

Leveraging the enabling environment to deliver
infrastructure and services to meet the real needs of end
users in developing countries



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This thesis is submitted for the degree of

Doctor of Philosophy

May 2024

Declaration

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Abstract

Poverty remains widespread in developing countries. Basic needs still fail to be met, and sustainable development is slow. There remains a vast infrastructure and service needs gap, as evident in the Sustainable Development Goals. However, infrastructure and services have the potential to reduce this gap through the sector's extensive reach into all areas of society; from water and sanitation to meet basic needs, to economy-boosting mega-projects.

However, provision of infrastructure and services does not simply eliminate the needs gap. Engineering technologies exist to meet most needs experienced in developing countries, however it is the surrounding context that creates the barriers to their implementation and success. Therefore, an understanding of the contextual influences that effect the success of infrastructure and services is critical. This is termed the enabling environment.

The enabling environment encompasses all influences in a national context, extending to institutional, economic, social, and environmental factors, which are highly interconnected through complex relationships. The enabling environment behaves as a system, where change in one area can generate change in another. When applied to the context of this study, a system representation of the enabling environment can be used to understand the barriers and opportunities to reducing the service needs gap in developing countries.

A causal loop diagram is presented to model the enabling environment. Seven case studies are employed to analyse real-world projects, their interactions with the enabling environment, and its influence on the project outcomes. Five archetypes are suggested which classify project types by the way they typically interact and are influenced by the enabling environment, to identify facilitating and inhibiting characteristics that might be expected in similar future projects. This allows policy-makers and practitioners to make informed decisions to implement targeted change, to help deliver services that achieve their intended purpose in the future.

This research builds on previous studies and industry practices, to bring together all elements of the enabling environment into one framework, to facilitate an understanding of the full enabling environment and its relationship to infrastructure and services not yet achievable using existing methods. With this understanding, it is possible to leverage the enabling environment to improve the outcomes of future infrastructure projects, to ensure that the services they deliver can effectively meet the needs of end users.

Acknowledgements

I would like to extend my gratitude to my supervisor, Professor Richard Fenner, for his ideas and insights, and for challenging my thinking to develop my ideas and push my capabilities. Also, for his encouragement and patience during both the highs and lows of PhD research.

With thanks to my advisor, Dai Morgan, for his guidance in clarifying the research direction, and for his reassurance when needed.

I would also like to thank those at Arup, the Asian Development Bank, Lifewater International, Mott MacDonald, Sabre Education, and the World Bank who generously gave their time and expertise to contribute to this research.

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Nomenclature

ABM	Agent-Based Models
ADB	Asian Development Bank
BGP	Blue Gold Program
BGW	Blue Gold Program Wiki
BN	Bayesian Networks
BWDB	Bangladesh Water Development Board
C-CLD	Case Study Causal Loop Diagram
CDSP-IV	Char Development and Settlement Project
CLD	Causal Loop Diagram
CLTS	Community Led Total Sanitation
CMO	Construction Management Organization
CSF	Critical Success Factor
CUG	Conditional Uniform Graphs
CWC	Central Water Commission
DAE	Department for Agricultural Extension
D-CLD	Dimension Causal Loop Diagram
DLS	Department of Livestock Services
DoF	Department of Fisheries
DWSS	Department of Water Supply and Sewerage
EEA	Enabling Environment Appraisal
EIA	Environmental Impact Assessment
EKN	Embassy of the Kingdom of the Netherlands
EMP	Environmental Management Plan
ERGM	Exponential Random Graph Models
EUR	Euro
FFS	Field Farmer Schools
GALOP	Ghana Accountability for Learning Outcomes Project
GDP	Gross Domestic Product
GES	Ghana Education Service
GNI	Gross National Income
GNP	Gross National Product
GoB	Government of Bangladesh
GTZ	Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
HDI	Human Development Index

IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IDA	International Development Association
IEE	Initial Environmental Examination
IFAD	United Nations International Fund for Agricultural Development
IPL	International Poverty Line
KfW	Kreditanstalt für Wiederaufbau (Reconstruction Credit Institute)
LCS	Labour Contracting Societies
LGED	Local Government Engineering Department
LGI	Local Government Institutions
M-CLD	Master Causal Loop Diagram
MDG	Millennium Development Goals
MFI	Micro-Finance Institutions
MoA	Ministry of Agriculture
MOE	Ministry of Education
MoWR	Ministry of Water Resources
MOWS	Ministry of Water Supply
MPI	Multidimensional Poverty Index
MPPW	Ministry of Physical Planning and Works
NA	Network Analysis
NDP	National Development Plan
NGO	Non-Governmental Organisations
NIP	National Infrastructure Pipeline
NSPS	National Social Protection Strategy
O&M	Operation and Maintenance
OBA	Output Based Aid
ODF	Open Defecation Free
OECD	Overseas Economic Cooperation Fund
OHPC	Odisha Hydro Power Corporation
PA	Project Appraisal
PEA	Political Economy Analysis
PIU	Project Implementation Unit
PMO	Project Management Office
PPP	Public Private Partnerships
PRAP	Poverty Reduction Action Plan
PRC	Power Finance Corporation
PWM	Participatory Water Management approach

SA	Sustainability Assessment
SDG	Sustainable Development Goals
SEA	Strategic Environmental Impact Assessment
SEIU	Sector Efficiency Improvement Unit
SIA	Social Impact Assessment
SIC	Slum Improvement Committees
STWSSSP-2	Small Town Water and Sanitation Sector Project 2
TA	Technical Assistance
TDF	Town Development Fund
TLCC	Town Level Coordination Committees
UGIAP	Urban Governance Improvement Action Plan
UGIIP-2	Urban Governance and Improvement Project 2
UP	Union Parishads
VHV	Vision of a Healthy Village
WALMI	Water and Land Management Institute
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organisation
WLCC	Ward Level Coordination Committees
WMA	Water Management Associations
WMG	Water Management Groups
WMO	Water Management Organisations
WUSC	Water Users and Sanitation Committees

1. INTRODUCTION

Infrastructure is acknowledged for its ability to contribute to poverty alleviation and global development, with influence on many other areas of society, as demonstrated by significant presence in the United Nations' Sustainable Development Goals (SDGs) (United Nations, 2020). However, there remains a vast needs gap in developing countries, with millions living below the poverty line, and where basic and development needs still fail to be met (United Nations, 2020).

The infrastructure sector's extensive reach offers opportunities to help close this gap. However, to design and implement suitable infrastructure, need and the needs gap must be fully understood. The definition of need is complex, subjective, and often contested (Benabou, 1996). Definitions range by perspective, motivations, and values of those asked, and argue for different focuses. For example, a beneficiary may determine infrastructure need as that required to fill the needs gap, comprising the fundamental human needs to sustain a life above the poverty line, including resources such as safe water and sanitation, education, and shelter (Hicks & Streeten, 1979; Streeten, 1984). Alternatively, a government might prioritise economic development, given evidence that infrastructure investment can stimulate economic and social growth (Koné, 2010). Otherwise, an environmental paradigm would prioritise environmental need (Koné, 2010; Matsui et al., 2001).

The definition of need will determine the needs gap, which in turn will determine the infrastructure required to fill it. However, a second challenge arises even once a definition is chosen, and the need gap determined. That challenge relates to the fact that physical infrastructure and technologies are rarely a limitation to meeting need and filling the infrastructure gap, evidenced by the presence of suitable infrastructure to meet most basic needs in developed countries (Lau & Kong, 2006). Therefore, explanations must be sought elsewhere.

There are two possible avenues for exploration. Firstly, infrastructure is too often considered a physical asset, however this definition must be reframed to include the facilitating mechanism and social structure required to animate physical assets and link services to society (Franco-Torres et al., 2020). A second avenue is exploration of the wider context in which infrastructure is delivered.

The influence of the wider context, known as the enabling environment, has not been fully considered in literature. The enabling environment considers the political, economic, social, development, and natural environmental context surrounding infrastructure, and serves as both a facilitator and inhibitor to infrastructure and services' ability to contribute to development (Global Infrastructure Hub and Deloitte, 2020; KPMG, 2014). It forms the constraints on what can be delivered and achieved, and may

offer opportunities for intervention to create the most conducive environment possible for infrastructure to successfully achieve its potential (Taylor et al., 2017). However, the most significant influences and their impacts are difficult to determine, which themselves differ between prevailing environments worldwide (Matsui et al., 2001).

A further complexity is the interconnectedness between components of the enabling environment (Taylor et al., 2017). Taylor et al. (2017) suggests the value of a systems approach to represent it and understand the relationships between components. Given such interconnectedness, change in one area can percolate the entire network behaviour, but the pattern of diffusion and propagation is difficult to map (Valente, 2012). Further challenges are the difficulty in understanding the ‘synergies’ and ‘trade-offs’ caused by change; the variation of significance and importance of changes at various points; and failure to consider the enabling environment as an evolutionary system, with constantly changing variables and interactions (Radcliffe, 2017a; Roberts, 2016).

Therefore, there is scope to explore both the type of intervention and the area for intervention, to best meet need. The key is to understand the enabling environment more accurately, which can be achieved through consideration as a system. With this knowledge, recommendations can be made for future projects, to improve the impact of infrastructure interventions to better meet identified need.

1.1. Research aim

This research aims to reframe infrastructure as an integrated system of physical assets, the facilitating mechanism, and social structure, and its suitability for filling a needs gap within the wider enabling environment of political, economic, social, and environmental constructs. It also aims to consider the execution of project and service delivery as parallel influences alongside the enabling environment on the ability of services to meet need.

This research aims to diagnose characteristics within the enabling environment that facilitate, inhibit, and influence the way in which services can meet need, and the significance of impact of each. This will help inform future infrastructure design, to understand expected barriers and opportunities to improve service efficacy in any given environment.

1.2. Research question and sub-questions

The central research question is supported by three sub-questions that form the logic of this research.

Central research question

How can infrastructure and services be better designed to meet need in developing countries within the prevailing enabling environments?

Sub-question 1

How can need be determined?

Sub-question 2

How does the enabling environment influence infrastructure design and project delivery and outcomes?

Sub-question 3

Are there trends between project characteristics, the way the enabling environment affects project outcomes, and the interventions that can be made to change project outcomes?

1.3. Thesis structure

The high-level structure is shown in Figure 1. An explanation of these chapters follows.

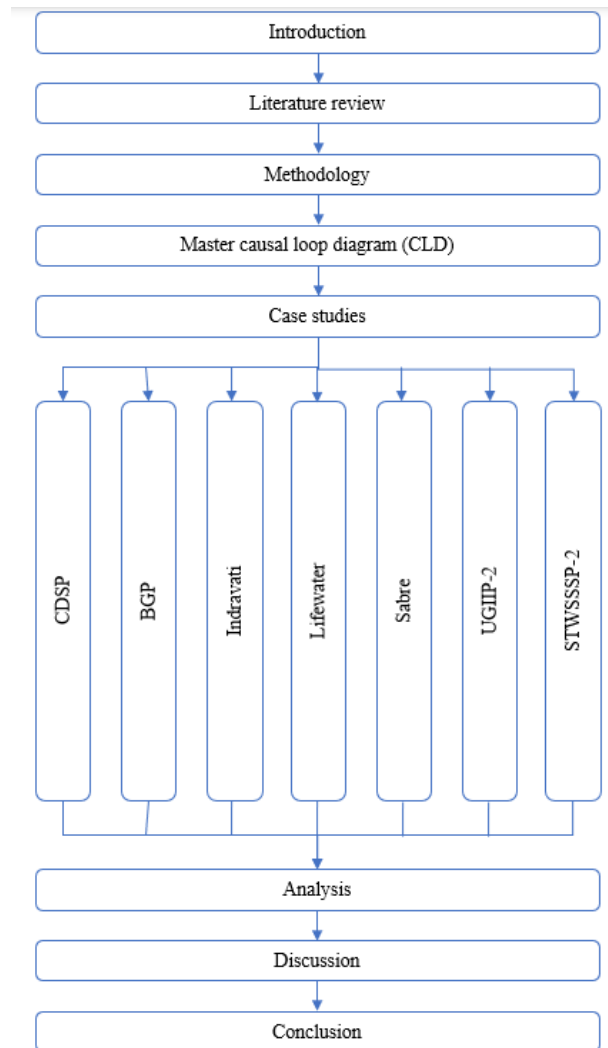


Figure 1 - High-level thesis structure.

Chapter 1

The introduction has explored the motivation for this research and the problem it aims to address. It identifies definitions of need, the concept of the enabling environment, and the challenges that exist to ensure optimal infrastructure is delivered. This chapter also introduces the central research question and three supporting sub-questions designed to direct the research.

Chapter 2

The literature review examines bodies of literature regarding need, infrastructure and services, project delivery, and the enabling environment individually, and subsequently explores the interlinked relationships between these subjects. It goes on to explore existing studies in this field, assessment tools, and the value of a systems approach.

Chapter 3

The methodology chapter explores the chosen system modelling method, causal loop diagrams (CLDs), data collection methods using a case study approach, and the data analysis process comprising frameworks and further systems thinking.

Chapter 4

This chapter comprises the master causal loop diagram (M-CLD), formed from an understanding gained from the literature review. It first considers CLDs representing each dimension of the enabling environment, then combines them to form the M-CLD. The purpose of this chapter is to clearly map the gradual process from the literature review to the formulation of the M-CLD, which has a central role in the subsequent analysis.

Chapter 5

This extensive chapter explores seven case studies, including infrastructure projects with a wide range of characteristics. The chapter examines each case study in turn, beginning with an explanation of the background and enabling environment, followed by application of the methodology, including creation of a case study CLD (C-CLD), and lastly, identification of suggested leverage points in each project.

Chapter 6

The analysis brings together the results from all case studies for comparison in order to answer sub-question 3. It explores trends in the findings, and suggests project archetypes, in order that recommendations for infrastructure interventions can be made to improve the outcomes of future projects.

Chapter 7

The discussion reflects on the work carried out and research outcomes. It considers the leverage points and archetypes, and the challenges experienced when interpreting the enabling environment. It also reflects on the methodology, including application of a systems approach, and the quality and robustness of the study.

Chapter 8

The concluding chapter reflects on the main conclusions in relation to the research question. It explains contributions to knowledge, and implications of the findings. Limitations of the study are also discussed, and recommendations are made for further work.

2. LITERATURE REVIEW

The field of research is defined as the exploration of how infrastructure and services function as facilitators to meet need within the enabling environments of developing countries. This research is multi-disciplinary in nature and encompasses aspects of adjacent fields of research, including development, development economics, infrastructure and services, infrastructure delivery, systems thinking, and network analysis.

The literature review discusses existing research in both the primary and adjacent fields, identifies gaps, and informs the research question and sub-questions.

The following sections discuss the concept of need; infrastructure systems and the services they provide as a facilitator to meet need; the enabling environment as a facilitator of service provision; the influence of service delivery and execution on the ability to meet need; existing assessment frameworks; systems thinking; and network analysis.

2.1. Literature review method

ScienceDirect, Scopus, Google Scholar and the Cambridge University online library database were used to search academic literature and peer-reviewed articles. The following key words and phrases were used: “basic needs”; “enabling environment”; “enabling environment” *and* “infrastructure”; “infrastructure” *and* “development”; “socio-economic” *and* “development”. The results from these broad search terms were subsequently filtered within the databases by journals relating to development, infrastructure and themes within the enabling environment. The remaining results were reviewed by title, and abstract if deemed relevant. Key word searches returned relevant articles from a wide range of journals, likely given the breadth of the subjects included in this research.

The following key journals were also monitored throughout the research for applicable publications: ‘World Development’, ‘Journal of Development Studies’, ‘Journal of Development Economics’, ‘World Bank Economic Review’, ‘International Journal of Project Management’, and ‘Journal of Infrastructure Development’.

In addition to peer-reviewed articles, online publications and grey literature was sourced from credible sources, such as government reports and conference proceedings. Only literature published in English was included; both quantitative and qualitative studies were reviewed; and no geographical preference was given such that research studying all developing countries was considered, including locations outside of the case studies.

The literature review began with background literature to gain a broad understanding of the current state of research in the field. Subject areas were also researched individually, particularly when a lack of literature joining fields was apparent.

A comprehensive approach was taken to the literature review, and the criteria were intentionally set to include a wide range of literature. This approach was intended to provide the most complete overview of the field possible to provide a solid foundation for the research; to align with the varied case studies included which cover a wide range of sectors, locations, and issues; to draw from various fields and perspectives given the multi-disciplinary nature of the research; to gain insight to as many methodologies as possible to ensure that the chosen methodological design was well-informed and reflected the most appropriate method possible; and to ensure gaps in research could be reliably identified.

2.2. Needs

2.2.1. Defining need

Multiple definitions of need exist which influence the approach taken to development; five prominent definitions are explored here. This thesis examines developing countries specifically, and therefore the definitions discussed apply to the needs of the poor, and needs frequently observed in developing countries, and assume an anthropocentric perspective.

The basic needs approach refers to the fundamental human needs required for a dignified life and to alleviate from absolute poverty (Hicks & Streeten, 1979; Hoadley, 1981). Basic needs were initially defined as nutrition, healthcare, education, water supply, sanitation and housing (Hicks & Streeten, 1979; Streeten, 1984), although most literature now goes on to include employment, transport, safe energy sources, a healthy and safe environment, dignity, freedom to pursue personal goals, and the ability to participate in decision-making (ILO, 2006, as cited in Willis, 2011; Hoadley, 1981).

A second definition of need is expressed through the human rights approach. Human rights can be defined as legal guarantees to enforce the fundamental freedoms, protection and dignity awarded to all human beings (OHCHR, 2012). The rights-based approach argues that the possession of rights, participation in decision-making, and empowerment are fundamental human needs (McDonald, 2010; Sen, 2009; Streeten, 1984; Szadziwski, 2007; Uvin, 2007), and defends the right for participation in development, founded on the belief that poverty is a violation of human rights (Szadziwski, 2007).

A third definition is the capabilities approach which promotes development through opportunities and capabilities in process and outcome; underlining the capability to pursue one's values as a fundamental need (Alkire et al., 2015; Anand et al., 2009; Hick, 2011; Sen, 1999, 2009). Sen (1999) proposes five freedoms: political, economic, social opportunities, transparency guarantees and protective security, and terms any barriers to achieving such freedoms, 'unfreedoms'. Capabilities move beyond fulfilment

of rights to ensure the guarantees for participation in the approach: notably, fulfilment of human rights does not equate to the capabilities to fulfil them oneself (Uvin, 2007).

A fourth definition is the need for equality as the necessary base to achieve equal opportunities and capabilities, pursue personal values, achieve social and economic progress, and access required services (Breunig & Majeed, 2020; Fukuda-Parr, 2019; Oestreich, 2018; Szadziwski, 2007; World Bank, 2020). Two approaches to reducing inequality exist: that which prioritises poverty reduction via intervention of the poverty cycle, and that which prioritises economic growth and resource redistribution (Breunig & Majeed, 2020; Fukuda-Parr, 2019; Shields, 2010; TWI2050, 2018; World Bank, 2020).

In sequence these definitions reflect Maslow (1943) hierarchy of needs, a fifth definition, which ranks fundamental physiological needs as the base, through safety, love, esteem, to the need for self-actualisation at the pinnacle. This definition reinforces those above; building on basic needs, through the need for rights and equality, to the need to fulfil one's own capabilities. Maslow's (1943) theory is highly anthropocentric, much like the Brundtland Report which argues the need for 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland, 1987).

The definitions contrast with respect to prioritisation of immediate provision versus long-term development. The basic needs approach sacrifices long-term development in favour of immediate fulfilment of needs, which Leys (1996) argues more directly impacts at the grassroots level. However, the human rights and capabilities-based approaches advocate ingrained societal change to achieve long-term poverty alleviation and intergenerational development (McDonald, 2010; TWI2050, 2018). Comparatively, meeting basic needs can be accused of addressing only the symptoms, and for its palliative nature of direct provision to a passive recipient without the means for internalised self-help (Hoadley, 1981; Streeten, 1984; Szadziwski, 2007). Alternatively, targeting inequality, enforcing human rights, and ensuring capabilities aim at the cause of the need gap and advocate empowerment for internalised development established over the long-term (Hicks & Streeten, 1979; Streeten, 1984).

Ultimately, the chosen definition depends on the interpretation of those asked, however a needs gap exists with respect to all definitions (Vuorinen & Martinsuo, 2019). This thesis incorporates all above definitions to define need as: *the need for fulfilment of basic needs for their ability to meet the immediate physiological needs of the poorest, and the need for rights, capabilities, and equality for their ability to create long-term systemic change for current and future generations.*

2.2.2. Determining needs

Two common methods of determining need exist. A first method is participatory needs assessments, which consult affected populations to understand lived experiences and the needs gap (Anderson et al., 2012; Carter, 2016; Robb, 2001). However, a challenge is that results are heavily dependent on the view

of those interviewed, which are influenced by background, knowledge, and experience; comments can be contradictory, context specific or misinterpreted through translation; and data processing can be biased in determining the importance and weighting of values (Alkire et al., 2015; Merry, 2011).

Alternatively, needs can be determined by a top-down approach: determined by policy-makers on behalf of the public, requiring less public consultancy and often achieving faster results (TWI2050, 2018). Although participatory methods are favoured in literature, there is argument that policy-makers are in a stronger position at the higher level to mitigate and arbitrate between competing needs of the wider population (Kovacevic, 2010; TWI2050, 2018).

A challenge to determining need using either approach is that many needs can exist at one time. For example, the poor frequently experience all the realities explained above: a lack of basic needs, lack of rights, lack of opportunities and capabilities, and inequality. This makes it difficult to determine the most urgent needs.

A second challenge is conflicting needs. For example, someone may need access to safe, piped water at an affordable price, however piped water is often expensive, and therefore both needs cannot be met simultaneously. Similarly, the government may need to charge tariffs for access to water to recuperate costs, whilst also needing to provide affordable services. In these cases, needs are in conflict.

Arguably, a holistic view of need at the higher level using a top-down approach can best understand the full picture. However, it remains that fundamental needs of the affected populations can only be assessed for certain by consulting those experiencing the needs gap.

2.3. Infrastructure and services

Infrastructure and services can contribute to fulfilling basic needs, rights, equalities, and capabilities, as well long-term sustainable development (Thacker et al., 2019).

2.3.1. Defining infrastructure and services

Multiple definitions of infrastructure exist in literature but there is no universally agreed term (Buhr, 2003; Butković et al., 2019). The traditional outlook considers physical infrastructure as discrete services fulfilling a specific need in a decontextualised environment (Franco-Torres et al., 2020). Too often literature fails to acknowledge the facilitating mechanism and systems behind physical infrastructure, such as management processes. This thesis refers to infrastructure as a composite term comprising three components: physical assets, the facilitating mechanism, and social infrastructure (Buhr, 2003; Butković et al., 2019; Taylor et al., 2017; Torrasi, 2009).

Physical infrastructure refers to capital goods and civil structures that perform the physical function required to provide a service (Buhr, 2003; Torrasi, 2009). Literature typically cites the following, although by no means comprehensive, services: water supply, sanitation, energy supply, shelter,

wastewater management, transport, communication networks, schools, and hospitals (Annamalai et al., 2016; Goubran, 2019; Karas, 2019; Koppenjan et al., 2008; Torrissi, 2009; Zergawu et al., 2020).

The facilitating mechanism is that which transforms the physical infrastructure into a functioning service connected with the end user, such as financing schemes, managerial frameworks, governance, and operation and maintenance services (Butković et al., 2019; Karas, 2019). This supporting framework is critical to the connectivity between different forms of infrastructure and dictates the mechanism for supply and operation of services, however, it is often overlooked as an integral component of services (Butković et al., 2019; Karas, 2019; Torrissi, 2009).

Social infrastructure is the underlying community and societal framework that dictates how infrastructure is used and incorporated into everyday society (Butković et al., 2019; Karas, 2019). Shared values, cultural concepts and practices shape social structure, and for infrastructure to succeed the design and implementation must align synergistically with the social framework to meet the needs and behaviours of the population (Buhr, 2003; The Economist, 2019). Social infrastructure has a critical difference from the facilitating mechanism; it refers to the human interface.

The definition of infrastructure adopted in this thesis aims to move towards a term representative of the functions that infrastructure fulfils beyond its component parts. The adopted definition defines infrastructure as: *an integrated system comprising physical assets, a facilitating mechanism and a social structure that facilitates sustainable long-term delivery of essential services within the surrounding context.*

2.3.2. Services as means of development

Services can contribute to meeting both basic needs and long-term, sustainable development, such as economic and social growth (Koné, 2010; Thacker et al., 2019). The need for new infrastructure in developing countries is often driven by urbanisation, industrialisation, and rapid population growth, which in turn stimulate the economy (Buhr, 2003; Karas, 2019; Koné, 2010; Owusu-Manu et al., 2019; Thacker et al., 2019; Torrissi, 2009). However, to ensure sustainable growth and development from investment in services, complementary social programmes must be in place to ensure that economic growth does not exasperate a wealth divide, and instead contributes towards equality, encourages opportunities for the poor, and stimulates progress towards the capabilities and freedoms required for development (Bhattacharya et al., 2016; Hall, 2019; Karas, 2019; Koné, 2010; Straub, 2011).

The many ways in which infrastructure can meet need is best articulated through examples. Improved water quality and quantity contributes to better health and nutrition, fulfilment of basic human needs, increased agricultural production, opportunities for energy generation, increased time available for employment, and reduced burden on women for increased gender equality (Carter, 2016; Matsui et al., 2001; Owusu-Manu et al., 2019). Electricity, water and sanitation infrastructure supports suitable educational facilities, subsequent improved employment opportunities, and improved long-term

opportunities and capabilities (Bhattacharya et al., 2016; Owusu-Manu et al., 2019; Straub, 2011). Internet access increases access to information, knowledge, and social and political affairs to generate opportunities and freedoms (Bhattacharya et al., 2016). Transport connects rural and urban areas; allows distribution of people, goods and services; facilitates travel to employment, school and hospitals; and facilitates access to new markets and income (Bhattacharya et al., 2016; Carlsson et al., 2013; Owusu-Manu et al., 2019; Thacker et al., 2019; The Economist, 2019). Mobile phones provide connections between rural and urban markets, facilitate money transfers for domestic use and between migrants in host and origin countries, enhance social connection and reduce social inequality, and contribute to globalisation and economic growth (Carlsson et al., 2013; Straub, 2011; Thacker et al., 2019; Willis, 2011). Improved wastewater treatment systems can effectively remove pathogens, prevent pollution of water bodies, and provide sanitary environmental conditions to decrease health risks (Carlsson et al., 2013; Koné, 2010; Thacker et al., 2019). Improved international connectivity and infrastructure investment can unlock resources from landlocked or resource-rich countries to generate economic growth (Calderón et al., 2018; The Economist, 2019). A steady pipeline of infrastructure projects can provide reliable employment through construction and in operation, in turn encouraging economic growth (Calderón et al., 2018; The Economist, 2019). The holistic and far-reaching benefit of infrastructure is also evident in its role towards achieving the SDGs (Bhattacharya et al., 2016; Goubran, 2019; The Economist, 2019). Thacker et al. (2019) found that infrastructure affects 72 percent of targets either directly or indirectly.

However, there are challenges to the use of infrastructure and services as a mechanism for development. A risk of heavy infrastructure investment is the lock-in versus leapfrog conundrum. Developing countries can learn from infrastructure in developed countries, which creates opportunities to leapfrog technologies to implement the most advanced available (Matsui et al., 2001). If unwise choices are made, capital, technologies, physical assets and skill requirements can be locked in for the lifetime of the asset and burden future generations (Bhattacharya et al., 2016; Hall, 2019). However, appropriateness of technology is dependent on context; successful solutions in developed countries may not be suitable in developing contexts, constraints such as insufficient finances and poor regulations may be inhibitors, and innovation can be resisted in favour of traditional technologies (Straub, 2011; Taylor et al., 2017). Therefore, in some contexts, the most appropriate solutions may not be the most technologically advanced.

Also, as more advanced technologies replace old ones and dependence on interconnected infrastructure increases, there is risk that past practices are forgotten and pre-existing infrastructure abandoned leaving no backup if a service or technology fails (Thacker et al., 2019). This is of greater risk if infrastructure advances too rapidly, which is more likely as technologies are leapfrogged (Thacker et al., 2019). There is therefore need for careful consideration of the optimal implementation strategy to prevent coping strategies being undermined.

Furthermore, in order for services to meet need and drive development forward, services must be accessible, affordable, and used. Community management is promoted as one method of achieving this, as behaviours can be encouraged to collectively change as a community. Decentralised services are an effective way of providing services suitable for community management, and social infrastructure to support maintenance and use of services is beneficial. (Whaley & Cleaver, 2017)

2.3.3. Design paradigms

Design paradigms refer to the approach taken, angle and priorities throughout all stages of service delivery, and are dependent on all surrounding factors such as actors, motives and the constraints of the enabling environment (de Gouvello et al., 2012).

An engineering paradigm views the technical infrastructure design as central to the solution (Amrose et al., 2021). Advanced engineering technologies already exist to meet most infrastructural needs, however the facilitating environment must be conducive and is typically the barrier to their implementation (Lau & Kong, 2006). Consequently, capable technologies are seldom the inhibitor to meeting service need.

A sustainability paradigm reflects the requirement for infrastructure to meet future as well as present demand and changing societal needs, which necessitates futureproof, flexible, and resilient designs (Du Plessis & Brandon, 2015; Franco-Torres et al., 2020). Similarly, a paradigm that views long-term service provision of services beneficial over short-term relief requires consideration of the full project lifecycle, assessment of the long-term socio-economic impact, and a sustainable funding model (Du Plessis & Brandon, 2015).

An environmental paradigm encourages consideration of the full infrastructure lifecycle, use of sustainable materials, and constraints of climate and natural resources (Koné, 2010; Matsui et al., 2001). However, prioritisation of anthropocentric needs can compromise environmental needs (Ofori, 2000).

A social paradigm will result in infrastructure that reflects the social need and public interface with the service (Zuluaga et al., 2021). Adoption of the social paradigm reflects attention to public values, and is arguably most likely to produce infrastructure that meets the needs of the poor.

Isolated paradigms are the result of segregated actors in design and delivery, each with their own priorities and entrenched views dependent on their roles and responsibilities (de Gouvello et al., 2012; Taylor et al., 2017; Thacker et al., 2019; Zuluaga et al., 2021). However, there is necessity for a paradigm shift to incorporate physical, facilitating, and social dimensions simultaneously into infrastructure design to overcome this mindset, and to ensure the design paradigm reflects the optimal solution to meet need.

2.4. Project delivery

To deliver services to the end user requires both initial project delivery and ongoing service delivery. There is a research gap in the interaction between the project delivery model and enabling environment, and the subsequent effect this interaction has on service delivery through the limits and opportunities it creates.

2.4.1. Project delivery stages

The project delivery stage is generally under-researched as an influence on service efficacy, the way in which services meet need, and for possible secondary benefits to development that can be achieved through considered design of the delivery mechanism (Koonan & Sampat, 2012).

Project delivery encompasses five primary stages: planning, procurement, construction, operation and maintenance, and completion (Kacaribu, 2019).

Identification and preparation

The identification and preparation process, also known as planning, is a critical stage in delivery that can affect the performance of the service throughout its lifespan, and can have major impact in meeting project objectives (KPMG, 2014; McDermot et al., 2020; Wells & Hawkins, 2008). One study found that the five primary reasons that projects fail are: poor upfront cost and programme estimation; designer and contractor inadequacies; socio-technical issues; site related issues; and unsuitable construction methods and technologies; all addressable in the planning stages (Long et al., 2004).

The purpose of the service must be clearly defined prior to implementation; a clear project scope details how the chosen infrastructure, design and construction meets proposed service need (Wells & Hawkins, 2008). A feasibility study should be carried out at an early stage, including participation of communities, to understand factors such as: stakeholder needs; service requirements; the surrounding enabling and social environment; and construction, operation and maintenance capabilities, in order that design and implementation reflects the context (Jones & Howarth, 2012; McDermot et al., 2020).

Thorough cost and programme forecasts are necessary to ensure sufficient funds to complete the work, guide feasible design, ensure all parties understand expectations for delivery, and to guarantee services are available when needed (Williams, 2015). Cost and programme overrun can cause contractors to abandon projects through mounting unaffordable costs, project incompleteness, extensive economic impacts throughout the supply chain, and have an attached social cost given a lack of required infrastructure (Long et al., 2004; Williams, 2015). Locatelli et al. (2017) argue that cost and programme forecasts are nearly always inaccurate and often the reason that projects fail to meet their objectives, and argue that mitigation can be achieved in the planning stage.

Procurement

Procurement strategies can be used as policy instruments to stimulate economic growth, promote industry sectors, protect national industries, and promote broader socio-economic objectives (Watermeyer, 2002). Socio-economic objectives include creation of jobs; fair employment conditions; fair opportunities for minority groups, vulnerable groups, or socially and economically marginalised groups; participation of the poor and poverty alleviation; and employment of local businesses (Watermeyer, 2002; Wells & Hawkins, 2008). Procurement should be transparent, competitive, efficient, fair, equitable and cost-effective; however, corruption is commonplace in tender and contract award in developing countries (Long et al., 2004; Watermeyer, 2002; Williams, 2015).

Construction

Lack of required skills through design, construction, and operation and maintenance is a common reason for service failure in developing countries, in both the public and private sectors (Long et al., 2004; Matsui et al., 2001; McDermot et al., 2020; Ofori, 2000). If required skills are unavailable locally, experienced international consultants can be employed; advantageous for the influx of expertise and subsequent skills and knowledge transfer to the local workforce, although compromised by expensive rates and unfamiliarity with local business culture (Ofori, 2000; Rwelamila & Ogunlana, 2015; The Economist, 2019). However, procuring locally capitalises on local knowledge of culture and business practices; use of locally sourced materials, skills and operation and maintenance services; and stimulates the local economy (Jones & Howarth, 2012; Wells & Hawkins, 2008).

The informal sector contributes unregulated labour to the market, characterised by casual, inadequately paid and legally unprotected workers; informal family businesses; and labour offered through labour brokers leaving workers vulnerable to exploitation (Ofori, 2007; Wells, 2007). This market is often used to circumnavigate conventional timely and costly procurement avenues and to fill gaps in service provision that would otherwise remain unfulfilled (Wells, 2007). Therefore, although unregulated, it can be advantageous to help the poor find employment and expedite project delivery (Wells, 2007).

Availability and sustainability of materials can also drive service solutions (Du Plessis & Brandon, 2015). Traditionally, construction has made use of locally available materials, using sustainable practices, and ensuring that waste is biodegradable to protect the local environment (Rwelamila & Ogunlana, 2015). However, although environment sustainability is growing in awareness, the economic feasibility is questionable in developing urban environments, and willingness to continue these practices is challenged by the ability to procure goods more easily and cheaply (Rwelamila & Ogunlana, 2015).

Operation and maintenance

Operation and maintenance are essential to ensure service provision over the long-term, and present opportunity for socio-economic benefit through employment and skills development (Wells &

Hawkins, 2008). Poor consideration risks service failure, but can be mitigated by a considered design and management framework (Wells & Hawkins, 2008; Whaley & Cleaver, 2017). Infrastructure must be designed to align with available technical capabilities for ongoing operation and maintenance, which often lack in developing countries (Matsui et al., 2001; The Economist, 2019; Whaley & Cleaver, 2017). One study showed that water point committees for the management of water services were only successful when support from technical experts and funds for spare parts were available, suggesting that either the design should be better suited to local capabilities, or that educational programmes should be implemented to increase locally available skills (Whaley & Cleaver, 2017).

The operation and maintenance strategy affects capital costs as well as running costs, and there is often a trade-off; for example, the choice of ozone rather than chlorine as a disinfectant in a water treatment plant will increase the capital costs but reduce operating costs (Institution of Civil Engineers, 2016). If the necessary capital investments are not made and sustainable funding plans are not in place, future generations can be burdened with sub-standard infrastructure without allocated budget for upkeep, risking long-term service failure and economic strain (Institution of Civil Engineers, 2016; Thacker et al., 2019).

Completion

The completion stage comprises transfer of ownership of services if applicable, asset appraisals, and ex-post evaluations (Kacaribu, 2019).

2.4.2. Project management models

Public delivery, private delivery, and joint delivery through public private partnerships (PPP) represent three common service delivery models.

In the public delivery model the government assumes responsibility for delivery and finance of infrastructure (Jones & Howarth, 2012). This model allows longer-term government control, however has shown to frequently overrun programme and budget (Jones & Howarth, 2012). Public projects also require suitable institutional capacity and sufficient public funds, which often lack in developing countries (KPMG, 2014; Rwelamila & Ogunlana, 2015; The Economist, 2019).

Private sector participation brings private organisations, financing bodies and expertise to the project, enables the government to build infrastructure they would unlikely be able to finance otherwise, and attracts private sector investment into emerging economies (Jones & Howarth, 2012; Kateja, 2012). However the motives and exit strategies of private stakeholders can be unknown, and situations where the dominant stakeholder is private can result in a failure to meet the intended service need (Hacking & Guthrie, 2008; Ofori, 2000).

PPPs are promoted as a mechanism to benefit from private involvement, while strengthening public capacities (Kateja, 2012; KPMG, 2014; Wells & Hawkins, 2008). When international organisations are

employed, a PPP model can help integration with local business cultures and social behaviours, and ease communication, which can otherwise present barriers to efficient delivery (Institution of Civil Engineers, 2016; KPMG, 2014; Locatelli et al., 2017; Long et al., 2004; Ofori, 2000, 2007). Despite the advantages, PPPs are used more in developed countries in environments with regulated delivery frameworks and more secure investment opportunities, and less in developing economies with weaker institutional governance presenting higher risk for investors (Al-Saadi & Abdou, 2016; Calderón et al., 2018; Kateja, 2012; KPMG, 2014; Leigland, 2018; The Economist, 2019).

In all project management models, competent managerial infrastructure is critical, including the management strategy and experience of the team (Cepeda et al., 2018). Without this, a lack of quality infrastructure, governance, and strategy risks failure of long-term service provision (Rwelamila & Ogunlana, 2015). Furthermore, the project management body should comprise a multi-disciplinary skillset, ranging from project managers, to financial professionals, to technical engineers (Cepeda et al., 2018). A common challenge is disbandment of delivery teams upon project completion, resulting in loss of knowledge and a lack of opportunity to transfer lessons learned (Oluikpe et al., 2019).

2.4.3. Capital and operational funding

Capital project financing can be achieved through various channels, such as public funds, private investment, aid, loans, and grants, but in any case is frequently a challenge to project and service delivery (Jones & Howarth, 2012). Tax funded services are attractive as finances are readily available from existing government revenue channels, and additional expenditure can likely be absorbed into other public funds in situations where private companies would fail (The Institute for Government, 2018; Williams, 2015). However, tax funded projects are not always viable in economies that collect a lower proportion of GDP as tax revenue and can cause controversy in situations where services serve only a limited population (OECD, 2015).

Funding models refer to the mechanism for ongoing funding of service provision throughout its lifetime, and are essential to ensure services continue to meet need (OECD, 2015; The Institute for Government, 2018). Charging for services to ensure financial return is more attractive for investors and can help secure financing for higher risk projects (Bond et al., 2012). However, charging faces criticism of widening inequality as fixed charges mean lower income households spend a higher proportion of income on the same services as higher income households (Bhattacharya et al., 2016; Koonan & Sampat, 2012), and governments may be unable to mitigate this through subsidies. Supplier monopolies and unregulated markets can also fuel price inflation, resulting in services becoming inaccessible for the poor and subsequently failing to meet need (Koonan & Sampat, 2012). The trade-off between private participation and affordability is unclear, and asks how private participation can be encouraged whilst limiting exploitation of the poor.

2.4.4. Stakeholders and actors

Stakeholders differ with respect to power, values, priorities, and motives, which influence the choice of infrastructure, service prioritisation, and chosen delivery models differently (Vuorinen & Martinsuo, 2019; Zuluaga et al., 2021). Internal stakeholders may be technical experts, the client, end users, communities, funders and companies directly involved in delivery, and are likely to have the most acute understanding of project requirements (Locatelli et al., 2017; Longstaff et al., 2010). Alternatively, external stakeholders include local and national governments, international funding agencies, donors and regulatory bodies, and benefit from a broader view of the project need (KPMG, 2014; Locatelli et al., 2017).

Stakeholders can have conflicting motives which creates dynamic relationships with attached trade-offs, as the concepts of need, value, and evaluation of political and socio-economic dimensions differ (Koppenjan et al., 2008; Zuluaga et al., 2021). Each has their own structure of priorities and values, including for example, physical services, economic growth, power, safety, health, equality and rights, and freedoms and opportunities (Alkire et al., 2015; Zuluaga et al., 2021). Conflicting stakeholder priorities can challenge public values, and worse, particularly influential stakeholders can pressure policy makers into selfish decisions intentionally unaligned with public values (Koppenjan et al., 2008).

There can also be feedback loops attached to stakeholder motives; for example, investors invest money to generate money; the government delivers on their manifesto to gain return voters; or a philanthropist delivers a service for recognition and satisfaction (OECD, 2015; The Economist, 2019). Stakeholders and feedback loops have repercussions of different levels of impact on delivery, wider society, and development. For example, a re-elected government has opportunity to implement longer-term policies for systemic change, whereas a philanthropist might donate a single investment to meet an immediate need (The Economist, 2019).

Therefore, stakeholders differ with respect to motives, power, importance, and magnitude of impact. The dynamic influences choice of infrastructure, service delivery, the project and enabling environments, and the ability of the service to meet intended need (Vuorinen & Martinsuo, 2019). The impact of conflicting values can be mitigated and managed with stakeholder mapping during the project planning stages and throughout the lifecycle of the services as the surrounding environment changes over time (Hacking & Guthrie, 2008; Koppenjan et al., 2008; Ofori, 2000).

2.4.5. Approaches to project delivery

The choice of project delivery model is somewhat dependent on the enabling environment and development paradigm, which is discussed in further detail in Section 2.5 (Zergawu et al., 2020). In environments where national economic growth is prioritised, PPPs and private investment models will likely be favoured to encourage international and private sector investment (Al-Saadi & Abdou, 2016; Kateja, 2012). Whereas in contexts where welfare and socio-economic development are prioritised,

delivery frameworks are likely to target increased employment, skills development, prioritise use of local companies, and facilitate a trickle-down affect into other areas of development (Jones & Howarth, 2012). If socio-economic development is prioritised, funding models are likely to be more cognisant of accessibility of services to the end user, whereas delivery models targeting economic growth and funded through charges are unlikely to be as considerate (Koonan & Sampat, 2012).

The rate of service implementation can also affect service efficacy. If there is urgent need there may be insufficient time to implement the optimal service, in which case there is a question of a compromised but immediate service in lieu of the most desirable but delayed solution (Du Plessis, 2007). However, fast delivery may not always be optimal in environments where steadier implementation will ensure more sustainable long-term development, such as circumstances requiring systemic behaviour change (Du Plessis, 2007; The Economist, 2019). Furthermore, the 'ideal' delivery model may not be optimal; for example, services delivered through formal procurement processes may be less efficient or successful in outcome than employment of informal labour (Ofori, 2007; Wells, 2007).

The approach to project delivery is generally under-researched as an influence on service efficacy and the way in which services meet need. Up-front project delivery sets the precedence for long-term service delivery, such as the balance between capital investment and operational costs, and can be specifically designed to benefit the population, such as through equality driven procurement strategies (Institution of Civil Engineers, 2016; Williams, 2015). There is a research gap in the interaction between the project delivery model and enabling environment, and the subsequent effect this interaction has on service delivery through the limits and opportunities it creates.

2.4.6. Technology, skills and resource availability

Lack of required skills through design, delivery, and operation and maintenance is a common reason for project failure in developing countries, in both the public and private sectors (Matsui et al., 2001; McDermot et al., 2020; Ofori, 2000). If required skills are unavailable locally, experienced international consultants can be employed; advantageous for the influx of expertise and subsequent skills transfer to the local workforce, although compromised by expensive rates and unfamiliarity with local business culture (Ofori, 2000; Rwelamila & Ogunlana, 2015; The Economist, 2019). Employment of the local workforce is of greater benefit to the national and local economy and can help find better solutions in context, however without the necessary skills and funds local companies present little competition at tender (Jones & Howarth, 2012; Rwelamila & Ogunlana, 2015). Additionally, inadequate or unsuitable equipment and technologies can prevent project delivery, and require capital investment which many small contractors cannot afford (Long et al., 2004; Whaley & Cleaver, 2017). This indicates an example of a reinforcing loop; as inadequate equipment and technology blocks the local workforce from the labour market, employment of international labour becomes necessary.

2.4.7. Critical success factors (CSF)

Critical Success Factors (CSF) are factors that influence and contribute to the success of a project (Howsawi et al., 2014), and those necessary for project participants to achieve their goals (Mustaffa, 2012). Project success is often considered to relate to meeting time, budget, and client expectations (Oluikpe et al., 2019). However, Baccarini (2004) argues that these are measures of project management success, and that project success should be measured against meeting strategic objectives, end user needs, and stakeholder needs.

Literature commonly cites insufficient or inadequate up-front planning as the most common reason for project failure (Cepeda et al., 2018; Ejaz et al., 2013; McDermot, 2021), including factors such as poor scheduling and costing, a lack of effort in the early planning stages, poorly defined project scope, and lack of commitment. Poor decision making is another factor attributed to project failures (Ejaz et al., 2013). Conversely, when these factors are managed well, McDermot (2021) claims them to be top success factors.

Institutional capacity and experience, and improved knowledge showed to be highly influential in meeting time, budget, and client expectations (Oluikpe et al., 2019). Similarly, Mustaffa (2012) cites competency and financial capability as CSFs. Also, early and continuous involvement of stakeholders, a collaborative approach to delivery, and appropriate risk management are identified as positively contributing factors (Cepeda et al., 2018; McDermot, 2021).

Many of the studies consulted carried out surveys with various organisations involved in project delivery, including the government, clients, consultants, and contractors (Baccarini, 2004; Mustaffa, 2012). Notably, opinions of success and failure factors differed between organisations with different perspectives on delivery and different needs.

However, the literature mainly considers CSFs as those within project delivery itself, including the factors discussed above, and mostly fails to explore outside of the direct project environment to the much wider enabling environment, as Baccarini (2004) argues is necessary, to include factors such as economic development and social impact.

