals? The 'Ends, Ways, Means' model requires clarity of the 'ends' prior to defining project success (in-project and post-project). See column 'e' in Table 1.	From Engineers' survey (Mansell, 2018). Identified as #1 and #3 critical success factor.
	4	Step 2 - Select targets relevant to the project. Which SDG goals and which relevant targets are selected at project level to measure impact? Prioritisation of (a limited) number of SDG targets relevant to the infrastructure project.	From SDG analysis (Mansell et al., 2019a) and identified in this paper as #5 and #6 critical success factor.
	5	Step 3 - Aligned Business Priorities / Integrate the targets across the TBL. How are the project success criteria balanced across the Triple Bottom Line – what trade-offs are made?	From Engineers' survey (Mansell, 2018). Identified as #3 critical success factor.
	6	Step 4 - Reporting and communication. Are the tools available for holistic measurement of success? What is the best way to share data on SDG progress, internally and externally?	From Engineers' survey (Mansell, 2018). Identified as #2 critical success factor.

Table 2: Critical Success Factors (CSF) for embedding SDG target measurement at project level.

The central investigation was to test the new IVC model against current practice using the example of one of UK's largest water utility companies, Anglian Water. It is amongst UK's leading sustainability and sustainable development reporting pioneers (with early use of SDG targets) and was the winner of Business in the Community's (BITC) Responsible Business of the Year Award in 2017. This recognised Anglian Water's ambitions laid out in its 'Love Every Drop' (of water) vision, which aimed to create a resilient environment that allowed sustainable growth and the ability to cope with the pressures of climate change.

The data for the case study was accessed by interviewing (1.5 hours) a senior Anglian Water executive, Chris Newsome OBE, who at the time was the Director for Asset Management. A second interview was held with the Head of Anglian Water's Sustainability Management, as a further source of data and information. Mr Newsome is also the Chair of the UK Government's Green Construction Board's Infrastructure Working Group and has been a major sponsor and champion of the sustainable development programme across Anglian Water as well as the infrastructure sector more generally, for the past 10 years. Mr Newsome provided publicly-available documents (i.e. as a form of secondary research) to support the in-depth insights into the company's pioneering work in sustainable development. This research was triangulated by further review and evaluation of the company's website and related documents as well as social media on the company's approach to sustainable development in order to verify the data validity.

3. Results

Case Study Investigation: Anglian Water – Organisational Focus on Sustainable Development [Permission granted for re-use of data and images by interviewee and organisation]

The Anglian Water approach to sustainability and the SDGs is explained in their Annual Integrated Report (Anglian Water, 2018a). The report includes a description of their impact-value objectives (performance against outcomes) assessment which correlates with the Triple Bottom Line of the economic, social and environmental thematic. In summary, Anglian Water (AW) describe their TBL priorities as follows (Table 3).

Anglian Water Outcomes	Objectives
1. Smart Business. Innovating by exploring new ways to operate more sustainably and helping customers, business partners and employees to embrace our Love Every Drop strategy.	i. Resilient business ii. Investing for tomorrow iii. Fair charges, fair returns iv. Our people: healthier, happier, safer
2. Smart Communities. Collaborating and engaging with customers, colleagues and business partners, and inspiring them to take positive steps towards achieving our vision for a sustainable future.	i. Positive impact on communities ii. Safe, clean water iii. Delighted customers
3. Smart Environment. Transforming behaviours by playing a leading role in reshaping how society values and uses water and reducing our combined impact on the world around us.	i. A smaller footprint ii. Flourishing environment iii. Supply meets demand

Table 3: Anglian Water's Performance against Outcomes.

These are shown below in the images from the Annual Report (Anglian Water, 2018a, pages, 24-25, 29) (Figure 7).



Figure 7: Anglian Water alignment of purpose-outcomes and SDGs (Anglian Water, 2018a). [Permission to re-use agreed by AW]. (for illustrative purposes only)

The following analysis of the case study is structured according to each of the CSF titles. The data is shown in the form of key quotes from the Director for Asset Management for the company, supported by data gathered from open source documents.