2.5. The enabling environment

For infrastructure and services to meet need, the wider enabling environment must be fundamentally conducive to their purpose, as it forms the limits of what can be delivered and determines constraints on implementation and service provision (Taylor et al., 2017). Infrastructure projects can take many years to deliver, during which time the political, economic, social, and environmental conditions can change, which in turn change the delivery parameters (Haidar & Ellis, 2010).

The development environment is dictated by multiple complexly interlinked factors, such as the political and economic context (Shields, 2010), social and cultural norms (Radcliffe, 2017a), public values and ethics (Alford & O'Flynn, 2009), and natural resources and climate (Venables, 2016).

2.5.1. Economic theories

The economic theories at the root of a society can influence its development decisions. Two primary views are explained: first, market centred approaches, capitalism, Keynesian economics, and neoliberalism; secondly, neo-Marxism and socialism.

Market centred approaches include production-oriented theories, Keynesian economics, and neoliberalism. A focus on production and divisions of labour in the production process was advocated for economic development through a naturally self-regulating market by Adam Smith in 1776, and is still widely discussed and relevant today (Willis, 2011). These theories encourage self-regulating markets, a reduced involvement of the state, and an attempt to depoliticise the economy (Caporaso & Lavine, 1992). Similarly, Keynesian economics proposes increased government expenditure and investment in national projects for a self-generating cycle ending in increased demand for goods and services through a trickle-down effect (Hicks & Streeten, 1979; Willis, 2011).

Neoliberal economics evolved to encourage self-regulating markets, a reduced role of the state, greater opportunity for foreign investment, reduced investment in physical assets and increased investment in human capital (Willis, 2011). Free markets and reduced state involvement allow greater control for the electorate, particularly in a democracy (Baum & Lake, 2003; Streeten, 1984). However there is also an argument that some state involvement is necessary to regulate influence of the electorate in the best interest of the general population, aligning with Keynesian economics (Baum & Lake, 2003; Streeten, 1995).

Socialist theories contrast with the above. Within socialist societies the state has significant involvement with all political, economic and social policy; argued that this allows for a greater prioritisation of the population, and equal and fair distribution of goods and services to meet needs (Hoppe, 1989; Willis, 2011). Breunig and Majeed (2020) and Zergawu et al. (2020) claim that a welfare centred approach and prioritisation of poverty alleviation most effectively encourages economic growth in developing countries. This logic suggests that socialism, at the fundamental level, provides a better basis for achieving equality and meeting the needs of the poor than a capitalist society would. Although, it is prudent to note that an equal society does not equate to meeting the needs of the population (Breunig & Majeed, 2020; Hicks & Streeten, 1979; Hoppe, 1989).

State intervention of infrastructure and welfare projects within socialist countries have shown success in achieving welfare improvements of the population (Streeten, 1995; Willis, 2011). For example, under communist rule the Indian state of Kerala saw improved education, healthcare, redistribution of wealth and gender equality (Willis, 2011). State governance also avoids the distribution of power to an elite

few, and can therefore safeguard the needs of the poor (Streeten, 1984). However it is noted that for large scale projects and policy overhaul, the state must assume a significant role even in capitalist societies (Willis, 2011).

Marxism, which centres around the relationship between capital, labour and production, challenges capitalism whilst acknowledging that it is part of the process towards a socialist society (Willis, 2011). Dependency theory challenges this, as it argues that the development of developing countries is stunted by the interrelationship with capitalist societies, which remove funds through export of cheap labour and goods (Willis, 2011). This suggests a need for greater consideration of development between countries in the global context. Similarly, neo-Marxism claims that in at a time of ‘monopoly capitalism’, where few organisations and powers have control of a significant portion of the global market, the state should assume greater responsibility to reallocate funds for development within the country and to protect national industries (Barrett, 2008; Streeten, 1984; Willis, 2011).

Modernisation theory assumes that all countries pass through the same process of development, and that some are simply behind others in this process (Willis, 2011). A criticism to modernisation is presented by Kuznets (1955) who suggests that there will likely be an increase in inequality in developing countries as they move towards developed status, but raises the ethical question over whether the trend should be allowed to continue on the assumption of a brighter future (Kuznets, 1955). Halter et al. (2013) supports this and finds that higher inequality leads to economic growth, increased investment and entrepreneurship in the short term, but subsequently questions Kutznets by claiming that inequality has detrimental effects on growth in the long term.

Kuznets (1955) also discusses income distribution and equality across populations in both developed and developing countries, and notes a more equal spread of the population across income quantiles in developed countries, versus a more polarised wealth gap between the rich few and the poor in developing countries. Therefore, a focus on reduction in inequality may have a more immediate positive effect on economic growth in developing countries rather than developed, but the long- term effects are unknown and there remains mixed evidence in literature (Barrett, 2008; Breunig & Majeed, 2020). These findings also question modernisation theory, as they suggest that the pathway to development may require a different focus dependent on the distribution of wealth across a population.

The position of each country on the economic spectrum moves naturally over time. This may be due to failed attempts at restructure, for example some attempted socialist models have reverted to capitalist models as socialism has caused economic difficulties and ultimately failed, triggering adoption of neoliberal policies (Willis, 2011). This changing economic landscape creates a changing framework for development.

2.5.2. The political economy

The political economy refers to the relationship between politics and the economy, and their interactions with society, which influences the pathway to development and the development paradigm (Caporaso & Lavine, 1992; Streeten, 1984; Zergawu et al., 2020). The national, regional, and local governance structures form part of the political economy, and the relationship between players within these, which affect issues such as power distribution, influence on policy, and the regulatory environment (Moncrieffe & Luttrell, 2005).

Bellù (2011) presents multiple development paradigms; the two primary contrasting views are as follows: free-market, trickle-down, growth-led development; and pro-poor, welfare-led development. The former argues that growth will ultimately trickle-down to the poor through income distribution, whereas the latter argues that equitable distribution of income is necessary as a precursor for development, and resulting economic growth is beneficial only if achieved alongside this (Bellù, 2011). The economic theories and political ideologies influence and are influenced by the development paradigm, and subsequently affect how infrastructure and services are implemented and able to meet the needs of the poor.

Literature demonstrates that free and self-regulating markets are more likely to have democratic governance, incorporating greater citizen participation, increased transparency and accountability, and greater political rights and freedoms (Zergawu et al., 2020). As such, research shows that capitalism, neoliberalism and free markets are linked to democracy (Shields, 2010). Literature shows that democratic governance promotes equality, human rights, civil liberties, and voting rights (Baum & Lake, 2003; Caporaso & Lavine, 1992; Shields, 2010; Streeten, 1984; Zergawu et al., 2020). Subsequently, there is evidence of a self-reinforcing relationship between democracy and economic freedom (Shields, 2010), and further evidence that a democratic society significantly positively correlates with improved population welfare (Baum & Lake, 2003).

However an important point to note is that a democratic and equal society does not necessarily create, and can conflict with, the optimal conditions to meet the needs of the public (Breunig & Majeed, 2020; Caporaso & Lavine, 1992; Hicks & Streeten, 1979; Hoppe, 1989; Streeten, 1984). Likewise, an autocratic society can meet needs as effectively or better than a democratic society, despite the inability of the population to articulate their own needs; autocratic decision-making can be to both the advantage or disadvantage of the population dependent on the agenda of those in power (Caporaso & Lavine, 1992). Notably, differing political mechanisms can reach the same goal if their motives are the same (Drazen, 2008).

The political economy greatly influences infrastructure delivery, as power dynamics and conflicting interests and values make investment choices difficult (Coelho et al.). Political and economic uncertainty is a common challenge in developing contexts, which creates a volatile environment for infrastructure delivery (Oluikpe et al., 2019).

2.5.3. Institutions and actors

Institutions can be defined as the rules which organise political, economic, and social interactions (North, 1990). Organisations, such as the government, businesses, and citizens, are the actors that bring these rules to life (North, 1990). The differing presence of and interrelationships between institutions and actors shape different enabling environments, and the interactions and power dynamics between them differ between societies depending on wider contextual factors (North, 1990; Solar & Irwin, 2010). In some cases, power struggles and conflicting motives can detract from meeting the intended purpose of services (Koppenjan et al., 2008).

Government motives are often linked to economic and political ideologies, desire to attract votes to maintain power, and often by clientelism and corruption (Drazen, 2008; Long et al., 2004). A lack of transparency and resistance to collaboration between government departments often further fuels these challenges (Wilkins et al., 2015). The electorate influence policy in voting populations as governments are incentivised to align with public views to encourage votes, although public influence is constrained by the power awarded to citizens in the prevailing political environment (Baum & Lake, 2003; Drazen, 2008). Individual voters have a range of motives, and a notable challenge is making pro-poor policies attractive to the non-poor population who typically form the majority of the electorate in developing countries (Desai, 2007).

The private, public and informal business sectors influence the enabling environment through financial contribution to the economy, skills availability and human capital, and often political influence in countries vulnerable to corruption (Kateja, 2012). International business can bolster the economy; import skills, resources and knowledge; but threaten national industries (Barrett, 2008; Willis, 2011). In the case of infrastructure and services, consultants and contractors facilitate delivery, and their skills and resources dictate the limits of feasibility (Locatelli et al., 2017).

The state, organisations' and donors' financial contributions differ in each development model and vary dependent on what they are able to and are willing to offer (Moncrieffe & Luttrell, 2005). Bi-lateral and multi-lateral aid can contribute economically and is often issued with conditions such as transparent distribution of funds, a more democratic governmental system, and increased accountability for the welfare of the public, which can positively impact development in the wider enabling environment (Willis, 2011). NGOs also have a central role in development; often focused on intervention at the grassroots level to address gaps missed by state or major development initiatives (Banks & Hulme, 2012).

Each actor affects the enabling environment differently, and facilitate opportunities and create barriers in different ways. These complex interactions can push and pull influence which dictates the parameters of infrastructure and service provision.

2.5.4. Social influences and societal constraints

Demography significantly affects the needs of the population, and changing demography generates changing needs (Bhattarai & Conway, 2021; DTDA, 2020). International migration influences the demographic distribution, the economy through remittances from diaspora, and contributes to brain drain (Bhattarai & Conway, 2021). Furthermore, internal migration contributes to urbanisation, exacerbates the urban/rural divide, and increases regional wealth and social inequalities (Lie & Mesfin, 2018). Migration is often driven by a desire for better paid work and improved employment opportunities, in order to increase household income, improve security, and increase future socio-economic opportunities (DTDA, 2020). High levels of employment in agriculture and the informal sector in developing countries, and correspondingly low income, further drives this (World Bank, 2023). Project delivery is often affected by low human capital and skills capacity, driven by poor educational levels and low enrolment in school (DTDA, 2020; Titumir, 2021).

Culture, religion, beliefs, social and ethical norms, identity, traditions, and public values shape the enabling environment and govern the societal framework that services must operate within (Radcliffe, 2017a, 2017b; UNESCO, 2002; Willis, 2011). Traditional social structures and behaviours, such as those based on hierarchical structure and gender roles, differ from ‘modern’ meritocratic societies (Willis, 2011). Strict customs and expectations can entrench behaviours which limit societal progress, freedoms, opportunities, and capabilities, and prevent progress towards equality, inclusion and freedom from marginalisation (Sovacool et al., 2018; Willis, 2011). However, strong social relationships can increase community and family resilience (Barrett & Constanas, 2014). Without fundamental characteristics such as inclusivity and equality fundamentally ingrained in society, it is difficult to seek to achieve these characteristics in service delivery (WaterAid, no date).

Gender discrimination, gender inequalities, and differing roles of men and women are common in developing countries (Momsen, 2016). Women are typically employed in low-paid and low-skilled jobs, or assume the role of homemaker or carer, whereas better paid work and work in emerging industries is typically appointed to men (Momsen, 2016). However, gender roles are changing in modernising societies as women are increasingly empowered (Momsen, 2016).

Alignment with social norms and expectations is essential, as without adoption or suitability for the intended population the ability of infrastructure to meet needs is limited, and radical behaviour change is difficult to achieve (Lau & Kong, 2006; Ofori, 2000, 2018; Zuluaga et al., 2021). Whaley and Cleaver (2017) advocate the need for ‘working with the grain’, to consider existing social dynamics and benefit from the opportunities these may offer.

Social protection measures can alleviate the negative impact of some of these issues, help protect against poverty, reduce vulnerability to the effects of unemployment, and increase basic living standards, yet, there are a lack of social protection programmes in developing countries (Barrientos, 2011).

Literature acknowledges social and societal barriers and the need the adapt infrastructure programmes to align with these limitations, however, they are more easily addressed in decentralised community programmes through community engagement, and require more extensive research to explore how these barriers can be overcome by large-scale infrastructure (Jones & Howarth, 2012; Whaley & Cleaver, 2017).

2.5.5. The natural environment

The natural environment dictates the bounds of possibility for service provision and is a major influence as both a facilitator and inhibitor to development (Venables, 2016). For example, seasonal weather and daylight hours affect agricultural production and commodifiable crops, and subsequently livelihoods and the economy (Whaley & Cleaver, 2017). Climate affects migration, population distribution, food and water availability, and weather related disasters and shocks (Mitchell & Maxwell, 2010). Climate change and a variable climate increases the likelihood of extreme weather events which increases vulnerability of livelihoods (Ngcamu, 2023). Natural resources also provide materials for construction, although abusive practices can lead to environmental degradation and pollution (Kaja & Goyal, 2023).

Availability of resources dictate the physical limits of service provision, for example natural water availability (Matsui et al., 2001; Ofori, 2000). Natural resources and reserves provide for the country, and act as capital assets which can be traded and liquidised (Venables, 2016). Nations lacking sufficient natural resources show slower economic growth, and less ability to meet the economic and social needs of the population (Koné, 2010).

The geographic location of the country impacts national needs and trade opportunities, and subsequently the national economy (Marshall, 2016). Landlocked countries do not have access to ports, must often transport goods through other countries to trade, are vulnerable to difficulties importing commodities such as energy, must maintain good relations with neighbouring countries to facilitate access, and often suffer economically as a result of these factors (Calderón et al., 2018; KPMG, 2014; Limão & Venables, 2001; Venables, 2016). Geopolitical and historical relations can be strained by competition for resource rich areas, regions providing geographical protection such as mountains, and strategical access routes (Marshall, 2016). Strategic infrastructure can ease these challenges, however poor infrastructure can add to an existing geographic and political disadvantage (Calderón et al., 2018; Roberts, 2016).

Literature typically cites examples of the natural environment as an inhibitor, most often to provision of physical infrastructure such as natural water availability, and lifestyle and livelihoods such as climate and crop production (Long et al., 2004). However, as evidenced above, the natural environment has significant indirect impact on geopolitics, trade, and economic growth, which can also be advantageous. Venables (2016) even argues that management of natural resources should be a focus point for assured economic growth. However, these more complex connections are frequently overlooked or

unacknowledged for their degree of influence on service provision specifically, indicating possible areas for further research.

2.5.6. Integration of influences

The sections above explain the influence of different contextual factors, however, their interconnectedness, relationships and power dynamics are what forms the holistic enabling environment, dictate how services can be delivered, and how needs can be met (Taylor et al., 2017).

The enabling environment can be best understood as a system of highly interconnected factors, as identified throughout the literature review (Taylor et al., 2017). However, the magnitude of impact of these influences is difficult to determine, as each is likely to be weighted differently with respect to significance, importance, impacts, and constraints, which themselves will differ over time and in different contexts (Matsui et al., 2001).

2.6. Linkages between infrastructure and the enabling environment

The subjects discussed above interact in such a way that the enabling environment influences need and infrastructure and service delivery, and in turn the ability of it to meet need. Others have acknowledged this, and as such there are a number of existing tools which explore these relationships.

2.6.1. Existing tools to assess infrastructure and the enabling environment

There are numerous existing tools used in industry which examine infrastructure projects within their enabling environment, as well as others which assess the enabling environment in isolation. However, most only focus on a single or a few subject areas, and none have been found to include all the factors previously discussed. Table 1 shows the main existing tools for assessment of the enabling environment and infrastructure application in industry.

Table 1 - Existing infrastructure assessment tools.

Tool	Implementing organisation	Primary focus	Application
InfraCompass	Global Infrastructure Hub	Infrastructure	Assesses the infrastructure investment enabling environments, with a focus on the economic landscape and infrastructure delivery mechanisms, to guide infrastructure decision-making. (Global Infrastructure Hub and Deloitte, 2020)
Infrascope	The Economist Intelligence Unit	Infrastructure	Evaluates a country's potential for use of PPPs in infrastructure delivery, but which only considers institutions, laws, and regulations; operational capability; and investment, business, and financial environment. (Economist Intelligence Unit, 2020)
UNOPS CAT-I	United Nations Office for Project Services	Infrastructure	Helps governments identify gaps in planning, delivery, and management of infrastructure, with primary consideration of the delivery mechanism itself and the surrounding governance and institutional environment. (UNOPS, 2018)
ASPIRE	Arup	Sustainability	Assesses the sustainability of infrastructure in developing countries, with consideration of the wider enabling environment including institutions, society, environment, and economic. (Arup, 2009)
SPeAR	Arup	Sustainability	Appraises infrastructure projects against the social, environmental, and economic pillars of sustainability to reduce environmental impact of infrastructure projects. (Arup, 2017)
DFID Sustainable Livelihoods Framework	UK Department for International Development	Livelihoods and poverty	Assumes a people-centred approach to understand the constraints they face to development, and their strengths which can be used to unblock potential. This is used to inform infrastructure project and programme planning. (DFID, 2008)

InfraCompass, Infrascopes, and UNOPS CAT-I are heavily infrastructure focused. They consider the institutional and financial environments, but none consider the societal or environmental contexts, which are also necessary to guide infrastructure decisions.

Conversely, ASPIRE and SPeAR are sustainability focused, and although consider a broad range of dimensions, fail to consider the project delivery mechanism itself. However, the dimensional approach works well in splitting subjects into easily understood groups.

The DFID framework is heavily focused on people and livelihood outcomes, and fails to consider the high-level influences in the wider environment. The system boundary in this framework is too narrow for use in isolation for this study.

Other tools are available which assess the enabling environment in isolation, with no link to infrastructure. These include: political economy analysis (PEA), which assesses how the political and economic dimensions interact with society in a given context to inform policy and decision-making (Australian Government, 2016); environmental impact assessment (EIA), which considers the impact of a project on the environment alongside some consideration of social impacts (Colantonio, 2009); social impact assessment (SIA), which examines the impact on society and measures to mitigate detrimental impacts and help individuals, organisations, and communities (Burdge, 2003; Colantonio, 2009); and sustainability assessment (SA), which evaluates economic, social and environmental dimensions considering needs of the public and social impact (Colantonio, 2009; Sala et al., 2015). The disadvantages of these approaches are a lack of integration with infrastructure; a narrow focus; and mostly qualitative analysis.

All tools and frameworks incorporate many desirable features, and are suited to a given purpose, yet there is no central tool which combines all features to present a holistic view of infrastructure within its full enabling environment.

The infrastructure assessment tools use a framework approach with criteria, which proves a successful method of collating and organising project data. Also, many of the frameworks use dimensions to classify criteria, such as environmental or political dimensions, yet most consider them either alone or in combination with one or two others, and none include the full spectrum of dimensions. Use of criteria can also be challenged by subjectivity in both design and scoring.

At the higher level, there can be subjectivity in design of the assessment. The methodology chosen depends on the viewpoint and motivation of the actor carrying out the study, as actors are likely to prioritise methodologies to suit their purpose (Hacking & Guthrie, 2008). This can be somewhat mitigated by consultation with multiple stakeholders, and use of multiple data sources to create the assessment framework.

The enabling environment assessment tools are challenged by limited applicability of quantitative methods. A replicable framework is required for application to numerous contexts and projects, which

requires selection of tangible and quantitative variables where possible. However, methods are becoming increasingly qualitative to allow inclusion of less tangible phenomena such as ethical and social factors (Sala et al., 2015).

Another challenge to all tools is that infrastructure and service delivery is rarely considered as part of the enabling environment itself. Existing tools examine the impact of factors in the surrounding environment on projects and outcomes, however the service delivery mechanism is also part of this enabling environment: infrastructure and service delivery is not only an outcome, it is also an influence.

Also, while a framework approach successfully collects information about the enabling environment, it fails to consider the interconnectedness of factors within the enabling environment and their behaviour as a complex system.

To answer this research question, all factors must be considered. Therefore, insights have been combined from each tool to compile six key dimensions representative of the full enabling environment, shown in Table 2.

Table 2 - Six key dimensions of the enabling environment.

	Dimensions					
	Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery
Primary focus	Influence of state, actors, and policy.	Global and national economic environment	Societal structure and issues of the poor.	External environmental factors.	Government approach to development.	Infrastructure to meet the service needs of the poor.
Key concepts	Geopolitical relations, states, government, regulation, and policy.	Global economy, investment and funding, national economy, personal wealth.	Social protection, social behaviour, equality, rights, participation in society.	Climate, natural resources, livelihood security.	Development paradigms, SDGs.	Service delivery, infrastructure design, skills, access to services.

2.7. Modelling the enabling environment as a system

2.7.1. Systems thinking

Complex real-world phenomena rarely exist in isolation; instead, intricately interlinked with other factors that influence their behaviour (Lim et al., 2018). A systems representation of real-world phenomena allows a better understanding of interactions between influences, identification of consequences to changes, and identification of leverage points (Sterman, 2002)

Ulrich (2010) proposes that the first steps of creating a system are: review and define the goals; compile all parameters which affect the goals; and observe how the system behaves without interference. A system boundary must be defined, which is determined by inclusion of the variables and relationships necessary to understand and answer the research question (Ulrich, 2010). However, this process is highly subjective and leads to a common critique of systems thinking; that the ‘worldview’ of the researcher influences the construction and interpretation of the system (Dehdarian et al., 2022; Ulrich, 2010).

There is a strong literature base which applies a systems thinking approach to understand infrastructure, although most either limits the system boundary to the capabilities of infrastructure itself, discusses it as a component of the SDGs, or is sustainability focused (Blair et al., 2021; Hall et al., 2016; Hjorth & Bagheri, 2006; Oughton et al., 2018; The Economist, 2019; Zuluaga et al., 2021).

There is value in representation of the full enabling environment as a system, given its size, complexity, and high interconnectedness. Also, much like a system within a system, infrastructure should be framed as an enabling environment itself, as the facilitating environment to provide services to meet need, within the boundaries of the wider enabling environment, as the facilitator for infrastructure implementation and service delivery. Ulrich (2010) and Blair et al. (2021) argue that the systems thinking approach is well-suited to the international development field, and can be employed to make development efforts more effective.

2.7.1.1. System modelling tools

There are multiple ways of modelling systems. Three commonly used methods are agent-based modelling (ABM), Bayesian networks, and causal loop diagrams (CLD) (Bureš, 2017; de Roo et al., 2012; Puga et al., 2015). Each were considered for their application to this study. Table 3 gives a brief explanation of each.

Table 3 - Table describing three system modelling methods considered in this thesis.

	Description
Agent-based models (ABM)	A quantitative assessment tool that describes a system from the perspective of its components (agents), examining changes in system behaviour according to behavioural rules as the condition state or actions of individual agents change over time (de Roo et al., 2012; Liddle & Fenner, 2017).
Bayesian networks (BN)	A quantitative tool using probability to analyse cause and effect and causal pathways in a network, represented as a directed acyclic network with conditional probabilities assigned to connections between variables, indicating the likelihood of a child variable to be in a certain condition state dependent on that of its parent variables. (Liddle & Fenner, 2017; Puga et al., 2015)
Causal loop diagrams (CLD)	A directed, cyclic graph that maps a complex system within a given system boundary using variables and links showing interconnected relationships, polarity of relationships, and reinforcing and balancing feedback loops which reveal insight into overall system structure. (Bureš, 2017; Liddle & Fenner, 2017)

Agent-based models (ABM) are valuable for their assessment of the change in individual agents' condition state according to behavioural rules (Gilbert, 2007; Macal & North, 2017). This facilitates modelling the effects of very specific, localised changes to macro-level behaviour, which is valuable in real-world contexts such as this study (Liddle & Fenner, 2017; Macal & North, 2017). However, ABMs require input knowledge to set the parameters and behavioural rules, and do not allow for discovery of influencing environmental factors as an output, which limits relevance to this study (de Roo et al., 2012).

Bayesian networks (BN) are useful for their calculation of cause and effect through quantitative conditional probabilities (Puga et al., 2015), providing a robust and replicable method. They can be used in two directions, allowing predictive and diagnostic scenario testing (Liddle & Fenner, 2017), which enables a multitude of uses. However, assigning conditional probabilities requires known parameters (Liddle & Fenner, 2017), which would require broad estimations in this study, risking inaccuracies.

CLDs are directed, cyclic graphs (Newman, 2010), able to model large, complex, highly interconnected system structures (Bureš, 2017). They are particularly useful for qualitative data input, modelling reinforcing and balancing feedback loops, time delays, and showing polarity and weighting

of connections, and facilitate an understanding of intended and unintended consequences of interventions (Bureš, 2017; Sterman, 2002). CLDs are useful to visually understanding system behaviour, although as the system size increases CLDs become increasingly difficult to understand, and the models themselves can become as difficult to interpret as the real-world (Bureš, 2017).

Ultimately, the value of the CLD is determined by the quality of the data input (Cernev and Fenner 2020), as is the case for all models. Box (1976) claims that ‘all models are wrong’ given inevitable bias to some degree, which must be remembered when interpreting system behaviour.

2.7.1.2. Intervention in a system

Identification of intervention points, known as leverage points, is important as it facilitates an understanding of influential variables where interventions can be made to propagate change around the system to alter holistic system behaviour (Meadows, 1999; Roxas et al., 2019; Valente, 2012). They can be used to direct change to achieve a specified and desired outcome, but can also cause intended consequences as a result of intervention (Bureš, 2017). In the context of this study, factors within the project delivery and enabling environments that make up the holistic system, as identified throughout the literature review, are potential leverage points.

Donella Meadows is a pioneer of systems thinking, and is particularly well known for her 1999 paper, ‘Leverage points: Places to intervene in a system’, which is widely regarded as a foundational text on the subject (Canty-Waldron, 2014). She defines leverage points as places in a complex system where intervention can lead to significant change throughout the system, and goes on to identify 12 leverage points which can be split into physical elements, information and controls, and ideas and goals driving the system, each with increasing effectiveness respectively (Meadows, 1999). These are shown in Figure 2.

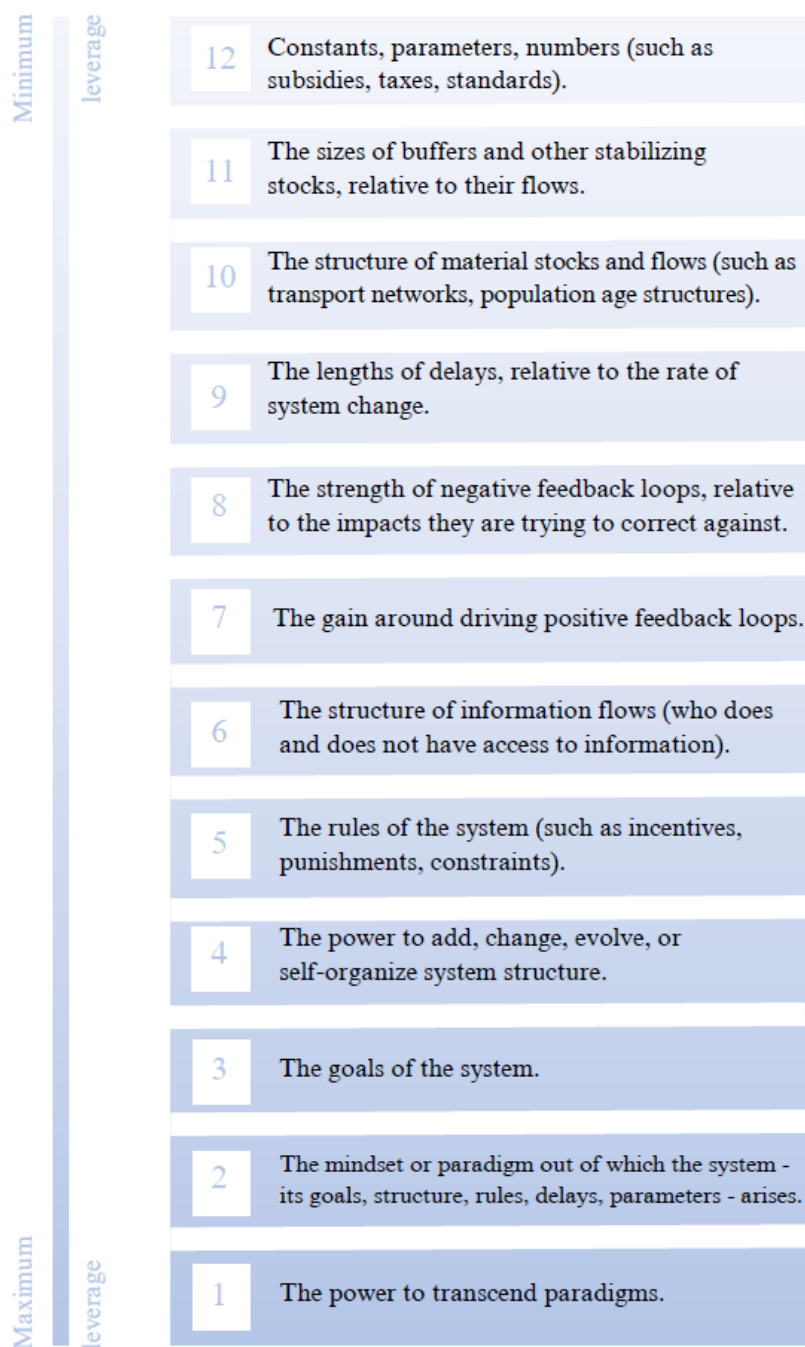


Figure 2 - Meadows' places to intervene in a system (Meadows, 1999).

In small system representations, leverage points and critical points in the system can be identified visually or inherently. However, in large complex systems visual analysis is not possible, and more sophisticated network analysis methods are necessary. (Bureš, 2017)

2.7.1.3. Application of network analysis (NA)

Network analysis (NA) is the study of networks (Newman, 2010). NA methods can achieve an understanding of the most influential targets, clusters representing thematic areas, the nature of diffusion around the network, and the robustness of the network, which cannot be gained from visual

analysis alone (Murphy & Jones, 2020; Newman, 2010). NA employs centrality metrics to achieve this understanding.

Centrality metrics are a measure of the influence of a node in a network (Borgatti & Everett, 2006), and each centrality metric reveals unique insight into system behaviour. It is also possible to calculate centrality using weighted edges (with the exception of eigenvector which cannot be weighted), which represent differing levels of impact of each connection as in a real-world context, and is a major advantage of NA. Table 4 details five common centrality measures and their explanations.

Table 4 - Table explaining centrality measures.

Centrality measure	Explanation
Indegree	Estimates how well-connected a node is within the system, by the sum of its inward connections. Variables with a high indegree are significantly impacted by other variables. (McGlashan et al., 2016)
Outdegree	Estimates how well-connected a node is within the system, by the sum of its outward connections. Variables with a high outdegree have high ability to impact other variables in the system. (McGlashan et al., 2016)
Betweenness centrality	A measure of how often a node sits between other node pairs, and its subsequent ability to connect nodes and clusters of nodes. Variables with high betweenness are mediators on paths that diffuse change around the system. (Borgatti & Everett, 2006; Freeman, 1979)
Eigenvector centrality	A measure of a node's connectivity to all other nodes in the system, and therefore ability to influence the system as a whole. (Bonacich, 1972)
Closeness centrality	A measure of the total distance from one node to all other nodes, and indicative of how central the node is in the whole system. (Borgatti & Everett, 2006; Freeman, 1979)

However, NA is typically applied to acyclic networks without polarity, such as Le Blanc (2015) and Coenen et al. (2021), and in cyclic networks, centrality calculations are unable to give finite answers. However, to mitigate this limitation, in similar studies with cyclic networks, such as Zucca et al. (2023), NA is supported by qualitative analysis to further analyse the results from NA.

2.8. Chapter summary

This chapter has explored existing literature related to the research question. Additionally, each component in the primary research question and sub-questions was researched individually, to include the concept of need, infrastructure and services, project delivery, and the enabling environment. Following this, the chapter explored existing tools for assessment of infrastructure and the enabling environment, and the application of a systems approach.

The ability of infrastructure and services to meet the needs of the poor, and the influence of the enabling environment and service delivery mechanism on its ability to do so, has been demonstrated. The necessity of infrastructure for development is evidenced, and the necessity for alignment with context. The complexly interlinked factors within the enabling environment have been discussed, forming the basis for a systems approach. However, the literature demonstrates that there is a research gap which fails to model all variables of the enabling environment and their relationships with infrastructure holistically.

This is important to be able to understand how services can best meet need in each enabling environment. Without this understanding, there is risk of delivering infrastructure and services which are not fit for purpose. This forms the basis of the research question: *How can infrastructure projects be better designed to meet need in developing countries within the prevailing enabling environments?*

The following chapter presents the methodology employed to answer this question.

3. METHODOLOGY

3.1. Methodology overview

This chapter explores the research design, provided in Section 3.2. Subsequently, Section 3.3 explains the data collection stage including case study theory and selection, and the frameworks used. Following this, Section 3.5 explains a two-stage analysis process: firstly, appraisal of the project and enabling environment, and secondly, the application of a systems approach using CLDs. Lastly, limitations and novelty of the methodology are discussed in Sections 3.6 and Section 3.7 respectively. The process is shown in Figure 3 culminating in influence points found in the M-CLD as the output of this methodology.

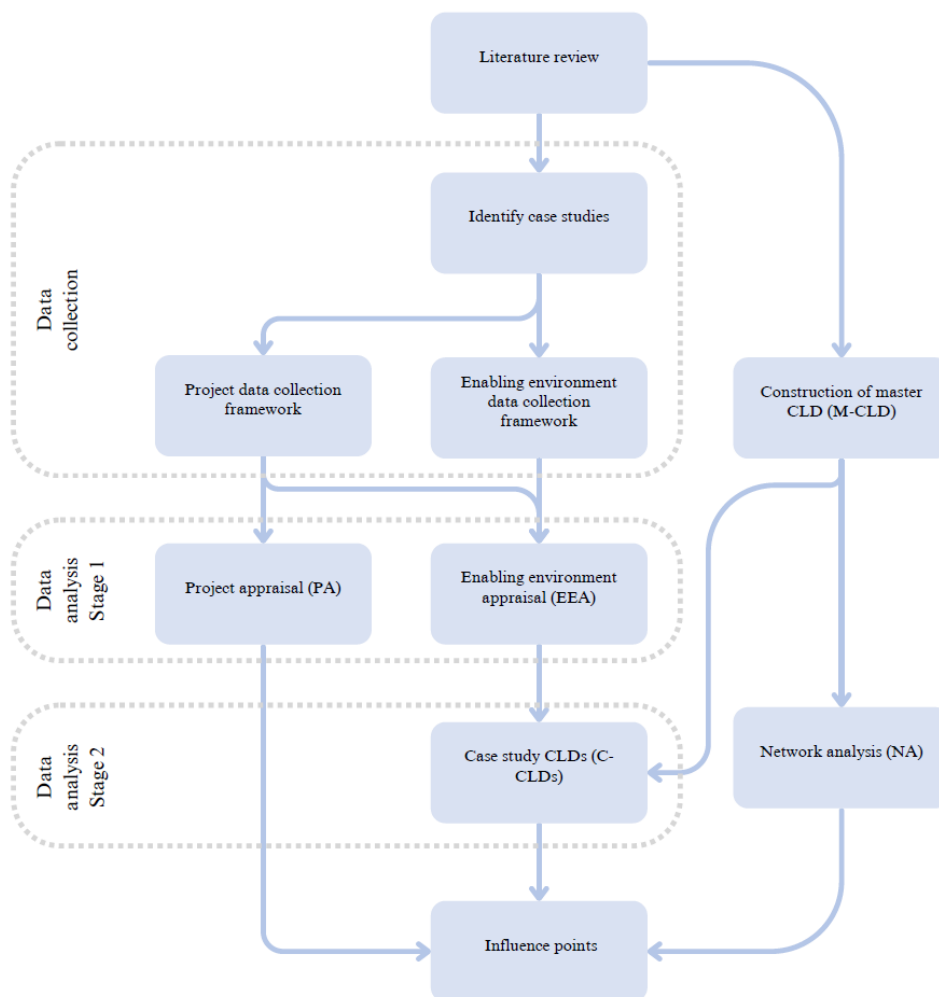


Figure 3 - Methodology flowchart.

3.2. Research design

3.2.1. Mixed methods

This research employs mixed methods, incorporating both qualitative and quantitative techniques, and using the links between them to provide further insight (Denscombe, 2014).

Three options are available when using mixed methods: convergent design, where both qualitative and quantitative methods are used independently to work towards the same hypothesis and compared; explanatory sequential design, where quantitative data is collected and analysed first, then qualitative data is collected and analysed based on the quantitative results; and exploratory sequential design, where qualitative data is collected and analysed to inform theory, and quantitative analysis is subsequently applied to further develop and test the theory (Creswell and Creswell, 2018).

This study employs exploratory sequential design. This research intrinsically requires qualitative methods to collect data and comprehend phenomena in context and interaction with social behaviours, and for its ability to gather and analyse large amounts of data in mixed formats whilst retaining richness and complexity of information. However, quantitative methods are also necessary for more qualified comparison between cases and establishment of a robust and replicable methodology for identifying intervention points.

This methodology applies a highly inductive strategy. Inductive reasoning builds theories from the ground up, allowing themes to emerge organically from the data, in direct contrast to a deductive strategy which challenges a preconceived hypothesis (Creswell, 2009).

3.3. Tool selected: Causal loop diagrams

From the three system modelling tools discussed in Section 2.7.1.1, CLDs were chosen as the most suitable method for the following reasons: their ability to model large, highly inter-connected, cyclic systems, as with the enabling environment; they are suitable for representation of qualitative relationships; and allow to weighting of influences as in the real-world context.

CLDs comprise nodes (variables in the system), edges (connections between variables indicating a relationship), and polarity notations (indicating a positive or negative relationship), which connect to show reinforcing and balancing loops, creating a simple, visually interpretable representation of a system (Bureš, 2017). These components sit within a system boundary, determined by the limit of the phenomenon that the system represents and the purpose of representation of the system (Liddle & Fenner, 2017), which must be carefully defined so as not to overcomplicate or oversimplify the system, which could undermine its usefulness. This is demonstrated in Figure 4.

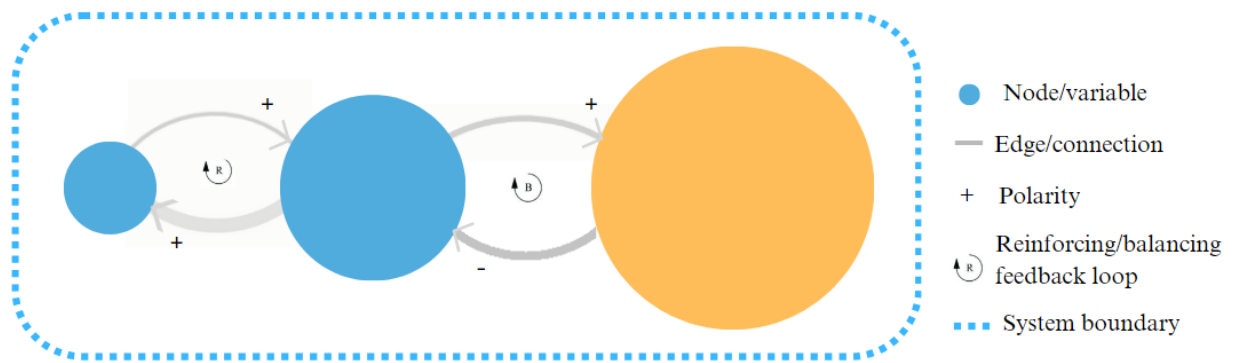


Figure 4 - Key to CLD components. Different colour nodes indicate different dimensions; increasing size of node indicates increasing level of influence.

Vensim (Ventana Systems Inc) and Kumu (Kumu Inc) software were considered for drawing the CLDs. Vensim is valuable for its ability for model stock and flow behaviours and time delays which offer a real-world understanding of the system. Although Kumu does not offer this, it does offer inbuilt NA capabilities and was selected for this reason.

3.3.1. Construction of the master CLD (M-CLD)

As shown in Figure 3, construction of a master CLD (M-CLD) was carried out independently and in tandem with the data collection and analysis processes. The M-CLD is a system representation of all factors and relationships identified within the enabling environment, informed by the literature review.

Construction of the M-CLD was carried out in stages, by gradually building up the evidence to create a trustworthy systems map. The full process is explained in detail in Chapter 5.

3.3.2. Network analysis (NA)

NA was then applied to the M-CLD. In NA terminology, the CLD variables are termed nodes, and connections are termed edges (Newman, 2010). The CLD can be considered a directed, cyclic network; when weighting is added to nodes and edges, the CLD becomes a directed, weighted, cyclic network.

NA methods were first used to ensure the quality and reliability of the M-CLD. Firstly, Exponential Random Graph Models (ERGMs) were used to test system randomness, to understand whether the system is statistically different from a random network of similar size and density. A random system indicates that the variables and connections have not been formed from meaningful analysis. However, a non-random system indicates that the system has been constructed with considered relationships and analysis. (Zucca et al., 2023)

Secondly, Conditional Uniform Graphs (CUGs) were generated for each centrality metric. Statistically significant results indicated randomness and applicability of the given centrality metric. (Zucca et al., 2023)

These stages were conducted using statistic computing software, R.

Thirdly, weighted centrality scores were generated for each applicable centrality metric using Kumu software. The 20 highest scores of each metric were recorded, representing approximately the top 10 percent of variables, and the final list of 100 variables was triangulated to identify the most influential variables overall. The triangulation exercise required variables to meet the following criteria: the variable has a particularly high score, for example in an indegree ranking (see Table 4) of 42-30-29-28, 42 is considerably higher; and the variable appears in at least two of the five result sets. These criteria were chosen because: a) this aligned with the peer-reviewed methodology in Zucca et al. (2023), indicating robustness and a generally accepted approach; and b) appearance in two of five result sets, within only five percent of variables, suggests reliability in the result. The results are considered nodes of high influence and importance in the network, and are termed influence points, which may or may not be suitable for intervention as leverage points. The process is shown in Figure 5.

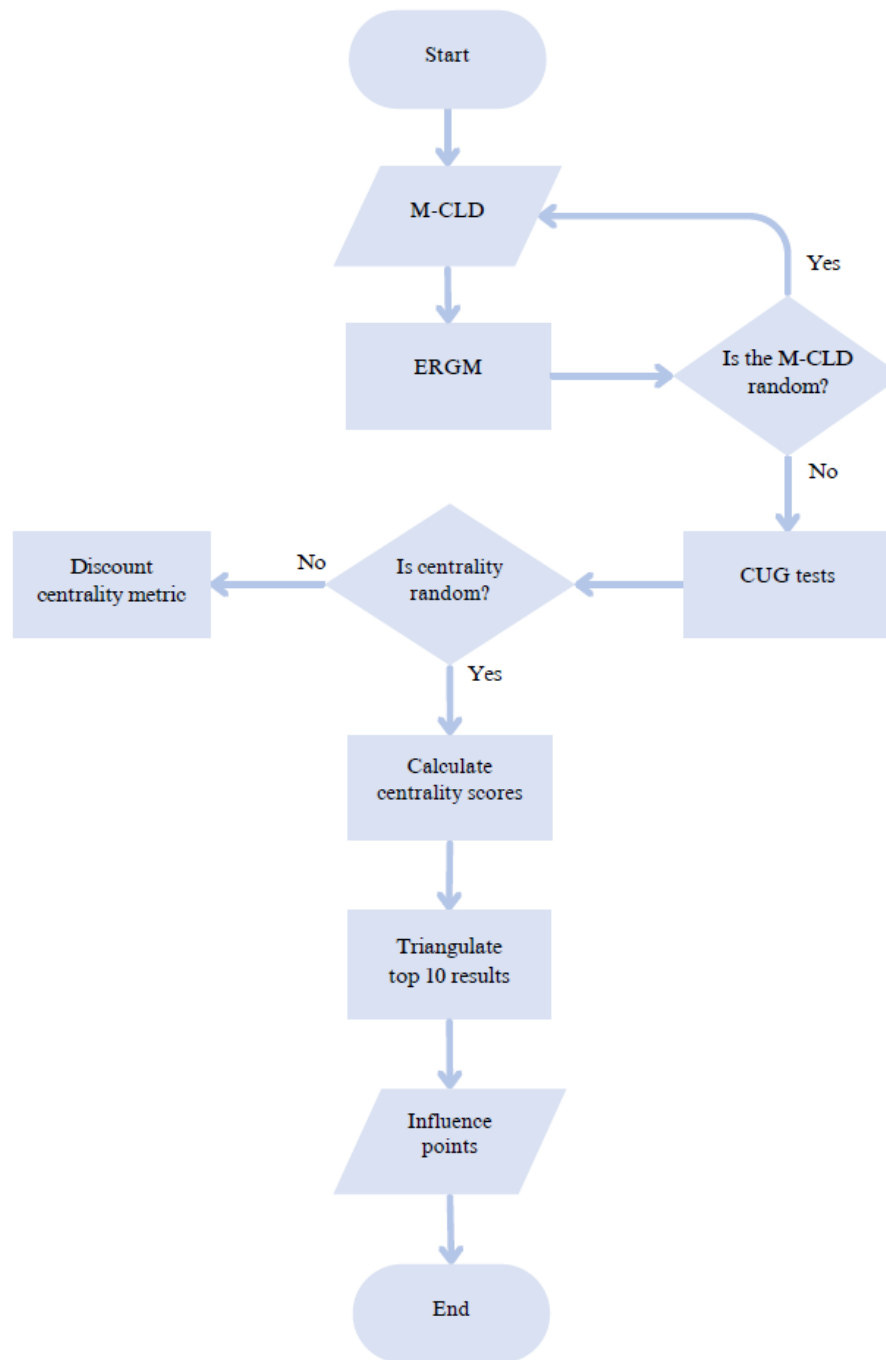


Figure 5 - The network analysis process.

This approach has been used by authors in other fields such as Zucca et al. (2023) and McGlashan et al. (2016), in the fields of early years education and childhood obesity respectively. However, the application of NA to CLDs is limited in existing research generally, and is novel in application to this field.

3.4. Data collection

The case studies were carried out simultaneously and independently of the M-CLD development, as shown in Figure 3.

3.4.1. Case study approach

3.4.1.1. Case study theory

Case study research refers to a holistic research approach, rather than simply a data collection method (Yin, 2018). The approach is defined as ‘an empirical method that investigates a contemporary phenomenon in depth and within its real-world context when the boundaries between phenomenon and context may not be clearly evident’ (Yin, 2018, p.5).

Yin (2018) and Priya (2020) highlight three primary case study designs: explanatory, which looks for causal factors and aims to answer the ‘how’ and ‘why’ of a phenomenon; descriptive, which describes a phenomenon in context as way of example; and exploratory, which evaluates a case study with the aim of identifying further research questions.

Exploratory case study design is valuable where the goal is to gain insight, generate ideas, and develop the understanding of a topic, and is also advantageous for its in-depth exploration of real-world examples in their holistic context, which contributes to an evidence base of practical knowledge and informed hypotheses (Priya, 2020; Yin, 2018). A deep understanding of phenomena in the social sciences often cannot be gained theoretically, and therefore inquiry into real-world experiences is necessary which can be achieved using case studies (Flyvbjerg, 2016).

In all cases, Yin (2018) argues that the basis of good case study research is carefully designed foundational questions, and that focus should be placed on defining these with clarity and precision to ensure a strong base for subsequent work. However, the author also raises the risk of researcher bias, which can affect the framing of questions in a questionnaire, and in the interpretation and narrative of findings. This can be mitigated by reflexivity, which constitutes a critical awareness and constant reflection by the researcher over his viewpoint, biases, preconceptions, and social background (Giddens & Sutton, 2014).

To further mitigate these concerns, and to ensure robustness in the overall approach, Priya (2020) presents ten fundamental elements of case study research for inclusion. The stages incorporate: clearly identifying purpose, identifying case study design, preparing considered research questions, choosing an appropriate and manageable case set, determining the epistemological basis, conducting a comprehensive literature review, sampling, data collection, data analysis, and coherent presentation of findings (Priya, 2020). A rigorous methodology such as this helps ensure replicability and greater confidence in the methodology.

An important point noted by Flyvbjerg (2016), is that grand conclusions and theories cannot be claimed through case study research alone given cases are only a representative example, but it is instead valuable to develop and evidence working theories, contribute to working hypotheses, and contribute to knowledge.

A case study approach is appropriate in this context for its ability to explore multiple cases in real-world scenarios, collect high quantities of rich, detailed information from complex contexts, and facilitate multi-case comparison. However, diligence in approach is critical to ensure findings are representative of the real-world context.

3.4.1.2. Sourcing and conducting case studies

Case studies were sourced from contacts in the development field. Collectively, the set was required to meet the following criteria: projects must cover a range of service sectors; projects must cover a range of enabling environments; projects must be located in developing countries; and projects must be sourced from a range of industry partners. The list and characteristics of each case study can be found in Table 5.

However, choice of case studies was somewhat opportunistic dependent on engagement from external partners, abundance of projects that meet the specified criteria, and availability and sensitivity of project information. Case studies were chosen to form the most suitable range possible, providing they met the criteria above, resulting in seven cases.

Data was sourced from three sources: semi-structured interviews with representatives from each organisation closely involved with project delivery, publicly available information, and project documents. Data was compiled using project and enabling environment data collection frameworks, discussed in Section 3.4.2. In interviews, details of the organisation, the professional experience of the representative, professional position, access to information, and personal interests was recorded, (although not presented in this thesis to maintain anonymity of the interviewees). Limitations were gaps in an individual's knowledge, someone with indirect experience of the project, an unwillingness to divulge information, and constraints on time and expertise.

Case studies were carried out over 18 months from September 2021 to March 2023, during which COVID-19 restrictions were in place for much of this time, limiting travel. Therefore, projects with abundant available data were chosen given that travel to conduct first-hand studies was not possible.

No ethical issues were experienced in this study. However, some of the data provided by organisations was sensitive and confidential. Confidentiality was respected throughout the research, and only non-confidential information has been explicitly included.

3.4.2. Data collection frameworks

Two data collection frameworks were developed to collect project and enabling environment data from each case study, structured to maintain a formal, systematic, and transparent procedure, to ensure uniformity across case studies. Similar studies also use structured framework approaches, see Section 2.6.1 likely due to the natural application to inductive analysis.

Questions in both frameworks were designed with open data fields to extract as much valuable information as possible, whilst limiting the number to ensure a balance between comprehensive data collection and a manageable amount for analysis. The frameworks were developed iteratively using literature to compile the first iteration, and review of the case studies to develop them further.

A central requirement of the methodology is applicability to any project in any context. Therefore, a broad range of questions and subjects were included, but remained unanswered if not applicable to a project.

The frameworks were completed using interviews and ongoing relationships with staff from organisations, together with project documents, open-source literature, and academic literature where relevant and available.

3.4.2.1. Project data collection framework

The framework is intended to gather data about the project characteristics within the case study, including the intended purpose, scope of services, all elements of service operation, and outcomes. Literature was used to identify key characteristics for inclusion in the framework.

The structure is split into seven primary categories for data collection: data source information; project overview; infrastructure; social drivers; project and service delivery; ongoing operation; and project and service outcomes. Within these categories are a combination of open and closed data fields. The framework can be found in Appendix A.

3.4.2.2. Enabling environment data collection framework

The enabling environment data collection framework collects information from the case study documents and open-source information to assess the context within which the project was delivered. It consists of 20 themes with open field component questions, used to guide the data collected. The overall structure was influenced by similar tools used in industry, explained in Section 2.6.1. The framework can be found in Appendix B.

3.5. Data analysis

A multi-stage analysis process was used. Stage 1 comprised project and enabling environment appraisals, and Stage 2 comprised systems analysis.

3.5.1. Stage 1: Appraisals

The content of the appraisals is informed by literature, which revealed the key factors for consideration when assessing a project and context, and with iterative development if new important factors emerged from each case study analysis.

3.5.1.1. Project Appraisal (PA)

The PA was developed to test whether the services fulfil their intended purpose, and critically, whether they met the identified need. The structure comprises six dimensions, containing 24 goals, comprising 70 criteria which are used to assess the case study to identify successes and failures, strengths and weaknesses, and areas for improvement. The six dimensions are: governance, financing, infrastructure, service delivery, social value, and contribution to development. The PA template is available in Appendix C.

The dimensions, goals and criteria were developed using literature, identified from the literature review as the key indicators necessary to measure the success of infrastructure services in their ability to meet need. Each dimension has a different number of goals, and each goal has a different number of indicators; this has not been standardised at risk of manipulating data collection to fit a framework, rather than development of a framework to fulfil the purpose of data analysis. Some goals and criteria will have more influence on outcome than others, which will be dependent on each project and enabling environment. This is considered in the analysis.

A brief explanation of the six dimensions and the themes of the goals are outlined below.

Governance

Governance refers to the actors, processes, and management infrastructure involved in the delivery of services. This dimension aims to understand responsibilities, relationships between actors and stakeholders, and the motives behind service delivery to ensure it is driven by the desire to meet needs of the population.

Financing

The *financing* dimension refers to the financing and funding required for delivery and ongoing service provision, including funding security, strategy, financial risk, cost recovery and subsidy, and also extends to consider affordability for the end user.

Infrastructure

The *infrastructure* dimension focuses on the physical infrastructure required for service delivery. It asks whether the services are suitable to meet their intended purpose and scope; the quality of technical design; resilience and redundancy in design; capacity for service expansion; and operation and maintenance protocol.

Service delivery

Service delivery considers the ongoing provision of services. It aims to understand whether plans are in place to meet expected increased future demand; whether the service is resilient to disruptions with

contingency plans in place to ensure a continuous service; whether monitoring and maintenance is in place; and elements of the delivery process such as the planning stages and milestones.

Social value

The *social value* dimension explores end user satisfaction and whether the service is perceived to meet their needs. It asks whether services promote social equality and inclusion, encourage community ownership, and respect local culture and values.

Contribution to Development

The *contribution to development* dimension considers the role of the service in the overall development of the area and population it serves. It considers whether it improves quality of life and livelihoods; adds social value; benefits the economy; and is sustainable.

Each project was scored by the researcher against the criteria for performance on a scale of one through five, informed by the data gathered in the project data collection framework. A score of one indicates that the criteria either performed extremely poorly or is not considered at all; two indicates that the criteria is not met although considered; three indicates that the criteria is partially or sometimes met; four indicates that the criteria is met; and five indicates that the criteria is met exceedingly well and is an exceptional strength of the project. Scores are also relative to each other to ensure consistency and robustness of the method.

The scoring scale was chosen to allow enough flexibility to avoid binary scores which risk loss of rich data, but equally limit the range to a manageable choice for the researcher to maintain consistency across criteria.

3.5.1.2. Enabling environment appraisal (EEA)

The EEA comprises a list form of the variables in the M-CLD for scoring. Development of the M-CLD is explained in detail in Chapter 4, including the dimensions and variables which make up the M-CLD, and therefore EEA.

The variables were scored using data gained from the enabling environment data collection framework for each project, according to their presence or absence in the enabling environment, and if present, their level of influence against a scale of low, medium, and high influence.

3.5.2. Stage 2: Systems approach

3.5.2.1. Case study CLDs (C-CLDs)

In the second stage of the analysis, case study CLDs (C-CLD) were produced by combining the M-CLD and EEA scores. Where variables were non-applicable according to the EEA, they were removed

from the M-CLD, thereby also removing any corresponding connections. This approach was inspired by Blair et al. (2021), where data is layered onto a CLD.

The influence scores from the EEA were represented on the C-CLD by circle size: small circles represent variables with low influence, medium circles show medium influence, and large circles indicate a high level of influence.

This resulted in C-CLDs which uniquely represented the system behaviour of each case study, which were then used to analyse the case studies in Chapter 5.

3.6. Limitations

Despite efforts to create a robust and transparent methodology, there remain limitations.

Question design

The design of questions is central to the efficacy of the overall methodology as they have the potential to predefine the study and findings. Considered and appropriate questions improve the quality of data collected, and therefore quality of input data for analysis, which improves the reliability of results.

Question design was limited to information gained from the literature review, and decisions made regarding relevance of information for inclusion by the researcher. Inclusion or exclusion of a subject could lead to skewed categorisation in the analysis and discussion. Over-emphasis of a subject could lead to exaggeration of influence in the results, and omission could exclude a subject from consideration unless found incidentally during data collection. Subconscious bias of the researcher and their worldview will affect the choice, intonation, and phrasing of questions. These limitations were mitigated by a robust and thorough literature review; maintaining awareness throughout design of the methodology; and acknowledging potential biases in the narrative to ensure reader awareness and allow them to maintain neutrality in their assessment of the work.

Case studies

The selection of case studies was somewhat opportunistic. Individual and the collective case studies were unlikely to cover a comprehensive range of scenarios, which limits the general conclusions that could be made. Conclusions were dependent on content, quality, and the number of case studies, and where data was insufficient, analysis was not possible in some areas. This is an acknowledged limitation of this research, but does not undermine the methodology. To mitigate this challenge in the long-term, more case studies should be added to the collection to strengthen the findings.

Case study selection was also limited by the inability to travel due to funding and COVID-19, which meant sufficient data to facilitate a desk-based study must have been available, which was a criteria for case study selection.

Data analysis

The PA requires judgement of success and failure in meeting objective criteria. Similarly, the EEA requires judgement of presence or absence of variables, and their level of influence. An additional risk is the compounding effect of decisions, and the potential to compromise validity of results. To mitigate this all assumptions have been stated and justified, and the potential effect of such assumptions on conclusions have been raised.

System representation

CLDs are designed to enable visual representation of a complex system, however they still require a degree of reductionism dependent on the level of the system representation and the system boundaries. Similarly, construction of the system, the level of representation, and the system boundaries are decided by the researcher, and will have an inherent bias dependent on the researcher's worldview and level of understanding. Verification exercises and iteration can help mitigate this, discussed in Section 4.4.

3.7. Novelty

The novelty of this method lies in the combination of its component parts. The combination of a qualitative data collection framework; an appraisal framework for analysis; transformation into a CLD; translation of the CLD into a cyclic, directed, weighted network; and application of NA to examine the system behaviour, is novel. Literature found that each component has been used in other studies individually, or with one other stage, but not as a full framework.

Secondly, modelling of the full enabling environment to include such broad system boundaries as this study has not been observed in literature. Individual dimensions have been studied, but not in combination, and most papers examine smaller systems or part of this system. This methodology brings together all dimensions in a single tool.

Thirdly, there is no evidence of the application of NA to CLDs represented as networks in the infrastructure sector, and very few papers found that apply this approach across any sector. The full enabling environment as defined here has not been represented as a CLD prior, possibly due to the size and complexity of the system.

3.8. Chapter summary

The key points discussed in this chapter are as follows.

- Causal loop diagrams (CLDs) were chosen as the appropriate tool to represent the enabling environment as a system.
- A case study approach was adopted, using seven cases. Data was sourced from semi-structured interviews, project documents provided by the organisation, and publicly available information.

- The data collection process comprises two qualitative frameworks, one to collect data relating to the project, and another to collect data relating to the enabling environment.
- A two-stage data analysis process was used. Stage 1 encompassed a project appraisal and enabling environment appraisal, developed and informed by the literature review. Stage 2 comprised a systems representation of the enabling environment using CLDs.
- Limitations were present, as with all methodologies, but efforts to overcome this were made through researcher awareness in the methodology design, and acknowledgment and transparency in communication of the method.
- The methodology is novel for its combination of framework, CLD, and NA methods; for its combination of all six dimensions to represent the full enabling environment; and for the application of this methodology to the infrastructure and service delivery sector.

The following chapter begins the application of this methodology to develop the M-CLD.

4. MASTER CLD (M-CLD)

The M-CLD represents the holistic enabling environment as a system, and subsequently serves as a tool for analysis of each case study. This chapter describes the process used to develop the M-CLD, using dimension CLDs (D-CLDs), and the subsequent application to case studies to create case study CLDs (C-CLDs).

Figure 6 outlines the methodology.

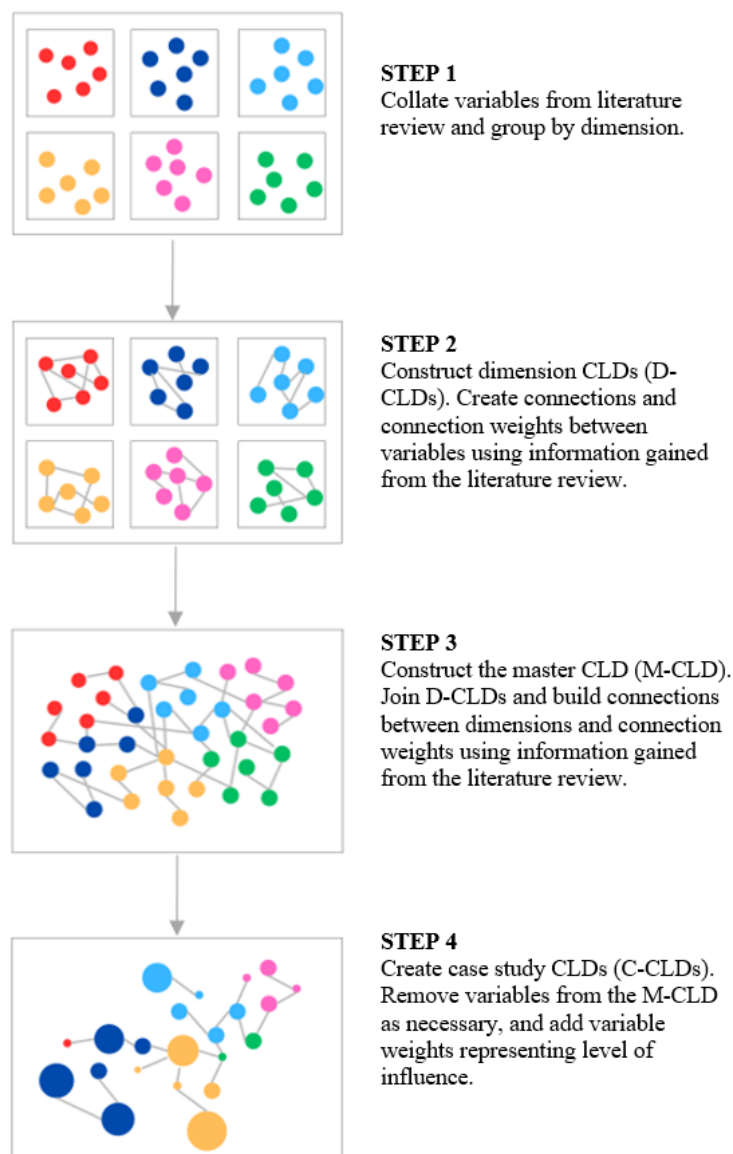


Figure 6 - Development process of CLDs.

4.1. System boundaries

This study aims to investigate the impact of high-level context on infrastructure and service delivery; therefore, the system purpose is to understand influences at the national and regional levels. The system boundary is therefore set to consider factors at the national and regional levels.

The research question openly assumes an anthropocentric worldview. The system boundary reflects this. For example, factors relevant to the natural environment typically refer to the way in which the natural environment affects the human experience.

Figure 7 shows the high-level system and system boundaries as understood from literature (format adopted from Groundstroem and Juhola (2021)).

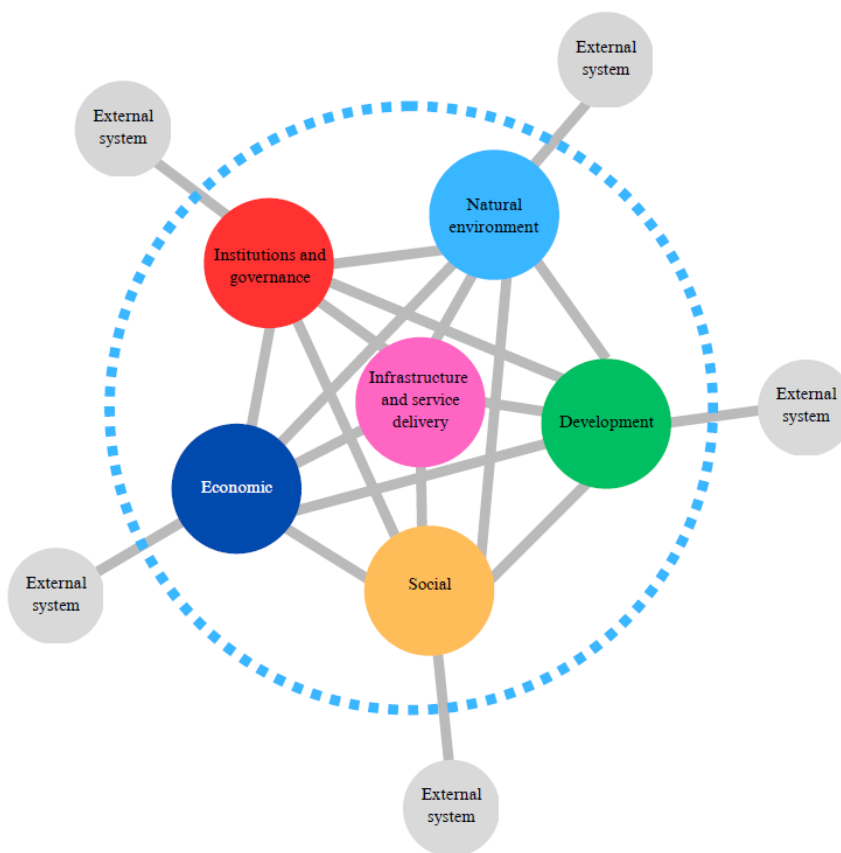


Figure 7 - System boundary applied to M-CLD, shown in blue dashed line.

4.2. Dimension CLDs (D-CLD)

The first stage towards development of the M-CLD was to create D-CLDs. This staged process was used to simplified modelling the M-CLD given the high number of variables.

Table 2 in Section 2.6.1 details the six dimensions that emerged from the literature review, and their primary focus and key concepts. The six dimensions are: institutions and governance, economic, social,

natural environment, development, and infrastructure and service delivery. A brief explanation of each and their colour coding are outlined in Figure 8.



Figure 8 – M-CLD dimensions and descriptions.

A CLD was created for each dimension to produce a D-CLD.

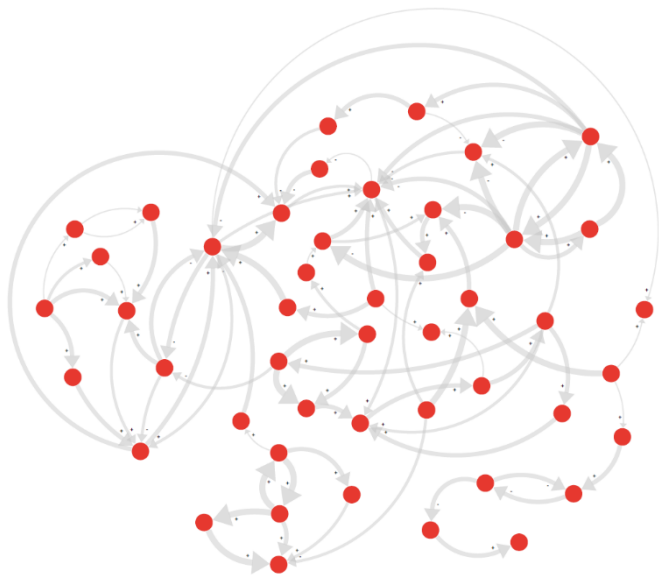
Each D-CLD has a different number of variables, which themselves differ in multiple ways: their broadness or specificity, their ability to be controlled, the time required to make change at a variable, and the time taken for change at a variable to propagate change elsewhere. This variability reflects real-world factors in the enabling environment.

Some variables, or similar variables, appeared in multiple D-CLDs. In this case they were within the system boundary for each. When combining the D-CLDs to form the M-CLD, they were placed in the most appropriate dimension in the context of the full system. Similarly, some variables in the D-CLDs appeared isolated, which indicated that they were connected with variables from other D-CLDs.

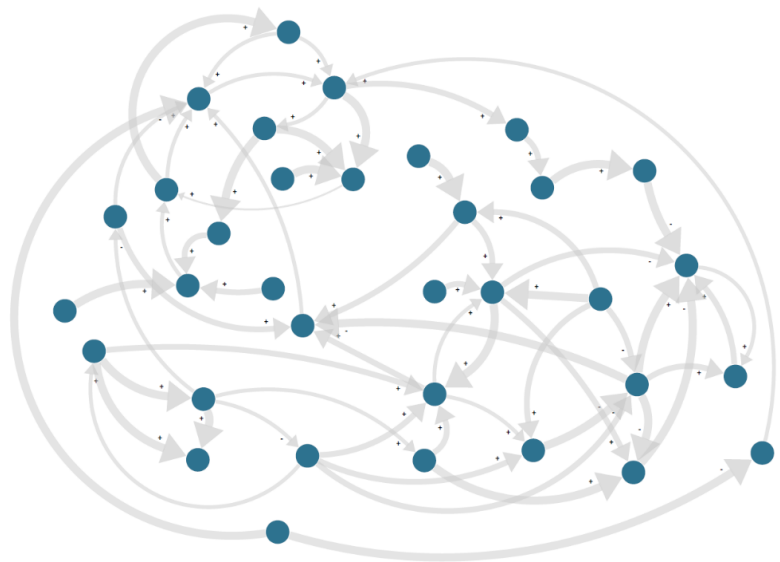
As with variables, connections were developed from relationships observed in literature. Literature was used to inform the direction, strength, and polarity of connections between variables. Arrowed lines

between variables indicate the direction of the relationship. Line thicknesses indicate the strength of the relationship graded on a scale of one through four: one indicating a weak connection, and four indicating the strongest connection. Each connection has a corresponding polarity. A positive (+) notation indicates that the variables change in the same direction (an increase of the first results in an increase of the second), and a negative (-) notation indicates that variables change in the opposite direction (an increase of the first results in a decrease of the second).

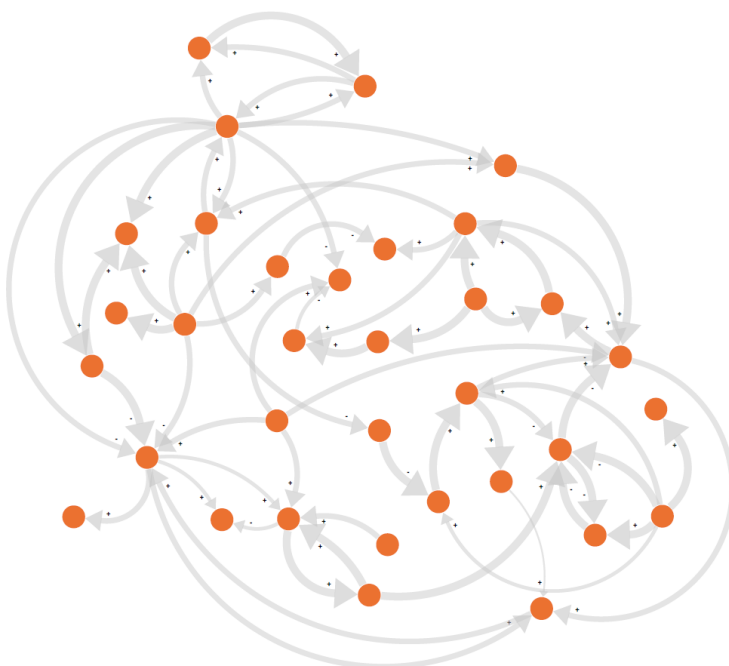
The D-CLDs for each dimension are shown in Figure 9, constructed using Kumu online software.



Institutions and governance



Economic



Social

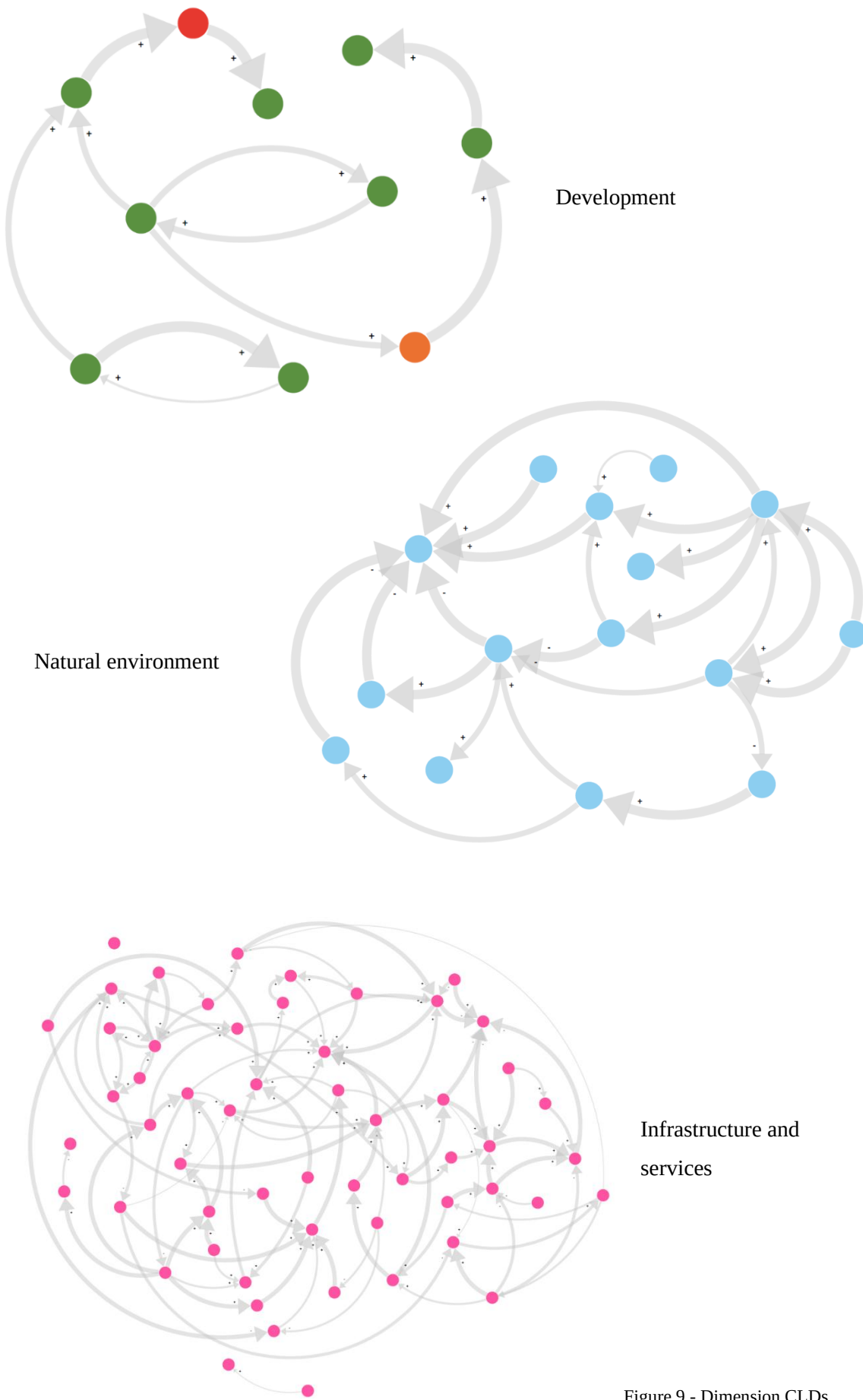


Figure 9 - Dimension CLDs.

4.3. Master CLD (M-CLD)

The six D-CLDs were combined to form the M-CLD. Connections and weighting between inter-dimensional variables were added using insight from the literature review and iteration during the case study data collection.

The M-CLD comprises 196 variables and 480 connections. The immense scale of the M-CLD and number of variables and connections demonstrates the complexity of the system.

A CLD is by nature a closed loop system with feedback loops, however the M-CLD also contains causal pathways which are not cyclic. This is representative of the real-world system, and the insight gained from causal pathways is also of immense value. Intervention at a variable along a causal pathway can cause desired change at a particular variable in the same way as a variable in a loop.

The M-CLD is shown in Figure 10.

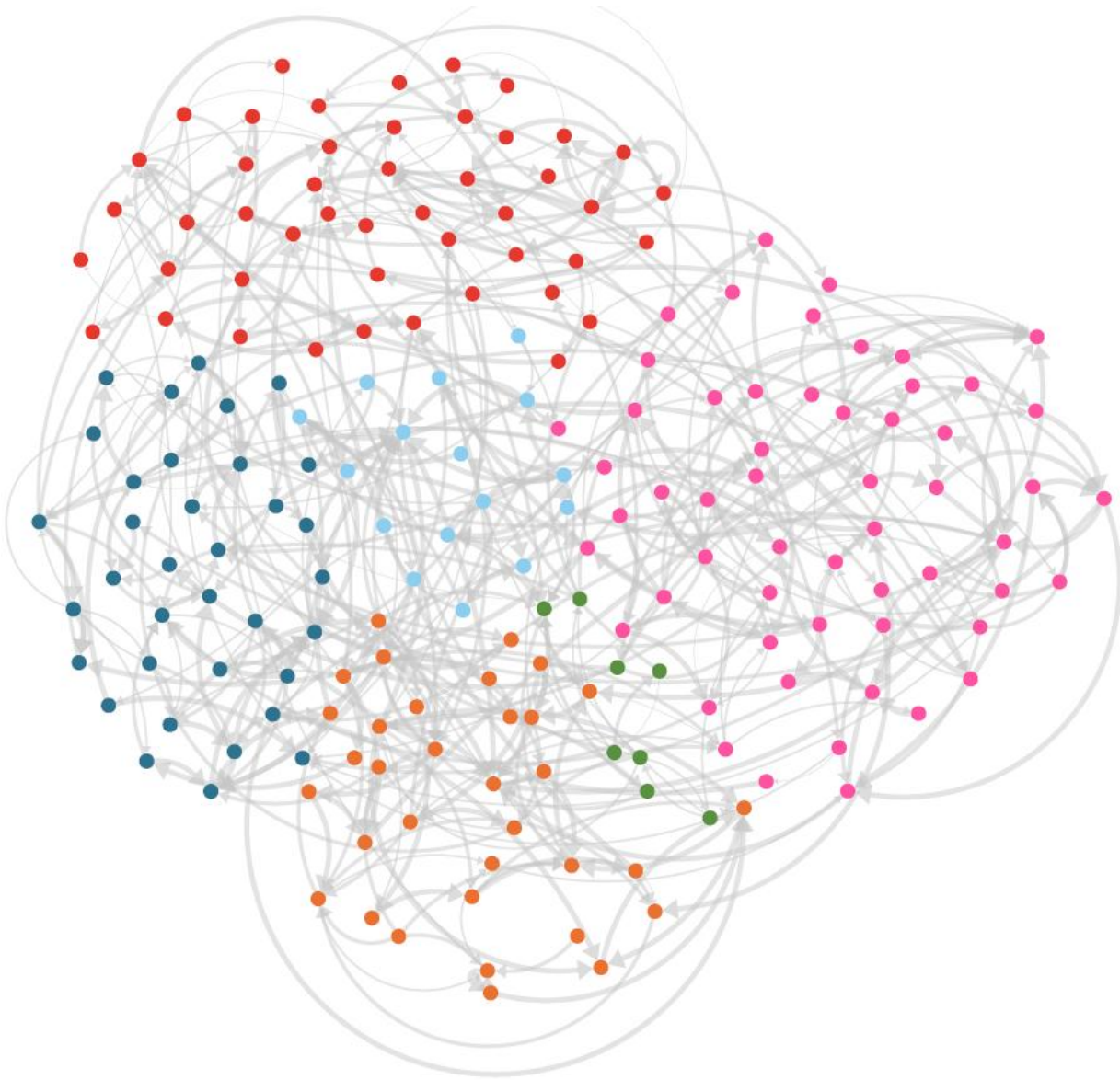


Figure 10 - Master CLD (M-CLD).

4.4. Verification

A verification exercise was carried out to confirm that the M-CLD was an accurate representation of the enabling environment, which is critical given that any further analysis is dependent on construction of the CLD. This process is adopted from the methodology used by Zucca et al. (2023) to validate their network, which showed to be robust.

The three checks are described below.

4.4.1. Peer review

A first check was peer review. Peer review is commonly used as a method for validation of a CLD, observed in Blair et al. (2021), Dhirasasna and Sahin (2019), and Zucca et al. (2023). The M-CLD was sent to interviewees interviewed as part of the case study review. Their comments were reviewed against literature, and amendments were made to the M-CLD where the arguments were supported.

4.4.2. Exponential Random Graph Models (ERGM)

The ERGM test, conducted in R, showed the M-CLD to have statistically different behaviour when tested against 1000 similar random networks, indicating that the CLD is not random and can be considered to reflect a unique system.

4.4.3. Condition Uniform Graph (CUG) tests

The CUG tests found a statistically significant score to that observed in a random network, indicating that all five centrality measures were applicable. All five centrality metrics were subsequently included for triangulation.

4.5. M-CLD influence points

Criteria for the triangulation exercise was that the variable must be present in the top 20 variables of two or more centrality scores. The top 20 were chosen as the results constituted approximately 10 percent of the total number of variables. Triangulation between outdegree, betweenness, closeness, and eigenvector revealed 23 variables. This is a manageable number to comprehend, yet large enough that a considerable number are likely to be present in each case study to enable insight.

Using the process described previously, NA revealed 23 variables as high influence points, and possible leverage points, as follows:

- Population welfare
- Service needs gap
- Economic growth
- Gender equality

- Internal migration and urbanisation
- Social protection
- Climate change
- State capture
- Access to better paid work
- NGO support
- Educated population
- Political stability
- Desire for infrastructure development
- International migration
- Conflict
- International trade
- Public investment in infrastructure and services
- Infrastructure output
- Electorate influence
- Private investment
- Employment opportunities
- Government motivated by development
- Socially motivated development agenda

4.6. Assumptions and limitations

There were a number of assumptions made when constructing the CLDs, many intrinsic to the nature of complex systems. These assumptions are outlined below.

The CLDs were constructed using information gathered from the literature review. Although the literature review aimed to understand the holistic enabling environment and all existing research on the subject, there is always the risk that some information has been missed. This may be due to a lack of previous research in the area, which could result in missing variables or links. The final CLDs are inherently dependent on the quality of input information, which in this case depends on the thoroughness of the literature review and existing information in the research area.

The relationships between variables were informed by literature, although somewhat subjective. The author's subjectivity and influence is unavoidable although every effort has been made to ensure neutrality by ensuring each relationship is supported by literature. This subjectivity can be confounded as the case study reviews progress and the CLDs are developed iteratively.

It is important to acknowledge that the relationships modelled in the CLDs cannot always be considered certain. In all cases the relationships represented are the most likely scenarios with a high confidence

level. However, in systems as complex as this, relationships may be reversed, non-existent, or of a different level of impact.

Another challenge is that relationships between variables in the enabling environment are in continual flux. This system is complex and represents an extremely broad network of interactions. As context changes over time, and as development progresses, these relationships evolve.

There is also a lack of a time dimension in the network. The time taken to make change at a variable, and time taken for this change to propagate around the system varies significantly. However, this is highly complex to measure and interpret, so has been omitted from the CLDs but considered in the analysis and subsequent discussion.

These challenges must be considered in the analysis. Some solutions may be more or less implementable and relevant depending on the project and environment.

4.7. Chapter summary

This chapter explains the process of developing the M-CLD. The following key points have emerged:

- A staged process using D-CLDs to build the M-CLD is effective at breaking down a highly complex and inter-connected system into more management and easily interpretable systems.
- Six dimensions organically emerged from the enabling environment, which can each be depicted as standalone systems, with their own variables and relationships.
- Every dimension links to every other dimension, indicating the high level of system complexity.
- The M-CLD is demonstrated as a random network through peer review, ERGM, and CUG tests, and therefore can be trusted as a reliable platform for the following work.
- NA has identified 23 variables with high influence, with potential to become leverage points.

5. CASE STUDIES

This chapter gives an overview of the case studies examined, and subsequently explores each in detail. The detailed analysis offers an explanation of the enabling environment, project overview, findings, analysis including the PA, EEA, and C-CLDs, and finally a discussion which explores the results.

5.1. Case study summaries

This chapter explores seven case studies: the Blue Gold Program (Bangladesh) which explores infrastructure to increase coastal resilience; the Char Development and Settlement Project (Bangladesh) which aims to increase land ownership and resilience in coastal areas; the Indravati Dam (India), a hydropower project to provide energy and irrigation; Lifewater (Ethiopia), an NGO providing water and sanitation to remote communities; Sabre (Ghana), an NGO improving school infrastructure and educational sector policies; the Small Town Water and Sanitation Sector Project 2 (Nepal) which provides water and sanitation, and strengthens governance; and the Urban Governance and Improvement Project 2 (Bangladesh) which improves governance in municipalities across Bangladesh.

The location of the seven case studies is shown in Figure 11.

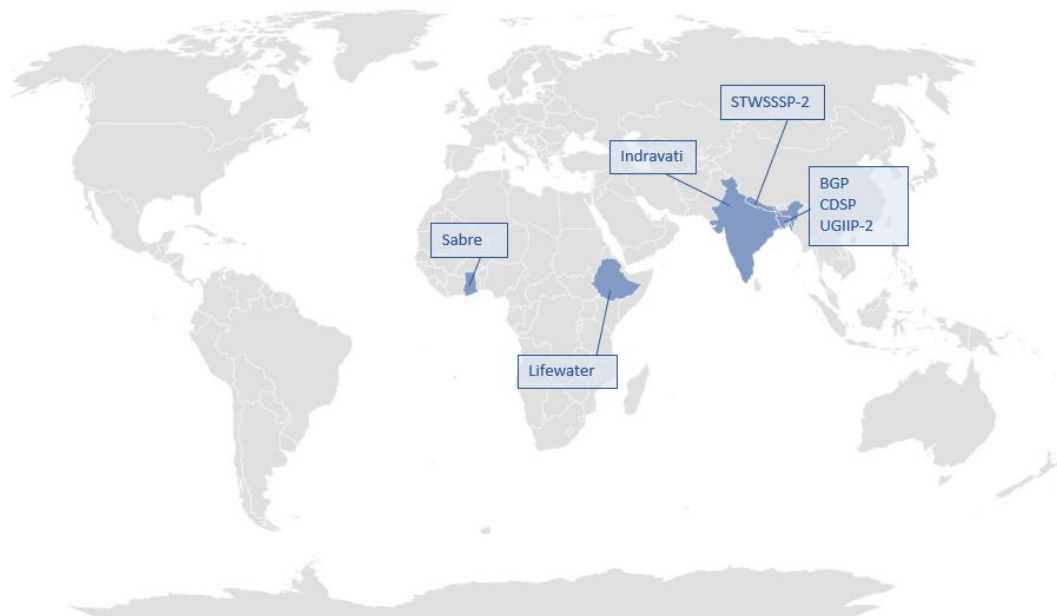


Figure 11 - Location of case studies shown on world map.

The fundamental characteristics of each case study are summarised in Table 5.

Table 5 - Fundamental characteristics of each case study.

Project name	Organisation	Organisation type	Region	Country	Project scale	Location	Sector	Funder	Leadership
Blue Gold Project (BGP)	Mott MacDonald	Engineering consultancy	South Asia	Bangladesh	Regional	Rural	Agricultural development Educational programmes Income and economic development Institutional capacity building/strengthening Socio-economic development Water infrastructure	National government International government	Community led
Char Development and Settlement Project (CDSP)	Mott MacDonald	Engineering consultancy	South Asia	Bangladesh	Regional	Rural	Agricultural development Educational programmes Institutional capacity building/strengthening Socio-economic development Water infrastructure	National government International government	Community led
Indravati Dam	World Bank	Development bank	South Asia	India	Regional	Rural	Energy Hydroelectric Irrigation Water infrastructure	Development bank State government	Authority led

Lifewater WASH Programme	Lifewater	NGO	Sub-Saharan Africa	Ethiopia	Local	Rural	Hygiene education and behaviour change Sanitation infrastructure Socio-economic development Religion WASH Water infrastructure	NGO	Community led
	Sabre	NGO	Sub-Saharan Africa	Ghana	Local National	Rural	Education Educational programmes Governance and policy School infrastructure Teacher training	NGO	Community led
	Asian Development Bank (ADB)	Development bank	South Asia	Nepal	Regional	Urban	Educational programmes Governance and policy Hygiene education and behaviour change Income and economic development Institutional capacity building/strengthening Sanitation infrastructure Socio-economic development Water infrastructure	Development bank National government	Authority led
Second Small Towns Water Supply and Sanitation Sector Project (STWSSSP-2)									

Urban Governance and Infrastructure Improvement (Sector) Projects (Second) (UGIP-2)	Asian Development Bank (ADB)	Development bank	South Asia	Bangladesh	Regional National	Urban	Governance and policy	Income and economic development Institutional capacity building/strengthening Sanitation infrastructure Socio-economic development Urban infrastructure Water infrastructure	Development bank National government International government	Authority led

Project name	Scale	Part of a larger programme?	Who initiated project/ identified need?	Other defining characteristics	Specified purpose of project	Were objectives considered to be met?
Blue Gold Project (BGP)	Decentralised	No	Government	Project motivated by climate.	Protection from environmental risks.	Yes. All planned infrastructure implemented.
Char Development and Settlement Project (CDSP)	Decentralised	Yes	Government	Project motivated by climate. Community participation.	Protection from environmental risks. To give rights to landless people.	Yes. Infrastructure built. Land rights allocated. Community groups implemented.
Indravati Dam	Centralised	No	Government	Resettlement and detrimental socio-economic impacts.	Energy generation. Irrigation for local landowners.	No. Irrigation part of project never completed.
Lifewater WASH Programme	Decentralised	No	NGO	Incentive driven. Incentives for self-driven change - need to meet criteria for qualification for project. Community participation.	To provide water, sanitation, and hygiene education to rural communities.	Yes. WASH infrastructure provided. Incentivisation approach deemed successful.

Sabre Education Programme	Decentralised	Yes	NGO	Community participation.	To build schools in villages without access. To improve national education policy.	Yes. Very well met. Exceeded expectations through government policy support.
Second Small Towns Water Supply and Sanitation Sector Project (STWSSSP-2)	Centralised	Yes	Government	Incentive driven with mandated targets. Incentives for self-driven change - need to meet criteria for qualification for project. Resettlement. Work to safeguard minorities.	To increase water and sanitation coverage in small towns. To strengthen governance capacity.	Partially. Sanitation part of project not delivered, and not all water supply targets met.
Urban Governance and Infrastructure Improvement (Sector) Projects (Second) (UGHIP-2)	Centralised	Yes	Government	Incentive driven with mandated targets. Incentives for self-driven change - need to meet criteria for qualification for project. Climate change and natural environment a driver for infrastructure development. Community participation.	To provide urban infrastructure and services to meet the growing urban population.	Yes. Deemed to have a positive socio-economic impact and incentivisation considered to have improved performance.

The following sections review the seven case studies in further detail.

5.2. Case study data availability

This section gives a high-level summary of the extent of data available for each case study.

Table 6 - Table detailing case study data availability.

Project name	Data type (data source, data characteristics)	Data quantity/ availability	Comment
Blue Gold Project (BGP)	Semi-structured interview (primary, qualitative) Project documents (secondary, qualitative, quantitative) Data published on project website (secondary, qualitative, quantitative)	Excellent	A large amount of both primary and secondary data. A central project contact was available for interview. Most sources were internal project documents, though which are now open-source following project completion.
Char Development and Settlement Project (CDSP)	Semi-structured interviews (primary, qualitative) Project documents (secondary, qualitative, quantitative) Book publication (secondary, qualitative)	Excellent	A large amount of both primary and secondary data. Key project contacts were available for interview. A book published about the project and lessons learned was a rich source of information.
Indravati Dam	Semi-structured interviews (primary, qualitative) Project documents (secondary, qualitative, quantitative) Data published on Government website (secondary, qualitative, quantitative)	Good	A good amount of primary and secondary data was available. However, the age of the project made sourcing project documents difficult compared to other case studies, as not all project documents were computerised at the time. Therefore, the amount published online was reduced compared to more recent projects.