3.1 CSF1: Strong Leadership. What is the role of leadership to champion the SDG impacts across the TBL?

Consistent with the survey results (Mansell, 2018), Anglian Water place a high priority on leadership to galvanise commitment to their corporate level sustainability objectives. They achieve this through consistent and strong communications, both graphically, such as through their ‘Purpose Wheel’ (Figure 8), and by the high profile championing of their sustainable development approach by their Board and Executive.



Figure 8: Anglian Water Purpose Wheel (Anglian Water, 2018a) aligned to the Triple Bottom Line. [Permission to re-use the wheel agreed by AW].

Mr. Chris Newsome, a Director and Executive Board member at Anglian Water, observed [note: in future, all quotes from the interview are labelled as ‘CN’ followed by the quotation]: *“Leadership is the most important critical success factor, both internally and externally, to align and galvanise our employees, our communities and the supply chain. It was about getting us all to be more collaborative in finding novel, innovative ways of delivering sustainable solutions ... It’s about the leaders capturing the hearts and minds of the stakeholders to champion changed behaviours to achieve big, bold strategic outcomes.”*

In his view, it played an important part in Anglian Water becoming a sustainable development leader across the sector. CN: *“there are a number of reasons why we won Business in the Community’s (BITC) Responsible Business of the Year Award in 2017 – but a key part was that our CEO brought a very specific challenge back to the business having been inspired by a ‘Seeing is Believing’ visit, organised by BITC, to an area near the Olympic Park in London. The visit looked at how businesses were able to create opportunities and skills for those living in areas of high deprivation and low social mobility. The CEO’s response was... ‘how can we do something on a similar scale, in the region we serve, to make a real difference?’ This led to our hugely successful programme in Wisbech and helped us develop an approach that we’ve subsequently used on project work in Nepal alongside Water Aid.”*

[Note: The Wisbech project, illustrated in detail in Table 5, was a forerunner of the Lahan project in Nepal. Lahan was the first WaterAid project with significant engagement from the

Utilities' supply chain and became a beacon to demonstrate how such projects can be driven across Nepal and beyond.]

He also notes the moral values that are implicit in the choice of making sustainable development a core business priority for Anglian Water. CN: *"a vital part of leadership is doing the right thing, just because it is the right thing to do, not because of a box-ticking exercise"*. He expands this to state, CN: *"Our leadership was engaging the supply chain proactively, to collaboratively change the way we thought about, and did, our business...we wanted the approach to become part of the way we jointly became leaders in delivering our businesses successfully... We wanted to establish meaningful change across the supply chain, and we recognised that to do this, we had to develop long-term relationships, hence we contracted on a five, plus five, plus five-year basis. This built longevity into our thinking and allowed true innovation to develop solutions to the bigger sustainable development issues across the environment – driving efficiency and effectiveness."*

This was not necessarily an approach that was either quick or easy and needed a tough commitment from the leadership, CN: *"It's fifty percent belief and fifty percent belligerence, when you start something like this; That is holding yourself and others to account. That's what I mean by belligerence. In other words, 'seeing it through'."*

The core principles of governance (OECD, 2015) of accountability, responsibility and transparency were also noted, CN: *"a key part of the leadership is the ownership of the sustainable development strategy. It is also about accountability and having the resources to deliver the solution. That is why the 'Infrastructure Clients' are the single most important stakeholders in addressing sustainable development. If they 'own' and champion the solution, then the supply chain will follow... hence leadership and procurement are the biggest elements of the recent Green Construction Board's 'Three Years On Report – Reducing Carbon Reduces Cost' report."* ref

3.2 CSF 2: *Clarity of IVC project success definition. Do businesses have a clear understanding of the need to separate definition of success between 'in-project' inputs/activities/outputs and 'post-project' outcomes and impact?*

In the Anglian Water Integrated Report 2018, (Anglian Water, 2018a, p.8), the CEO says: *"We are continuing to plan and to invest in protecting customers and the environment. This year saw the publication of our draft Water Resources Management Plan, which sets out how we propose to balance supply and demand in a fast-growing region over the next 25 years and to protect customers from severe water restrictions in a future drought."* The Annual Report highlights that Anglian Water explicitly assesses both the short-to-medium term economic factors that their investors value, as well as the longer-term strategic sustainable development impacts that are more aligned to SDG targets.