Lifewater WASH Programme	Semi-structured interviews (primary, qualitative)	Very good	A very good amount of primary and secondary data was available. Key project contacts were available for interview. The Lifewater website provided a useful source of varied information. Internal project documents were made available.
	Project documents (secondary, qualitative, quantitative)		
	Data published on project website (secondary, qualitative, quantitative)		
Sabre Education Programme	Semi-structured interviews (primary, qualitative)	Very good	A very good amount of primary and secondary data was available. Data was available from multiple organisations involved in project delivery: Arup, the designer of the school blueprint, and Sabre, the leading organisation, which provided multiple organisational perspectives of the project.
	Project documents (secondary, qualitative, quantitative)		
	Peer reviewed article publications (secondary, qualitative)		
Second Small Towns Water Supply and Sanitation Sector Project (STWSSSP-2)	Semi-structured interview (primary, qualitative)	Good	A good amount of primary and secondary data was available. Detailed project reports were available. A key project contact was available for interview. Publicly available documents were limited.
	Project documents (secondary, qualitative, quantitative)		
Urban Governance and Infrastructure Improvement (Sector) Projects (Second) (UGIIP-2)	Semi-structured interview (primary, qualitative) Project documents (secondary, qualitative, quantitative)	Good	A good amount of primary and secondary data was available. Detailed project reports were available. A key project contact was available for interview. Publicly available documents were limited.

Overall, data completeness was very good and a variety of data types was available for each case study, ensuring multiple sources of evidence for consideration and comparison. All case studies used both primary and secondary data sources, ensuring comparable data. Varied numbers of project documents were available, dependent on the project.

Projects delivered by development banks had a greater availability of high-level project documents such as completion reports and financial statements, as well as formal surveys such as environmental surveys, likely as the available information conformed to organisational standards and templates of data transparency and data to be made available. This was useful for direct comparison between case studies. Alternatively, NGO led projects had information available from a wider range of perspectives and data formats, which was valuable to offer a wide range of insights.

Indravati posed a unique challenge due to the age of the project. Availability of documents online was limited as they had not been computerised at the time of project delivery, and only selected documents had been uploaded and made publicly available.

5.3. Case study interview participants

Semi-structured interviews were used to gather primary data for each of the seven case studies. Participants were chosen due to their extensive experience of the projects, and the flexible semi-structured interview format allowed a wide range of subjects to emerge in the discussion.

Table 7 lists the participants and allocates naming codes to maintain anonymity throughout the following chapter and clearly indicate references to primary data, in accordance with the methodology used by Cañavera Herrera and MacAskill (2021). Table 7 also identifies the organisations of the participants to ensure any potential biases and perspectives are transparent.

Table 7 - Interview participants.

Project	Organisation	Interviewee code
Blue Gold Program	Mott MacDonald	INT-1
Blue Gold Program	Mott MacDonald	INT-2
CDSP	Mott MacDonald	INT-3
Indravati	World Bank	INT-4
Lifewater	Lifewater	INT-5
Sabre	Sabre	INT-6
Sabre	Arup	INT-7
STWSSSP-2	Asian Development Bank	INT-8
UGIIP-2	Asian Development Bank	INT-8

5.4. Blue Gold Program (BGP)

5.4.1. The enabling environment

Three case studies are located in Bangladesh: the Blue Gold Program (BGP), Char Development and Settlement Project (CDSP-IV), and the Urban Governance and Improvement Project 2 (UGIIP-2).

Bangladesh is one of the most vulnerable countries to climate change in the world, despite measures to improve climate resilience over multiple decades (World Bank, 2022b). The low-lying coastal regions are particularly exposed, and vulnerability to adverse climatic conditions and sea level rise is worsened by high levels of poverty (Shahed et al., 2016), where both BGP and CDSP-IV are located.

Bangladesh has been hailed by the World Bank and others as a ‘model for poverty reduction’, and has ambitions to reach developed status by 2041 (World Economic Forum, 2022). The government has implemented a long-term development plan, known as PP2041, constituting a combination of economic and social objectives, including plans to increase coastal resilience (GoB, 2020).

Economic stability is increasing, however continues to be challenged by factors such as political unrest, a stagnated government, inadequate infrastructure, reduced public investment, and poorly functioning institutions (Herbert, 2019; World Bank, 2018). There remain high levels of poverty and wealth inequality (ADB, 2023). Access to services and social security is limited for the poor, and there is a large wealth divide between rural and urban populations (Titumir, 2021). The National Social Security Strategy (NSSS) was implemented in 2015 to improve social equality and protection (GoB, 2020).

Although a theoretical democracy, leadership is becoming increasingly authoritarian, which challenges the necessary environment for economic and social development (Herbert, 2019). Governance is hierarchical and decentralised into local regions each with their own power and responsibilities (Jamil & Panday, 2012). However, effective governance is challenged by corruption and clientelism, low funding, and top-down decision-making (Herbert, 2019).

Infrastructure and services in Bangladesh are underdeveloped and inadequate, which is hindering economic development (Dawood, 2019; Titumir, 2021). Infrastructure is typically funded by tax revenue, but tax income is mostly diverted elsewhere to address more urgent needs; subsequently funding is a limiting factor to infrastructure development (Titumir, 2021).

5.4.2. Background and project description

BGP aims to improve the lives and livelihoods of approximately 800,000 people living in the coastal zones of south-west Bangladesh, where livelihoods are threatened by adverse climatic conditions and particularly flooding. A network of embankments aims to protect the area, but breaches can cause irreparable damage to homes and land, loss of income from agriculture, loss of infrastructure, and loss of life. (BGW, 2021h)

BGP cites its overall objective as: ‘To reduce poverty for 190,000 households living in 119,224 ha area of selected coastal polders by creating a healthy living environment and a sustainable socio-economic development.’ (Blue Gold Program, 2021b), and aimed to address this through a combination of physical, educational, and social infrastructure (BGW, 2021h). The approach centred around the concept of ‘water management for development’, using Participatory Water Management approach (PWM) for community driven development (BGW, 2021h).

The project began in March 2013 and completed in December 2021 (BGW, 2021a).

Many data sources refer to Blue Gold Program Wiki (BGW). This is an online database of all project information, compiled by the Technical Assistance (TA) team made up of international and national consultants, to produce a comprehensive project summary with the aim of making lessons learned publicly available. This resource includes all project documents.

5.4.3. Need for the project

The primary problems faced by the communities prior to the project were:

- Vulnerability to climate change
- Water insecurity
- Riverbank erosion and tidal flooding
- Drainage congestion
- Sediment congestion
- Salinity of water for farming
- Lack of irrigation

(Blue Gold Program, 2021b; Mott MacDonald and EKN, 2022)

Before BGP, embankments were washed away each year during monsoon season, causing flooding of saline sea water across farmland. Neither physical or institutional water management infrastructure existed to manage this or the associated risks. (Herbert, 2019; World Bank, 2022a)

5.4.4. Infrastructure implemented

BGP’s ‘water management for development’ strategy comprised three workstreams; physical, institutional, and agricultural development.

Physical infrastructure

Infrastructure implemented was split into water management and drainage infrastructure. Water management infrastructure comprised construction, restructuring and re-sectioning of 330km of embankments, and construction and repair of regulators and sluices. Drainage infrastructure comprised re-excavation of drainage channels to remove sediment and plant congestion. (BGW, 2021e).

Institutional development

A PWM approach was used to pass responsibility for water management to communities. BGP's PWM initiative involved: community consultation, establishing Water Management Organisations (WMOs) and strengthening capacities within WMOs, increasing female participation and gender equality, and establishing a water management partnership between WMOs and government departments and the private sector. (BGW, 2021j)

Agricultural development

The purpose of agricultural development was to strengthen farming practices and income generation. 1,358 Field Farmer Schools (FFS) were implemented to provide agricultural education across several farming disciplines, including farming in different sectors, water management methodologies, crop diversification, business skills, market knowledge, and connecting to the private sector. (BGW, 2021i)

5.4.5. Delivery

Organisations and responsibilities

The project was delivered through a collaboration between the Government of Bangladesh (GoB) and the Embassy of the Kingdom of the Netherlands (EKN), which has a diplomatic mission in Bangladesh. Specifically, within the GoB; the Ministry of Water Resources (MoWR), which formulated policies and regulations relating to the development and management of water resources, and the Ministry of Agriculture (MoA), which oversaw policies relating to agricultural development. The implementing agencies within the MoWR was the Bangladesh Water Development Board (BWDB), and the Department for Agricultural Extension (DAE), respectively. (BGW, 2021i; Blue Gold Program, 2021b)

At the local level, Local Government Institutions (LGIs) such as Union Parishads (UP), the smallest form of LGIs, form the local governance and link between farmers and government departments. The UPs advised the WMOs formed under the BWDB. (BGW, 2021d; Mott MacDonald and EKN, 2022)

Mott MacDonald were employed as the lead technical consultants. A TA team was created with responsibility for design, made up of international and national experts and consultants employed to support all aspects of the programme and guide development in the polders (Blue Gold Program, 2021a).

Within WMOs, Water Management Associations (WMAs) were established to manage water at the polder level, and Water Management Groups (WMGs) at the catchment level (INT-1). These groups consisted of members of the community responsible for managing, operating, and maintaining infrastructure (BGW, 2021j), and promoted increased participation of women (BGW, 2021c).

Despite the number of organisations involved, there is a long-established resistance to knowledge sharing and collaboration between government departments (INT-1).

Local Labour Contracting Societies (LCSs) were employed for many of the construction contracts. LCSs were formed of a group of disadvantaged and usually landless people, with the intention of providing a secure source of income for the poorest, who otherwise would likely be employed in the informal sector. LCSs were also inclusive of women, and aimed to empower women and provide them with additional skills to contribute to farming, management of the homestead, and economic knowledge. (BGW, 2021b)

Programme and budget

The total budget for BGP was EUR 75.3 million, funded by the GoB and EKN; approximately 18.7% and 81.3% respectively.

The project ran over eight years from March 2013 to December 2021, exceeding the original five-year programme (Blue Gold Program, 2021a). Delays were experienced due to design changes and delays releasing funds. (INT-2)

Surveys

Baseline surveys were conducted between 2013 and 2015 during the early stages of the project to understand the prevailing socio-economic situation and agricultural practices in the polders (Mott MacDonald, 2015). A mid-project survey was conducted in 2017 which reported positive progress (Blue Gold TA, 2018). Following project completion, WMG surveys were carried out to assess outcomes according to end users and beneficiaries, discussed in Section 5.4.6 (BGW, 2021f).

Community involvement

BGP used a Participatory Water Management approach (PWM), where BGP constructed infrastructure and simultaneously trained local communities, in order that communities could self-managed infrastructure following project completion (BGW, 2021h).

WMGs were formed of community members, and programmes to educate and transfer skills were offered to people within the local community (BGW, 2021j, 2021m).

O&M is the responsibility of WMGs and WMOs, with support from the BWDB. However, neither have sufficient finances to cover O&M costs, or the necessary skills capacities. (BGW, 2021m)

Design

Budget significantly affected the design of the infrastructure: polders requiring high levels of investment were excluded, and embankment crest levels to meet the 25-year return period maximum surge height were unachievable in new or upgraded embankments. (BGW, 2021l)

Design was also challenged by a high-level knowledge gap in the morphology of the rivers, and the accretion and erosion patterns in the region. This was worsened by a lack of knowledge sharing between agriculturalists and engineers within different government departments. (INT-2)

5.4.6. Outputs and outcomes

Overall, the project improved the livelihoods of approximately one million people in 200,000 households, and made infrastructural improvements to 22 polders covering an area of approximately 119,000 ha (Herbert, 2019).

Table 8 details the high-level project outputs and outcomes.

Table 8 - BGP project outputs and outcomes.

	Output	Outcome
Physical infrastructure	139 coastal polders created, new embankments constructed, and pre-existing embankments reconstructed (Blue Gold Program, 2021b; Mott MacDonald and EKN, 2022).	Water management and regulation has improved (Blue Gold TA, 2021).
		Drainage, crop production, and irrigation have improved; and salinity has reduced (Blue Gold TA, 2021).
	Drainage outlets and irrigation inlets constructed and repaired (Mott MacDonald and EKN, 2022).	Drainage of low-lying lands has improved, and irrigation of high land is possible (Blue Gold TA, 2021).
	Flow regulators and sluices built, reconstructed, and repaired (Mott MacDonald and EKN, 2022).	Water management and regulation has improved (Blue Gold TA, 2021).
	Reduced salinity of water (Mott MacDonald and EKN, 2022).	Reduction in soil salinity enabled increased crop production (Mott MacDonald and EKN, 2022).
		99% of households have access to clean water (BGW, 2021g).
Institutional capacity building	Strengthened capacity and management skills of WMOs, WMGs, and WMAs (BGW, 2021n).	Responsibility of management, O&M, and financing of infrastructure remains at the local level (unless considerable extra

		resources required) (Mott MacDonald and EKN, 2022).
		WMGs and WMAs have become the drivers of economic development in the polders through organisational management and adoption of modern technologies, and as a link to markets (BGW, 2021f).
		Communities and community groups have more involvement and autonomy over improvements and maintenance of water infrastructure (Mott MacDonald and EKN, 2022).
	Increased female representation on WMO and WMA committees: 43% of members are women (Mott MacDonald and EKN, 2022).	Improved gender equality, and increased decision-making power for women (Mott MacDonald and EKN, 2022).
	Strengthened relationships between WMOs and local government (Mott MacDonald and EKN, 2022).	Funding and support available for management and maintenance of infrastructure that could not be achieved with locally available resources alone (Mott MacDonald and EKN, 2022).
Agricultural development	Education provided by FFSs regarding homestead farming, crop production and commercialisation (Mott MacDonald and EKN, 2022).	Improved farming skills, increased crop yield, yield of high value crops, resulting in increased household income and increased food security (Mott MacDonald and EKN, 2022).
		Increased household income resulting in households reinvesting in farming, spending more on children's education, improved housing, and increased saving (BGW, 2021k).
	Increased number of women employed in agriculture, and a reduced male/female pay gap (Blue Gold TA, 2021)	Improvements in gender equality, contribution to household income more evenly distributed, and consequent reduction of economic risk (Blue Gold TA, 2021).

5.4.7. Findings

Table 9 details factors which proved to be influential in the case study. It explains how these factors shaped the enabling environment, the subsequent impact to infrastructure and services, and ultimately the effect on need.

Table 9 – BGP: Linkages between key influences, the effect on infrastructure and services, and need.

Influence	How does this shape the enabling environment?	How does this effect infrastructure services and implementation?	How does this effect ability to meet need?
Institutional capacity	· Planning and foresight within government departments was weak.	· Without strong governance projects cannot be planned properly and a long-term development strategy or infrastructure plan is unlikely to be in place.	· Sustainable development of the population is less achievable without a long-term development plan.
	· The government investment schedule was rigid.	· Improper planning meant that no budget was allocated to land acquisition or new embankments needed as a result of changing scope.	· New water infrastructure risked falling into disrepair without the necessary resources to maintain it.
	· Human resources and skills capacities were inadequate.		
Resistance to integration of government departments	· Engrained preference for single-discipline approaches, and resistance to a multi-disciplinary approach to development.	· Implementation is made more difficult and slower as decisions must pass through multiple departments and organisations.	· Slower delivery delays time for services to reach those in need.
	· Resistance to knowledge sharing between government departments.	· Tensions and bureaucratic ambiguities limit efficiency and what can be achieved.	· Best practices may be missed due to lack of knowledge sharing, which prevents best solutions reaching those in need.
International relations	· GoN had an interest in helping increase Bangladesh's coastal resilience, therefore grants and expertise were made available.	· Increased funding available for projects.	· Funding allowed projects to be implemented.

		· Knowledge available to support internal skills.	
Policy and regulation	· Bangladesh has rigorous development policy in place: PP2041 sets out development goals, and previous 5-year plans have helped Bangladesh achieve good economic development.	· BGP had high level support for its work.	· Without proactive development policy projects are less likely to happen, and the holistic needs of the population are less likely to be met.
	· The government's long-term development plan includes social protection measures to protect the poor and vulnerable.	· Infrastructure and services can be designed specifically to improve social wellbeing.	· Infrastructure more likely to meet need if conception and design reflects objectives as set out in socio-economic policies.
Project financing	· GoN provided a grant which enabled GoB to plan and implement projects.	· No need to repay grant. Took pressure off a repayment model built into service charges.	· Does not pass costs on to end user, helping to ensure affordable services.
	· GoB had poor financial planning.	· Projects difficult to plan with poor financial planning and funding timeline.	· Ongoing operation of services may be affected by restricted funding.
		· Infrastructure, services, and programmes cannot be delivered due to budget constraints.	
Poverty	· High levels of poverty in coastal areas.	· Costs of infrastructure and services must be funded or affordable to local people.	· Risk that agriculture focused interventions benefit landowners and farmers more than landless, therefore increasing inequality.
	· High levels of inequality in socio-economic aspects including income, opportunities, and welfare.	· Costs of O&M and resources required must be affordable.	· Higher rates of poverty mean needs gap is higher.

		· Facilitating and social infrastructure needed to increase skills and opportunities for the poor.	
Community engagement	· Community engagement and investment in BGP project.	· Communities took ownership over the infrastructure and were subsequently more likely to maintain it.	· Motivated people were more likely achieve positive changes.
	· Communities were motivated to improve their quality of life.	· Communities participated in WMGs and WMAs which helped maximise the long-term impact of BGP infrastructure and interventions.	· Can have a reinforcing affect over time as changes and improvements are evidenced.
	· Community demonstrated engrained gender norms.	· Design of infrastructure and the supporting programmes reflected women's needs, with some initiatives specifically aimed at women, whilst balanced with cultural gender norms.	· Women's knowledge base was increased to enable them to participate in income generating activities and farming.
Natural environment	· A volatile natural climate and harsh weather conditions shaped the environment within which services had to be delivered.	· Design was driven by the requirement to withstand the natural environment.	· Infrastructure may no longer be fit for purpose as the climate changes and needs change in the future.
	· Exposure to cyclones, flooding, and other extreme weather made the coastal areas vulnerable.	· Climatic conditions may change in the future, but it is difficult to design infrastructure without a clear understanding of future conditions.	
		· There is a continuously increasing and returning demand for infrastructure as the landscape changes and	

		embankments become damaged or eroded.	
Agriculture and livelihoods	· Primary income and livelihood source in the coastal areas.	· The interventions under BGP were most advantageous for landowning farmers.	· Improvements in yield increased income, which was reinvested in both agricultural and non-agricultural enterprises.
	· Low income from agriculture is resulting in outward migration from coastal to urban areas.	· BGP educational programmes included many aimed at farming practices, specifically FFSs.	· Outwards migration due to low wages in agriculture changes the social demographic and socio-economic opportunities.
		· Infrastructure required to protect farmland and subsequently protect livelihoods and income.	· The interventions affect and benefit households in different ways and to different extents depending on whether they are farmers or landowners, or are involved in agriculture or not.

5.4.8. Data analysis

The results firstly explore the project performance in the PA results, and subsequently the interactions between the enabling environment and project in the EEA results and the C-CLD.

5.4.8.1. Project appraisal (PA)

This section details the results of the PA. The methodology behind this can be found in Section 3.5.1.1.

Performance by criteria

Performance is shown against each criteria individually. The framework revealed good overall project performance. 70% of criteria were met, including 10% showing exceptional performance. The project failed to meet 4% of criteria, and only achieved partial success in 24% of criteria. 1% criteria were non-applicable.

Three criteria were not met, shown in Table 10.

Table 10 – BGP: Lowest performing criteria; not met.

Dimension	Goal	Criteria	BGP
Service delivery	Contingency plans are in place to cope with service disruptions.	Alternative services are available to temporarily meet demand in the event of failure.	2
Service delivery	Delivery milestones are met.	Project was delivered to programme.	2
Service delivery	Delivery milestones are met.	Project was delivered to budget.	2

Seven criteria showed exceptional performance, shown in Table 11 below.

Table 11 – BGP: Highest performing criteria; scoring exceptional.

Dimension	Goal	Criteria	BGP
Governance	Stakeholders are fairly represented.	Community and those served by services are involved, represented, and empowered.	5
Infrastructure	Infrastructure is fit for purpose.	Infrastructure is appropriate in context.	5
Infrastructure	Infrastructure is fit for purpose.	Infrastructure meets codes, standards, and regulations.	5
Service delivery	Universal access to services.	Service is accessible to poorest, vulnerable or minority groups.	5
Social value	Alignment with local culture and values.	Community and end users have been consulted.	5
Contribution to development	Service contributes to social development.	Service supports local livelihoods.	5
Contribution to development	Lessons learned benefit future projects.	Lessons learned are being applied to future work.	5

Performance by goal

The 24 goals break the six dimensions into component themes, to allow comparison at a more granular level. Figure 12 shows the performance score of each goal calculated by the average score of all component criteria, on a scale of 0 to 5, rounded to one decimal place. The parent dimension of each goal is also shown.

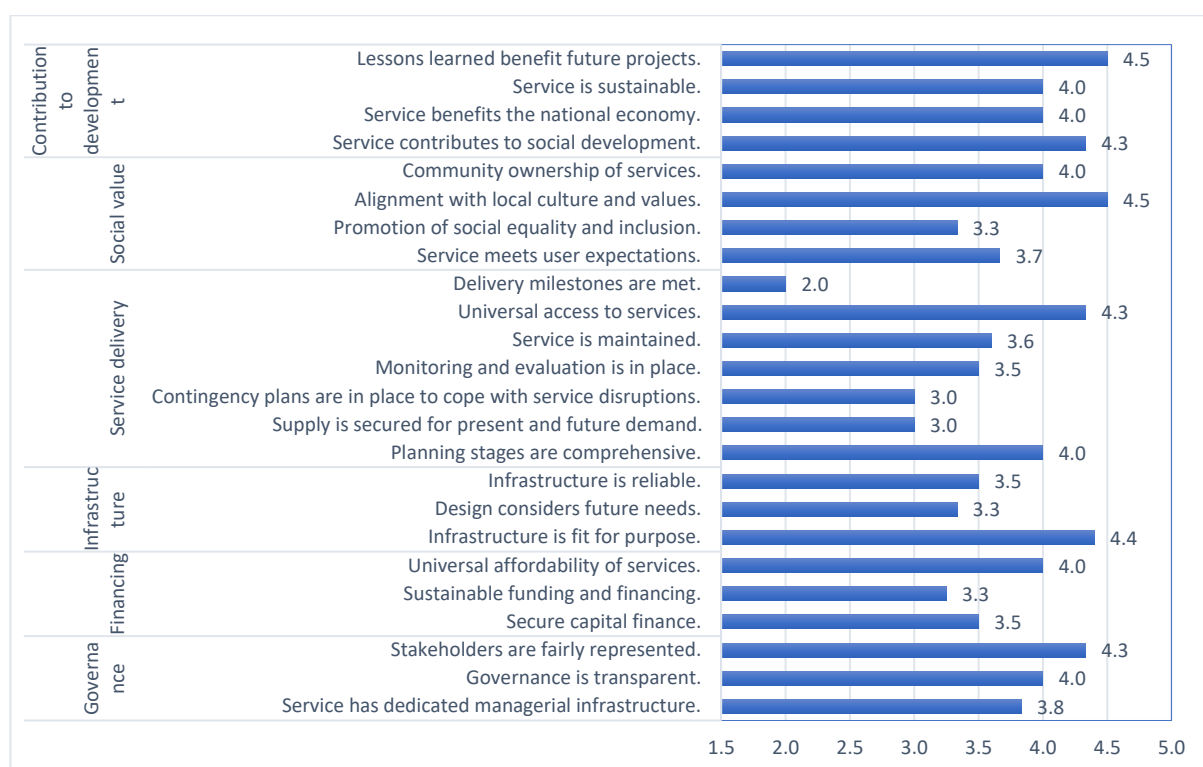


Figure 12 – BGP: Bar chart showing performance score of each goal, calculated by the average of component criteria.

Lessons learned benefit future projects and *alignment with local culture and values* score best, at 4.5/5. The first belongs to the *contribution to development* dimension, which scores well overall. The second belongs to the *social value* dimension, but is considerably higher than two goals in this dimension, thus is considerably higher than the overall dimension performance score. *Delivery milestones are met* was the poorest performing goal, belonging to the *service delivery* dimension; also, the poorest performing dimension.

Performance by dimension

Table 12 shows performance by dimension, shown as percentage of total points achieved.

Table 12 - BGP: Performance by dimension in descending order.

Dimension	Percentage score
Contribution to development	84
Governance	80
Infrastructure	78
Social value	76
Financing	70
Service delivery	69

The *contribution to development* dimension performed best scoring 84%. *Governance* also scored well, achieving 80%. The service delivery dimension showed poorest performance, scoring 69%. The range of scores is 15%.

5.4.8.2. Enabling environment appraisal (EEA)

The completed EEA in Table 13 shows influences within the enabling environment scored as low, medium, or high. Further information regarding the structure of the EEA can be found in Section 3.5.1.2.

Table 13 – BGP: EEA results table. Variables scored on a scale through low, medium, and high, structured by dimension.

Institutions and governance		Economic	
Alignment between actors	M	Ability of states to self-generate income	N/A
Centralised policy	N/A	Aid	L
Civil liberties	N/A	Borrowed finance	N/A
Clear vision for the future	M	Capital finance	H
Clientelism	L	Economic globalisation	N/A
Closeness of inter-national relationships	N/A	Economic growth	N/A
Collaborative inter-organisation relationships	H	Economic stability	N/A
Conflict	N/A	Economic strength	N/A
Conflicting stakeholder motives	M	Employment opportunities	L
Consistent behaviour	L	Grants	M
Corruption	N/A	Household income	M
Decentralisation of decision making power	L	International trade	N/A
Decentralisation of governance	L	Investment in research	N/A
Decentralised policy	L	Investment opportunities	N/A
Deliver manifesto	N/A	Investor confidence	N/A
Democracy	N/A	Investor interest	N/A
Disparities between provinces	M	Loans	N/A
Electorate influence	N/A	Local economic growth	M
Fair political and policy decision making	L	Local industry	N/A
Free media	N/A	Local resources	N/A
Geographical advantage	N/A	National industries	N/A
Geographical proximity to other countries	N/A	Poverty	M
Government motivated by development	L	Private investment	L
Growth and capacity building of local	M	Private property rights	N/A
Institutional capacity	H	Privatisation	N/A
Inter-government collaboration	M	Provincial financial autonomy	L
Political change	N/A	Public funds	M
Political parties incentivised to align with public opinion	N/A	Public investment in infrastructure and services	M
Political self-interest in inter-national	N/A	Public revenue	N/A
Political stability	L	Reliance on other economies	N/A
Power struggles	L	Remittances	N/A
Provincial autonomy over implementation and management of infrastructure and services	L	Risk for investors	N/A
Public confidence in institutions and	N/A	Unemployment	L
Resistance to integration of government	H	Value of personal assets	M
Rules and regulations followed	L	Wealth divide	M
Rules and regulations in place	L		
Sectoral policy	N/A		
Shared natural resources	N/A	Development	
Social unrest	N/A	Desire for infrastructure development	M
Stable government	L	Economically motivated development agenda	N/A
State capture	N/A	NGO support	L
State stability	N/A	Respect for human rights	L
Strategic location for trade and protection	N/A	SDGs met	L
Strong leadership	N/A	Socially motivated development agenda	M
Transparency	N/A	Trickle-down development policies	N/A
Votes	N/A	Trickle-up development policies	L
Voting rights	N/A		

Social		Natural environment	
Access to better paid work	N/A	Available natural resources	N/A
Behaviour change	M	Climate change	H
Brain drain	N/A	Climate migration	L
Caste system	N/A	Commodifiable crops	M
Changing role of women in society	H	Consistent agricultural production	M
Citizen's power	L	Environmental degradation	L
Community and family resilience	H	Food security	M
Community engagement	H	Likelihood of extreme weather events	H
Demographic changes	L	Physical limits of service provision	L
Diaspora	N/A	Pollution	N/A
Educated population	N/A	Risk to livelihoods	H
Employment in agriculture	H	Variable climate	H
Empowerment	M	Vulnerability of geographical location	H
Engrained social behaviours	L	Vulnerability to weather related disasters and shocks	H
Gender equality	H	Water availability	M
Human capital	L	Water security	L
Informal sector employment	L		
Internal migration and urbanisation	L		
International migration	N/A		
Investment in education	N/A		
Marginalisation of vulnerable and minority groups	M		
Population welfare	M		
Regional inequality	M		
Religion	N/A		
Resettlement	N/A		
School enrolment	N/A		
Skilled workforce	L		
Social equality	H		
Social protection	M		
Strong social relationships	L		
Traditional culture	L		
Urban/rural divide	L		
Vocational training	M		
Worker's rights	L		

Infrastructure and service delivery	
Ability to adapt to external shocks and stresses	H
Access to services	M
Accurate up-front cost and programme estimation	M
Affordable services	L
Aligned business culture and communication	M
Available technology	M
Availability of resources and materials for construction	L
Risk of budget overrun	L
Changing service needs	H
Clear project scope	L
Community managed infrastructure	H
Construction cost	H
Cost of consultants and contractors	N/A
Cost of labour	N/A
Cost of materials	N/A
Decentralised services	M
Design options	H
Efficient delivery	N/A
Engineering and management expertise	M
Fair procurement	L
Feasibility studies	L
Financial return	N/A
Financially motivated stakeholders	N/A
Funding available for O&M	H
Infrastructure output	H
Internal national engineering and management capability	H
Knowledge sharing	H
Easily maintained and operational infrastructure	H
Monitoring and evaluation	L
Needs prioritised in design	H
Opportunities for local businesses	N/A
Opportunities to leapfrog	N/A
Optimal design to meet need	H
Participatory consultation with communities	H
Payment of services through tariffs	N/A
Planned infrastructure pipeline	L
Achievable programme	M
Project budget	H
Quality of infrastructure and services	M
Redundancy in design	M
Reliance on international supply chain	N/A
Resilient infrastructure	H
Service needs gap	M
Services available	M
Skills available for O&M	H

Infrastructure and service delivery (cont.)	
Skills transfer	M
Social infrastructure	H
Subsidised services	N/A
Supplier monopoly	N/A
Sustainable funding model	H
Sustainable services in the long-term	H
Thorough planning	M
Use of international consultants and contractors	M
Use of public or PPP delivery model	M
Use of services	L
Workers available	L

Summary

Dimension		Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery	TOTAL
Applicable	H	3	1	6	6	0	19	35
	M	6	8	7	4	2	15	42
	L	13	5	11	4	4	10	47
Total applicable		22	14	24	14	6	44	124
Percentage variables applicable		47	40	71	88	75	79	63
Non-applicable		25	21	10	2	2	12	72
Total		47	35	34	16	8	56	196

5.4.8.3. Case study CLD (C-CLD)

The C-CLD represents the project enabling environment, and is formed by mapping the results of the EEA onto the M-CLD. The M-CLD is available in Figure 10 and the structural elements of the C-CLD are explained Figure 4.

The level of influence of each variable is represented by circle size on the C-CLD. Variables with no influence are not present; variables of low influence are represented by small circles; variables of medium influence are represented by medium sized circles; and variables of high influence are represented by large circles.

Dimensions are colour coded as per the convention stated in Section 4.2.

The BGP C-CLD is shown in Figure 13.



Figure 13 - The C-CLD for the BGP project, adapted from the M-CLD. Size of circles show level of influence on a low-medium-high scale; larger circles show higher influence. Thickness of connection lines show strength of relationship on a 1-2-3-4 scale; 4 indicates the strongest relationship.

5.4.9. Discussion

A large proportion of the variables in the M-CLD are also present in the BGP C-CLD: 124 of 196 (see Table 13).

The *natural environment* dimension has the highest percentage of variables present in the CLD, with both high prevalence and influence. The *infrastructure and services* dimension is also influential, with 44 of 56 variables present, many with high influence. However, the *institutions and governance* and *economic* dimensions have low representation, and most variables of low influence.

The influential variables identified in the results span multiple dimensions, although there is strongest influence from social factors. Key influences are discussed below.

Infrastructure output and the service needs gap

Physical infrastructure is the primary output of BGP; social and supporting programmes have a reduced role in project objectives compared to other case studies.

The PA revealed that the infrastructure implemented was fit for purpose, and performed particularly well for its appropriateness in context and compliance to codes, standards, and regulations.

The C-CLD shows that the *infrastructure output* variable is of high influence in the network, including strong inward and outward connections. A notable pathway is: increased infrastructure output increases the services available, which increases access to services and decreases the service needs gap. This relationship is shown as part of a larger loop in Figure 14.

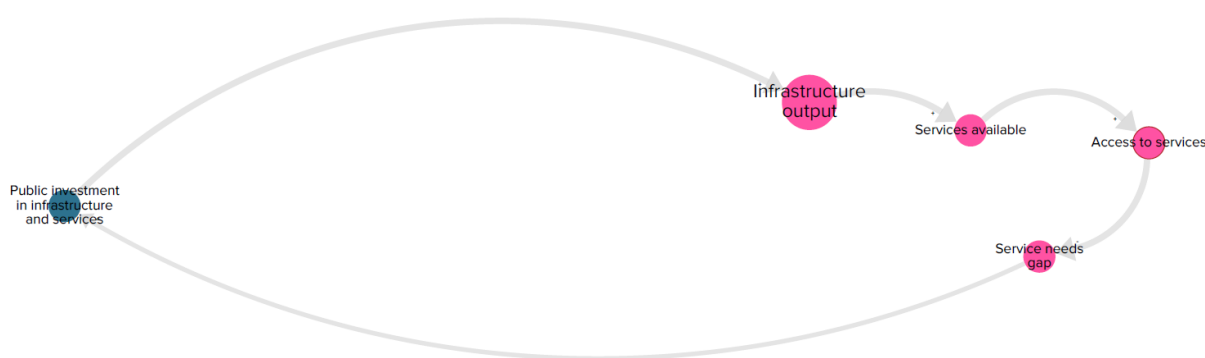


Figure 14 - Loop through infrastructure output.

The financial model was a limiting factor. Although the EKN provided a grant which did not need to be repaid, the project budget limited factors such as embankment design to a 25-year return period. As observed in literature, investment in infrastructure is insufficient in Bangladesh. The project itself also performed poorly in the *financing* dimension of the project appraisal, in particular: insufficient capital available to finance the project, lack of financial strategy for the future, insufficient fund to cover O&M costs, and inability to generate new funds to cover any necessary additional capital costs.

Therefore, the high infrastructure output shows to be of high importance to the success of the project, but could be improved further by more secure and increased finances. The M-CLD shows that increased public investment in infrastructure and services has high influence on infrastructure output, and therefore could be an affective intervention point to achieve this.

Social protection

Social equality was a poorly performing project area. The services only partially met the criteria of serving all community members equally, and discouraging marginalisation of social groups in the PA. The reason for this, is that BGP interventions benefit landowners more than landless people. As landowners' incomes increase, landless people remain economically stagnant, thus the wealth divide grows.

The C-CLD shows a reinforcing loop between social equality and marginalisation of vulnerable and minority groups: as social equality reduces so too does marginalisation, which in turn reduces social equality further. A possible intervention is an increase of social protection measures which can increase social equality. This relationship is shown in Figure 15.

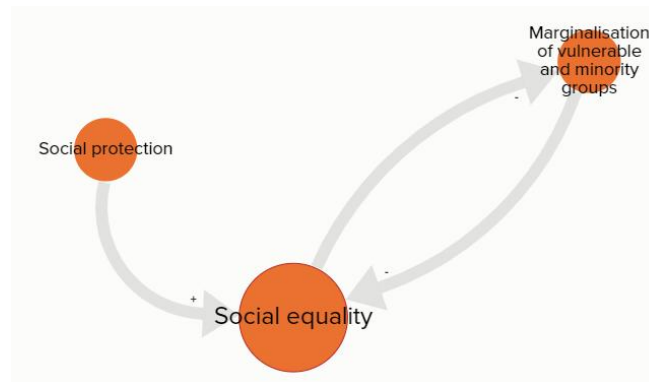


Figure 15 - Loop relating to social protection.

The BGP project prioritised physical infrastructure, so improved supporting social programmes are suggested to bolster the poorly performing social equality and ultimately overall project outcomes.

Social protection is an identified influence point in the M-CLD, and is also considered of high importance to this case study.

Gender equality

A related factor, which shows to be of high influence in both the BGP C-CLD and M-CLD, is gender equality. Addressing gender inequalities was an important initiative within BGP; the supporting programmes encouraged representation of women in community groups and provided education aimed specifically towards women. However, despite high influence, gender equality has a low outdegree in the C-CLD, suggesting it would not be an affective intervention point to further improve project outcome. Notably, the outdegree is higher in the M-CLD, indicating how loss of variables in each case study can break loops and causal pathways, limiting influence of interventions.

Gender equality is also related to community engagement given participation of a new demographic of society: increased gender equality increases community engagement. Community engagement is discussed in the results table as a significant reason for the project successes. It is a high influence variable in the C-CLD, evident in the project as community groups have ownership over the infrastructure, with responsibility for O&M.

Natural environment and risk to livelihoods

The natural environment and vulnerability and risk caused by adverse environmental conditions are a very significant influence on the project. This factor drives the need for the project, to protect the welfare and livelihoods of the local population, and influences the infrastructure design. However, it is

difficult to change adverse climatic conditions, so other intervention points must be sought, which returns to the need for protective infrastructure, and measures in place to protect livelihoods. Figure 16 shows a loop in the C-CLD connecting risk to livelihoods to other influential variables.



Figure 16 - Loop connecting risk to livelihoods to other influential variables.

Risk to livelihoods can be reduced by social protection measures, which itself can be increased by social infrastructure. This is achieved by BGP through social programmes and education, as a form of infrastructure output. Infrastructure output is increased with increased public investment in infrastructure and services, which is high when the service needs gap is large, as in this project. The service needs gap is increased when population welfare is poor, which itself is bad when there is high risk to livelihoods. Therefore, as discussed previously, measures to improve social protection, supported by physical and social infrastructure may be suitable intervention point, may be the most effective way to reduce risk to livelihoods. The *risk to livelihoods* variable is not itself an identified influence point, but it is the factor under threat by adverse environmental conditions, and therefore other means to influence and improve this variable can be employed.

Summary

Numerous influence points are common between the BGP C-CLD and the M-CLD, such as the natural environment, gender, infrastructure output, and the service needs gap. However, there are also some important factors unique to BGP, such as social equality, social protection, and the risk to livelihoods. This suggests that intervention points can be unique to each enabling environment.

Suggested focus points for intervention are listed in Table 14.

Table 14 – BGP: Suggested leverage points and their intended outcomes.

Suggested leverage point	Intended outcome
Focus efforts on quantity of physical infrastructure implemented.	Expand the area that benefits from BGP interventions.
Increased public investment and secure funding for future projects.	Increased infrastructure output and ensure planned projects are delivered.
Social programmes needed to support families that did not benefit directly from infrastructure.	Socio-economic benefit of the project to be enhanced for all. Reduce the unintended increase in social inequality, caused when the socio-economic divide between landowners and landless widened as project benefited landowners more.
Increased community engagement, including involvement of women in community groups and education targeted specifically at women.	Increased female participation and increased gender equality. Community ownership of services, and community responsibility for O&M.
Social protection measures and social support programmes in place to increase resilience against the natural environment.	Mitigate risk to livelihoods caused by the natural environment and adverse climate.

5.5. Char Development and Settlement Project IV (CDSP-IV)

5.5.1. The enabling environment

An explanation of the Bangladesh enabling environment in which CDSP-IV was delivered can be found in Section 5.4.1.

5.5.2. Background and project description

CDSP-IV was a multi-disciplinary development project in south-west Bangladesh, with the central objective to ‘bring about an improvement in the economic situation and in the living conditions of the coastal chars’ (Haider and Jenkins, 2020, pp.4). The focus of the project was development of five chars (newly emerged islands from the sea, known as ‘chars’ in Bangla) covering approximately 26,000 ha with a population of 170,000 people in 29,000 households (Haider and Jenkins, 2020, pp.6).

The char population was newly established, following migration due to loss of their land and homes from erosion in other coastal or riverbank areas. However, the chars themselves were also vulnerable to changing environmental conditions, presenting further risk to livelihoods. (Haider and Jenkins, 2020, pp.2).

The goals of CDSP-IV were to achieve sustainable socio-economic development for the char population, develop an institutional environment to manage CDSP-IV interventions into the future, and improve knowledge in local communities (Haider and Jenkins, 2020, pp.4).

In order to meet these goals, the project comprised six component parts: protection from climate change, climate resilient infrastructure, land settlement and titling, livelihood support, institutional development, and knowledge management (Haider and Jenkins, 2020, pp.22).

This CDSP-IV project is the fourth in a series, known as CDSP (Haider and Jenkins, 2020, Chapter 2). CDSP-I begun in 1994, followed by CDSP-II and III (Haider and Jenkins, 2020, pp.6). In 2011 CDSP-IV was begun with an initial completion date of December 2018 (Haider and Jenkins, 2020, pp.6), later revised to and completed in 2024 (INT-3). The location of each CDSP phase is shown in Figure 17.

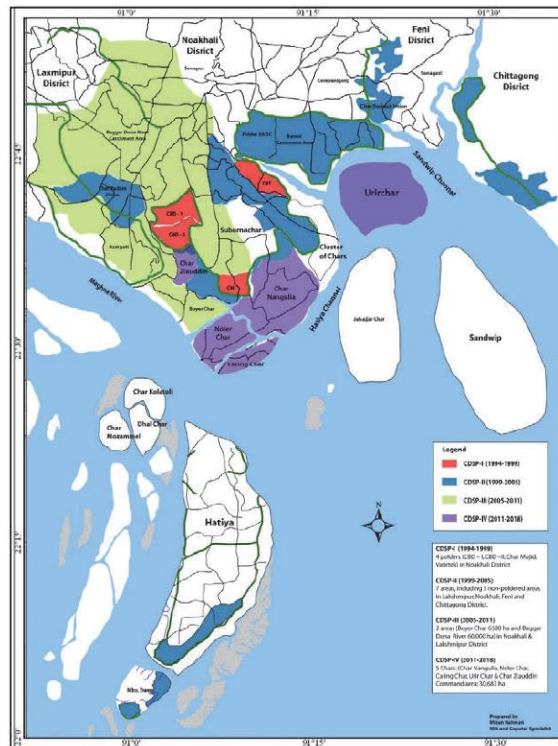


Figure 17 - Map showing location of CDSP phase I, II, III and IV (Haider and Jenkins, 2020, pp.9).

5.5.3. Need for the project

The key problems identified in the pre-project stages were as follows.

Inadequate physical infrastructure failed to protect the population from harsh coastal conditions and flooding, failed to provide accessible drinking water or safe sanitation facilities, provided poor access to cyclone shelters, and provided poor quality road infrastructure (CDSP-IV, 2012; Haider and Jenkins, 2020).

A lack of land rights or ownership meant migrants typically had no assets, which threatened their livelihoods and left them economically exposed. There was need for land ownership to sustain livelihoods through livestock rearing and arable farming. (INT-3)

Unproductive agricultural practices meant potential for increased yield and reduced food insecurity; especially necessary due to high employment in agriculture and reliance on agricultural production to sustain livelihoods (CDSP-IV, 2012).

Social needs included: a lack of social security; a lack of economic security; lack of land and asset ownership; resettlement causing disruption of social structure and norms; human rights frequently violated; no land rights; high gender inequality and discrimination against women; low educational levels in the shar areas; and no rights to inheritance or land ownership for women (Haider & Jenkins, 2020).

5.5.4. Infrastructure implemented

A combination of physical infrastructure, educational, social, and economic programmes were implemented by the project (Haider and Jenkins, 2020, pp.13, Table 2.4). Infrastructure was split into six components: protection from climate change, climate resilient infrastructure, land settlement and titling, livelihood support, institutional development, and knowledge management (Haider and Jenkins, 2020, pp.10).

Physical infrastructure

Physical infrastructure was used to address the first two project components. A broad range of infrastructure was built, including embankments, sluices, canals, roads, bridges, cyclone shelters, wells, markets, and latrines. (Haider and Jenkins, 2020, Chapter 6, pp.43).

Social infrastructure and land titling

Measures to ensure land settlement and titling included surveys of the previous ownership status, processing land titling, and establishment of a computerised land management system (Haider and Jenkins, 2020, pp.11).

Social and livelihood support programmes included establishment of community support groups, skills training, access to hygiene education, and promotion of rights (Haider and Jenkins, 2020, pp.11). Measures were also implemented to allow women to become legal landowners; access saving and micro-credit services; promote women's rights; access training for farming; access family planning services, maternal and neo-natal birth care; access health, nutritional and water, sanitation, and hygiene (WASH) education; access good quality water and sanitation nearby; and access improved education (Haider and Jenkins, 2020)

Facilitating infrastructure

Institutional development and knowledge management were achieved through establishment of community groups to manage physical infrastructure, including WMOs, FLIs, and LCSs (Haider and Jenkins, 2020, pp.10).

Supporting programmes were used to support the agriculture, fishing, and forestry industries, including training on new techniques and technologies (Haider and Jenkins, 2020, pp.31 and pp.84). Programmes were also implemented to improve disaster management education, given chronic exposure to natural hazards (Haider and Jenkins, 2020, pp.29).

Micro-credit policies were an integral part of the CDSP-IV programme. Micro-finance institutions (MFIs) were created to encourage saving for later investment, income generation, and sustainable finances (Haider and Jenkins, 2020, pp. 27).

5.5.5. Delivery

Organisations and responsibilities

CDSP-IV was a collaborative project between the GoB, EKN, and the United Nations International Fund for Agricultural Development (IFAD) (Haider and Jenkins, 2020, pp.6). The programme was delivered by six Bangladeshi government agencies, led by a central Project Management Committee chaired by the BWDB, itself overseen by the Inter-Ministerial Steering Committee (Haider and Jenkins, 2020, pp.16). The organogram with these and other organisations is shown in Figure 18.

The TA team managed the integration and collaboration between the government departments and NGOs (INT-3). As the lead consulting firm, Mott MacDonald provided technical assistance as part of the TA team, provided project management throughout the programme, and were responsible for tendering and appointing NGOs and contractors (Haider and Jenkins, 2020, pp.20).