Chris Newsome explains how Anglian Water used the overall 'Love Every Drop' banner campaign to balance long-term and short-term priorities, CN: *"In 2015 we refreshed our 'Love Every Drop' goals and aligned them with the Outcomes Wheel shown in the Annual Report. So, we thought long and hard about, not just the goals that we created, but how did that fit with a set of longer-term outcomes in our region and what that would look like in terms of implementation. This was our way of meaningfully connecting the strategy with outcomes that our stakeholders recognised."*

It was also noted, that Anglian Water uses simple and accessible language (see CSF 6 on communications) to explain their ‘Purpose Wheel’ and its linkage to Outcomes-Impacts. This aligns with the IVC model and indicates a viable way of thinking ‘big and long’, whilst managing the activities and outputs on a short-term basis to track progress.

3.3 CSF 3: Prioritising SDG goals aligned to Strategic Vision. Do businesses have a clearly defined strategy that can guide the prioritisation of SDG goals? The ‘Ends, Ways, Means’ model requires clarity of the ‘ends’ prior to defining project success (in-project and post-project).

The Anglian Water approach aligns closely with the IVC model, since it also uses an ‘Ends, Ways, Means’ logic, similar to the Theory of Change concept (Figure 5), CN: “*you must start with the end in mind, even if you haven’t got a detailed routemap to deliver at every stage of the journey. Part of the mantra is to set big audacious goals and then adopt an attitude of ‘I’ve started so ill finish’ and by the way, you never actually finish, because the end goal is moving, its like you achieve one peak, but realise it is a false horizon, and so you continue your climb to the next summit.*”

As well as the ten prioritised goals, Anglian Water have also prioritised 35 targets that are most easily measured at project level, which are reproduced below (Figure 9).