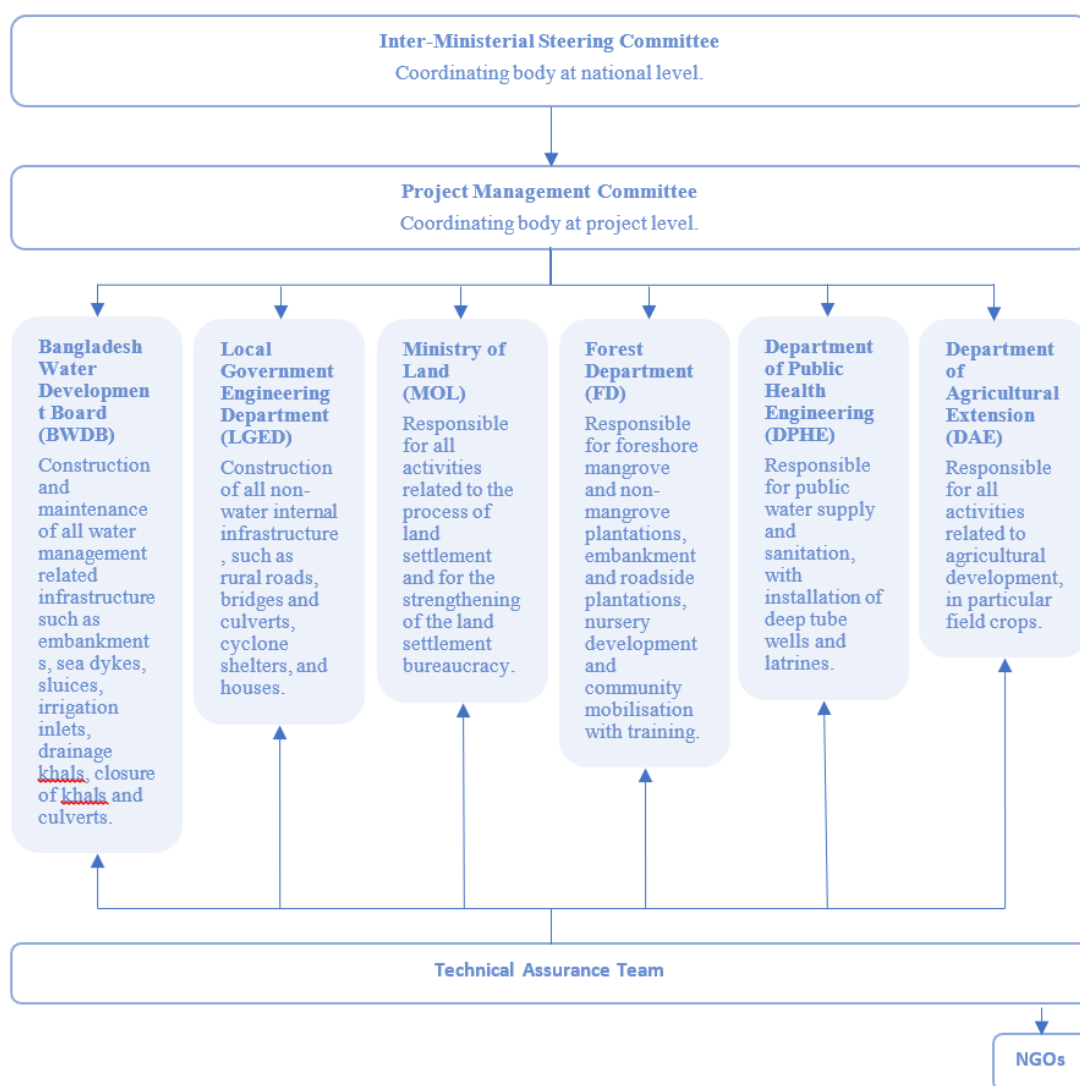


Figure 18 – CDSP-IV delivery organisations and responsibilities (adapted from Haider and Jenkins, 2020, pp.16).

LGIs sit below these high-level government departments, and act as the intermediary between Field Level Institutions (FLIs) and government agencies (Haider and Jenkins, 2020, pp. 25). FLIs are run by the communities themselves, and include WMOs and LCSs (Haider and Jenkins, 2020, pp.33).

Programme and budget

The total project funding allocation at inception in 2011 was USD 89.2 million, however, actual costs are predicted to total USD 79.63 million at completion in June 2024, attributed to overestimation of the cost of physical infrastructure (IFAD, 2023).

CDSP-IV was begun in 2011, with a planned completed date of December 2018 (Haider and Jenkins, 2020). The completion date was later revised to March 2022, and again to June 2024 following further delays (IFAD, 2022). The need for extensions were due to unfavourable weather conditions which meant construction could not be carried out when planned and previously constructed infrastructure had to be repaired (IFAD, 2023).

Surveys

Baseline surveys were conducted to assess the holistic need and socio-economic status of communities prior to the project (CDSP-IV, 2012). Throughout delivery, the monitoring and evaluation process included bi-annual progress reports; completion of standard IFAD progress reporting requirements; surveying of members of FLIs to monitor changes in their lives; completion of IFAD household outcome surveys; impact evaluation against the baseline survey; household impact assessments; and other ad hoc surveys (CDSP-IV, 2018, pp.38).

Design

The design of both the physical and social project elements responded to the parameters set by the natural environment. Due to the nature of the instability, erosion, and accretion of the chars, and for cost-effectiveness, infrastructure was designed for a 20-year lifespan. (Haider and Jenkins, 2020, pp.45)

Community involvement

The CDSP-IV programme was a socially focussed initiative, requiring a participatory approach to involve communities to ensure ownership and long-term change (Haider and Jenkins, 2020, pg. 25). Communities and settlers were initially involved with planning and implementation, and later with management of services (Haider and Jenkins, 2020, pp.25). LGIs represented community members of WMOs, provide a link to higher administrative levels, and provide institutional support (Haider and Jenkins, 2020, pp.26).

LCSs were used to deliver smaller, labour-intensive packages of work, comprised of local people, and advantageous as they can be appointed without a lengthy procurement process (Haider and Jenkins, 2020, pp. 33).

WMOs and WMGs were responsible for the management and ongoing O&M of infrastructure, to enable newly settled communities to manage infrastructure and land rights autonomously (Haider and Jenkins, 2020, pp. 26).

5.5.6. Output and outcomes

CDSP-IV successfully delivery a range of physical infrastructure and programmes to improve the socio-economic capabilities of the char populations. The major project outcomes are detailed in Table 15.

Table 15 - CDSP-IV project outputs and outcomes.

	Output	Outcome
Physical infrastructure	Construction of climate resilient water management infrastructure including embankments, drainage sluices, and sea dykes. (CDSP-IV, 2018)	Vulnerability of livelihoods to natural shocks and disasters was reduced. (Haider and Jenkins, 2020)
		Reduced crop damage from decreased salinity and flooding. (CDSP-IV, 2018)
		Increased crop production and improved food security. (Haider and Jenkins, 2020)
	Provision of safe water infrastructure; one deep tube well available per 15-20 households. (Haider and Jenkins, 2020)	Average distance to safe water reduced from 380m to 60m. (CDSP-IV, 2018)
		98% households have access to safe water. (Haider and Jenkins, 2020)
	Improved sanitation facilities. Provision of one latrine per household, (although some were constructed and later lost to erosion). (Haider and Jenkins, 2020)	74% households have access to a latrine, and Reduction of water borne diseases observed. (Haider and Jenkins, 2020)
		79% have access to soap and water. (Haider and Jenkins, 2020)
	Provision of infrastructure connecting rural to urban areas, including links to markets. (Haider and Jenkins, 2020)	Improved economic opportunities for the poor, and increased access to income generating activities. Improved social connectivity. (Haider and Jenkins, 2020)

Education	Varied training programmes to increase capacity, skills, and knowledge of char dwellers. (Haider and Jenkins, 2020)	Strengthened human capital. Char dwellers enabling to pursue new livelihoods. (Haider and Jenkins, 2020)
	Educational programmes provided for agricultural skills development including: agricultural methodologies, homestead farming, fish farming, forest management, family planning, human rights, and legal awareness. (Haider and Jenkins, 2020)	Improved farming efficiency, methods and technologies, higher income, and increased food security. (Haider and Jenkins, 2020)
		Annual income has increased in total (farming and non-farming activities) by 313% in CDSP-IV. (Haider and Jenkins, 2020)
Community participation	Formation of community and infrastructure management groups, including: 24 WMGs, of between 20 and 56 members, and 630 SFGs with approximately 25 members each made up of 40% women. (CDSP-IV, 2018)	Increased knowledge sharing and skills capacities. (Haider and Jenkins, 2020)
		Increased female representation, gender equality, and empowerment. (Haider and Jenkins, 2020)
	Community institutions with a high percentage of female members. (Haider and Jenkins, 2020)	Empowerment of women increased female participation in decision-making. (Haider and Jenkins, 2020)
Land rights	12,868 households were allocated land rights. Men and women have 50% equal share of land rights. (Haider and Jenkins, 2020)	Landowners are able to manage land in the way they feel most productive so generating increased income and economic security, and families are investing money to build larger and better quality houses. If widowed, women have 100% ownership over land. (Haider and Jenkins, 2020)
		New communities have become established and transience of the population has reduced. (INT-3)

5.5.7. Findings

Table 16 details influences from the enabling environment identified in the CDSP-IV project, how they shape the enabling environment, the impact to infrastructure and services, and the effect on need.

Table 16 – CDSP-IV: Linkages between key influences, the effect on infrastructure and services, and need.

Influence	How does this shape the enabling environment?	How does this effect infrastructure services and implementation?	How does this effect ability to meet need?
Governance structure	· The governance structure is hierarchical and decentralised since reorganisation in the 1980s and 1990s to decentralise power.	· A hierarchical system can slow down delivery as multiple approvals are required at various levels.	· The public and those in need of services rely on strong institutions to represent them, without which their needs cannot be expressed as clearly.
	· Performance at lower administrative levels was weak despite power and funding. A top-down approach was not working; bottom-up approach was needed to allow community to mobilise themselves.	· Weak institutions made affective implementation difficult as the necessary management capacity was not available.	
		· Without strong and consistent leadership, the direction of infrastructure development was not clear.	
Economic environment	· Available capital for development was limited despite policies and ambitions in place.	· Lack of funds and diversion to other government expenditure needs, means less infrastructure can be built.	· Services cannot be delivered when budgetary constraints mean infrastructure cannot be built.
	· Low development expenditure caused by little government spending on projects that generate employment and stimulate growth; was deemed necessary for development.	· Difficult to plan projects without long term secure finance secured.	· Underdeveloped and inadequate infrastructure was inhibiting socio-economic development and therefore economic growth of the population.

Poverty	· Settlers were vulnerable due to no land rights or ownership, and did not have means to make change for themselves.	· Capital costs of infrastructure and services must be funded or affordable to local people.	· Micro-finance schemes assisted by giving people the support to manage their money and generate new income from their capital.
	· National Social Security Strategy (NSSS) was implemented in 2015 to improve social protection measures and government spending strategy.	· Costs of O&M and resources required must be affordable.	· Even with the interventions made by CDSP, the poverty trap in the poor char areas means alleviation from poverty is still difficult.
	· Access to education, healthcare, services, and social security was limited for the poor, as well little protection of human rights and frequent human rights violations.	· Multi-disciplinary infrastructure required to address multi-dimensional aspects of poverty.	
		· There was a need for micro-finance to encourage economic stability.	
Agriculture and livelihoods	· Agriculture was the primary income and livelihood source in the char areas.	· Infrastructure required to protect farmland and subsequently protect livelihoods and income.	· Services that align with behavioural norms and are similar to existing practices are more likely to be used and achieve behaviour change.
	· Char areas offered opportunity for farming on newly accreted land.	· Services aligned with local livelihoods practices where possible, to increase use and alignment with norms.	· Land ownership allowed families to farm their own land and become self-sufficient.
Gender issues	· Engrained gender norms made change difficult to initiate and be adopted.	· The design of infrastructure and supporting programmes reflected women's needs, with some initiatives specifically aimed at women.	· Women's needs addressed specifically, such as land rights for women, maternal services made available, and training given in marriage law.

	· Widespread gender inequalities in education and employment, although improving.	· Women were heavily involved in community groups, particularly micro-finance, and continued to hold positions of power within the community after the project.	· Land rights were allocated 50% to women.
	· Traditional gender roles and subsequent disempowerment of women provided the cultural backdrop within which the project operated.		· Women's knowledge base was increased to enable them to participate in income generating activities and farming.
Development policy	· PP2041 in place to achieve high-income country status.	· Due to policy specifying the char areas, infrastructure in these areas was supported and prioritised, and a focus was given to meet needs of the local population.	· WMOs are community led, and therefore management of resources is closer to the end user which increases the chance of the infrastructure meeting need.
	· National Poverty Reduction Strategy specifically identified the chars as being areas of extreme poverty and refers to the CDSP project as a means of economic development and poverty reduction in these areas.	· Gave responsibility for water management to community WMOs rather than government ministries.	· Policies and strategies to develop the char areas help protect the poor and vulnerable in the region.
	· CDSP-IV followed the Bangladesh Guidelines for Participatory Water Management (PWM).		
Natural environment	· Bangladesh is one of the most exposed and at-risk countries in the world to climate change, and particularly the Meghna Estuary.	· Infrastructure must be designed to withstand these weather conditions and protect the chars and communities from it.	· Such high exposure to the effects of climate change rendered char dwellers extremely vulnerable to the consequences to lives and livelihoods, such as damage to crops, erosion of land, and loss of homes.

	· Exposure to cyclones, flooding, and other extreme weather made the char areas vulnerable.	· The chars were a priority area for infrastructure investment, as acknowledged in government development plans.	· The highly changeable natural landscape made it difficult to predict how long interventions will work or be appropriate in context.
Coastal morphology	· The accretion of new land gave opportunity to allocate land ownership, whereas this opportunity would not be available if previously owned.	· Infrastructure designed for 20-year design life given potential redundancy in the future if land moves.	· Accretion of new land facilitated allocation of land rights without capital outlay to buy the land. This gave people a chance to increase their economic capital and begin generating new income without initial capital investment.
	· Changing coastal morphology created changing infrastructure needs and needs of the populations living there.	· There is a continuously increasing demand for infrastructure as new land accretes.	

5.5.8. Data analysis

5.5.8.1. Project appraisal (PA)

Performance by criteria

The framework revealed good overall project performance. 83% of criteria were met, including 10% showing exceptional performance. The project failed to meet 4% of criteria, and only achieved partial success in 13% of criteria. Zero criteria were non-applicable.

Three criteria were not met, shown in Table 17.

Table 17 – CDSP-IV: Lowest performing criteria; not met.

Dimension	Goal	Criteria	CDSP-IV
Service delivery	Contingency plans are in place to cope with service disruptions.	Alternative services are available to temporarily meet demand in the event of failure.	2
Service delivery	Delivery milestones are met.	Project was delivered to programme.	2
Service delivery	Delivery milestones are met.	Project was delivered to budget.	2

Seven criteria showed exceptional performance, shown in Table 18 below. Four criteria, shown in bold, are key criteria.

Table 18 - CDSP-IV: Highest performing criteria; scoring exceptional.

Dimension	Goal	Criteria	CDSP-IV
Governance	Stakeholders are fairly represented.	Community and those served by services are involved, represented, and empowered.	5
Financing	Universal affordability of services.	Service is affordable to the poorest, vulnerable or minority groups.	5
Service delivery	Universal access to services.	Service is accessible to poorest, vulnerable or minority groups.	5
Social value	Promotion of social equality and inclusion.	Service serves all community members equally.	5
Social value	Promotion of social equality and inclusion.	Service enhances wellbeing of communities and users.	5

Social value	Community ownership of services.	Community and end users feel ownership over services.	5
Contribution to development	Service contributes to social development.	Service supports local livelihoods.	5

Performance by goal

Performance by goal is shown in Figure 19.

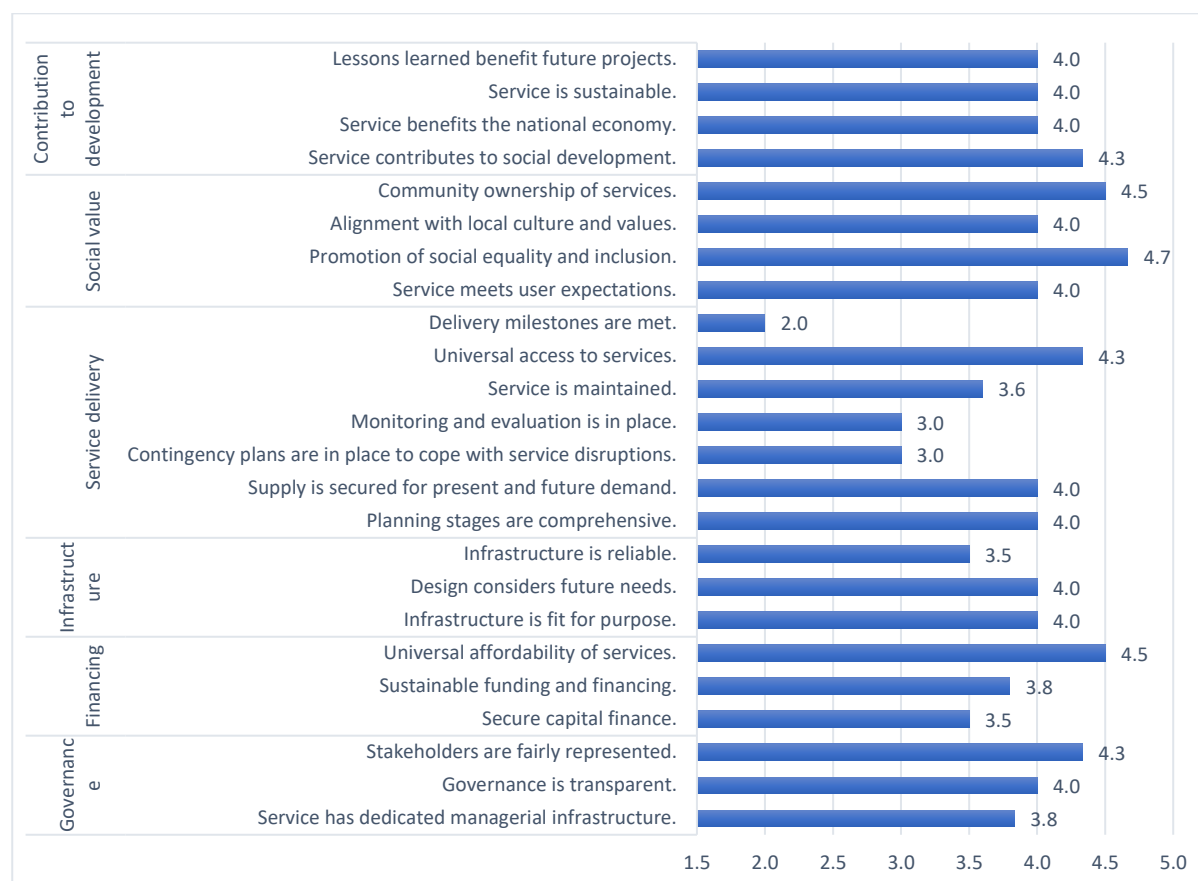


Figure 19 - CDSP-IV: Bar chart showing performance score of each goal, calculated by the average of component criteria.

Promotion of social equality and inclusion scores the best, at 4.7/5. This sits within the *social value* dimension, which correspondingly scores the best of the six dimensions. The second highest performing goals are *community ownership of services* and *universal affordability of services*, belonging to the *social value* and *financing* dimensions respectively. *Delivery milestones are met* was the poorest performing goal, belonging to the *service delivery* dimension, also the poorest performing dimension.

Performance by dimension

Table 19 shows performance by dimension, shown as percentage of total points achieved.

Table 19 - CDSP-IV: Performance by dimension in descending order.

Dimension	Percentage score
Social value	86
Contribution to development	82
Governance	80
Financing	78
Infrastructure	78
Service delivery	70

The *social value* dimension performed best scoring 86%. The *contribution to development* dimension also scored well, achieving 82%. The *service delivery* dimension showed poorest performance, scoring 70%. The range of scores is 16%, which suggests that there may have been a focus on social value and development over infrastructure and service delivery.

5.5.8.2. Enabling environment appraisal (EEA)

The completed EEA in Table 20 shows influences within the enabling environment scored as low, medium, or high.

Table 20 - CDSP-IV: EEA results table. Variables scored on a scale through low, medium, and high, structured by dimension.

Institutions and governance		Economic	
Alignment between actors	M	Ability of states to self-generate income	N/A
Centralised policy	M	Aid	L
Civil liberties	N/A	Borrowed finance	L
Clear vision for the future	M	Capital finance	H
Clientelism	L	Economic globalisation	N/A
Closeness of inter-national relationships	N/A	Economic growth	N/A
Collaborative inter-organisation relationships	M	Economic stability	N/A
Conflict	L	Economic strength	N/A
Conflicting stakeholder motives	M	Employment opportunities	H
Consistent behaviour	L	Grants	L
Corruption	L	Household income	H
Decentralisation of decision making power	L	International trade	N/A
Decentralisation of governance	M	Investment in research	N/A
Decentralised policy	L	Investment opportunities	N/A
Deliver manifesto	N/A	Investor confidence	N/A
Democracy	N/A	Investor interest	N/A
Disparities between provinces	M	Loans	L
Electorate influence	N/A	Local economic growth	M
Fair political and policy decision making	L	Local industry	M
Free media	N/A	Local resources	L
Geographical advantage	N/A	National industries	N/A
Geographical proximity to other countries	N/A	Poverty	H
Government motivated by development	L	Private investment	L
Growth and capacity building of local	L	Private property rights	H
Institutional capacity	M	Privatisation	N/A
Inter-government collaboration	M	Provincial financial autonomy	L
Political change	N/A	Public funds	M
Political parties incentivised to align with public opinion	N/A	Public investment in infrastructure and services	M
Political self-interest in inter-national	N/A	Public revenue	N/A
Political stability	L	Reliance on other economies	N/A
Power struggles	L	Remittances	N/A
Provincial autonomy over implementation and management of infrastructure and services	L	Risk for investors	N/A
Public confidence in institutions and	N/A	Unemployment	L
Resistance to integration of government	H	Value of personal assets	H
Rules and regulations followed	L	Wealth divide	M
Rules and regulations in place	L		
Sectoral policy	N/A		
Shared natural resources	N/A		
Social unrest	N/A		
Stable government	L		
State capture	N/A		
State stability	L		
Strategic location for trade and protection	N/A		
Strong leadership	N/A		
Transparency	N/A		
Votes	N/A		
Voting rights	N/A		
		Development	
		Desire for infrastructure development	M
		Economically motivated development agenda	N/A
		NGO support	M
		Respect for human rights	H
		SDGs met	L
		Socially motivated development agenda	M
		Trickle-down development policies	N/A
		Trickle-up development policies	M

Social	
Access to better paid work	M
Behaviour change	M
Brain drain	N/A
Caste system	N/A
Changing role of women in society	H
Citizen's power	L
Community and family resilience	H
Community engagement	H
Demographic changes	H
Diaspora	N/A
Educated population	N/A
Employment in agriculture	H
Empowerment	H
Engrained social behaviours	L
Gender equality	H
Human capital	M
Informal sector employment	L
Internal migration and urbanisation	M
International migration	N/A
Investment in education	L
Marginalisation of vulnerable and minority groups	H
Population welfare	H
Regional inequality	H
Religion	N/A
Resettlement	H
School enrolment	N/A
Skilled workforce	L
Social equality	H
Social protection	H
Strong social relationships	M
Traditional culture	L
Urban/rural divide	L
Vocational training	H
Worker's rights	M

Natural environment	
Available natural resources	N/A
Climate change	H
Climate migration	H
Commodifiable crops	H
Consistent agricultural production	M
Environmental degradation	H
Food security	M
Likelihood of extreme weather events	H
Physical limits of service provision	H
Pollution	N/A
Risk to livelihoods	H
Variable climate	H
Vulnerability of geographical location	H
Vulnerability to weather related disasters and shocks	H
Water availability	L
Water security	L

Infrastructure and service delivery	
Ability to adapt to external shocks and stresses	H
Access to services	M
Accurate up-front cost and programme estimation	M
Affordable services	L
Aligned business culture and communication	M
Available technology	L
Availability of resources and materials for construction	L
Risk of budget overrun	M
Changing service needs	H
Clear project scope	M
Community managed infrastructure	H
Construction cost	N/A
Cost of consultants and contractors	N/A
Cost of labour	N/A
Cost of materials	N/A
Decentralised services	M
Design options	M
Efficient delivery	N/A
Engineering and management expertise	H
Fair procurement	M
Feasibility studies	M
Financial return	N/A
Financially motivated stakeholders	N/A
Funding available for O&M	H
Infrastructure output	H
Internal national engineering and management capability	H
Knowledge sharing	H
Easily maintained and operational infrastructure	H
Monitoring and evaluation	M
Needs prioritised in design	H
Opportunities for local businesses	M
Opportunities to leapfrog	N/A
Optimal design to meet need	H
Participatory consultation with communities	H
Payment of services through tariffs	N/A
Planned infrastructure pipeline	L
Achievable programme	M
Project budget	M
Quality of infrastructure and services	M
Redundancy in design	M
Reliance on international supply chain	N/A
Resilient infrastructure	H
Service needs gap	H
Services available	M
Skills available for O&M	M

Infrastructure and service delivery (cont.)	
Skills transfer	H
Social infrastructure	H
Subsidised services	N/A
Supplier monopoly	N/A
Sustainable funding model	H
Sustainable services in the long-term	H
Thorough planning	M
Use of international consultants and contractors	H
Use of public or PPP delivery model	L
Use of services	M
Workers available	L

Summary

Dimension		Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery	TOTAL
Applicable	H	1	6	14	10	1	19	51
	M	9	5	6	2	4	19	45
	L	16	8	7	2	1	6	40
Total applicable		26	19	27	14	6	44	136
Percentage variables applicable		55	54	79	88	75	79	69
Non-applicable		21	16	7	2	2	12	60
Total		47	35	34	16	8	56	196

5.5.8.3. Case study CLD (C-CLD)

The CDSP-IV C-CLD is shown in Figure 20.



Figure 20 - The C-CLD for the CDSP-IV project, adapted from the M-CLD. Size of circles show level of influence on a low-medium-high scale; larger circles show higher influence. Thickness of connection lines show strength of relationship on a 1-2-3-4 scale; 4 indicates the strongest relationship.

5.5.9. Discussion

As shown in Table 20, a large proportion of the variables present in the M-CLD are also present in the CDSP-IV C-CLD: 136 variables, marking 69%. 51 variables have high influence, which is significantly more than any other project. The C-CLD shows this visually through a highly populated CLD with many large circles.

Compared to other dimensions, the *institutions and governance* and *economic* dimensions are poorly represented, however many more variables are present in these dimensions than in other projects. The *natural environment* dimension has the highest percentage of variables present: 88%. This is expected due to the influence of the climate and environment on the project need and design, as discussed in this section.

The project can be summarised as driven by the need to reduce vulnerabilities of the char population, which have been caused by a volatile climate and unstable livelihoods. Key influences on the project outcome are discussed below.

Natural environment and risk to livelihoods

The natural environment is the major driver for the need for the project and the way it is executed. The C-CLD shows high presence and influence of variables in the *natural environment* dimension: 14 of 16 variables are present, 10 of which are of high influence. The results table highlights that the main issues relating the environment are exposure and vulnerability to extreme weather conditions, particularly due to the coastal location. An extract of the *natural environment* dimension in the C-CLD is shown in Figure 21 (reorganised compared to the M-CLD in this instance for clarity).

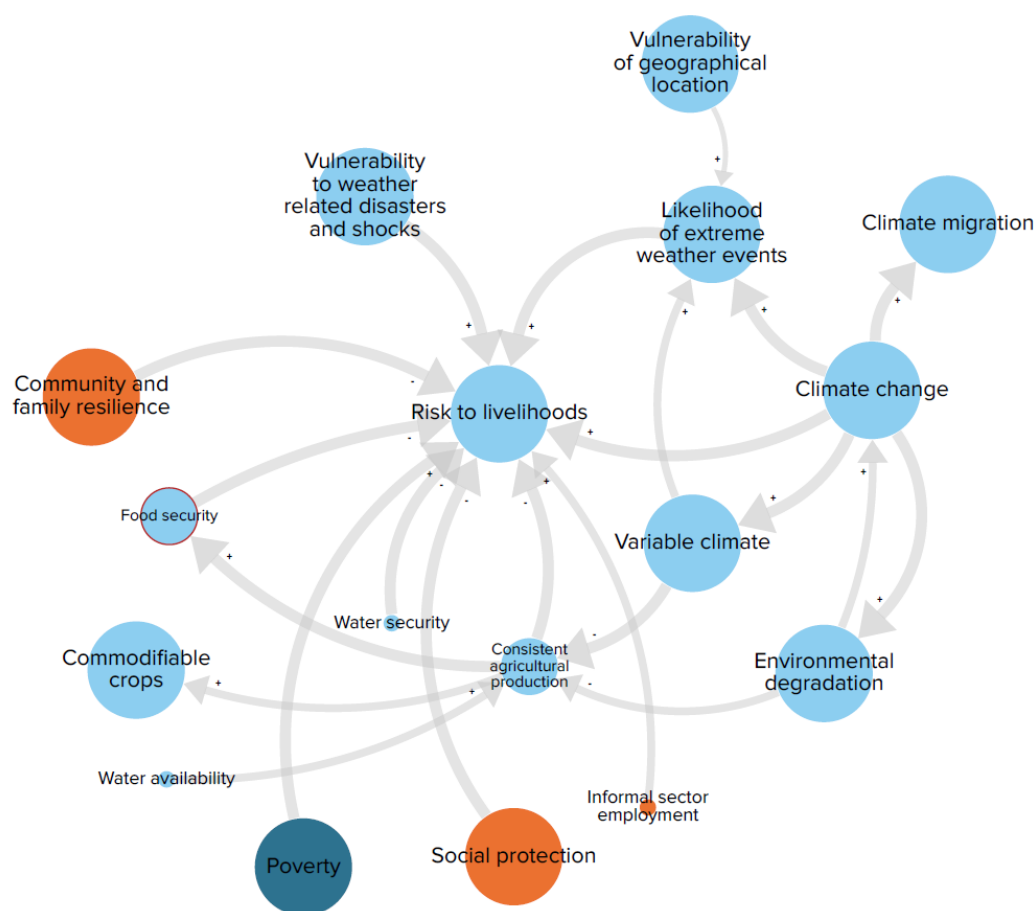


Figure 21 - An extract of the natural environment dimension from the CDSP-IV C-CLD.

The vulnerable coastal environment increases the likelihood of extreme weather events, which increases risk to livelihoods. Climate change is also causing environmental degradation in the coastal environment, which decreases consistent agricultural production which in turn decreases commodifiable crops and food security. As the primary source of income in the region is agriculture, this decreases household income, which decreases resilience, which increases risk to livelihoods. Reduced household income also increases poverty, which also directly increases risk to livelihoods, and via an indirect pathway of increasing vulnerability to weather related disasters and shocks. Evidently, the variables in the *natural environment* dimension are closely interlinked, and mostly result in an increased risk to livelihoods.

Despite these close connections, the *natural environment* dimension features in very few loops; those which do pass through this dimension mostly include the *risk to livelihoods* variable, reinforced by its status as a high influence variable. Finding leverage points in the *natural environment* dimension is unlikely, and intervention here is already extremely difficult. Reduction of climate change is achievable in the long-term, supported by national policy at the higher level. However, in the short to medium-term, mitigation measures to reduce detrimental climate impact is a more realistic strategy.

Poverty

Risk to livelihoods is exacerbated and directly increased by poverty. Poverty has high influence in the C-CLD, impacts population welfare, and behaves as a bridging point between the *economic* and *natural environment* dimensions, although is not an identified influence point in the M-CLD. Particularly pertinent to the CDSP-IV project, is the role of land ownership and land rights in poverty alleviation. The C-CLD shows that private property rights increase the value of personal assets, which in turn reduce poverty and improve population welfare. Whereas allocation of land rights would be difficult in other areas of Bangladesh where land is already owned, the newly accreted chars provide new land and therefore a unique opportunity to use land allocation and land rights as a facilitator of development. Increasing private property rights in this unique environment would be a leverage point to decrease poverty and risk to livelihoods, and the benefits that follow.

A reduction in poverty is also supported by increased household income which is dependent on the wider local economy; employment in agriculture as the primary source of income regionally; and access to paid work. Via poverty, household income can reduce vulnerability and increase resilience to climate induced disasters and risks, subsequently reducing risk to livelihoods as discussed previously. The M-CLD also identifies increased employment opportunities as an influence point. The micro-finance scheme also aims to provide households with the tools to better manage money, invest, encourage economic stability, and generate new income from their capital, and subsequently increase household income. This is reflected by the high PA scores reflective of economic opportunities created by the project. Therefore, measures to increase household income and ensure economic security of households is considered a leverage point. These relationships are shown in Figure 22.

PA results show that the infrastructure supports local livelihoods and enhances the wellbeing of communities and users. Although poverty is not identified as an influence point in the M-CLD, it appears significant to CDSP-IV. The challenges faced by CDSP-IV and the measures implemented to address them align closely with the logic of the C-CLD. Therefore, in order to address risk to livelihoods and poverty, the already existing initiatives are suggested to continue.

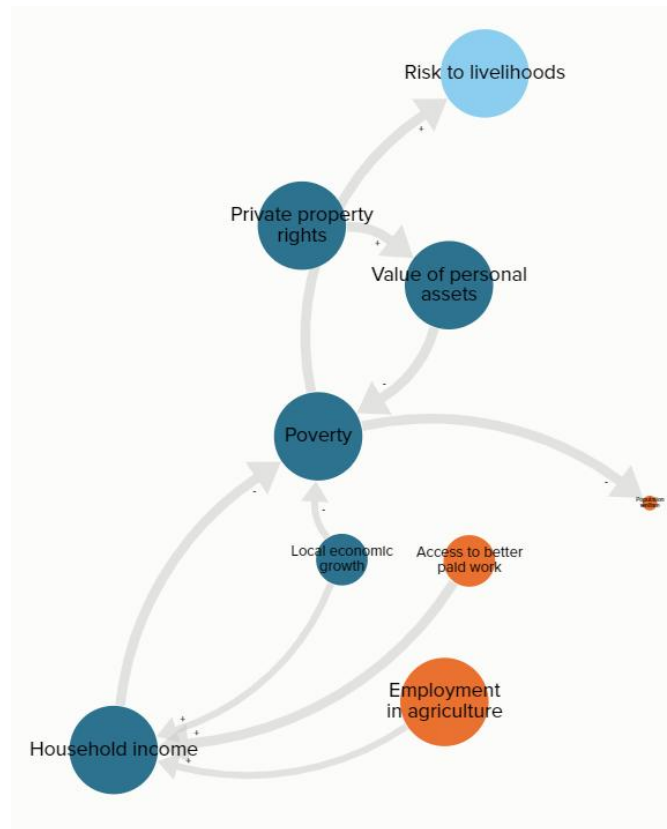


Figure 22 - Loop showing the influence of poverty on other variables.

Social protection

Social protection is identified as an influential variable in the M-CLD. It also shows to be of high influence in the CDSP-IV C-CLD. Social protection can directly decrease risk to livelihoods and increase population welfare, and may be a suitable intervention point to address some of the issues already discussed.

The M-CLD shows that social protection can be facilitated through centralised policy to reduce marginalisation of vulnerable and minority groups, increase respect for human rights, increase social equality, and decrease risk to livelihoods. As shown in the C-CLD, a government motivated to improve welfare across the population, supported by a socially motivated development agenda, increases the possibility of a successful social protection system. Social protection can be reinforced by social infrastructure, which is one of the major successes of CDSP-IV and shown by a strong positive connection and high influence in the C-CLD. Social infrastructure directly and positively impacts access to services; helping achieve the service goals. Figure 23 shows these relationships.

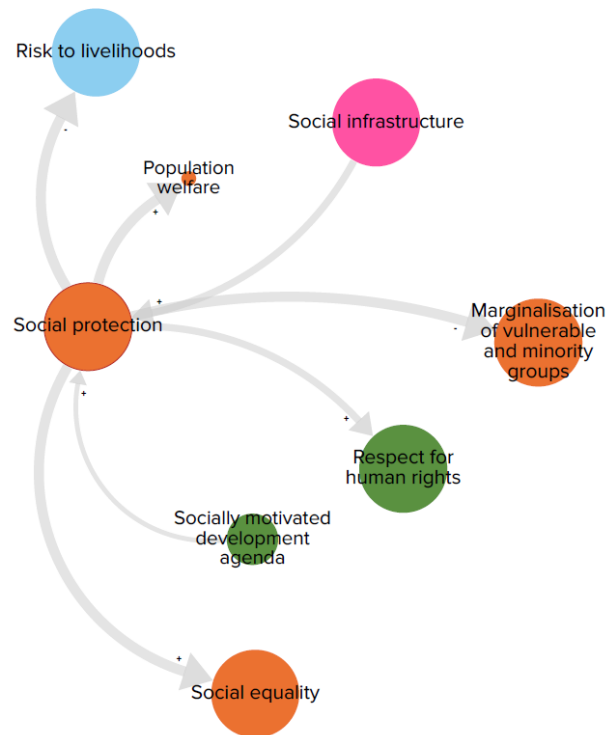


Figure 23 - The influence of social protection on neighbouring variables.

Bangladesh has a socially motivated development agenda with multiple policies in place; it is also an influence point. The NSSS was implemented in 2015 to review social protection measures and develop a social system which aims for equality across society. However, the strategy is still in its infancy and there is much progress to be made until these goals are realised. The government's development plans also specifically identify the chars as being areas of extreme poverty and refers to the CDSP-IV project as a means of economic development and poverty reduction in these areas. A review of, the strengthening of, and the promotion of these policies would help address the socio-economic challenges discussed. Further bolstering and expanding the socio-economic programmes already implemented is recommended as a tangible and achievable leverage point.

Internal migration and urbanisation

Migration and resettlement to the char areas is a key driver for the need of the project. *Internal migration and urbanisation* is particularly strongly linked in the C-CLD to other variables in the *social* dimension. It is also identified as an influential point in the M-CLD.

One of the relationships shown in the C-CLD, is that internal migration and urbanisation is increased by climate migration, which is driven by climate change, which itself is increased by environmental degradation. One of the reasons for migration to the char areas is the deterioration of the areas that migrants are migrating from, particularly if these are also coastal regions. A suggested measure is to explore the origin of migrants and gain a better understanding of their motivations for migrating. Subsequently interventions can be explored to reduce migration at the outset.

Gender

The role of women and gender inequalities is also central to Bangladeshi society and traditional culture and social norms. The C-CLD shows that traditional cultures and marginalisation of women strongly reinforce gender inequality. However, a changing role of women in society and increasing female empowerment is helping move towards a more equal society. Addressing gender inequalities was central to CDSP-IV's objectives, and the design of infrastructure and the supporting programmes reflected women's needs, with some initiatives specifically aimed at women. Specifically, women were heavily involved in community groups, particularly micro-finance, and continued to hold positions of power within the community after the project; land rights were allocated 50% to women; and education regarding marriage law and female rights was provided. In this way, CDSP-IV acknowledged the significance and widespread nature of gender inequality in society and reframed it as an opportunity for intervention. By facilitating the involvement of women in community groups and infrastructure management, a new perspective and ideas emerged, female engagement with the wider community increased, and pressure was alleviated from men who remain mostly responsible for income generating work.

Gender equality forms part of a large loop in the C-CLD, as shown in Figure 24. The loop shows that gender equality increases community engagement, which increases the strength of social relationships, which subsequently increases engrained social behaviours. Engrained social behaviours increase resistance to integration of government departments which reduces the growth and capacity building of local governments. This increases regional inequality, which increases internal migration and urbanisation. This forces a changing role of women in society, typically towards gender equality. Therefore, changing engrained cultural gender norms to empower women has widespread impact on the holistic system and should be considered a leverage point.

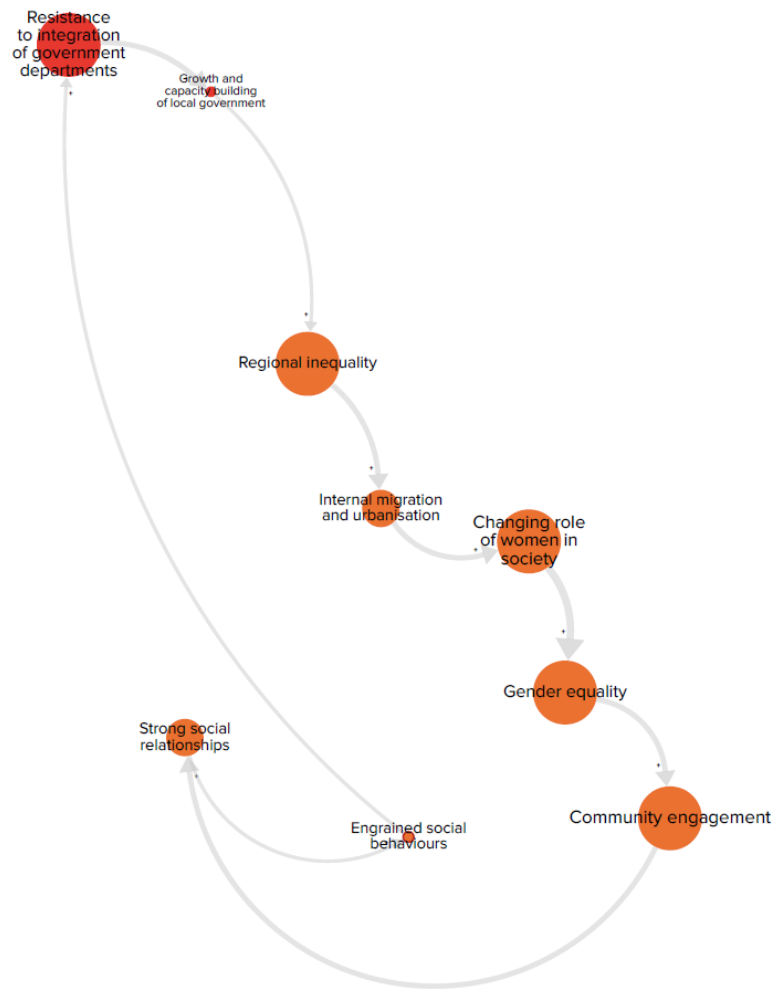


Figure 24 - Loop through social factors including gender equality.

Summary

As the main objective of CDSP-IV is to reduce the vulnerability of the poor coastal population, most influential interventions relate to the risk to livelihoods variable, and loops that pass through it. Figure 25 shows one such loop which passes through many of the influence points discussed, but also identifies other variables which are potential influence points given their place in a feedback loop. Examples of other intervention points are: increased infrastructure output, increased public investment, and increased community engagement.

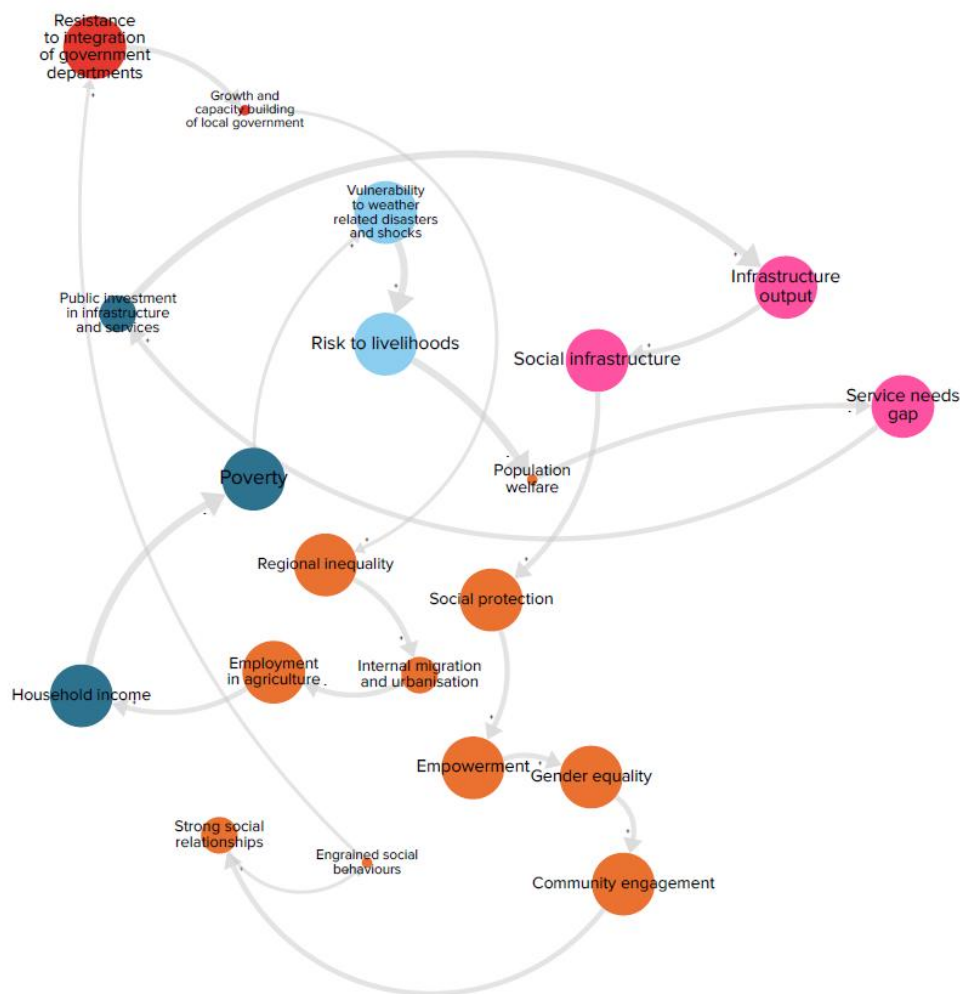


Figure 25 - Loop indicating the influence of risk to livelihoods of the coastal population.

Suggested leverage points are listed in Table 21.

Table 21 - Suggested leverage points and their intended outcomes.

Suggested leverage point	Intended outcome
Implement measures to decrease risk to livelihoods and increase resilience to adverse environmental and climatic conditions, in lieu of being able to affect environmental conditions themselves in the short or medium-term.	Increased household and community resilience. Reduced risk to livelihoods.
Increase land ownership by allocating private property rights.	Increase value of household assets. Increase resilience and decrease exposure and vulnerability to unforeseen shocks and stresses. Increase household income as income can be made from farming owned land.

Centralised policy to protect the char population. Strengthening of the existing social security strategy which remains weak.	Reduced vulnerability of marginalised groups. Protection and enforcement of human rights.
Explore opportunities to protect original coastal regions that the settlers are migrating from.	Reduced migration; no disruption of social relationships and communities; livelihoods and land ownership remain; no need to establish new infrastructure in new areas.
Implement programmes to educate subjects such as farming and livelihood practices, financial management, and social wellbeing.	Encourage families to self-drive their social and economic growth.
Increase female participation in community groups, provide education targeted at women, allocate 50% land rights to women.	Improved gender equality. Ensure female ownership of land to reduce vulnerability of lack of assets or income source if a male spouse dies. Modernise the role of women in society to empower them.