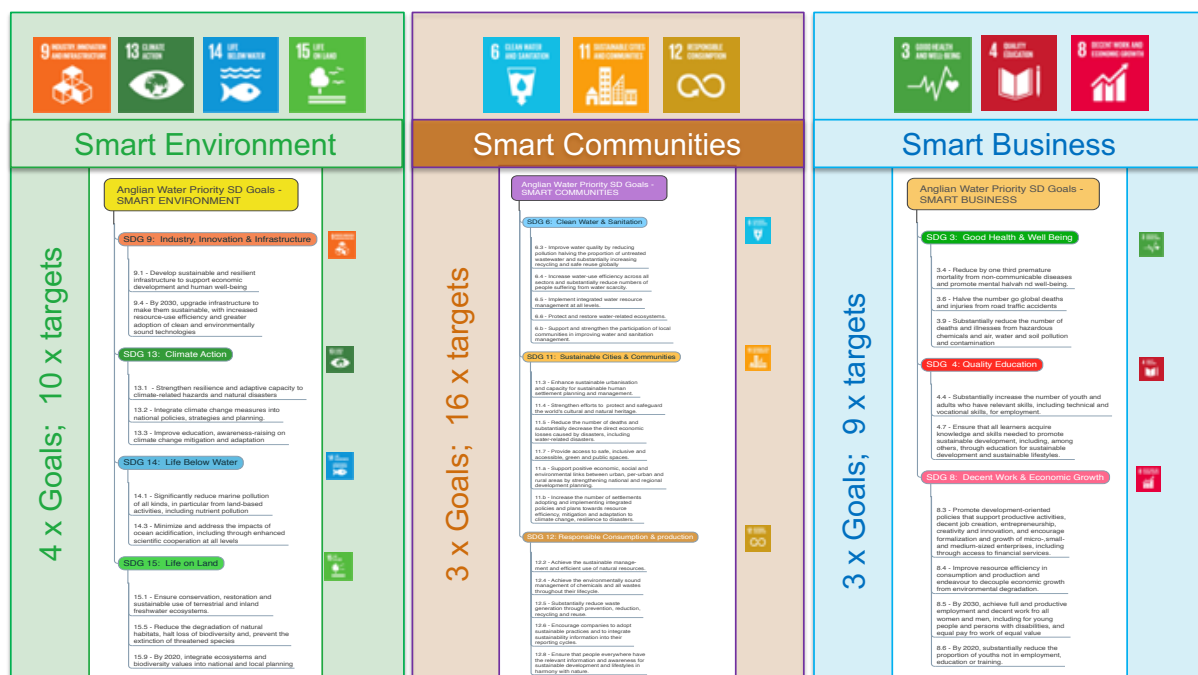


Figure 9: Anglian Water has three business priorities that are balanced across the Triple Bottom Line. The specific SDG targets (N = 35) in this figure are reproduced in readable format in Table 4. (for illustration only)

The value of having clarity of the strategic ends, is noted, albeit with a caution that the identification of targets for tracking performance must not become a ‘box-ticking’ exercise that distorts clarity of outcomes, CN: “*if you actually begin with the end in mind of the outcome you're seeking and how you wire your DNA to achieve that, you are far more likely to achieve those outcomes, and in so doing the boxes get ticked. But if you predicate your thinking with thoughts about just filling the boxes, you've constrained yourself.*”

The representation shown in Table 4, of mapping Anglian Water's top 27 projects to their prioritised SDG targets, shows that all projects had at least one target to measure success against, while one project had 10 targets to map success against. This mapping by Anglian Water highlights that only a few targets can realistically be measured at project level. It also suggests that if the targets are measured across a portfolio of projects and programmes, then a composite SDG impact measurement could be made. This would provide useful insights to support investment appraisals that seek to better understand the strategic impacts of investments and their broader TBL's Return on Investment.

3.5 CSF 5: Aligned Business Priorities / Integrate the targets across the TBL. How are the project success criteria balanced across the Triple Bottom Line – what trade-offs are made?

A representation of the linkage of the Anglian Water three TBL thematic outcomes, aligned to their ten prioritised SDG goals, is shown below:

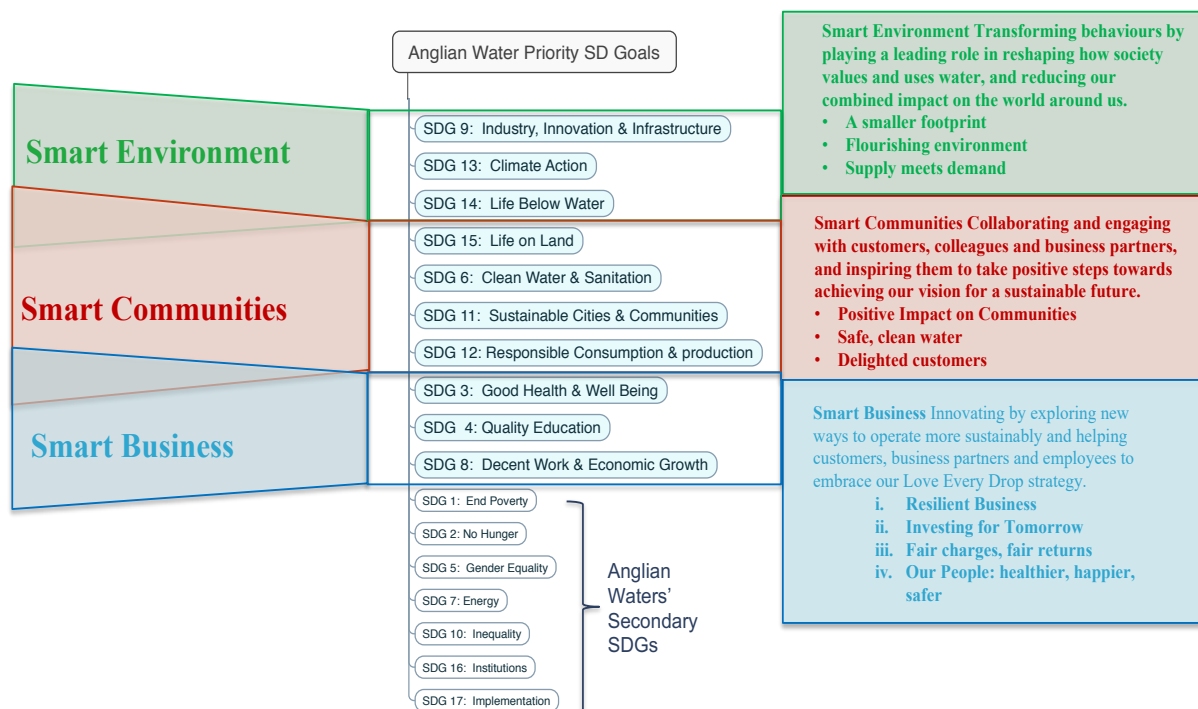


Figure 10: Anglian Water has three business priorities that are balanced across the Triple Bottom Line.

In the Anglian Water Integrated Report 2018, (AW, 2018a, p.9), the CEO, Peter Simpson says: “Since becoming Responsible Business of the Year, we have been working hard to show others how sustainability makes good business sense.” This quote emphasises the Anglian Water experience that aligns with the Creating Shared Value (Porter, 1985 and 2011). It implies that the TBL can be balanced – a strategy that focuses on the environment and society, which can equally achieve economic success. When in harmony, real growth is delivered to the benefit of all, as shared by CN: “For example, our approach to ‘product lifecycle management’ was learned from the aeronautical and automotive industry from 2004-5 and this meant that we looked at the whole life costs, which not only ensured we were more outcomes focused, but by the way, improved our productivity by three percent each year, year on year, highlighting that good sustainable development also made good business sense.”

3.6 CSF 6: Reporting and communication. *What is the best way to share data on SDG progress, internally and externally?*

It has already been noted that Anglian Water had a policy of thinking long-term, explaining their sustainable development approach in accessible language, and also, the need to uphold strong governance principles of accountability and transparency (OECD, 2015). This has led to a strong ethic of being held accountable for delivering meaningful change, including publishing their strategic objectives in quantifiable terms (such as the carbon figures noted in the paragraph above) as well as, equally importantly, the results, CN: *“learning from the likes of Marks and Spencer's Plan A, we realised you had better publish your sustainability plans and outcome targets so that you are kept honest in the process - there is very little point nailing your colours to the mast and then not living to the high expectations ... so the message was that we must commit to do the things that matter to us. That is what gets people excited, because it really matters. We are tough on ourselves on reporting what happens, and this allows us to measure what impact we are having so that we can measure the benefit.”*

The theme of honesty and allowing stakeholders to hold the Executive and Board to account is a powerful lesson that also relates to measuring SDG impacts at project level, CN: *“But the point about turning your ambitious goals into reality, to avoid superficial statements, is that it is all recorded - it is published annually; which is an important part of defining where you are going. Driving towards it with no 'U' turns when some tough decisions have to be made. It's obvious that you have to make loads of tough decisions rather than duck them, and then, recording your progress in an open and visible way, helps keep you honest in that process.”*

A cautionary note about communication was that the messaging should be kept simple and accessible, CN: *“We found that our campaign and collaborative working with partners had created a different conversation with different language. Ultimately, accessible language on meaningful outcomes are what people can buy into and this is what creates the momentum of changed behaviours...Through engagement, innovative solutions address the big problems, Wisbech is an example of working with the community to achieve meaningful long-term changes.”*

3.7 Overview Analysis of Anglian Water's projects set against the IVC Framework

The reference to Anglian Water's Wisbech project in the previous quote, provides a holistic test against the six critical success factors, and a useful way to cap the case study analysis. The table below mirrors the formatting of the IVC table (Table 1) and has been updated with data from the Wisbech Project (Anglian Water, 2018b). This provides a clear assessment as to whether projects could have both the 'in-project' successes measured as well as the 'post-project' outcomes and SDG impacts. It should be noted that the Wisbech project is an outreach community programme inspired by HRH Prince of Wales' 'Seeing is Believing' initiative, that seeks to find ways to support marginalised communities.

	Input	Activity	Output	Outcome	Impact
Economy	Seconded a Senior Operational Manager to Wisbech in 2013; agreed support from other supply chain partners to become involved in the project; this allowed the cost, expertise and effort to be shared across a broad range of partners.	Worked jointly with the local Fenland District Council to develop a longer term strategy beyond their existing 2020 Vision, which was thought to be too short-term to encompass the 'big, hairy, audacious' strategic goals that could achieve transformational change; building a business case for the 'Garden Town' that would attract investment and large transport infrastructure improvements.	Championing apprenticeships and training scheme with 20 trained and employed year on year; turn the community centre from a £30k pa loss making entity to a vital community hub fuelling future economic success; a confirmed lease and implemented the creation of the 'Jobs Fair' and the 'Jobs Café'; The campaigning body for getting rail back – now in the County Transport Plan.	Bills, affordability and profits to stimulate and sustain the local economy, especially those on lower incomes (bills have only increased by 10% since 1990). Viability of future rail and integrated transport system attracting more regional investment and raising local people's aspirations; Market Town proposal, with planning for over 10,000 new homes, providing 'scale of growth' confidence.	SDGs 8, 9, 10, 12
Social	Started by listening – to understand the local issues from the local community's perspective; Brought together senior leaders from 'The @One Alliance'; creating a collaborative multi-stakeholder approach; focused on building long-term sustainable relationships with the local community.	Collaborative innovation with the local community in open and honest talks; health & wellbeing; stakeholder engagement; skills and learning; working conditions; production activity; user engagement; keeping the local community at the heart of the project plans and delivery; worked with the College of West Anglia to train more mechanical and electrical engineers; designed and ran new courses; providing IT support from partners to raise aspirations of unemployed.	Providing a community centre (refurbishment of the Queen Mary Centre) that is the hub of employment opportunities; active STEM subjects engagement with schools; specifically focus efforts on helping those not in employment, education or training; untapped unused human resource; organised the BITC 'Big Connect' event align business connectors from across UK; a second phase for the Queen Mary community Centre to include theatres and a music teaching centre.	Achieving 'Business in the Community' outcomes such as regeneration; Building on the 'Seeing is Believing' community initiatives; Understanding the value of long-term thinking; Providing safe, clean and reliable water; Improve the town/regions standing as the 6 th worst ranked town on social mobility index in UK; addressing the life expectancy that was 3 years less than in Cambridge.	SDGs 1,2,3,4,5,7,11
Environment	Raw materials; land take; water; light; clean air; energy; planned land use; ecology ecosystem valuation assessment.	Management plans for the flood risk, building resilience into engineering designs; using innovative modelling techniques developed by the Dutch government.	A commitment to protecting and restoring our wealth of wetland habitats. make a difference to rare and common species, be they in wet grasslands, open water, fens, or mires.	Build resilience to cope with future challenges. Protecting the environment, we live in; Through its Flourishing Environment Fund, helps environmental organisations deliver real benefits for nature.	SDGs 6,13,14,15

Table 5: Applying Anglian Water's Wisbech Project initiative to the IVC Grid with mapping of the TBL with the 5 stages of the IVC (data accessed from open source material on website and printed material).