5.6. The Indravati dam

5.6.1. The enabling environment

The Indravati hydropower project is located in the south-eastern coastal state of India, Odisha, across the Indravati river and its tributaries (OHPC, 2016b).

India is underdeveloped and classified as a lower-middle income country (Schwab, 2019). There are very high levels of wealth inequality and poverty, and a significant divide between the urban wealthy and rural poor (Schwab, 2019; Tewathia et al., 2020). Odisha suffers such inequalities; exaggerated as the population is largely reliant on agriculture to sustain livelihoods (Panda, 2016). These challenges are acknowledged by the government, and as such the government agenda emphasises the desire to improve welfare and conditions for the poor (Ministry of Finance, 2023).

Provision and access to infrastructure and services varies greatly between urban and rural areas (Ministry of Finance, 2023). In 2018 the National Infrastructure Pipeline (NIP) was implemented to improve infrastructure across the country, however progress is threatened by insufficient budget for the scale of investment required (Ministry of Finance, 2023). Hydropower infrastructure in Odisha is operated and maintained by the Odisha Hydro Power Corporation (OHPC), acting on behalf of the Odisha state government (OHPC, 2016a).

5.6.2. Background and project description

The Upper Indravati Hydropower Project was commissioned by the Government of Odisha, to construct four dams across tributary rivers draining into the Indravati basin (Government of Odisha, 2017; OHPC, 2016b).

The two primary objectives at project conception were: provision of low-cost energy to meet increasing electricity demand, and provision of irrigation infrastructure to irrigate agricultural land downstream of the dam (World Bank, 1996a, 1996b). Notably, the project did not include any social objectives to specifically address the livelihoods of the local population.

The project was approved in 1978, and begun in earnest in 1983 following approval of a loan from the World Bank. However, due to safety and quality concerns, the World Bank withdrew funds in 1996, when only part of the project had been delivered. (INT-4; World Bank, 1996a)

Further funds were raised over time, and the dam became fully operational in 2001 following the commissioning of the fourth of the four powerhouse units (OHPC, 2016b).

Note: In 2011 the state of Orissa was formally renamed in English to the state of Odisha to align with the state language. Both names are used in this thesis; Orissa when referring to project documents which themselves refer to Orissa, and Odisha in all other circumstances.

5.6.3. Need for the project

The project was conceptualised to meet an approximate 20% electricity deficit in the region, and to provide irrigation for surrounding agricultural land (OHPC, 2016b; World Bank, 1996a).

5.6.4. Infrastructure implemented

Physical infrastructure

Most infrastructure implemented was physical, including:

- Four dams across the Indravati river and its tributaries
- A reservoir
- Eight dykes and two linking channels
- A 4.32km tunnel
- A power station with four turbo generators
- A 9km tail race channel
- Irrigation canals and infrastructure
- Accompanying civil infrastructure including roads, water, and sewerage.

(OHPC, 2016b)

Facilitating infrastructure

In order to facilitate the construction of the reservoir as part of the dam infrastructure, 97 villages were affected, including submergence of 65 villages. Land, including both agricultural land and homes, was acquired between 1989 and 1992, displacing approximately 17,000 people. (Dash, 2008)

Social infrastructure

There was little social infrastructure in place, including a lack of support for displaced communities, and there was subsequently a significant detrimental socio-economic impact (Das and Tewari, 2014; Dash, 2008). Cash compensation was offered but was typically less than the asset market value, resulting in families owning less land and assets following displacement (Choudhury et al., 2012).

5.6.5. Delivery

Organisations and responsibilities

The dam was commissioned by the Odisha state government, however responsibility changed over time given delays and unsatisfactory delivery. This failure was attributed to a lack of the necessary engineering skills, a preference to manage from New Delhi, and a consequent lack of project management presence at site. (World Bank, 1996a)

In 1991, the World Bank issued a condition for the lifting of disbursements that project management be transferred to a newly established Construction Management Organization (CMO), which was realised in 1993. However, this was met with resistance from the Odisha government, resulting in strained working relationships which limited the CMO's ability to improve delivery. (World Bank, 1996a)

In 1996 responsibility for operation and management was transferred to OHPC (World Bank, 1996a).

Capital financing

In May 1983 the World Bank formally supported the project with \$170 million credit from the International Development Association (IDA). An additional \$156.4 million was secured from the International Bank for Reconstruction and Development (IBRD). The Government of Orissa contributed \$180.3 million. (World Bank, 1983)

However, the IBRD loan was cancelled in 1991, six months after the planned date, because the IBRD was unsatisfied with the quality of engineering and construction, and safety of dams under construction (Upper Indravati Hydro Project, 1997).

The World Bank also later halted disbursements due to concerns over safety and quality. When the World Bank withdrew in 1996, the project was approximately two thirds complete, and subsequently halted due to lack of funds. (Upper Indravati Hydro Project, 1997)

Following this, the energy and irrigation components were split to be delivered as separate projects. Government funds were raised to complete the hydropower infrastructure, and responsibility for funding the irrigation project was taken over by the Overseas Economic Cooperation Fund (OECF) of Japan (World Bank, 1996a).

Construction

The World Bank officially confirmed funding in 1983, marking official initiation of the project, and was scheduled for completion in 1988. However, delays were experienced throughout the project due to slow procurement, slow construction, changing project management, and flooding. In hindsight the programme agreed with the World Bank during project appraisal (1979 - 1988) was acknowledged as too optimistic. (World Bank, 1996a; World Bank, 1996b)

The Odisha government awarded contracts to companies with unrealistically low bids, which ultimately resulted in the appointment of contractors unable to deliver the work required. Typically, this was due to a lack of funds, insufficient equipment and a reliance on manual labour, and poor skills levels. The capacity and skills levels of contractors were questioned once construction had begun. On evaluation at the end of the project this was said to be one of the causes of delays and cost increases. (World Bank, 1996a)

Impact assessments

An initial environmental impact assessment was done in 1979 by an appointed committee, and a second impact assessment was carried out in 1994 which revealed both environmental and social impacts (Choudhury et al., 2012). Choudhury et al. (2012) suggests that the authorities did not take the issue of environmental and social impacts seriously, with little consideration for the welfare of displaced people, and that a lack of consideration of the environmental and social impact was a major failing of the project.

O&M

OHPC is responsible for O&M of the dam (Government of India and Government of Odisha, 2013). The Department of Water Resources is responsible for O&M of the irrigation infrastructure, which is regularly maintained although necessary work is limited by budget constraints (JICA, 2003).

The dam became operational sequentially. The first two units of the dam were commissioned in 1999, and the third and fourth in 2000 and 2001 respectively. Therefore, the dam only became fully operational in 2001 when all four units were productive. (OHPC, 2016b)

The irrigation infrastructure was completed in 1998 (JICA, 2003).

5.6.6. Output and outcomes

The outputs and outcomes listed in Table 22 reflect progress to date. Notably, the project completion report (World Bank, 1996a) did not consider the project to have delivered its objectives, but in most cases the planned infrastructure has since been completed. The outcomes reflect this.

Table 22 - Indravati project outputs and outcomes.

	Output	Outcome
Physical infrastructure	Construction of dam and associated infrastructure. (OHPC, 2016b)	Successfully increased energy availability, and Odisha became an energy surplus state in 2020. (The Economic Times, 2020)
		Achieved objective of affordable energy for all through the 24x7 Power for All programme. (Government of India and Government of Odisha, 2013)
		Following completion of the dam portion of the project and prior to completion of the irrigation component, water availability downstream of the dam decreased, agricultural

		production in the region decreased and farming patterns changed. (Choudhury et al., 2012).
	Construction of irrigation infrastructure. (OHPC, 2016b)	Year-round irrigation rose from 11,160 Ha to 57,012 Ha, constituting 82.3% of the total cultivable land. (JICA, 2003) (JICA, 2003)
		The irrigation project showed an increase in household income; increased farm employment opportunities for minority castes and tribes; improved food self-sufficiency and food surplus in the state; no negative environmental impact; no resettlement due to the project; other impacts such as increased availability and use of water for household duties, and the subsequent positive socio-economic impact such as increased schooling. (JICA, 2003)
Resettlement and displacement	Displacement of 17,000 people between 1989 and 1992. (Dash, 2008)	Detrimental social consequences, including the breakdown of societal structure and organisations, disbursement of social groups, and changing occupations. (Das and Tewari, 2014; Upper Indravati Hydro Project, 1997)
		The basic living standards of families decreased post-resettlement, given increased unemployment, loss of land, depleted income sources, and food insecurity. (Dash, 2008)
		Given a lack of consideration for the wellbeing of displaced people and the wider socio-economic impact, in 2006 the Orissa Resettlement and Rehabilitation (R&R) was developed and implemented for future projects to better protect displaced people. (Dash, 2008)

5.6.7. Findings

Table 23 details influences from the enabling environment identified in the Indravati dam project, how they shape the enabling environment, the impact to infrastructure and services, and the effect on need.

Table 23 – Indravati dam: Linkages between key influences, the effect on infrastructure and services, and need.

Influence	How does this shape the enabling environment?	How does this effect infrastructure services and implementation?	How does this effect ability to meet need?
Institutional capacity	· Odisha government were heavily involved in direct management of the project.	· The Odisha government project management team did not have the necessary engineering skills for a project of this scale and complexity.	· Services cannot be delivered as efficiently which delays provision of services to meet need.
	· A lack of clearly delineated responsibilities resulted in a lack of autonomy and parties able to make direct decisions.	· Effective delivery is more difficult without clear responsibilities, or collaboration. Work can be duplicated or not done.	
		· Contributed to withdrawal of World Bank loan until management was transferred to an international consulting firm.	
Policy and regulation	· Weak policy and regulation facilitated a negative environmental impact, such as submergence of land and villages.	· Feasibility studies were less thorough; infrastructure which might not be approved today due to adverse socio-economic effects on the population was approved.	· Fewer protection measures risk infrastructure being delivered for the wrong reasons, and not to meet the fundamental needs of the population.
	· Lack of social protection policies to protect displaced population.	· Poor safety due to weak safety policies resulted in finances being withdrawn.	· Weak regulation and corruption did not protect the local population from exploitation.
Project financing	· World Bank is willing to support projects in India, meaning more projects are possible.	· Insufficient government budget available if government is reliant on taxes to pay for infrastructure.	· If funds are withdrawn partway through the project, needs remain unmet, but the situation for the poor can be worse if resettlement has already occurred.

	· The private sector is welcome as state governments and departments are typically underfunded. However private investment has shown to increase corruption.	· Funding was withdrawn midway through the project. The withdrawal of funds threatened delivery.	· Farmers did not receive the promised and necessary irrigation.
		· Work package was split and irrigation portion of the project was not delivered as planned.	· Funding of services through tariffs which may be unaffordable for some.
Wealth inequality (High poverty, wealth and income inequalities)	· Odisha has a much higher percentage of people below the poverty line than the Indian average. Odisha is a poor, mainly agrarian state.	· Disparities in access to infrastructure depending on economic status, such as between the poor and wealthy, rural and urban, and socio-economic group and caste.	· Farmers must rely on irrigation systems given desperate need for water regulation. This means there is a monopoly on the cost of water services that farmers are 'forced' to pay if they want their crop yield to increase.
		· Poor people in Odisha were not consulted during project planning and delivery. Needs not prioritised or even considered.	
Social relationships	· Many of the people affected by the dam were of local tribes, honouring a traditional way of life within a community.	· Different groups have specific needs. For example, farmers require water provision for farming, reflected in irrigation delivery.	· People within the same social groups likely have similar needs.
	· Exclusion and marginalisation of tribes and some social groups.	· Difficult for international staff to understand and behave in a way that reflects local business customs.	· Government more likely to respond to needs if multiple people and social groups require same service.

			· Entrenchment of poverty if infrastructure not aligned with social context.
Social protection	· Poor and minority groups were vulnerable and marginalised.	· The negative social impact of the dam may have been mitigated if social protection policies were stronger.	· People's rights and needs are less observed or fulfilled without a safety net to protect them.
	· Creates an urgent need for infrastructure to meet basic needs.	· Health and safety of construction would be a greater priority if workers had better legal protection.	
	· Human rights unprotected.		
Resettlement	· Dispersed social groups.	· Increased need for supportive services and policies to improve welfare of displaced people.	· People may be relocated away from well serviced areas that previously met their needs, or areas where they had adapted to meet their needs within the available boundaries.
	· Loss of livelihood for many people, and subsequent increase in poverty.	· Services likely required to meet immediate need of people as they resettle. These may be different from the long-term services required, and cost additional budget.	· Loss of social networks and therefore loss of social and economic resilience.
	· Exclusion and marginalisation of social groups.		
Natural environment	· Odisha has a seasonal climate with periods of heavy rain during monsoon season, and drought at other times of year.	· Dam needed to regulate water management for year-round crop irrigation.	· Farmers have water for year-round crop irrigation to enable crop production throughout the year, to improve food and income security.

	· The Indravati river provided high hydropower potential.	· Infrastructure needed to accommodate seasonal variation, such as higher river flow in monsoon season.	· Hydropower provides electricity to the region.

5.6.8. Data analysis

5.6.8.1. Project appraisal (PA)

Performance by criteria

The framework revealed mixed performance. Only 41% of criteria were met. Compared to other projects, a high number of criteria were either not met or partially met. 9% of criteria performed extremely badly. 17 criteria were not met, shown in Table 24 below.

Table 24 - Indravati dam: Lowest performing criteria; not met.

Dimension	Goal	Criteria	Indravati
Governance	Stakeholders are fairly represented.	Community and those served by services are involved, represented and empowered.	1
Financing	Secure capital finance.	Sufficient capital is available to finance the project.	1
Financing	Secure capital finance.	Funding is secure.	1
Service delivery	Delivery milestones are met.	Project was delivered to programme.	1
Service delivery	Delivery milestones are met.	Project was delivered to budget.	1
Social value	Promotion of social equality and inclusion.	Service serves all community members equally.	1
Governance	Governance is transparent.	Service delivery is free from corruption and bias.	2
Governance	Governance is transparent.	Procurement and the supply chain are transparent and fair.	2
Governance	Stakeholders are fairly represented.	All stakeholders are involved and consulted according to their respective roles.	2

Governance	Stakeholders are fairly represented.	Stakeholders are not marginalised.	2
Infrastructure	Infrastructure is fit for purpose.	Infrastructure meets quality standards.	2
Service delivery	Planning stages are comprehensive.	Project delivery and construction consider local context, skills and resources.	2
Social value	Promotion of social equality and inclusion.	Service discourages marginalisation of social groups.	2
Social value	Alignment with local culture and values.	Cultural preferences and barriers have been considered in design.	2
Social value	Alignment with local culture and values.	Community and end users have been consulted.	2
Social value	Community ownership of services.	Community and end users feel ownership over services.	2
Social value	Community ownership of services.	Community and end users are considered in decision-making.	2
Contribution to development	Service is sustainable.	Environmental sustainability is considered in the design and delivery.	2

Although 28 criteria were met, none showed exceptional performance.

Performance by goal

Performance by goal is shown in Figure 26.

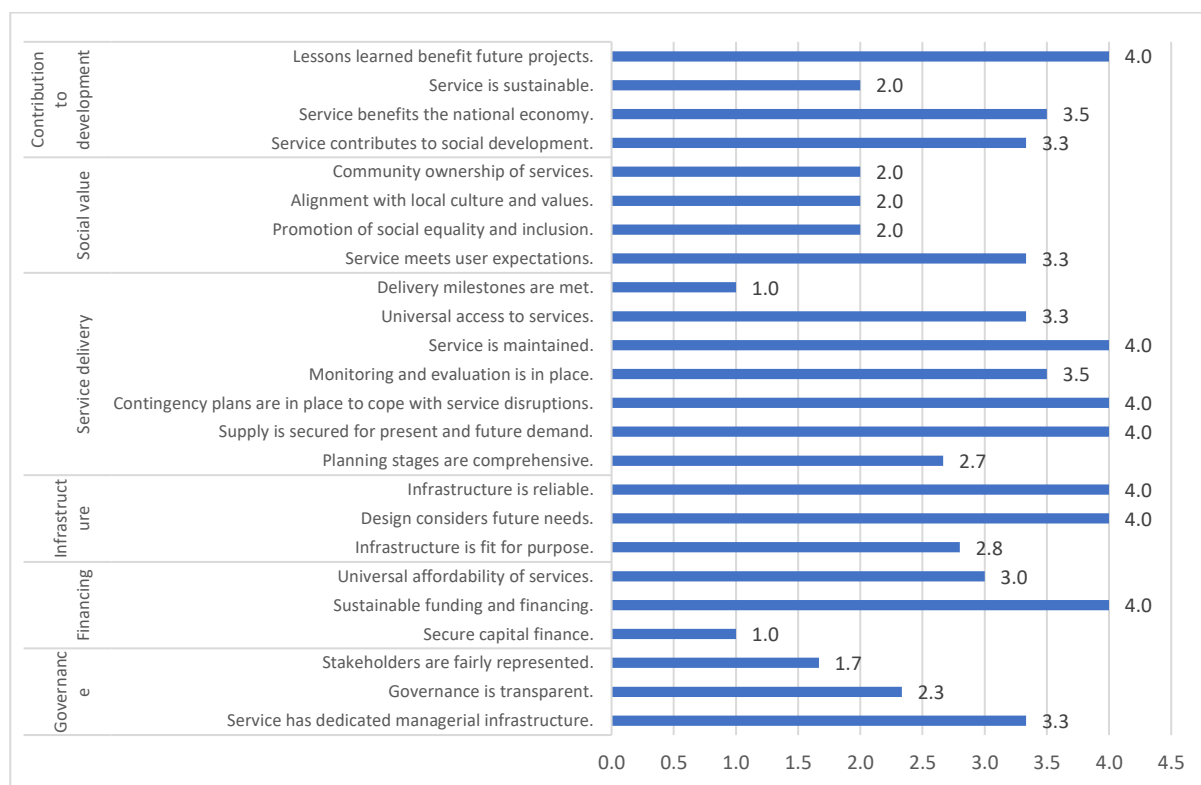


Figure 26 - Indravati dam: Bar chart showing performance score of each goal, calculated by the average of component criteria.

Seven of the 24 performance goals scored 4.0 which is acceptable, however zero scored above this. Seven goals scored two or below. *Delivery milestones are met* and *secure capital finance* both scored one. Criteria failed to be met in every dimension.

Performance by dimension

Table 25 shows performance by dimension, shown as a percentage of total points achieved.

Table 25 - Indravati dam: Performance by dimension in descending order.

Dimension	Percentage score
Infrastructure	68
Service delivery	67
Contribution to development	66
Financing	62
Governance	53
Social value	48

The *infrastructure*, *service delivery*, and *contribution to development* dimensions performed similarly; within two percentage points of each other. The *governance* and *social value* dimensions performed

very poorly, both as a project and when compared to other case studies. The range of scores is significant, 20%, which suggests that infrastructure was a much greater priority to the project than social value.

5.6.8.2. Enabling environment appraisal (EEA)

The completed EEA in Table 26 shows influences within the enabling environment scored as low, medium, or high.

Table 26 - Indravati dam: EEA results table. Variables scored on a scale through low, medium, and high, structured by dimension.

Institutions and governance		Economic	
Alignment between actors	H	Ability of states to self-generate income	M
Centralised policy	M	Aid	N/A
Civil liberties	N/A	Borrowed finance	H
Clear vision for the future	L	Capital finance	H
Clientelism	L	Economic globalisation	N/A
Closeness of inter-national relationships	N/A	Economic growth	N/A
Collaborative inter-organisation relationships	H	Economic stability	N/A
Conflict	N/A	Economic strength	N/A
Conflicting stakeholder motives	N/A	Employment opportunities	N/A
Consistent behaviour	N/A	Grants	N/A
Corruption	L	Household income	L
Decentralisation of decision making power	M	International trade	N/A
Decentralisation of governance	M	Investment in research	N/A
Decentralised policy	M	Investment opportunities	N/A
Deliver manifesto	N/A	Investor confidence	N/A
Democracy	N/A	Investor interest	N/A
Disparities between provinces	L	Loans	H
Electorate influence	N/A	Local economic growth	N/A
Fair political and policy decision making	M	Local industry	N/A
Free media	N/A	Local resources	M
Geographical advantage	N/A	National industries	N/A
Geographical proximity to other countries	N/A	Poverty	M
Government motivated by development	L	Private investment	N/A
Growth and capacity building of local	L	Private property rights	N/A
Institutional capacity	H	Privatisation	N/A
Inter-government collaboration	N/A	Provincial financial autonomy	M
Political change	N/A	Public funds	M
Political parties incentivised to align with public opinion	N/A	Public investment in infrastructure and services	M
Political self-interest in inter-national	N/A	Public revenue	N/A
Political stability	N/A	Reliance on other economies	N/A
Power struggles	N/A	Remittances	N/A
Provincial autonomy over implementation and management of infrastructure and services	M	Risk for investors	N/A
Public confidence in institutions and	N/A	Unemployment	N/A
Resistance to integration of government	H	Value of personal assets	M
Rules and regulations followed	M	Wealth divide	M
Rules and regulations in place	H		
Sectoral policy	N/A	Development	
Shared natural resources	N/A	Desire for infrastructure development	M
Social unrest	N/A	Economically motivated development agenda	L
Stable government	N/A	NGO support	N/A
State capture	L	Respect for human rights	H
State stability	N/A	SDGs met	N/A
Strategic location for trade and protection	N/A	Socially motivated development agenda	N/A
Strong leadership	N/A	Trickle-down development policies	M
Transparency	L	Trickle-up development policies	N/A
Votes	N/A		
Voting rights	N/A		

Social	
Access to better paid work	N/A
Behaviour change	N/A
Brain drain	N/A
Caste system	N/A
Changing role of women in society	N/A
Citizen's power	N/A
Community and family resilience	M
Community engagement	L
Demographic changes	L
Diaspora	N/A
Educated population	N/A
Employment in agriculture	M
Empowerment	M
Engrained social behaviours	N/A
Gender equality	N/A
Human capital	L
Informal sector employment	N/A
Internal migration and urbanisation	L
International migration	N/A
Investment in education	N/A
Marginalisation of vulnerable and minority groups	H
Population welfare	H
Regional inequality	M
Religion	N/A
Resettlement	H
School enrolment	N/A
Skilled workforce	N/A
Social equality	H
Social protection	H
Strong social relationships	M
Traditional culture	L
Urban/rural divide	L
Vocational training	N/A
Worker's rights	N/A

Natural environment	
Available natural resources	H
Climate change	N/A
Climate migration	N/A
Commodifiable crops	M
Consistent agricultural production	M
Environmental degradation	N/A
Food security	N/A
Likelihood of extreme weather events	M
Physical limits of service provision	N/A
Pollution	N/A
Risk to livelihoods	H
Variable climate	M
Vulnerability of geographical location	N/A
Vulnerability to weather related disasters and shocks	M
Water availability	H
Water security	H

Infrastructure and service delivery	
Ability to adapt to external shocks and stresses	L
Access to services	H
Accurate up-front cost and programme estimation	H
Affordable services	L
Aligned business culture and communication	N/A
Available technology	N/A
Availability of resources and materials for construction	N/A
Risk of budget overrun	H
Changing service needs	N/A
Clear project scope	M
Community managed infrastructure	N/A
Construction cost	H
Cost of consultants and contractors	N/A
Cost of labour	N/A
Cost of materials	N/A
Decentralised services	L
Design options	L
Efficient delivery	M
Engineering and management expertise	M
Fair procurement	L
Feasibility studies	H
Financial return	N/A
Financially motivated stakeholders	N/A
Funding available for O&M	N/A
Infrastructure output	H
Internal national engineering and management capability	H
Knowledge sharing	N/A
Easily maintained and operational infrastructure	N/A
Monitoring and evaluation	L
Needs prioritised in design	M
Opportunities for local businesses	N/A
Opportunities to leapfrog	N/A
Optimal design to meet need	M
Participatory consultation with communities	M
Payment of services through tariffs	L
Planned infrastructure pipeline	L
Achievable programme	M
Project budget	H
Quality of infrastructure and services	M
Redundancy in design	L
Reliance on international supply chain	N/A
Resilient infrastructure	N/A
Service needs gap	H
Services available	H
Skills available for O&M	N/A

Infrastructure and service delivery (cont.)	
Skills transfer	N/A
Social infrastructure	H
Subsidised services	N/A
Supplier monopoly	N/A
Sustainable funding model	N/A
Sustainable services in the long-term	L
Thorough planning	H
Use of international consultants and contractors	N/A
Use of public or PPP delivery model	N/A
Use of services	N/A
Workers available	N/A

Summary

Dimension		Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery	TOTAL
Applicable	H	5	3	5	4	1	12	30
	M	7	8	5	5	2	8	35
	L	8	1	6	0	1	10	26
Total applicable		20	12	16	9	4	30	91
Percentage variables applicable		43	34	47	56	50	54	46
Non-applicable		27	23	18	7	4	26	105
Total		47	35	34	16	8	56	196

5.6.8.3. Case study CLD (C-CLD)

The Indravati project C-CLD is shown in Figure 27.



Figure 27 - The C-CLD for the Indravati project, adapted from the M-CLD. Size of circles show level of influence on a low-medium-high scale; larger circles show higher influence. Thickness of connection lines show strength of relationship on a 1-2-3-4 scale; 4 indicates the strongest relationship.

5.6.9. Discussion

Only 46% of total variables from the M-CLD are present, and the C-CLD has low representation of variables from all dimensions of the M-CLD, as shown in Table 26. There is a varied distribution of low, medium, and high influence variables.

The project can be characterised by a central focus on infrastructure output. The two objectives were to increase energy and irrigation infrastructure, but no social objectives were present. A second notable

characteristic is a lack of consideration for social wellbeing and impact to the local and affected population.

Institutional environment

The PA results show that the wider institutional environment and managerial arrangements were weak and contributed to some of the project failings. Accountability and liability for service delivery, and clear delineation of responsibilities were not present. Engineering and management expertise were not always available, and organisations did not always work collaboratively together. There was also a restructure of project management midway through the project due to poor performance, a temporary withdrawal of funds during this, and a resultant resistance to integration of past and present project management teams, including government departments. This affected the efficiency of the delivery team and the infrastructure output. Figure 28 demonstrates this.

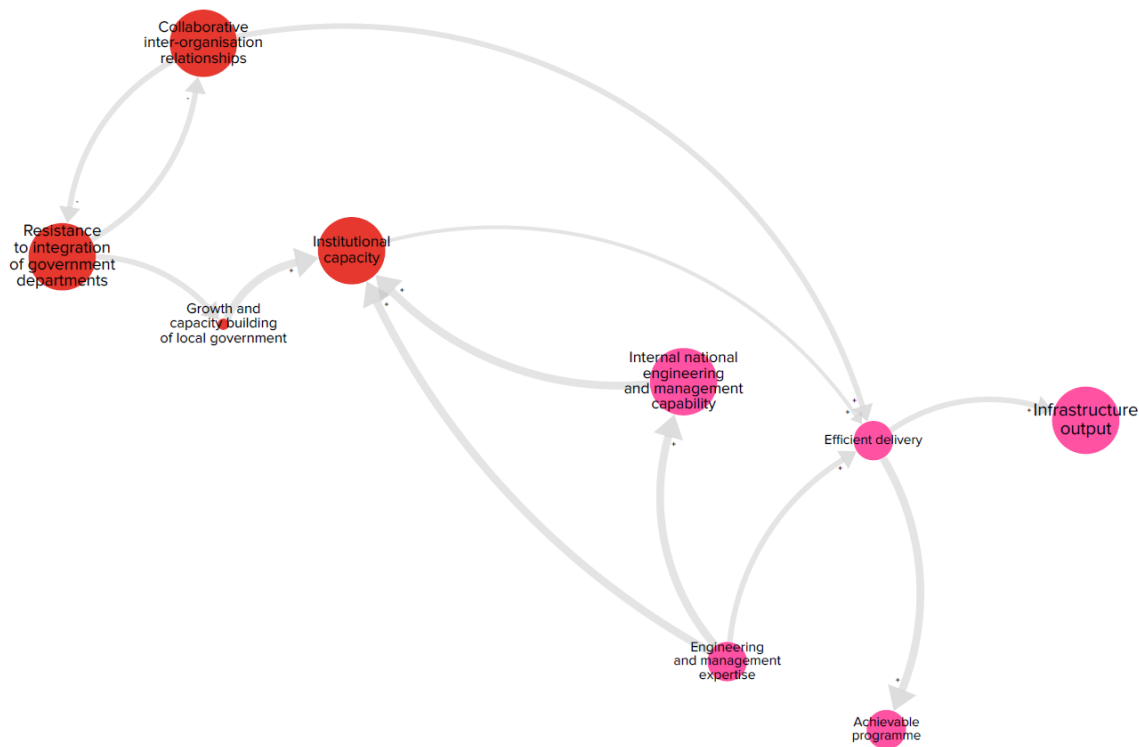


Figure 28 - Relationships showing the influence of the institutional environment.

Institutional capacity can be increased by growth and capacity of local government, which can itself be increased as resistance to integration of government departments is reduced, inside and outside of the project. This is reduced when inter-organisation collaboration is improved, which also increased efficiency of project delivery. Institutional capacity is also increased by engineering and management expertise and internal national engineering and management capability. These factors are mostly of high influence. This indicates that two intervention points to increase institutional capacity are increased expertise and capabilities, and improved collaboration. In turn, increased institutional capacity increases efficiency of delivery and subsequently infrastructure output. Notably, as efficiency of delivery

improves, the programme becomes more achievable. The project performed very poorly for delivery to programme, due to slow procurement and construction, and deemed to be too optimistic at the outset. Therefore, these intervention points would also benefit this.

An interesting finding is the resistance of staff to work from site in preference for remote working from major cities. The geographical location of Indravati deterred government staff from working locally, which was attributed to delays. This was a limiting factor to securing the necessary expertise.

Financing

Financing arrangements had significant impact on the outcome of the Indravati project. Work was delayed or not completed due to withdrawal and withholding of funds. This was attributed to poor quality and safety performance, which is reflected by low PA scores relating to quality, safety, and adherence to codes, standards, and regulations. Figure 29 shows how capital finance and a resultant increased budget increases infrastructure output, which increases services available and access to services. Increased access reduces the service needs gap which reduces the need and amount of public investment in infrastructure and services, which in turn reduces capital finance. At present this is a reinforcing loop. However, if intervention was made to ensure capital finance remained constant and secure, the loop would become balancing, and infrastructure output would remain consistent and continue to reduce the service needs gap.

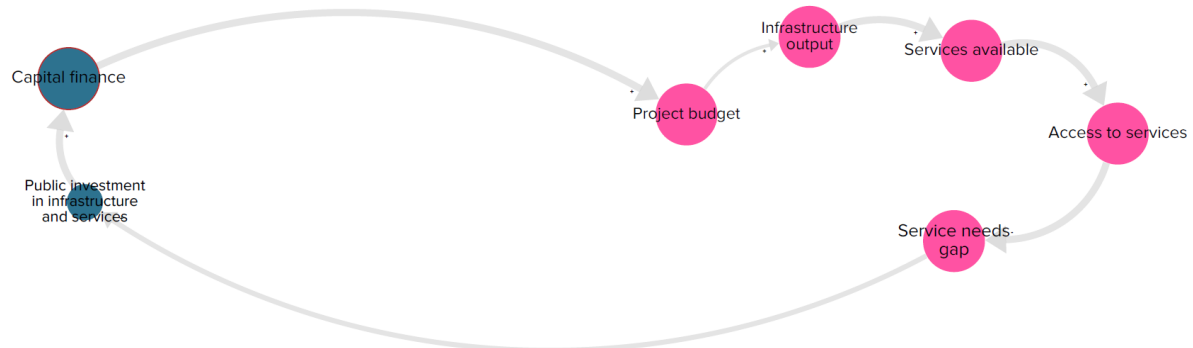


Figure 29 - Loop showing the relationship between budget and infrastructure output.

In a project with these challenges, a performance-based funding mechanism is suggested as a possible solution for consideration. Performance targets could be used to ensure that the project is delivered to the required standards, and used as a driver for meeting infrastructure output targets. *Infrastructure output* is a high influence variable in the C-CLD, reflecting the failure to deliver irrigation infrastructure, which became a point of failure and blocker to meeting need and the project objectives. In projects where infrastructure output is the primary objective, a performance-based model should be explored.

Policy and regulation

A poor regulatory environment also contributed to poor project performance. Failure to meet programme and budget were attributed to slow procurement and construction. Corruption was also present throughout procurement, as contracts were awarded to low bidders with insufficient skills or resources to deliver. The C-CLD shows that as corruption increases, rules and regulations are not followed, which reduces the quality of infrastructure and services. Figure 30 shows that intervention points are ensuring rules and regulations are in place, and increased transparency. Tighter ADB controls and regulations may have helped improve quality of delivery, which in turn would have helped achieve programme and budget.

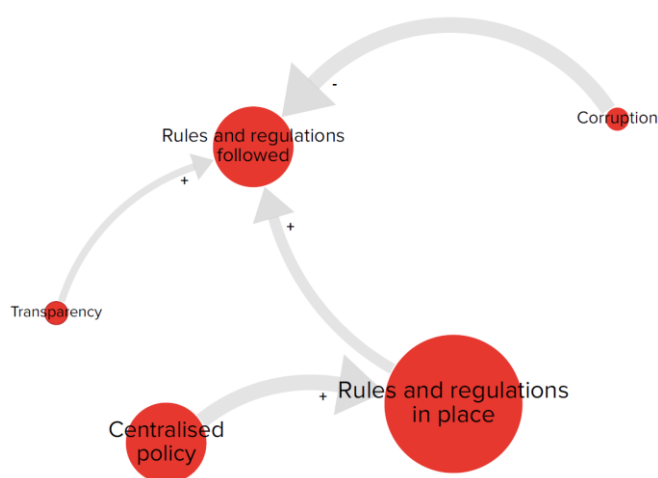


Figure 30 - Influencing variables which affect rules and regulations.

A lack of policy and regulation was also partly responsible for the detrimental socio-economic impact on the population, as discussed below.

Social protection and social infrastructure

Social factors were a primary failure point in the Indravati project, as shown in the PA results. There were no measures in place to ensure that the communities served by the services were involved, represented, or empowered, or to ensure that all people were served equally. Further failures were a lack of fair stakeholder representation, services did not contribute to discouraging marginalisation of social groups, the project did not align with local cultures and values, and the community were not considered in decision-making or awarded ownership of services.

Social protection and *population welfare* are identified influence points in the M-CLD. Improved social protection can directly improve many of these failure points: it improves population welfare, reduces risk to livelihoods, increases social equality, increases empowerment, decreases marginalisation of vulnerable and minority groups, and increases respect for human rights.

Social protection can be influenced by improved social infrastructure and centralised policy. There was no social infrastructure or supporting programmes implemented under the Indravati project, which was

particularly necessary to support the displaced population. In large scale government commissioned projects such as this, it is necessary to ensure that any social repercussions are well considered and mitigated by supporting social measures. Social infrastructure is a recommended leverage point in the system that would have likely improved the project outcomes in this area.

A second important influence of increased social protection is increased social equality, which in turn forms a reinforcing loop with marginalisation of vulnerable and minority groups. These relationships are shown in Figure 31. Marginalisation of tribal populations was a particular failure of the project, and efforts to reduce this are necessary. Increased social protection is a suggested leverage point to achieve this.

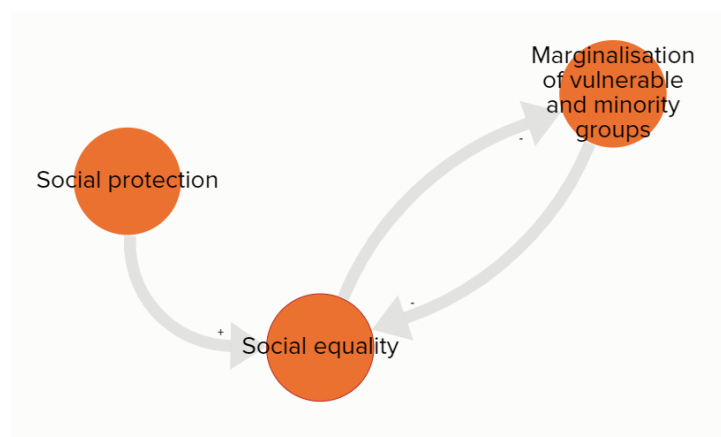


Figure 31 - Loop showing the relationship between social protection and protecting minority groups.

The rights and cultures of displaced people were not observed, social groups were dispersed, and little support was available for people to rebuild their livelihoods. The C-CLD shows that resettlement decreases strong social relationships, which decreases community and family resilience, which increases risk to livelihoods, which subsequently decreases the population welfare. Although displacement was necessary to enable new infrastructure, the supporting social infrastructure should be improved. Improved social infrastructure increases social protection which reduces risk to livelihoods, as previously discussed, which can be used to partially mitigate the detrimental impact caused by displacement. Therefore, although possible intervention in the relationships which link resettlement to risk to livelihoods is limited in projects of this scale, improved social infrastructure would help reduce the socio-economic impacts.

Furthermore, the impact of resettlement should be more carefully considered during the planning stages. Comprehensive feasibility studies should be carried out to assess and weigh the positive versus negative impact, whilst considering that projects of this scale will likely have some detrimental impact on local populations.

Summary

The project has a focus on physical infrastructure, which is ultimately required to meet the stated project objectives. Given that this is the case, the suggested interventions relate to delivery of the physical infrastructure, such as the institutional environment, financing, and policy. However, evidently a lack of consideration of the social implications of the project is a major downfall, and the discussion argues that intervention to strengthen social protection would improve the overall project outcomes. Many of the high influence points identified in the M-CLD are also related to social change.

Table 27 details suggested leverage points with their intended outcome that intervention aims to achieve.

Table 27 - Suggested leverage points and their intended outcomes.

Suggested leverage point	Intended outcome
Increase institutional capacity through appointment of organisations with greater expertise. Once appropriate appointments are made, clearly delineate responsibilities.	Project is delivered more efficiently through collaborative relationships, and to higher quality and safety standards given higher skills availability.
Explore a performance-based funding mechanism with performance criteria attached to programme, budget, quality, and safety.	Delivery to programme, budget and required standards. Infrastructure output and increased access to services achieved faster.
Policy and regulations to be in place to include design and construction codes and standards, and environmental and social protection policy.	Delivery of safe infrastructure or high quality. Increased protection of the local population, reduced detrimental socio-economic impact, and reduced adverse environmental impact.
Social protection policy to be implemented, including resettlement plans.	Fair compensation for resettled populations, observation of culture and values of local population, better consideration of the needs of the local population, and decreased marginalisation.
More extensive feasibility studies and a more comprehensive planning stage. Needs assessment and impact assessments required for social, economic, and environmental impact.	Better understanding of population needs, and mitigation of any detrimental impacts caused by the project.

5.7. Lifewater

5.7.1. The enabling environment

The Lifewater project is located in the West Arsi region of Ethiopia, on the east coast of Africa. The region experiences a variable climate, including periods of drought and monsoon rainfall, which is worsening with climate change. Droughts limit access to safe water, and the ability of infrastructure projects to successfully improve water access. The impact of droughts and a lack of access to safe water is exacerbated by high levels of poverty and high dependence on agriculture in the region. (Climate change knowledge portal, no date)

Ethiopia has a 10-year development plan in place, which begun in 2020, and aims to set strategic goals for sustainable long-term development, including reduced poverty rates, increased school enrolment, improved population welfare, and improved infrastructure. A focus area is water resources development, to include improved access and equitable provision of potable WASH services. However, the government acknowledges a significant challenge to progress is weak institutional capacity. (Planning and development commission, 2021)

In addition to the 10-year development plan, The National Social Protection Strategy was implemented in 2016 to improve social and economic wellbeing nationwide (International Labour Organisation, 2021).

Quality of infrastructure in Ethiopia is poor, and there is inadequate infrastructure to support the increasing population (World Bank, 2022c). Access to safe water and sanitation is particularly poor (UNICEF, no date); a problem which Lifewater aims to address. The government has a key role in the funding and delivery of infrastructure projects (Federal Democratic Republic of Ethiopia, 2016).

5.7.2. Background and project description

Lifewater is a Christian NGO working to solve the water and sanitation crisis, working in villages across Ethiopia, Uganda, Tanzania, and Cambodia to install decentralised water and sanitation infrastructure and change hygiene behaviours by working closely with communities (Lifewater International, 2020).

The West Arsi project was a major project in the Kokosa and Nensebo districts of Ethiopia, lasting three years from 2015 to 2018 (Lifewater International, 2019c). The project aimed to provide approximately 45,000 people with safe water, sanitation, and hygiene, using the Vision of a Healthy Village (VHV) programme (INT-5; Lifewater International, 2015).

5.7.3. Need for the project

Ethiopia has the second largest population in Africa, with approximately one third of the population without safe water, approximately one quarter of the population without a toilet, and almost half of the

population without access to handwashing facilities (Lifewater International, 2019b). Other poverty indicators are also worrying, including high rates of child mortality, a decreasing fertility rate, and low life expectancy, however, notably, poverty is reducing overall (Lifewater International, 2019a).

Lifewater determined need by the level of water coverage, prevalence of waterborne illness, and ways in which communities were managing water. Communities are chosen if they demonstrated evidence of pre-existing community development efforts, were of settled status, were in rural or hard-to-reach locations, and lacked a strong Christian presence (Lifewater International, 2018).

When communities themselves were asked about their needs and the community's greatest problems in the 2015 baseline report, 69% answered water quality, 51% answered water scarcity, 26% answered roads, and 24% answered health facilities (Lifewater International, 2015). The baseline report also revealed the following issues: varied water availability between seasons, a long distance and travel time to water, only 1% of water users paid for water, a poor management mechanism and lack of Water Committees, poor O&M, a lack of latrine availability, poor handwashing facilities and behaviours, and a lack of hygiene education (Lifewater International, 2015).

5.7.4. Infrastructure implemented

Physical infrastructure

Lifewater infrastructure was designed specifically for context within the wider VHV approach, involving: custom engineering to develop appropriate solutions to context; technology suited to the community and context; infrastructure to meet international standards; and water quality testing (Lifewater, 2016).

Infrastructure included provision of new and rehabilitated hand dug wells, provision of wash basins and cattle troughs to protect springs from contamination, and provision of latrine blocks in schools (Lifewater International, 2015).

Facilitating infrastructure

Lifewater's programme to support installation of physical infrastructure is made up of four areas with specific objectives: healthy homes, healthy schools, health churches and healthy villages (Lifewater, 2018a, 2018b, 2020a, 2020b).

Healthy homes ensure measures such as handwashing in place, safe water storage, and latrine access (Lifewater, 2018a). Healthy schools ensure, for example, provision of toilets with handwashing facilities, WASH lessons, and access to WASH for disabled students (Lifewater, 2020b). Healthy churches provide, for example, church leaders trained in WASH, and outreach programmes to support households (Lifewater, 2020a). Healthy villages ensure measures such as provision of a Water Committee, community-led sustainable change, and trained local leaders (Lifewater, 2018b).

Social infrastructure

Much of Lifewater's work can be considered social infrastructure, given the heavy focus on community-led change, behavioural and educational programmes, and employment of local community members to lead the programme. (INT-5)

5.7.5. Delivery

Role of communities

Communities were heavily involved in project delivery, including initial consultation to understand their needs, involvement in the design process, employment in the construction of the infrastructure, responsibility for O&M, and responsibility for collecting funds to finance the infrastructure (INT-5; Lifewater International, 2020).

Many Lifewater staff were members of the recipient communities, which stimulated behaviour change from within, further encouraged by strong social relationships and group behaviours (INT-5). This helped achieve Lifewater's mandate that infrastructure is only installed when positive behaviour changes are evident across 90% of the community (Lifewater International, 2020).

Once constructed, a Water Committee was established to manage the services within the communities, including O&M (Lifewater International, 2020). However, limited skills capacities within communities for O&M was a challenge, although Lifewater attempted to mitigate this by ensuring infrastructure design aligned with skills capacities where possible (INT-5). Monitoring and evaluation is carried out by local facilitators once per month in each village to check each household's progress against baseline (Lifewater, 2022), and for the five years following project completion water points and open defecation were monitored (Lifewater, 2018c).

Assessments

Before implementation, formative data was gathered about the region's water supply, population, and topography (Lifewater International, 2015), and a project feasibility assessment and baseline survey were carried out to assess pre-existing WASH practices (Lifewater International, 2016).

Following assessments, Lifewater follows a set procedure: selection of villages; assessment of pre-existing WASH practices; registration of healthy homes once hygienic behaviours were observed; certification that households were open-defecation free; selection of a Water Committee; construction of infrastructure; healthy village certification once more than 90% of households were healthy (Lifewater, 2021).

Funding

Lifewater is mostly funded by general giving, and therefore the income stream is unpredictable. To mitigate this, projects are designed and started only when the total funds required are secured and available. (Lifewater International, 2020)

Design

Lifewater's VHV is the programme design 'blueprint', however all villages are assessed for their unique needs and differing hydrology, resulting in infrastructure designed specifically for context. Design is often challenged by natural water availability in the drought seasons. (Lifewater International, 2015)

At the time of design and implementation of the project, the required international standard in accordance with WHO guidelines was that all water sources must be within 1km of homes and have a 30-minute waiting time or less (WHO and UNICEF, 2017). However, by project completion the guidelines had been changed, requiring a total maximum travel time to water of 30 minutes (WHO and UNICEF, 2017). The project therefore failed to meet this standard (INT-5; Lifewater International, 2019c).

Challenges

INT-5 reported that lengthy and complex approval process for NGOs to work in Ethiopia deter participation of NGOs.

5.7.6. Output and outcomes

The key project outputs and outcomes are shown in Table 28, sourced from the programme results report (Lifewater International, 2019c).

Table 28 - Lifewater project outputs and outcomes.