4. Discussion of Findings

The results of the case study investigation have showed that there is a verifiable link across the IVC of activities-inputs-outputs during the ‘in-project’ phase, connecting to the ‘post-project’ outcomes and SDG impacts. A number of Anglian Water’s projects were mapped to this schematic (although for brevity only one, Wisbech, is reproduced in this paper) and this gave confidence that the approach could have wider applicability. Therefore, the results led to a proposed methodology for project leaders to use as a way of strategically aligning stakeholders on a common definition of success, linking tactical ‘in-project’ success of outputs, with the more strategic outcomes and SDG impacts ‘post-project’. The methodology would ideally be used during the design phase of the project. The emphasis is switched from ‘doing projects right’ to ‘doing the right projects’. It includes selection of longer-term outcomes and strategic SDG impacts – which it is suggested offer improved definitions of project success.

The five proposed steps, that have emanated from the six critical success factors that were used as a framework for the case study, are proposed as a way to initiate the ‘right project’ in the ‘right way’ – and with increased clarity of ‘Ends, Ways and Means’.

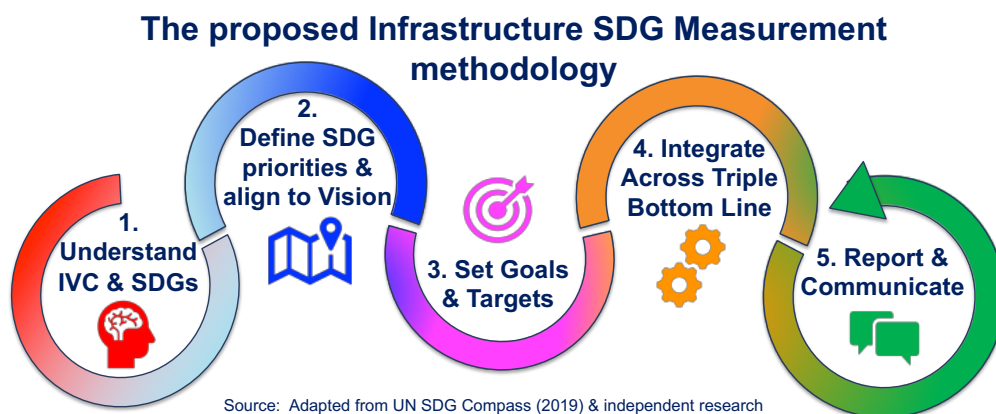


Figure 11: The proposed Infrastructure SDG Measurement Methodology derived from the six critical success factors and the application of the IVC model to the Anglian Water case study.

5. Conclusions and Future Work

The central investigation in the case study of Anglian Water was to test and validate whether the new Infrastructure Project Transformation Process Model, called the ‘*Infrastructure SDG Impact-Value Chain*’ (IVC), could link tactical-level project delivery with global-level strategic SDG impacts. The study used the ‘golden thread’ of the TBL thematic areas (namely economic, social, and environmental) to interrogate whether one of UK’s leading water utility companies, Anglian Water, was already delivering strategic sustainable development solutions that could be mapped to SDG targets. The case study investigation has resulted in a proposed methodology for project leaders that can be used as a strategic-level tool to link tactical ‘in-project’ success of outputs, with the more strategic outcomes and SDG impacts ‘post-project’.

The results provide insights for further research. The next stage of the research is to develop the Infrastructure SDG Measurement methodology (proposed in Figure 11), into a fully defined methodology that can be tested in industrial scenarios on identified projects. These case studies will include both developing and developed countries and will focus on a single

asset type across the national economic infrastructure categories of either energy, waste, water, transport, or ICT. The practical application is significant since, with improved linkage of tactical delivery to strategic SDG impacts, improved investment decisions will be made, and systemic level lessons can be applied to increase the likelihood of success in achieving the SDG 2030 targets.

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