	Output	Outcome
Physical infrastructure	Construction of 101 safe water points.	192% increase in safe water access in the West Arsi region; 69% of households with safe drinking water; reduction in water collection time from 1.5 hours to 52 minutes; improved equality in water access, including for the poor and vulnerable.
	Provision of latrines in communities.	92% of households with access to a latrine, providing dignity; 98% reduced incidences of diarrhoea in children under five years; increased school enrolment, particularly

		amongst girls with a 22% increase in girls attending school.
Education to support physical infrastructure	Establishment of the holistic Vision for a Healthy Village programme.	A higher percentage of people were able to save money; school enrolment increased, particularly amongst girls; and 'crowd mentally' behaviour change occurred.
	Healthy homes hygiene education to increase handwashing.	An increase of handwashing from 33% to 70%, reducing illness including incidences of diarrhoea in children under five years.
Institutional change	Implementation of Water Committees: post-project, 63% of communities have a Water Committee.	Improved management of water sources, more people paying for water, and improved maintenance.
		Provides a mechanism to manage funds to ensure water access for the poor.

5.7.7. Findings

Table 29 details influences from the enabling environment identified in the Lifewater project, how they shape the enabling environment, the impact to infrastructure and services, and the effect on need.

Table 29 – Lifewater: Linkages between key influences, the effect on infrastructure and services, and need.

Influence	How does this shape the enabling environment?	How does this effect infrastructure services and implementation?	How does this effect ability to meet need?
Development plan	· Development seemed economically motivated, and lacked coordination between investment and development need.	· Poor quality and high inequity in infrastructure projects.	· With a focus on economic development, the fundamental immediate needs of the poor are likely not to be met.
	· Poor alignment of federal, regional and district level investment plans with the national development goals.	· High regional disparities in infrastructure development and access to services.	· Increased inequality as regional differences increase risks worsening inequality and poverty divide.

		· Funds are less likely to be directed towards decentralised infrastructure, although large scale projects may be seen as a priority.	
Policy and regulation	· Lengthy approval processes for NGOs to work in the country.	· Lifewater could not operate without approval from government.	· Without approval to work services could not be provided for people, who remain without water and sanitation.
	· WHO water and sanitation international standards dictated the required service provision.	· WHO standards changed midway through the project, so the design met international standards but at project completion the infrastructure failed to meet them.	
Religion	· Country is divided by ethnicity and religion, causing conflict.	· Lifewater prioritised communities without a strong Christian presence or thriving church. These were often Muslim or animist villages.	· Christian communities may go without help even if more in need than non-Christian communities prioritised by Lifewater.
	· People often only integrate with others in their religion.		
Social relationships	· Social relationships in communities across Ethiopia are strong, revolving around family and close friends.	· Lifewater staff lived in villages which improved the understanding of need and better informed the design.	· More likely to meet need if staff and those implementing the projects have a fuller understanding of communities and their individual needs.
	· There is high dependence on neighbouring communities and families.	· Interventions could be designed for each community and village independently, rather than a generic solution.	· Specific solution for each village is more likely to meet need.

	· Social network is strong which increases resilience to experiences of individual families and people.	· Strong social relationships could be used to increase the resilience of physical infrastructure through social infrastructure. For example, by implementing a plan for use of other water sources in the event that one fails.	
Skills availability	· The wider economy suffered from a skills shortage, seen also in the capacity of the government.	· Skills available for O&M were limited.	· Lifewater's work helped increase the skills base in the local community.
	· Skills availability in rural areas worse than urban.	· Skills available for construction of infrastructure were limited.	
Natural environment and resources	· Seasonal weather variations affected the farming calendar; most people in the rural areas relied on agriculture as their primary income.	· Communities themselves helped build Lifewater infrastructure. Therefore, the project programme had to be designed around the farming calendar.	· Needs of communities vary depending on season. Water availability is lower in dry periods, so the need for wells is increased.
	· Ethiopia highly vulnerable to climate shocks, including drought and subsequent food insecurity.	· Lifewater designed wells to reach aquifers, however, were limited to depth and sophistication of the infrastructure for cost-effective reasons.	
	· Natural availability of water determines accessibility of water. In dry periods less or no water is available.		
Poverty	· 19% of the population live below the poverty line (2020).	· A widespread lack of access to basic services.	· Basic needs unmet, including water and sanitation.
	· High wealth inequality.		· Poor population is vulnerable to shocks such as

			unforeseen economic or climate events.

5.7.8. Data analysis

5.7.8.1. Project appraisal (PA)

Performance by criteria

Performance is shown against each criteria individually. The framework revealed overall good performance. Fewer criteria performed exceptionally than some other projects, but overall a high proportion met the criteria, 74%. Only two criteria were not met, shown in Table 30.

Table 30 - Lifewater: Lowest performing criteria; not met.

Dimension	Goal	Criteria	Lifewater
Governance	Service is maintained.	Spare parts are available and affordable.	2
Service delivery	Service is maintained.	Technical support is available.	2

Eight criteria showed exceptional performance.

Table 31 - Lifewater: Highest performing criteria; scoring exceptional.

Dimension	Goal	Criteria	Lifewater
Governance	Governance is transparent.	Feasibility assessments and planning consider need over stakeholder gain or alternative motives.	5
Governance	Stakeholders are fairly represented.	Community and those served by services are involved, represented, and empowered.	5
Infrastructure	Infrastructure is fit for purpose.	Infrastructure is appropriate in context.	5
Service delivery	Planning stages are comprehensive.	Project delivery and construction consider local context, skills and resources.	5
Service delivery	Universal access to services.	Infrastructure increases service coverage.	5

Social value	Promotion of social equality and inclusion.	Service serves all community members equally.	5
Social value	Promotion of social equality and inclusion.	Service enhances wellbeing of communities and users.	5
Social value	Alignment with local culture and values.	Community and end users have been consulted.	5

Performance by goal

Performance by goal is shown in Figure 32.



Figure 32 - Lifewater: Bar chart showing performance score of each goal, calculated by the average of component criteria.

The best performing project goal was *promotion of social equality and inclusion*, followed by *alignment with local culture and values*, both within the *social value* dimension, reflective of the socially motivated nature of the project.

Performance by dimension

Table 32 shows performance by dimension, shown as a percentage of total points achieved in descending order.

Table 32 - Lifewater: Performance by dimension in descending order.

Dimension	Percentage score
Social value	86
Contribution to development	80
Governance	80
Service delivery	74
Infrastructure	73
Financing	73

The *social value* dimension performed best, although the project performed well in all dimensions.

5.7.8.2. Enabling environment appraisal (EEA)

The completed EEA in Table 31 shows influences within the enabling environment scored as low, medium, or high.

Table 33 - Lifewater: EEA results table. Variables scored on a scale through low, medium, and high, structured by dimension.

Institutions and governance		Economic	
Alignment between actors	N/A	Ability of states to self-generate income	N/A
Centralised policy	N/A	Aid	L
Civil liberties	N/A	Borrowed finance	N/A
Clear vision for the future	N/A	Capital finance	M
Clientelism	N/A	Economic globalisation	N/A
Closeness of inter-national relationships	N/A	Economic growth	N/A
Collaborative inter-organisation relationships	N/A	Economic stability	N/A
Conflict	N/A	Economic strength	N/A
Conflicting stakeholder motives	N/A	Employment opportunities	L
Consistent behaviour	N/A	Grants	H
Corruption	N/A	Household income	M
Decentralisation of decision making power	N/A	International trade	N/A
Decentralisation of governance	N/A	Investment in research	N/A
Decentralised policy	N/A	Investment opportunities	N/A
Deliver manifesto	N/A	Investor confidence	N/A
Democracy	N/A	Investor interest	N/A
Disparities between provinces	M	Loans	N/A
Electorate influence	N/A	Local economic growth	N/A
Fair political and policy decision making	N/A	Local industry	N/A
Free media	N/A	Local resources	N/A
Geographical advantage	N/A	National industries	N/A
Geographical proximity to other countries	N/A	Poverty	H
Government motivated by development	M	Private investment	L
Growth and capacity building of local	N/A	Private property rights	N/A
Institutional capacity	M	Privatisation	N/A
Inter-government collaboration	N/A	Provincial financial autonomy	N/A
Political change	N/A	Public funds	N/A
Political parties incentivised to align with public opinion	N/A	Public investment in infrastructure and services	N/A
Political self-interest in inter-national relationships	N/A	Public revenue	N/A
Political stability	L	Reliance on other economies	N/A
Power struggles	N/A		N/A
Provincial autonomy over implementation and management of infrastructure and services	N/A	Remittances	N/A
Public confidence in institutions and	N/A	Risk for investors	N/A
Resistance to integration of government	N/A	Unemployment	N/A
Rules and regulations followed	H	Value of personal assets	L
Rules and regulations in place	H	Wealth divide	L
Sectoral policy	H		
Shared natural resources	N/A	Development	
Social unrest	N/A	Desire for infrastructure development	M
Stable government	L	Economically motivated development agenda	N/A
State capture	N/A	NGO support	H
State stability	N/A	Respect for human rights	L
Strategic location for trade and protection	N/A	SDGs met	H
Strong leadership	N/A	Socially motivated development agenda	H
Transparency	N/A	Trickle-down development policies	N/A
Votes	N/A	Trickle-up development policies	M
Voting rights	N/A		

Social	
Access to better paid work	N/A
Behaviour change	H
Brain drain	N/A
Caste system	N/A
Changing role of women in society	H
Citizen's power	N/A
Community and family resilience	H
Community engagement	H
Demographic changes	L
Diaspora	N/A
Educated population	L
Employment in agriculture	M
Empowerment	N/A
Engrained social behaviours	H
Gender equality	H
Human capital	N/A
Informal sector employment	N/A
Internal migration and urbanisation	L
International migration	N/A
Investment in education	L
Marginalisation of vulnerable and minority groups	M
Population welfare	H
Regional inequality	M
Religion	H
Resettlement	N/A
School enrolment	N/A
Skilled workforce	N/A
Social equality	M
Social protection	N/A
Strong social relationships	H
Traditional culture	H
Urban/rural divide	M
Vocational training	N/A
Worker's rights	N/A

Natural environment	
Available natural resources	H
Climate change	L
Climate migration	N/A
Commodifiable crops	N/A
Consistent agricultural production	N/A
Environmental degradation	N/A
Food security	M
Likelihood of extreme weather events	N/A
Physical limits of service provision	H
Pollution	N/A
Risk to livelihoods	M
Variable climate	M
Vulnerability of geographical location	M
Vulnerability to weather related disasters and shocks	M
Water availability	H
Water security	H

Infrastructure and service delivery	
Ability to adapt to external shocks and stresses	N/A
Access to services	H
Accurate up-front cost and programme estimation	N/A
Affordable services	M
Aligned business culture and communication	M
Available technology	M
Availability of resources and materials for construction	N/A
Risk of budget overrun	N/A
Changing service needs	N/A
Clear project scope	M
Community managed infrastructure	H
Construction cost	N/A
Cost of consultants and contractors	N/A
Cost of labour	N/A
Cost of materials	N/A
Decentralised services	H
Design options	M
Efficient delivery	N/A
Engineering and management expertise	M
Fair procurement	N/A
Feasibility studies	H
Financial return	N/A
Financially motivated stakeholders	N/A
Funding available for O&M	M
Infrastructure output	H
Internal national engineering and management capability	N/A
Knowledge sharing	M
Easily maintained and operational infrastructure	H
Monitoring and evaluation	M
Needs prioritised in design	H
Opportunities for local businesses	N/A
Opportunities to leapfrog	N/A
Optimal design to meet need	H
Participatory consultation with communities	H
Payment of services through tariffs	M
Planned infrastructure pipeline	L
Achievable programme	L
Project budget	N/A
Quality of infrastructure and services	L
Redundancy in design	M
Reliance on international supply chain	N/A
Resilient infrastructure	N/A
Service needs gap	H
Services available	H
Skills available for O&M	H

Infrastructure and service delivery (cont.)	
Skills transfer	L
Social infrastructure	H
Subsidised services	N/A
Supplier monopoly	N/A
Sustainable funding model	M
Sustainable services in the long-term	H
Thorough planning	N/A
Use of international consultants and contractors	N/A
Use of public or PPP delivery model	N/A
Use of services	H
Workers available	L

Summary

Dimension		Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery	TOTAL
Applicable	H	3	2	10	4	3	15	37
	M	3	2	5	5	2	12	29
	L	2	5	4	1	1	5	18
Total applicable		8	9	19	10	6	32	84
Percentage variables applicable		17	26	56	63	75	57	43
Non-applicable		39	26	15	6	2	24	112
Total		47	35	34	16	8	56	196

5.7.8.3. Case study CLD (C-CLD)

The Lifewater C-CLD is shown in Figure 33.



Figure 33 - The C-CLD for the Lifewater project, adapted from the M-CLD. Size of circles show level of influence on a low-medium-high scale; larger circles show higher influence. Thickness of connection lines show strength of relationship on a 1-2-3-4 scale; 4 indicates the strongest relationship.

5.7.9. Discussion

The CLD has 84 variables present, which accounts for only 43% of variables within the M-CLD, as shown in Table 33. The *institutions and governance* and *economic* dimensions have very low representation; 17% and 26% respectively.

The Lifewater project can be characterised as driven by a desire for social wellbeing and prioritisation of population welfare.

Poverty

Poverty is widespread in Ethiopia which contributes to the widespread service needs gap, and lack of access to basic services. This is worsened by high wealth inequality and regional divides in infrastructure access.

The C-CLD shows that poverty reduces population welfare, which if reduced increases the service needs gap. An increased service needs gap further decreases population welfare, forming a reinforcing loop, as shown in Figure 34. These are three critical and high influence variables in the C-CLD and Lifewater context.



Figure 34 - The influence of poverty on welfare and the service needs gap.

The PA results show that the infrastructure provided by Lifewater successfully contributes to addressing these challenges and intervening at these variables. With respect to provision and access, the project scores well against criteria including access for poor, vulnerable and minority groups and improved geographical access, and scores particularly well in increasing service coverage. With respect to social impact, the project scores very well for enhancing wellbeing of communities and end users, and supporting local livelihoods.

Poverty encompasses many different factors, and is difficult to address directly. However, intervention to address population welfare is suggested as a more tangible intervention point. Population welfare can be improved when the government are socially motivated and adherence to the SDGs. Ethiopia is motivated to improve the welfare of the population and specifically to reduce the percentage of the population living below the poverty line in its 10-year development plan. However, infrastructure and services are not a focus area. Targets towards improved and increased infrastructure access is a suggested intervention point, which would simultaneously work towards achieving the SDGs, reduce the service needs gap, and contribute to holistic development.

Government motivation towards development and NGO support

The Ethiopian government has a development plan in place, and NGO support is able to help achieve these ambitions. The C-CLD shows that as the government is motivated by development, NGO support increases, which in turn increases social infrastructure, and subsequently access to services. Access to services goes on to reduce the service needs gap and increase use of services, which both serve to

increase population welfare, which is one of the key objectives of the project. Another important connection in this pathway is that infrastructure output also increases social infrastructure, and simultaneously increases services available which increases access to services. These relationships are shown in Figure 35.

Increased NGO support also triggers another important pathway as shown in Figure 35: as NGO involvement increases so too does participatory consultation with communities. This results in needs being prioritised in the design, which ensures optimal design to meet need, which subsequently reduces the service needs gap.

There are three possible intervention points in this sequence: NGO support, infrastructure output, and use of services, the first two of which are identified influence points in the M-CLD.

Increased NGO support can be achieved by engaging with both national and international NGOs. However, Lifewater reported lengthy and complex approval processes to register as an NGO in Ethiopia, which can act as a deterrent to NGO participation. Revising this to create a simplified process might attract more NGOs, which, as shown in the C-CLD, also increases finances available for development.

A second possible intervention point is increasing infrastructure output. Lifewater has a framework which provides the starting point for all projects. However, there is flexibility to adapt the design and delivery of infrastructure to each village. This framework ensures that implementation is efficient, and is suggested as one of the reasons for Lifewater's success and wide reach. This approach could be explored in similar projects, and would be particularly useful where infrastructure is decentralised.

A third possible intervention is increased use of services. Lifewater's work comprises a large social component aimed at educating communities on WASH to change detrimental behaviours and optimise the positive impacts of physical infrastructure. This educational component, a form of social infrastructure, should include efforts to increase use of services, which can be achieved with increased participation and consultation of communities. Even with the correct knowledge, if services are not adopted the effect of infrastructure provision will not be seen.

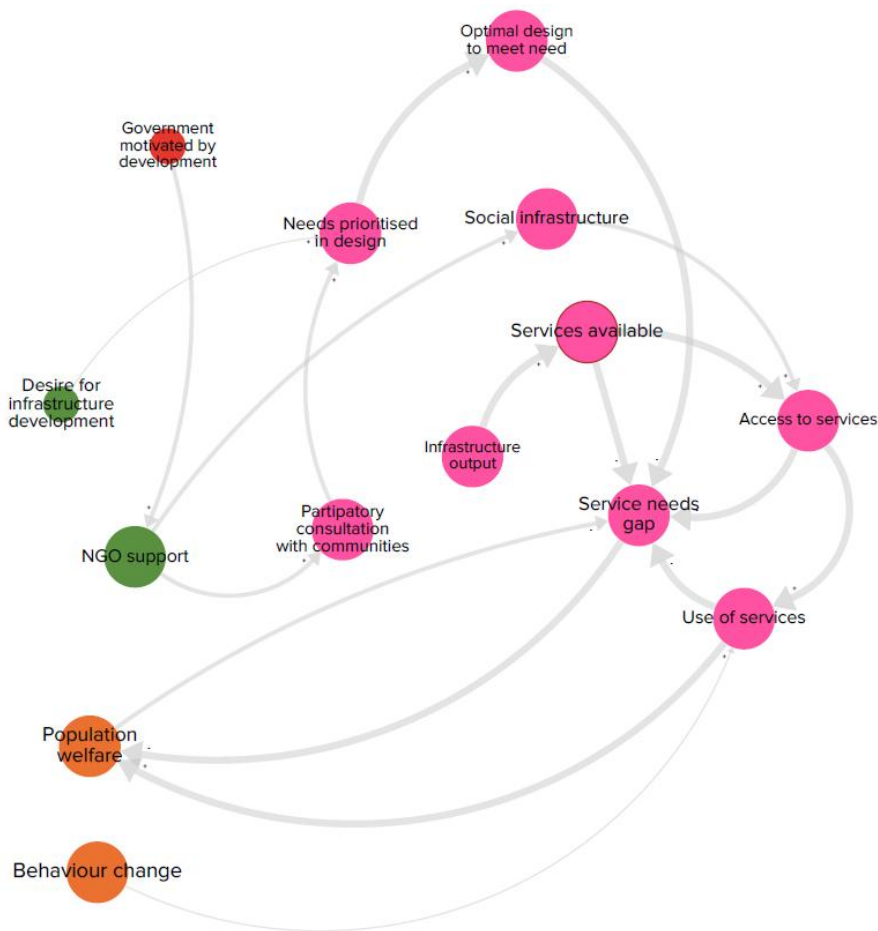


Figure 35 - The impact of a motivated government and NGO involvement.

Social relationships and traditional behaviours

WASH behaviours and the barriers to changing behaviours are linked to pre-existing social norms and customs. If behaviours are engrained, they are typically more difficult to change. In the case of Lifewater, behaviour is affected by strong social relationships and engrained social behaviours, as shown in Figure 36.

Traditional culture affects both variables, and is a good potential intervention point as it has no other outward connections and an indegree of zero, suggesting any intervention would have intended consequences and no side effects on other variables. Religion is another unique factor to the Lifewater project. Lifewater unites communities through religion and teaches best practices in churches, which encourages the spread of behaviour changes through strong and close religious communities. However, use of the church to promote hygiene behaviours risks exclusion of those with other religious beliefs. Therefore, measures to change detrimental engrained behaviours are suggested to encourage positive behaviour change. However, it is important to ensure that measures are respectful and consider cultural preferences and barriers in the design, which Lifewater successfully achieved as shown in the PA scores. This change may be achieved through capitalising on strong social relationships to initiate group behaviour change for more widespread impact.

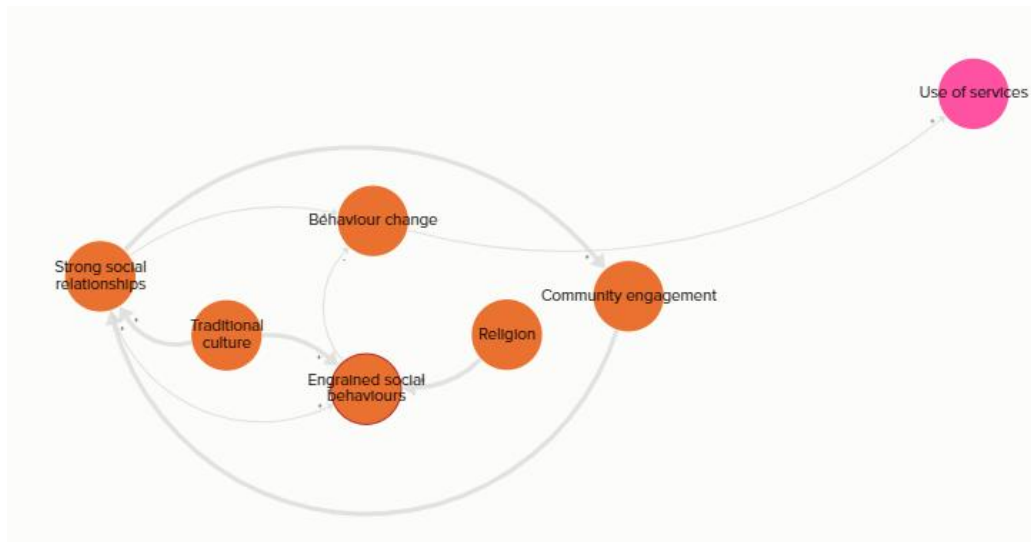


Figure 36 - The influence of social factors on use of services.

Lifewater capitalised on existing strong social ties by employing staff that were members of recipient communities. People that know each other are more likely to have influence over group behaviour than those unknown to the community, evident through the peer pressure observed. A lesson can be learned for other decentralised projects in similar environments: employment of locals who know other members of the community and understand social and cultural behaviours can have significant positive impacts on the efficacy of the infrastructure delivered.

Strong social relationships and community ownership has also served to improve the resilience of the infrastructure in unexpected ways. In the event of failure, villages were able to use alternative water sources in nearby villages given the closeness of communities. This is reflected in the C-CLD by high influence of the community and family resilience variable. Projects and organisations delivering them should be careful to nurture existing social connections rather than disrupt them, which will serve to increase the efficacy of any infrastructure implemented.

Programme design

A further method of achieving behaviour change is to adopt an incentivisation approach. Villages must demonstrate sustained behaviour change before Lifewater will sponsor and install water and sanitation facilities. This likely increases success because a) families are incentivised to change behaviour in advance of infrastructure, framed as a reward; and b) infrastructure that is earned is likely to be valued higher and therefore maintained better. This programme model should be explored as a leverage point to improve other projects in similar enabling environments.

Natural resources

The natural environment formed the limits of possibility for infrastructure design. Limited water availability created physical limits of service provision, which in turn limited design options. This reinforces the value of a framework approach, which provides a basis for design but allows freedom for

amendment of infrastructure design depending on water availability, which is critical to the water infrastructure installed by Lifewater.

Summary

The discussion highlights the need to make change at the local level, including interventions to change group behaviours through use of the strong social relationships which already exist. However, change is also suggested at the higher level, through means which at present do not exist. It is suggested that increased government support would facilitate increased and smoother NGO involvement to improve project outcomes. Indeed, NGO support is a shared intervention point between Lifewater and the M-CLD.

Table 34 shows suggested leverage points extracted from the discussion above.

Table 34 - Suggested leverage points and their intended outcomes.

Suggested leverage point	Intended outcome
The 10-year development plan is revised to include targets for infrastructure and service provision and access.	Increased provision and access to infrastructure and services; reduced service needs gap; improved population welfare.
Review of the registration process for NGOs to work in Ethiopia to simplify and quicken it.	Attract increased NGO participation to increase funds available for development, and reach end users more directly than high-level government interventions.
Use an infrastructure framework to provide a blueprint, but which can be adapted to each unique context.	Design and implementation are faster; lessons are learned and problems are resolved over time to increase efficiency of delivery of future projects.
Infrastructure adoption should be encouraged by encouraging positive behaviour change, and measured as part of the social infrastructure programmes, and could be combined with incentivisation methods.	A change towards positive WASH behaviours; increased use of services is necessary to achieve the positive impacts of provision, including improved population welfare.
Employ locals that are members of beneficiary communities to deliver educational and behaviour components of the programme.	End users are more likely to adopt new behaviours when education is received from a trusted community member; group behaviour change is more likely; social conventions more likely to be observed and respected so that behaviour changes can integrate with customs more smoothly.

5.8. Sabre and the Dwabor school

5.8.1. The enabling environment

Sabre operates in the central, western, and eastern areas of the southern coast of Ghana, working to improve schools and the education sector (Sabre Education, 2020; Sabe Education, 2023).

Ghana achieved Lower Middle-Income Country (LMIC) status in 2011 (FDO, 2022; Srivastava & Pawlowska, 2020), and continues to have ambitious development goals in its National Development Plan (NDP), which aims to progress social, economic, environment, and institutional development (Government of Ghana, 2021). The National Social Protection Strategy (NSPS) was implemented in 2007 to strengthen social protection measures, particularly for the poor and vulnerable groups (DTDA, 2020).

Data from 2022 estimated that 20.5% of the population lived below the poverty line (World Bank, 2024). There are high levels of wealth inequality, particularly between rural and urban areas, and highly versus poorly educated areas (Ministry of Education, 2018). There is also a large infrastructure gap (Ministry of Finance, 2021). Notably, school infrastructure is poor due to underfunding and under-resourcing, often with too few classrooms, a lack of access to potable water, and a lack of access to toilets (National Schools Inspectorate Authority, 2021).

Overall, Ghana's government and institutions are considered relatively stable (Schwab, 2019), and show growing capacity and increasing performance (Ministry of Education, 2018). Governance is moving towards a system of decentralised power at the district level, including self-management of budgets and decentralisation of services (Government of Ghana, 2021). The Ministry of Education (MOE) is responsible for the education system in Ghana, supported by a number of departments including the Ghana Education Service (GES) which is responsible for pre-tertiary education including kindergarten (Ministry of Education, 2018).

5.8.2. Background and project description

Sabre is an educational charity, working to develop school infrastructure and the education sector in Ghana (Sabre Education, 2020, 2023).

Sabre's vision is to provide the best possible early years education, and to improve the opportunities available to children in developing countries through education (Sabre Education, 2020).

It also specifically targets SDG 4.2, 'by 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education', and SDG indicator 4.c.1, 'proportion of teachers with the minimum required qualifications, by education level' (Sabre Education, 2021; UNSD, 2023).

In 2007, the GES, under the Government of Ghana and within an initiative to reform education, extended compulsory education from nine to 11 years with an additional two years of compulsory early years kindergarten education for four and five year olds. (Sabre Education, 2010, 2021, 2023)

Sabre works towards this goal, and comprises two key components within the ‘Brighter Futures Programme’: ‘Building Playful Schools’ and ‘Transformational Teacher Training’ (Sabre Education, 2023). In recent years their work has extended to include advocacy and policy, and now Sabre has a close relationship with the MOE to strengthen and develop the educational institutions (Sabre Education, 2020).

Sabre has worked with the government of Ghana to shape policy to strengthen and improve kindergarten education. In 2008, the Building Playful Schools programme started. Sabre, Arup, and the Government of Ghana collaborated to develop a blueprint design for a kindergarten school which could be rolled out across the Government's national school building programme (Sabre Education, 2023). Since 2008 Sabre has reached over 80,000 people (Sabre Education, 2020), and as of November 2021, 19 schools have been implemented (INT-6).

The Brighter Futures Programme implements change at each of the levels shown in Figure 37.

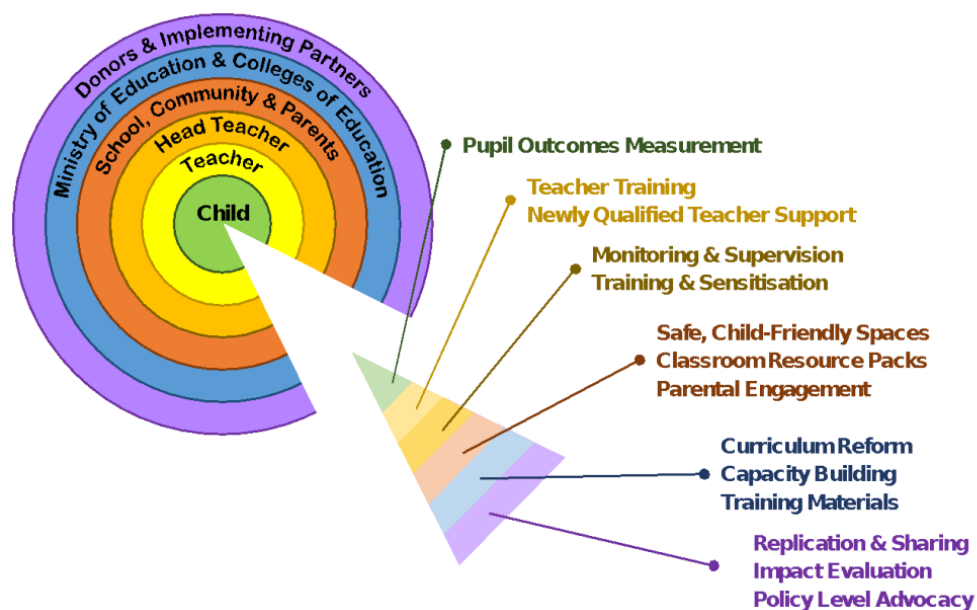


Figure 37 - The Building Brighter Futures model (Sabre Education, 2021).

5.8.3. Need for the project

Sabre’s projects respond to the following needs:

- Kindergarten education was made compulsory in Ghana, increasing need for kindergarten school infrastructure, suitably qualified teachers for this age group, and a suitable

curriculum. Sabre's workstreams respond directly to these needs, and their work directly aligns with government initiatives. (Sabre Education, 2010)

- The number of school-age children is projected to grow and Sabre is responding to the need for more, improved schools. (INT-6)
- The GALOP study findings show shortfalls in educational infrastructure provision and appropriate teaching methods. (National Schools Inspectorate Authority, 2021)
- There is a need for an increase in both education and skills levels across Ghana. Sabre's programmes address early education to produce a more highly skilled population in the long-term, whilst also providing practical skills and training within their project delivery. (INT-7)

5.8.4. Infrastructure implemented

Physical infrastructure

Sabre and Arup created a school design blueprint following a thorough feasibility assessment and design process, to enable fast roll out and construction (INT-6; Sabre Education, 2020). This case study discusses lessons learned from the pilot school; the Dwabor school.

The school blueprint is shown in Figure 38 below.

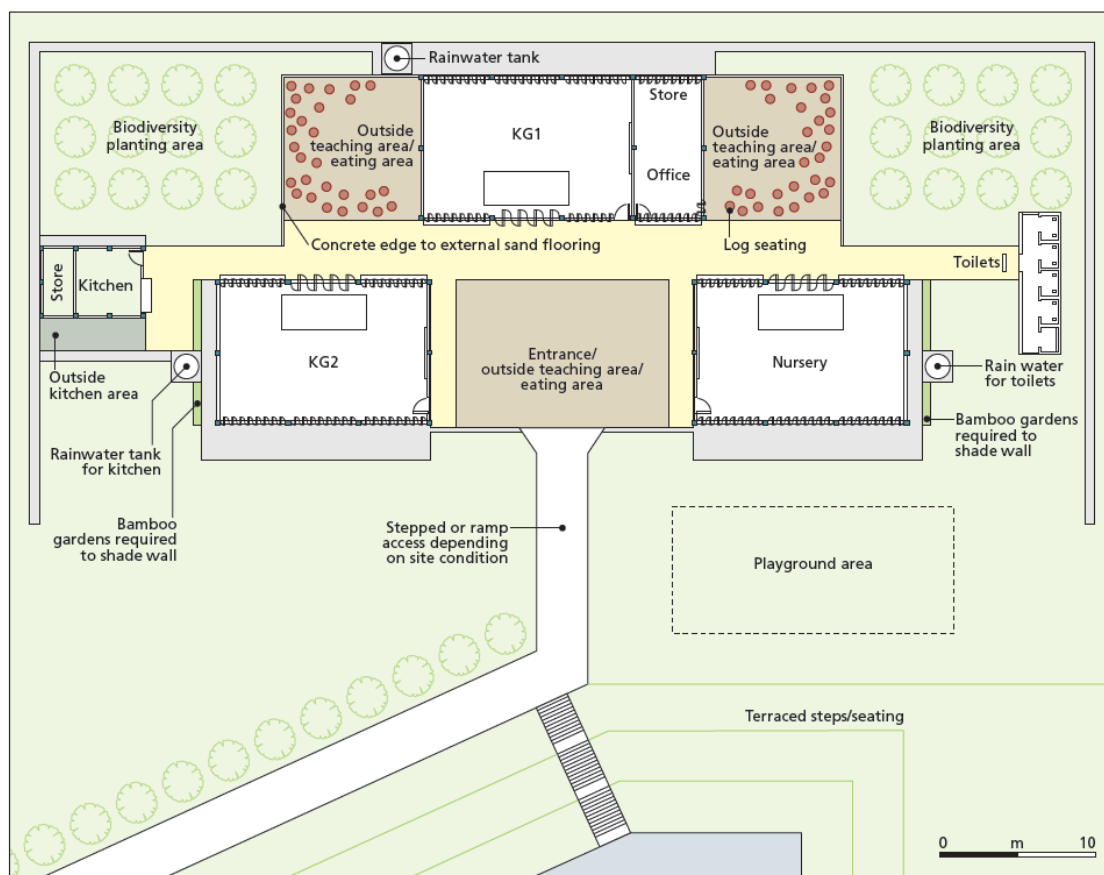


Figure 38 - Plan of school 'blueprint' (sourced from Gryc and da Silva (2013)).

Facilitating infrastructure

The Transformational Teacher Training programme supports new school infrastructure using child-centred approaches to improve teaching methods, comprising three components: fast-track transformational teacher training; in-service teacher training; and newly qualified teacher support year (Sabre Education, 2021).

Fast-track transformational teacher training provides education in colleges and universities for student teachers; in-service teacher training provides training to practising teachers in existing schools to revise, update, and improve teaching methods; and newly qualified teacher support assists teachers through the transition from the Transformational Teacher Training programme and their first year in the classroom (Sabre Education, 2021).

Sabre is also involved in advocacy and policy for early years education through a strong relationship with the Government of Ghana and the MOE (Sabre Education, 2020). It is working with the MOE to create an assessment tool for kindergarten children for eventual roll out nationally and is working to rewrite the national kindergarten curriculum (Sabre Education, 2020).

Social infrastructure

Most of Sabre's work is in some part social infrastructure. Besides construction of schools, their work is driven by the desire to improve the lifelong socio-economic prospects of children, and communities are heavily involved in Sabre's work.

5.8.5. Delivery

Sabre has an established relationship with the MOE and the GES, and work together to deliver educational programmes (Sabre Education, 2021). Sabre was supported by the design consultancy, Arup (Gryc et al., 2013).

Sabre funded the pilot Dwabor school, which itself is mainly funded by grants and sponsorship. Government funds are a limiting factor to providing the high-quality educational facilities required in Ghana. (Sabre Education, 2021)

Design of the Dwabor pilot project school took approximately 10 to 12 months, and construction took between four and five months. The school was constructed by local contractors and the community, in line with local skills capacities, and adjusted to align with the agricultural calendar as labourers were mostly farmers. (INT-7)

Sabre intended the construction of the schools to enhance local skills capacities and facilitate knowledge transfer, boosted by the permanent presence of an Arup engineer. Hands-on training was offered to develop skills for use during construction and maintenance. (INT-7)

Following completion of the Dwabor project, the team evaluated buildability and functionality through post-project evaluation exercises with the community (Gryc & da Silva, 2013). The Ghanaian government is also currently running a five-year monitoring programme in collaboration with the World Bank to assess and improve the quality of kindergarten and primary education, known as the Ghana Accountability for Learning Outcomes Project (GALOP), using data from the 10,000 poorest performing schools across all 16 regions of Ghana (National Schools Inspectorate Authority, 2021).

Involvement of communities

Feasibility studies included consultation with the government in the early stages of Sabre's involvement in Ghana, which resulted in widespread support (INT-7).

Participatory interviews with stakeholders and communities comprised a large part of the feasibility study process to identify need and inform the design of schools. Extensive interviews with teachers were carried out to understand educational needs. These measures helped to encourage community ownership of infrastructure (Gryc and da Silva, 2013).

The funding model left responsibility for any repairs of school infrastructure to communities, and as part of Sabre's business model, they intended to leave the project to be community managed and funded following implementation (INT-7).

Design

The design was developed to be nationally replicable, whilst considering local context such as local needs, materials, skills capacity, culture, sustainability, climate, building performance, cost, and buildability. Teacher interviews were intrinsic to understanding design needs. (Gryc and da Silva, 2013)

The schools were designed to international standards, although there was initially some resistance from communities at such stringent standards (Gryc, Fray, and Bond, 2013).

Materials were chosen for their availability, environmental sustainability, suitability in context, and ease of construction. Arup preferred the choice of materials such as timber, bamboo, or soil blocks for the structural frame, however, these were seen as 'poor man's materials', whereas concrete was perceived as a sign of development. Therefore, the frame was made of concrete to align with local needs and wants, to encourage ownership and a sense of development. (Gryc, Fray, and Bond, 2013)

5.8.6. Output and outcomes

To date, Sabre has delivered 19 schools across Ghana, following the successful pilot Dwabor project.

The key project outputs and outcomes are summarised in Table 35.

Table 35 - Sabre project outputs and outcomes.

	Output	Outcome
Physical infrastructure	Construction of 19 schools across Ghana. (INT-6)	79,556 kindergarten children have received improved education as a result of Sabre schools. (Sabre Education, 2020)
		A more conducive learning environment. (Gryc and da Silva, 2013)
		Attainment levels increased. (National Schools Inspectorate Authority, 2021)
	Construction of the Dwabor trial school. (Gryc and da Silva, 2013)	An immediate 45% increase in school attendance, which increased to 190% one year later. (Gryc and da Silva, 2013)
		Increased community engagement due to high community involvement during construction, also resulting in skills and knowledge transfer to communities. (INT-6; Sabre Education, 2020)
Teacher training	2,135 teachers have received enhanced training; and 961 newly qualified teachers have received support through their first year in school. (Sabre Education, 2020)	Higher pupil attainment scores. (INT-6; National Schools Inspectorate Authority, 2021)
		Capacity of community teachers increased, and an understanding of how to better teach in line with the curriculum, including play-based learning. (Sabre Education, 2010)
Government engagement	Advocacy to improve educational policy nationwide; creation of an assessment tool to assess kindergarten attainment; and development of the kindergarten curriculum. (Sabre Education, 2020)	Increased engagement with government following recognition for positive impact, and establishment of a relationship with government to develop educational policy. (Sabre Education, 2020)

5.8.7. Findings

Table 36 details influences from the enabling environment identified in the Sabre project, how they shape the enabling environment, the impact to infrastructure and services, and the effect on need.

Table 36 – Sabre: Linkages between key influences, the effect on infrastructure and services, and need.

Influence	How does this shape the enabling environment?	How does this effect infrastructure services and implementation?	How does this effect ability to meet need?
Government engagement	· Government focus on education is increasing, and beginning to approach educational reform as a means to development.	· Increased appetite and funding available for school infrastructure.	· More children receive education and participate in school.
	· GALOP developed as a 5-year programme alongside World Bank to increase quality of education.	· Support for widespread rollout of new schools.	· As government engagement grows, the education system will be strengthened, and children's needs will be increasingly met.
Education policy	· Provided the framework for Sabre to work within.	· Policy can both support and hinder implementation of schools.	· New policy for compulsory kindergarten education is supporting needs of young children to access education they would likely otherwise not have received.
	· Type, strength, and enforcement of policy was indicative of the level of government engagement in education.	· More schools needed following kindergarten education made compulsory.	
	· Kindergarten education now compulsory.		

Project financing	· Sabre is a charitable trust and most income comes from grants and donations. Therefore, financing is heavily dependent on others, which increases vulnerability.	· Difficult to plan without long-term secure finance.	· Without improved schools, children will continue to receive no or poor education.
	· Government funds were a limiting factor to providing the high-quality educational facilities required.	· Infrastructure, services, and programmes cannot be delivered due to budget constraints.	
	· An unstable economic climate discouraged the necessary investment.	· Insufficient pipeline of bankable projects.	
Skills and education	· Poor education has resulted in high levels of illiteracy which blocks personal development.	· An urgent need for schools and infrastructure for education.	· Need for education becomes a priority as an intervention point.
	· Children do not have equal opportunities in education, and therefore do not have equal opportunities in life.	· Fewer skilled people available for project delivery.	· High demand for schools and insufficient funds and resources to deliver leaves need unmet.
	· Large gender divide: girls receive less education than boys, and women have fewer employment opportunities than men.	· Quality of infrastructure and O&M compromised without suitable skills levels.	
	· High numbers of unskilled workers and low paid jobs.	· Infrastructure designed to ensure locals had the necessary skills to maintain it after Sabre left.	
Resources and materials	· Limited construction materials available.	· Sabre designed to use locally available materials as much as possible for ease of construction, sustainability, and environmental reasons.	· Design may not provide the 'perfect' solution. For example, a tin roof was still used due to availability of the material, even though the noise was a design issue

			and therefore an alternative material would preferably have been used.
		· Design solutions must be a compromise between 'perfect' and 'appropriate for context'. Therefore, the design reflected what was possible within the limits of available resources.	
Natural environment	· Available resources and materials dependent on context.	· Resources available for construction.	· Children must still walk long distances to school.
	· Climate affect lifestyle and livelihood sources.	· Design requirements reflected climate, including need for ventilated classrooms given heat, and consideration of noise reduction in the roof design given rainfall.	· A comfortable environment provides a conducive learning environment for education.
	· Geographic location of schools determined how far children walk to school.	· Infrastructure can be difficult to design and construct in remote locations.	
		· Location of schools chosen to reflect where children live.	
		· Construction had to happen outside of monsoon seasons, and when labourers were available.	
Community engagement	· Community participated in authorising, planning, and constructing schools.	· Engagement from teachers ensured the classrooms were designed specifically for the learning needs of the children.	· Community participation achieves a better understanding of need.

	· Support for Sabre's work, mutual understanding, and more amicable relationship between Sabre and the community.	· The community can be involved in construction which generates work.	· The school design was suitable for purpose.
			· Skills were taught and transferred for use elsewhere.

5.8.8. Data analysis

5.8.8.1. Project appraisal (PA)

Performance by criteria

Performance is also shown against each criteria individually. The framework revealed very good overall project performance. 82% of criteria were met; 21% performed exceptionally. The project did not fail to meet any criteria. Therefore, unlike other projects, the unmet criteria are not listed. Instead, those that were only partially met are shown in Table 37.

Table 37 - Sabre: Lowest performing criteria; partially met.

Dimension	Goal	Criteria	Sabre
Governance	Service has dedicated managerial infrastructure.	A long-term management plan is in place including contingency planning.	3
Financing	Secure capital finance.	Funding is secure.	3
Financing	Sustainable funding and financing.	The provider has the capacity to generate new funds to cover additional capital costs.	3
Financing	Sustainable funding and financing.	The provider is free from substantial financial risks, debts or cost constraints that may threaten service delivery.	3
Infrastructure	Infrastructure is reliable.	Infrastructure is integrated with others where possible and advantageous.	3
Service delivery	Contingency plans are in place to cope with service disruptions.	Resources are available for timely response to failures.	3

Service delivery	Monitoring and evaluation is in place.	Regular inspections, testing and maintenance is carried out to ensure full operation.	3
Contribution to development	Service benefits the national economy.	Service directly enables economic opportunities.	3

15 criteria showed exceptional performance, shown in Table 38 below.

Table 38 - Sabre: Highest performing criteria; scoring exceptional.

Dimension	Goal	Criteria	Sabre
Governance	Service has dedicated managerial infrastructure.	Organisations work together collaboratively.	5
Governance	Governance is transparent.	Feasibility assessments and planning consider need over stakeholder gain or alternative motives.	5
Governance	Stakeholders are fairly represented.	Community and those served by services are involved, represented and empowered.	5
Infrastructure	Infrastructure is fit for purpose.	Infrastructure is appropriate in context.	5
Service delivery	Planning stages are comprehensive.	Project delivery and construction consider local context, skills and resources.	5
Service delivery	Service is maintained.	Appropriate skills are available for operation and maintenance.	5
Service delivery	Service is maintained.	Training has taken place where needed.	5
Service delivery	Service is maintained.	Necessary skills and resources are aligned with locally available capacities.	5
Social value	Service meets user expectations.	User experience is positive.	5
Social value	Service meets user expectations.	Service supports need as expressed by end users.	5
Social value	Alignment with local culture and values.	Cultural preferences and barriers have been considered in design.	5

Social value	Alignment with local culture and values.	Community and end users have been consulted.	5
Social value	Community ownership of services.	Community and end users feel ownership over services.	5
Social value	Community ownership of services.	Community and end users are considered in decision-making.	5
Contribution to development	Service is sustainable.	Service is aligned with the SDGs.	5

Performance by goal

Figure 39 shows the performance score of each goal on a scale of 0 to 5. The parent dimension of each goal is also shown.

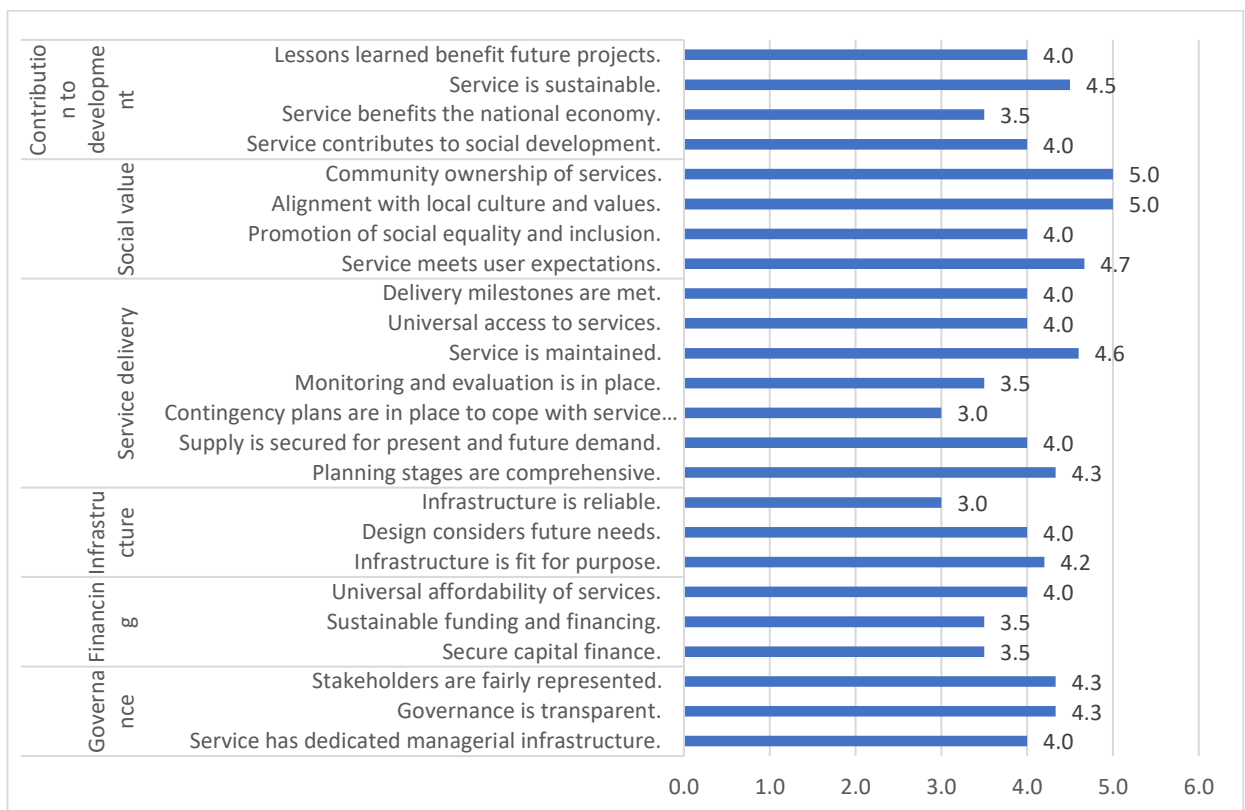


Figure 39 - Sabre: Bar chart showing performance score of each goal, calculated by the average of component criteria.

The project performs very well in the social value dimension, specifically the community ownership of services and alignment with local culture and values goals.

Performance by dimension

Table 39 shows performance by dimension, shown as percentage of total points achieved.

Table 39 - Sabre: Performance by dimension in descending order.

Dimension	Percentage score
Social value	92
Governance	83
Service delivery	82
Infrastructure	80
Contribution to development	80
Financing	73

The *social value* dimension performed extremely well. Although still high, the *financing* dimension performed lowest at 73%. Overall, the dimensions scored highly.

5.8.8.2. Enabling environment appraisal (EEA)

The completed EEA in Table 40 shows influences within the enabling environment scored as low, medium, or high.

Social	
Access to better paid work	N/A
Behaviour change	N/A
Brain drain	N/A
Caste system	N/A
Changing role of women in society	L
Citizen's power	N/A
Community and family resilience	N/A
Community engagement	H
Demographic changes	N/A
Diaspora	N/A
Educated population	M
Employment in agriculture	L
Empowerment	N/A
Engrained social behaviours	N/A
Gender equality	L
Human capital	L
Informal sector employment	L
Internal migration and urbanisation	N/A
International migration	N/A
Investment in education	H
Marginalisation of vulnerable and minority groups	N/A
Population welfare	N/A
Regional inequality	M
Religion	N/A
Resettlement	N/A
School enrolment	H
Skilled workforce	M
Social equality	M
Social protection	N/A
Strong social relationships	L
Traditional culture	N/A
Urban/rural divide	L
Vocational training	H
Worker's rights	N/A

Natural environment	
Available natural resources	H
Climate change	N/A
Climate migration	N/A
Commodifiable crops	N/A
Consistent agricultural production	N/A
Environmental degradation	N/A
Food security	N/A
Likelihood of extreme weather events	N/A
Physical limits of service provision	L
Pollution	N/A
Risk to livelihoods	N/A
Variable climate	M
Vulnerability of geographical location	N/A
Vulnerability to weather related disasters and shocks	M
Water availability	N/A
Water security	N/A

Infrastructure and service delivery	
Ability to adapt to external shocks and stresses	N/A
Access to services	H
Accurate up-front cost and programme estimation	N/A
Affordable services	L
Aligned business culture and communication	M
Available technology	N/A
Availability of resources and materials for construction	H
Risk of budget overrun	N/A
Changing service needs	N/A
Clear project scope	H
Community managed infrastructure	H
Construction cost	N/A
Cost of consultants and contractors	L
Cost of labour	N/A
Cost of materials	N/A
Decentralised services	L
Design options	H
Efficient delivery	L
Engineering and management expertise	H
Fair procurement	N/A
Feasibility studies	H
Financial return	N/A
Financially motivated stakeholders	N/A
Funding available for O&M	L
Infrastructure output	H
Internal national engineering and management capability	L
Knowledge sharing	H
Easily maintained and operational infrastructure	M
Monitoring and evaluation	M
Needs prioritised in design	H
Opportunities for local businesses	N/A
Opportunities to leapfrog	N/A
Optimal design to meet need	H
Participatory consultation with communities	H
Payment of services through tariffs	N/A
Planned infrastructure pipeline	L
Achievable programme	N/A
Project budget	N/A
Quality of infrastructure and services	M
Redundancy in design	N/A
Reliance on international supply chain	N/A
Resilient infrastructure	L
Service needs gap	M
Services available	M
Skills available for O&M	M

Infrastructure and service delivery (cont.)	
Skills transfer	H
Social infrastructure	M
Subsidised services	N/A
Supplier monopoly	N/A
Sustainable funding model	L
Sustainable services in the long-term	M
Thorough planning	H
Use of international consultants and contractors	H
Use of public or PPP delivery model	N/A
Use of services	M
Workers available	L

Summary

Dimension		Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery	TOTAL
Applicable	H	3	2	4	1	2	15	27
	M	6	2	4	2	1	10	25
	L	4	1	7	1	2	10	25
Total applicable		13	5	15	4	5	35	77
Percentage variables applicable		28	14	44	25	63	63	39
Non-applicable		34	30	19	12	3	21	119
Total		47	35	34	16	8	56	196

5.8.8.3. Case study CLD (C-CLD)

The Sabre C-CLD is shown in Figure 40.



Figure 40 - The C-CLD for the Sabre project, adapted from the M-CLD. Size of circles show level of influence on a low-medium-high scale; larger circles show higher influence. Thickness of connection lines show strength of relationship on a 1-2-3-4 scale; 4 indicates the strongest relationship.

5.8.9. Discussion

Overall, the C-CLD and M-CLD look markedly different. Only 77 of the 196 variables in the M-CLD are present in the C-CLD, representing 39%. There are few loops in the C-CLD, which is due to such a low proportion of variables from the M-CLD present; as variables are removed, loops are broken.

Presence of variables in the *economic* dimension is noticeably low in the Sabre C-CLD compared to the M-CLD; only 14% of variables are present. Representation of the *institution and governance* and *natural environment* dimensions is also low in comparison to the M-CLD, with only 28% and 25%

variables present respectively. However, the *infrastructure and services* dimension has high representation; 63% of variables are present with predominantly high influence.

Nine of the 23 influence points identified in the M-CLD are present in the Sabre CLD, which is fewer than most other projects. In general, the influence points align with the influences identified in the results table.

The following narrative discusses the most influential variables and themes in the C-CLD, and their relationships to the behaviour observed in the M-CLD.

Government engagement

Government engagement was critical in the success of the Sabre programme; government support enabled new education policies to be implemented, and increased funding available for long-term measures to improve education in Ghana such as teacher training. These factors are present in the C-CLD, as well as government engagement through investment in infrastructure and services, a desire for development, and an infrastructure pipeline in place.

The C-CLD shows that an increase in public investment in infrastructure and services increases infrastructure output, this in turn increases the services available, which increases access to services and reduces the service needs gap. As the service needs gap is reduced, so too is investment, forming a balancing loop. This is shown in Figure 41.

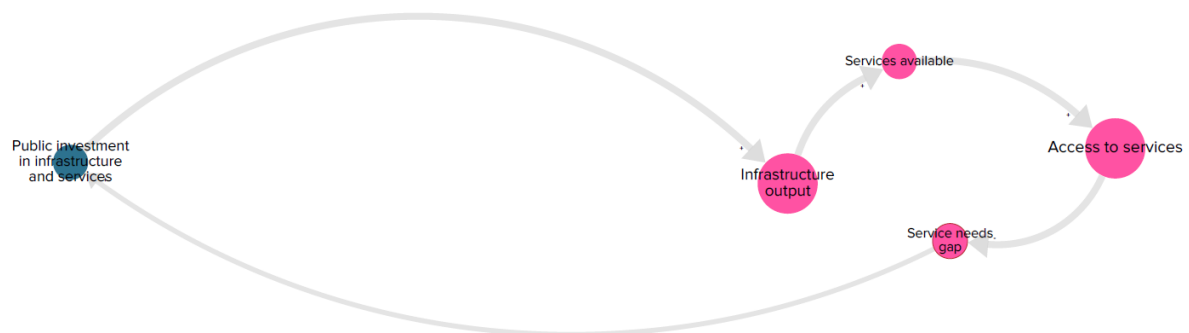


Figure 41 - Loop showing the impact of public investment.

Increased public investment in infrastructure and services, infrastructure output, and the service needs gap are all influence points identified through network analysis, reinforcing their value as intervention points in the C-CLD. Intervention here could be supported by continued lobbying to encourage increased government engagement and investment.

A second related causal pathway in the C-CLD is: a socially motivated development agenda increases a desire for infrastructure development, which encourages a government to be motivated by development. Research showed that this typically increases engagement of NGOs, which in turn increases participation of communities. This suggests that a socially motivated development agenda, an

M-CLD influence point, is responsible for a number of the positive influences on the outcome of the Sabre project.

NGO supported projects typically result in an increase of decentralised infrastructure, which increases community managed infrastructure, which in turn increases community engagement. Community managed infrastructure also typically initiates a sustainable funding model.

However, the project performed poorly in the *financial* dimension, particularly with respect to insecure funding, a lack of capacity to generate new funds for capital costs, and vulnerability to financial risk. Much of this is caused by the nature of NGO project funding, which is largely reliant on donors and irregular income streams. This reinforces the importance of secure public investment.

Community involvement was deemed partly responsible for some of the project's success. Particularly, engagement with teachers was instrumental to ensure an optimal design to meet need. However, availability of construction workers was limited by the agricultural calendar, which affected output. Figure 42 below shows how increased participation of communities, increases needs prioritised in design, which increases optimal design to meet need, which decreases the service needs gap.

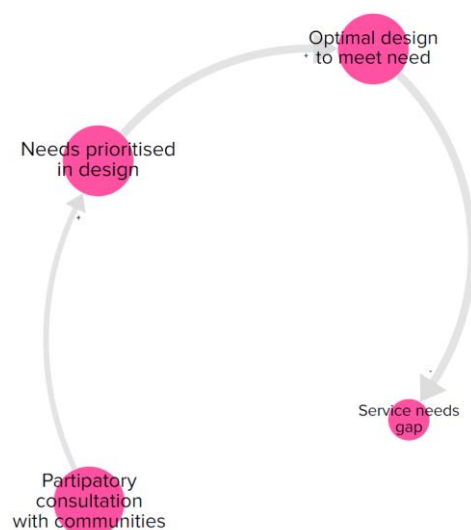


Figure 42 - Causal pathway showing how community participation decreases the service needs gap.

The C-CLD also shows presence of the *variable climate* variable. However, it is isolated because neighbouring variables, and therefore links and pathways, have been removed from the M-CLD if not relevant to the Sabre case study. Given the relationship between the environment and labourer availability a link would be expected, which demonstrates an example of a break in causal pathways and loops when variables are removed.

Access to services, school enrolment, and an educated population

In the case of Sabre, infrastructure output refers to the number of schools built, which was considered a determinant of project success, indicated by the desire for a school blueprint to enable fast roll-out of new schools. Figure 43 shows that increased infrastructure output increases services available, which

increases access to services. When children can access schools, school enrolment increases, which increases the educated population over time. This shows that increasing the number of schools has a direct impact on the long-term positive outcomes that Sabre achieved, reinforced by the high influence scoring of the *infrastructure output* variable.

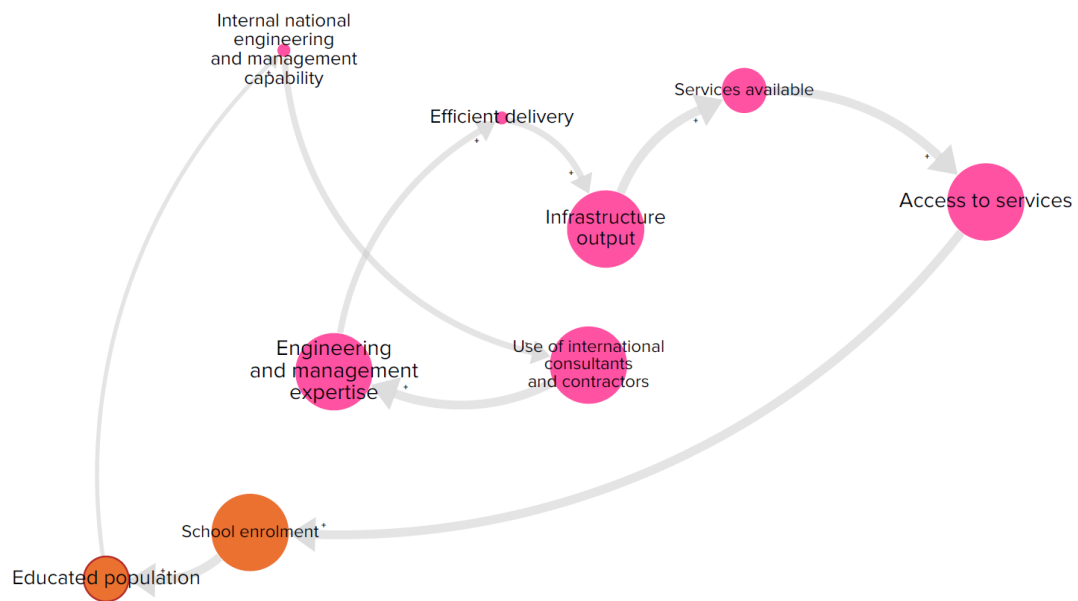


Figure 43 - Loop showing that as infrastructure output increases, so too do services available.

The same loop also evidences the value of engineering expertise, which is a high influence variable. The project evaluation showed that the project performed well for availability of skills, training, and resources. The results also show that presence of engineering and management expertise significantly improved project outcomes. Sabre attributed some success to the employment of Arup as design consultant, and suggested during interview (INT-7) that Arup's reputation may have helped gain government support for the project.

However, the loop shows that as the educated population increases, so too does the national skills capacity, which reduces the need for international consultants and contractors. The C-CLD shows that as use of international consultants and contractors decreases, engineering and management expertise also decreases. Hence intervention to make sure that expertise are always available, and do not decrease if international organisations are not present, would be an affective leverage point to ensure access to services and school enrolment. This can be done through skills transfer and knowledge sharing with communities, and increased participation of communities.

A small loop showing the relationships between three key variables is shown below in Figure 44.

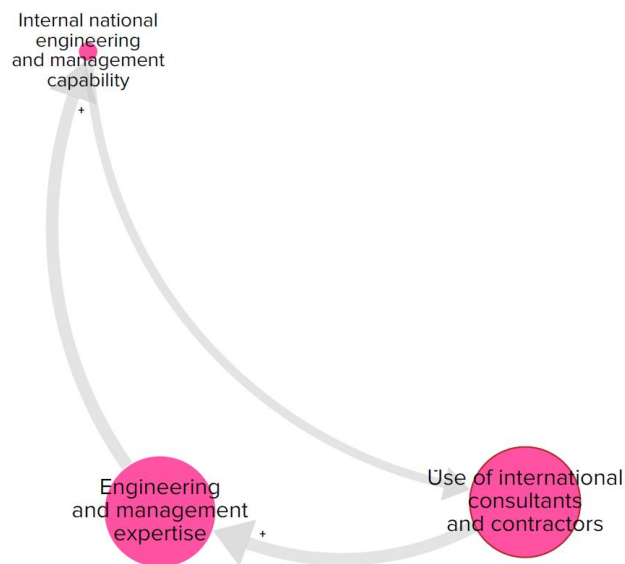


Figure 44 - Loop showing the relationships between international organisations and expertise.

The need to ensure an educated population aligns with the influence point identified in the M-CLD, suggesting that measures to ensure or increase this can have an overall positive impact, and indeed has on the Sabre project.

Summary

Sabre's overarching aim, to increase the education level of the population, is itself an intervention point in the M-CLD. Other intervention points are also shared, such as the need for a motivated government, and physical infrastructure output. However, the extent of the importance of government engagement is unique to Sabre, which has been attributed to much of Sabre's success.

Suggested focus points for intervention are shown in Table 41.

Table 41 - Suggested leverage points and their intended outcomes.

Suggested leverage point	Intended outcome
Maintain and increase government motivation towards development in the education sector, perhaps through lobbying or engagement of other organisations and NGOs.	Government attention on education to encourage development of education policy and increase sector funding. Traction maintained and support increased for the teacher training programme.
Prioritise number of schools constructed.	Increased access to schools and increased enrolment, to improve overall educational level of the population.
Engagement of the community in design and construction of schools.	Needs of the community are more likely to be understood and reflected in the design. Expectations more likely to be met. More labour available for construction which will build schools faster.
Use of international consultants and contractors.	Reputable international organisations can help gain government support. Technical expertise is available.
Skills transfer and knowledge sharing with local communities.	Skills transfer to local community for O&M of infrastructure and to build new schools. Secure long-term independency from international organisations and capacity within communities.

5.9. Second Small Towns Water Supply and Sanitation Sector Project (STWSSSP-2)

5.9.1. The enabling environment

The Second Small Towns Water Supply and Sanitation Sector Project (STWSSSP-2) is the second of three projects to improve water availability and wastewater and sanitation facilities for unserved small towns in Nepal (ADB, 2020; Shrestha, 2021).

Nepal has ambitious development plans, and aims to achieve middle-income status by 2030 and developed country status by 2043. The ‘15th plan’ is in place with ambitions to shift the focus from economic to socially motivated development (INT-8; Limbu, 2019).

Nepal does not have a specific infrastructure plan in place, although the development agenda does include aspirations for development in a number of infrastructure sectors (INT-8). However, progress is challenged by underfunding, political instability, and institutional capacity (Limbu, 2019).

Nepal has a declining population, however, internal migration is increasing, both rural to urban and rural to rural migration, both driven by improved prospects of living conditions, access to services, and employment (Nepal Economic Forum, 2022). This internal migration is resulting in a growing urban population, and an increasing number of small towns (Nepal Economic Forum, 2022), which in turn is contributing to declining poverty rates (ADB, 2014; Hatlebakk, 2017).

Nepal was undergoing a transition to federalism at the time of STWSSSP-2, and the governance structure was in the process of transferring autonomy for planning, allocating funds, and implementing policies to provincial governments (Hatlebakk, 2017). However, institutional capacity within state governments is often inadequate, and mechanisms for infrastructure delivery and funding are often poorly established at the provincial level (World Bank, 2019). Institutional capacity is a major blocker to progress in the infrastructure sector, justifying the need for the STWSSSP-2 project (World Bank, 2019).

5.9.2. Background and project description

The STWSSSP programme was conceived in response to rapid urbanisation in Nepal. Rural villages begun developing into small towns at an unprecedented rate, driven by inadequate employment opportunities in rural areas and conflict (ADB, 2020). However, the small towns lacked the necessary water and sanitation infrastructure to support the rising migration and rapid urbanisation (ADB, 2020; Shrestha, 2021).

The first STWSSSP project begun on the 16th March 2001 and completed on the 3rd December 2009 (ADB, 2012b); the second 14th January 2010 to 18th March 2019 (ADB, 2022b); and the third from 23rd February 2015 to 23rd March 2021 (ADB, 2022c). This case study examines STWSSSP-2.

The project aimed to achieve environmentally sustainable growth, inclusive economic growth, and improved wellbeing for the town populations, through provision of water and sanitation infrastructure and supportive enabling mechanisms (ADB, 2020).

The three key objectives of the project were to:

1. Strengthen institutions;
2. Implement adequate, safe, accessible water and sanitation facilities in 20 small towns;
3. And, strengthen management capacity for ongoing operation of the services.

(ADB, 2020)

Towns were selected according to 11 criteria: a population between 5,000 and 40,000; a population density of 10 or more people per hectare; and permanent access to roads (ADB, 2020). Using these criteria, the Government of Nepal identified 176 small towns in 2015 for consideration (ADB, 2020). This was reduced to 21 small towns for participation (INT-8).

5.9.3. Need for the project

The STWSSSP programme responded to a lack of water and sanitation infrastructure in expanding small towns, where rapid urbanisation and an increasing urban population was exacerbating the service demand, necessitating increased provision and access (ADB, 2020; INT-8). Furthermore, towns and infrastructure were developing ‘haphazardly’, and required a more planned approach to infrastructure provision to effectively meet need (ADB, 2022b).

Prior to the project, the water supply was sourced from surface water and groundwater, but was inadequate, intermittent, and of poor quality (ADB, 2009). Improved sanitation was only available to 27% of the population according to 2006 data, gathered a few years prior to STWSSSP-2 (WHO & UNICEF, 2008).

5.9.4. Infrastructure implemented

Physical infrastructure

New water infrastructure expanded coverage and improved quality of water supply; provided water treatment facilities; and provided water tanks for storage. A new piped supply aimed to increase water supply to between 90-100 litres per day per capita for household connections and provide water access 24 hours per day. The project also committed to treating water to meet water quality standards, and to ensure that after five years there continued to be a coverage area of at least 90%. (ADB, 2009).

Sanitation infrastructure included provision of public toilets and septic tanks in each town, under the management responsibility of the town. Natural waste management methods were used where possible as a means of easily manageable, low-cost sanitation solutions. In some pilot towns more sophisticated

waste management plants were constructed. Stormwater drainage was also constructed in the centre of towns. (ADB, 2009)

Facilitating infrastructure

A large part of the programme centred around developing a clear strategy for future delivery and O&M. Training and capacity strengthening programmes were administered to service providers and water users and sanitation committees (WUSCs). Responsibility for management and monitoring of service operation was allocated to the Project Management Office (PMO) within the Department of Water Supply and Sewerage (DWSS) through the newly established project reporting system. (ADB, 2009)

Social infrastructure

Safeguarding monitoring programmes were implemented throughout delivery in 21 towns and 23 sub-projects, including an action plan to promote gender equity and social inclusion (GESI) (ADB, 2020).

NGOs were engaged in each town to promote hygiene behaviours through social programmes, and were instrumental in forming and registering the democratically elected WUSCs (ADB, 2019; INT-8).

An Output Based Aid (OBA) programme was implemented by the project to ensure access to water and sanitation for the poor and vulnerable. The initiative provided grants to WUSCs and service distributors, to provide services to selected households who would otherwise struggle to afford these services. (ADB, 2009)

5.9.5. Delivery

Organisations and responsibilities

Prior to the project, the water and sanitation sector across Nepal was led by the Ministry of Physical Planning and Works (MPPW). Initially, project management was led by the MPPW, however a national government reorganisation during project delivery resulted in redistribution of priorities. (ADB, 2009)

The Ministry of Water Supply (MOWS) was created, which became the executing agency and took much of the delivery responsibility from MPPW, with specific goals to develop policies to regulate the sector, implement technical standards, implement a monitoring and reporting system with performance indicators, establish service standards and ensure service providers adhere to them, strengthen sector coordination, evaluate progress, and develop a plan for the medium to long term for service delivery. (ADB, 2009)

The DWSS was responsible for implementing services and to create management capacity for ongoing service delivery. A PMO was created within DWSS. (ADB, 2009)

NGOs supported WUSCs and residents to increase awareness and understanding of water and sanitation services. (ADB, 2019)

Programme and budget

The project was funded by the Asian Development Bank (ADB) and Government of Nepal, and amounted to USD 71.88 million on completion (ADB, 2020; ADB, 2019).

The ADB loan was only approved once the Government of Nepal had evidenced implementation of a development plan for small towns water and sanitation from 2000 to 2015; proven institutional capacity to deliver the project; and implementation of water and sanitation sectoral policy (ADB, 2020). The ADB loan was approved in September 2009 and became effective in January 2010, with a planned end date of March 2016, later extended to an actual end date of December 2017. ADB's loan was awarded with 73 conditions and covenants, of which all but one was met. (ADB, 2020)

The services are funded by tariffs which contribute towards loan repayments, however typically tariffs do not cover these costs entirely. Most towns have not raised service rates given strong opposition from users due to the risk of unaffordability and users reverting to use of unsafe water sources. (ADB, 2020; ADB, 2009)

The project experienced programme overrun of an average of 15.83 months per town, compared to the planned 30-month timescale. Reasons included: unfavourable weather and excessive rainfall, land erosion, social conflict and unrest, an earthquake, delays in procurement of materials, and strikes and blockades. (Mishra & Aithal, 2020)

Design

The PMO, within the DWSS, was responsible for overall design. Smaller subdivisions of the DWSS, overseen by the PMO, were responsible for individual town projects, including developing the detailed design and managing design consultants. (ADB, 2009)

Both international and national consultants were appointed to support project management, supervise design and construction, and provide training programmes (ADB, 2022). The procurement process also encouraged bidding from local contractors to encourage local labour (INT-8).

Assessments

Impact assessments were carried out to assess the impact on the environment and local populations. Results indicated that the project had few adverse environmental impacts. (ADB, 2020)

Upon completion, ADB scored the project 'less than likely sustainable'. Sustainability was in part assessed on the capacity of WUSCs to manage, fund, operate and maintain the infrastructure and services. WUSCs were unable to fully cover O&M costs, and lacked the necessary skills for O&M, suggesting that the mechanism for management of services is somewhat unsustainable in the long-term. (ADB, 2020)

The environment was safeguarded in line with the environmental assessments (ADB, 2019). However, the lack of wastewater management facilities presented environmental concern, as wastewater and excreta is still being disposed of in water bodies and the surrounding land, compromising environmental sustainability (ADB, 2020).

Involvement of stakeholders and communities

Consultations with stakeholders were carried out during the project planning stages, including site visits to understand issues and need from the perspectives of the communities (INT-8). The outputs were considered and included in the design of the project (ADB, 2022). During the implementation stage, stakeholder participation was encouraged through reporting mechanisms where their concerns and views could be raised. (ADB, 2022)

WUSCs are responsible for O&M, however many lack the technical skills required despite strengthened institutional and management capacity achieved through the STWSSSP-2 programme. This was attributed to training too late in the programme, which did not allow for capacity strengthening over time, and no follow-up training. (ADB, 2020)

5.9.6. Output and outcomes

STWSSSP-2 has successfully improved water and sanitation services in numerous small towns, including improved accessibility, affordability, and capacity of management institutions. Although, notably, not all targets were met.

Table 42 details the high-level project outputs and outcomes as stated in the evaluation report (ADB, 2020) and the ADB project data sheet (ADB, 2022b).

Table 42 - STWSSSP-2 project outputs and outcomes.

	Output	Outcome
Physical infrastructure	Existing water supply services expanded and repaired. 9,305 water connections achieved and delivery of 1,785km of water pipes installed. Access available 14 hours per day.	96% households have water connections; water collection time reduced to zero; resultant positive impact on gender equality.
	Existing sanitation services expanded and improved. Household latrines provided to approximately 278,000 people. (However, three wastewater treatment plants failed to be constructed.)	Overall sanitation conditions improved. However, unsafe sanitation practices not completely eradicated as some wastewater and excreta is still being released into surrounding water bodies and land, presenting a health risk.

Strengthened institutions	Management responsibilities for infrastructure and services redistributed to more qualified and newly formed government departments. New regulation implemented, new performance indicators for monitoring introduced, and medium-term service delivery plan implemented.	Greater institutional capacity, skills, and knowledge within bodies managing services.
		Sector regulation increased and greater adherence to regulations.
		Support available for WUSCs from government departments for ongoing management of services.
Strengthened management capacity	Responsibility for management, funding, O&M of infrastructure and services transferred to WUSCs. Insufficient training given and training given too late in the programme.	A sustainable funding model is not in place as tariffs collected are insufficient.
		O&M is poor as skills capacity of WUSCs is inadequate.
Social programmes	Safeguarding measures implemented to protect resettled people, promote gender equality and social inclusion, and support the very poor.	Positive socio-economic impacts. Responsibly managed resettlement; higher representation of women and reduced gender disparities; very poor supported by the OBA scheme ensuring they had access to water and sanitation services.

5.9.7. Findings

Table 43 details influences from the enabling environment identified in the STWSSSP-2 project, how they shape the enabling environment, the impact to infrastructure and services, and the effect on need.

Table 43 – STWSSSP-2: Linkages between key influences, the effect on infrastructure and services, and need.

Influence	How does this shape the enabling environment?	How does this effect infrastructure services and implementation?	How does this effect ability to meet need?
Development plan	· The 15th Development Plan is in place, and is helping to shift the focus from economic to socially motivated development.	· Infrastructure is motivated by social wellbeing, and choices are made to improve the welfare of the population.	· A plan that prioritises social wellbeing is more likely to prioritise the wellbeing of those in need.
	· Socially motivated policy prioritises the wellbeing of the population.		
	· New social protection policies have been implemented since 2015.		
Decentralisation of governance (Transition)	· Major political change can make the development agenda of the country unclear.	· Institutional change can threaten an overarching long-term infrastructure plan.	· Needs must be reframed as regional rather than/as well as national.
	· States and provinces have autonomy over finances, and are able to generate income internally.	· Provinces have autonomy to manage their own infrastructure, services, planning, finances, and policies.	· Infrastructure can be designed to meet local needs and be more context specific.
	· Disparities between states.	· States are more likely to know their acute infrastructure needs than the central government.	· Disparities and inequalities may grow, which could change and increase the needs gap.
		· Disparities between states means some states are able to implement better services than others.	
Internal migration and urbanisation	· Demographics within provinces changed, changing needs and the way	· Existing services were unable to meet demand.	· People unable to access services due to increased demand.

	provincial governments must govern.		
	· Dynamic and responsive governance required to home migrants.	· Increased and improved services required in areas where migrants are resettling.	· Needs are changing and therefore difficult to determine them.
	· Increased mixing of ethnic groups, languages, cultures, and religions with different requirements.	· More skilled and unskilled labour may be available.	
Institutional capacity	· Progress was blocked through lack of skills, and unclear roles and responsibilities.	· The necessary technical and managerial skills were lacking for all stages of project delivery.	· Without a detailed plan for the future, future service needs are unlikely to be met.
	· Government reorganisation during project delivery redistributed responsibilities amongst institutions, resulting in confusion and a lack of capacity within newly appointed organisations.	· Lack of established planning, procurement, and financial processes.	· Without investment, projects often cannot go ahead, and services fail to be provided.
	· Provincial governments did not have sufficient or suitable support from central government.	· There was no long-term infrastructure plan in place.	
Wealth inequality	· Greater poverty and inequality in rural areas than urban, and big regional differences.	· Wealth inequality creates inequality in access to services.	· The poverty trap is reinforced with large wealth divides.
	· Vulnerability was forcing people to move from low-paid agriculture to the service industry, and consequently migration from rural to urban areas.	· Services also required in rural areas with poor infrastructure and services to level-up.	· Equality increased and needs of the poor better met when services also provided in rural areas.

Skills and education	· High numbers of unskilled workers and low paid jobs.	· Fewer skilled people available for project delivery.	· Need for vocational education becomes a priority as an intervention point.
		· Effects the employment ratio of national to international staff as skills must be imported.	· Investment in skills and education can help find sustainable solutions for development and reduce the needs gap in the future.
		· Quality of infrastructure and O&M compromised without suitable skills levels.	

5.9.8. Data analysis

5.9.8.1. Project appraisal (PA)

Performance by criteria

Overall, 72% of criteria were met, and 6% performed exceptionally well. A high proportion of criteria were only partially met, 27%, which are outlined in Table 44.

Table 44 - STWSSSP-2: Lowest performing criteria; partially met.

Dimension	Goal	Criteria	STWSSSP-2
Governance	Service has dedicated managerial infrastructure.	A long-term management plan is in place including contingency planning.	3
Governance	Service has dedicated managerial infrastructure.	Engineering and management expertise are available.	3
Financing	Sustainable funding and financing.	A financial strategy and funding mechanism is in place for the future.	3
Financing	Sustainable funding and financing.	Sufficient funds or financial programmes are available to cover O&M costs.	3
Financing	Sustainable funding and financing.	Sufficient funds are available to repay any loans.	3

Financing	Sustainable funding and financing.	The provider is free from substantial financial risks, debts or cost constraints that may threaten service delivery.	3
Infrastructure	Infrastructure is fit for purpose.	Infrastructure design is fit for purpose.	3
Service delivery	Contingency plans are in place to cope with service disruptions.	Resources are available for timely response to failures.	3
Service delivery	Contingency plans are in place to cope with service disruptions.	Alternative services are available to temporarily meet demand in the event of failure.	3
Service delivery	Monitoring and evaluation is in place.	Data collection and reporting mechanisms are in place to monitor the service.	3
Service delivery	Monitoring and evaluation is in place.	Regular inspections, testing and maintenance is carried out to ensure full operation.	3
Service delivery	Service is maintained.	Appropriate skills are available for operation and maintenance.	3
Service delivery	Service is maintained.	Spare parts are available and affordable.	3
Service delivery	Service is maintained.	Technical support is available.	3
Service delivery	Service is maintained.	Training has taken place where needed.	3
Service delivery	Service is maintained.	Necessary skills and resources are aligned with locally available capacities.	3
Service delivery	Delivery milestones are met.	Project was delivered to programme.	3
Contribution to development	Service benefits the national economy.	Internal national employment is prioritised and skills capacity is increased.	3

Contribution to development	Lessons learned benefit future projects.	Project is being evaluated post-completion.	3

Four criteria showed exceptional performance as shown in Table 45.

Table 45 - STWSSSP-2: Highest performing criteria; scoring exceptional.

Dimension	Goal	Criteria	STWSSSP-2
Service delivery	Universal access to services.	Infrastructure increases service coverage.	5
Service delivery	Delivery milestones are met.	Project was delivered to budget.	5
Social value	Promotion of social equality and inclusion.	Service enhances wellbeing of communities and users.	5
Contribution to development	Lessons learned benefit future projects.	Lessons learned are being applied to future work.	5

Performance by goal

Performance by goal is shown in Figure 45 below.

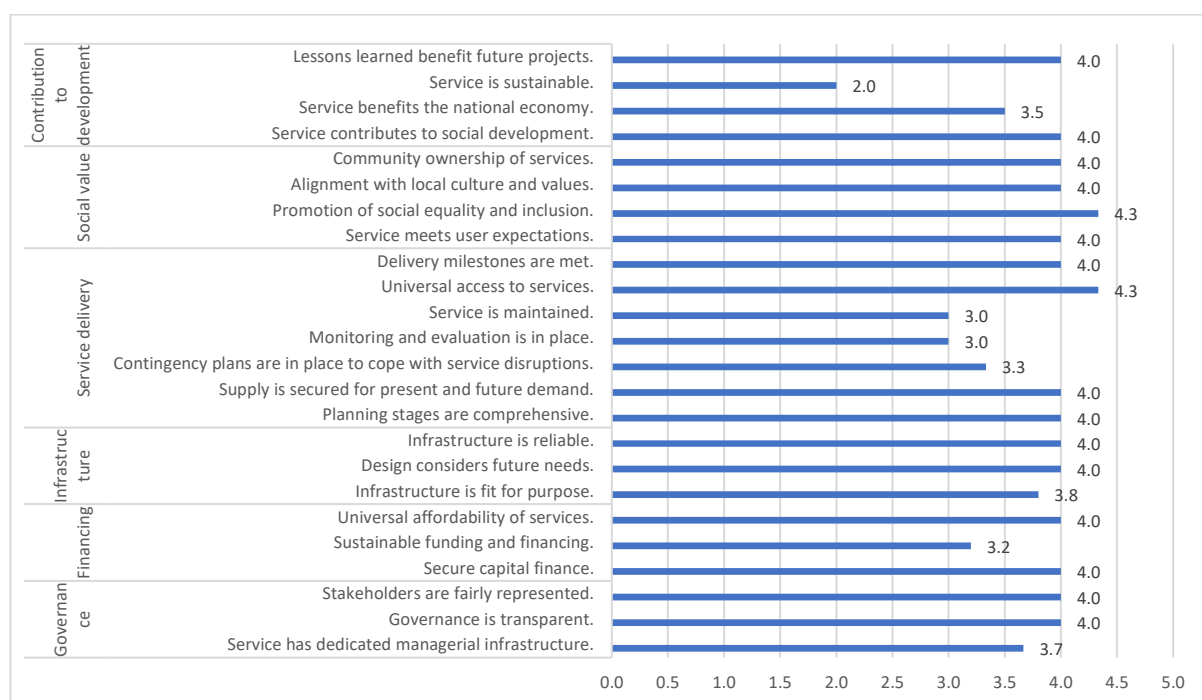


Figure 45 - STWSSSP-2: Bar chart showing performance score of each goal, calculated by the average of component criteria.

The project performed poorly in goals across most dimensions, including particularly poor performance for sustainability.

Performance by dimension

Table 46 shows performance by dimension in descending order.

Table 46 - STWSSSP-2: Performance by dimension in descending order.

Dimension	Percentage score
Social value	82
Infrastructure	78
Contribution to development	78
Governance	77
Service delivery	72
Financing	71

The *social value* dimension performed best. *Financing* and *service delivery* performed poorest, and considerably lower than other dimensions.

5.9.8.2. Enabling environment appraisal (EEA)

The completed EEA in Table 47 shows influences within the enabling environment scored as low, medium, or high.

Table 47 - STWSSSP-2: EEA results table. Variables scored on a scale through low, medium, and high, structured by dimension.

Institutions and governance		Economic	
Alignment between actors	L	Ability of states to self-generate income	H
Centralised policy	M	Aid	L
Civil liberties	N/A	Borrowed finance	M
Clear vision for the future	H	Capital finance	L
Clientelism	N/A	Economic globalisation	N/A
Closeness of inter-national relationships	N/A	Economic growth	N/A
Collaborative inter-organisation relationships	M	Economic stability	L
Conflict	N/A	Economic strength	N/A
Conflicting stakeholder motives	N/A	Employment opportunities	N/A
Consistent behaviour	N/A	Grants	M
Corruption	N/A	Household income	N/A
Decentralisation of decision making power	H	International trade	N/A
Decentralisation of governance	H	Investment in research	N/A
Decentralised policy	H	Investment opportunities	N/A
Deliver manifesto	N/A	Investor confidence	N/A
Democracy	N/A	Investor interest	N/A
Disparities between provinces	M	Loans	M
Electorate influence	N/A	Local economic growth	L
Fair political and policy decision making	M	Local industry	N/A
Free media	N/A	Local resources	N/A
Geographical advantage	N/A	National industries	N/A
Geographical proximity to other countries	N/A	Poverty	M
Government motivated by development	H	Private investment	N/A
Growth and capacity building of local government	H	Private property rights	N/A
Institutional capacity	H	Privatisation	N/A
Inter-government collaboration	N/A	Provincial financial autonomy	H
Political change	L	Public funds	M
Political parties incentivised to align with public opinion	N/A	Public investment in infrastructure and services	H
Political self-interest in inter-national relationships	N/A	Public revenue	M
Political stability	L	Reliance on other economies	N/A
Power struggles	N/A	Remittances	N/A
Provincial autonomy over implementation and management of infrastructure and services	H	Risk for investors	N/A
Public confidence in institutions and government	N/A	Unemployment	N/A
Resistance to integration of government departments	N/A	Value of personal assets	N/A
Rules and regulations followed	L	Wealth divide	M
Rules and regulations in place	L		
Sectoral policy	L	Development	
Shared natural resources	N/A	Desire for infrastructure development	H
Social unrest	L	Economically motivated development agenda	N/A
Stable government	N/A	NGO support	L
State capture	N/A	Respect for human rights	L
State stability	L	SDGs met	N/A
Strategic location for trade and protection	N/A	Socially motivated development agenda	M
Strong leadership	L	Trickle-down development policies	M
Transparency	N/A	Trickle-up development policies	N/A
Votes	N/A		
Voting rights	N/A		

Social	
Access to better paid work	N/A
Behaviour change	L
Brain drain	N/A
Caste system	N/A
Changing role of women in society	L
Citizen's power	N/A
Community and family resilience	N/A
Community engagement	L
Demographic changes	H
Diaspora	N/A
Educated population	N/A
Employment in agriculture	L
Empowerment	L
Engrained social behaviours	N/A
Gender equality	M
Human capital	N/A
Informal sector employment	N/A
Internal migration and urbanisation	H
International migration	N/A
Investment in education	N/A
Marginalisation of vulnerable and minority groups	M
Population welfare	H
Regional inequality	H
Religion	N/A
Resettlement	L
School enrolment	N/A
Skilled workforce	M
Social equality	M
Social protection	N/A
Strong social relationships	N/A
Traditional culture	N/A
Urban/rural divide	H
Vocational training	N/A
Worker's rights	N/A

Natural environment	
Available natural resources	M
Climate change	N/A
Climate migration	N/A
Commodifiable crops	N/A
Consistent agricultural production	N/A
Environmental degradation	N/A
Food security	N/A
Likelihood of extreme weather events	N/A
Physical limits of service provision	M
Pollution	L
Risk to livelihoods	M
Variable climate	L
Vulnerability of geographical location	N/A
Vulnerability to weather related disasters and shocks	N/A
Water availability	M
Water security	M

Infrastructure and service delivery	
Ability to adapt to external shocks and stresses	N/A
Access to services	M
Accurate up-front cost and programme estimation	M
Affordable services	M
Aligned business culture and communication	N/A
Available technology	N/A
Availability of resources and materials for construction	L
Risk of budget overrun	L
Changing service needs	H
Clear project scope	M
Community managed infrastructure	H
Construction cost	N/A
Cost of consultants and contractors	N/A
Cost of labour	N/A
Cost of materials	N/A
Decentralised services	M
Design options	L
Efficient delivery	L
Engineering and management expertise	M
Fair procurement	L
Feasibility studies	M
Financial return	M
Financially motivated stakeholders	L
Funding available for O&M	H
Infrastructure output	H
Internal national engineering and management capability	H
Knowledge sharing	N/A
Easily maintained and operational infrastructure	H
Monitoring and evaluation	L
Needs prioritised in design	H
Opportunities for local businesses	N/A
Opportunities to leapfrog	N/A
Optimal design to meet need	H
Participatory consultation with communities	L
Payment of services through tariffs	M
Planned infrastructure pipeline	L
Achievable programme	M
Project budget	M
Quality of infrastructure and services	L
Redundancy in design	L
Reliance on international supply chain	N/A
Resilient infrastructure	N/A
Service needs gap	H
Services available	H
Skills available for O&M	H

Infrastructure and service delivery (cont.)	
Skills transfer	N/A
Social infrastructure	L
Subsidised services	M
Supplier monopoly	N/A
Sustainable funding model	H
Sustainable services in the long-term	H
Thorough planning	M
Use of international consultants and contractors	M
Use of public or PPP delivery model	L
Use of services	N/A
Workers available	N/A

Summary

Dimension		Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery	TOTAL
Applicable	H	8	3	5	0	1	13	30
	M	4	7	4	5	2	14	36
	L	9	4	6	2	2	13	36
Total applicable		21	14	15	7	5	40	102
Percentage variables applicable		45	40	44	44	63	71	52
Non-applicable		26	21	19	9	3	16	94
Total		47	35	34	16	8	56	196

5.9.8.3. Case study CLD (C-CLD)

The STWSSSP-2 C-CLD is shown in Figure 46.



Figure 46 - The C-CLD for the STWSSSP-2 project, adapted from the M-CLD. Size of circles show level of influence on a low-medium-high scale; larger circles show higher influence. Thickness of connection lines show strength of relationship on a 1-2-3-4 scale; 4 indicates the strongest relationship.

5.9.9. Discussion

The STWSSSP-2 C-CLD shares many of the same influence points as the M-CLD. Representation of the dimensions is more balanced than other projects, although there is a strong influence of the *infrastructure and service delivery* dimension. The *institutions and governance* dimension has the highest number of high influence variables with the exception of *infrastructure and service delivery*.

The project can be characterised as having a focus on infrastructure output delivery to meet objectives, but overall motivated by a desire to improve the wellbeing of the population.

Internal migration and urbanisation and service needs gap

Internal migration and urbanisation is a high influence variable in the *social* dimension, and is a driving force behind the need for the project; as more people migrate to towns, the need for urban infrastructure to support a growing population increases. However, the project performs poorly in the PA in its ability to be adapt to an increase in population density and growth, which suggests that the rate of migration exceeds the rate of new service provision, creating a service needs gap.

The *internal migration and urbanisation* variable does not appear in any feedback loops in the C-CLD. However, there are two clear casual pathways linking migration and urbanisation to an increased service needs gap. Firstly, as international migration and urbanisation increases, so too does the urban/rural divide, which in turn increases the service needs gap, as shown in Figure 47. Secondly, as internal migration and urbanisation increases, demographic changes increases, which creates changing service needs, and a service needs gap forms as needs change quicker than services can be provided to meet need. This is shown in Figure 48.



Figure 47 - Causal pathway showing the relationship between internal migration and urbanisation and the service needs gap, passing through urban/rural divide.



Figure 48 - A second pathway showing the relationship between internal migration and urbanisation and the service needs gap, showing the influence of a changing demographic and needs.

Therefore, intervention to reduce, or slow, internal migration and urbanisation would help improve the success of the STWSSSP-2 project by reducing the service needs gap. In the C-CLD, internal migration and urbanisation is increased by regional inequality, although does not have any other inward connections. However, in the M-CLD, it is also increased by access to better paid work which attracts people to urban areas. By increasing access to better paid work in rural areas, migration could be reduced, and rural areas could become more prosperous, slowing the rate of migration and urgency for infrastructure. This would also serve to reduce regional inequality, reduce the urban/rural divide, increase rural household income, and reduce risk to livelihoods in rural areas. Increasing access to paid work in rural areas is suggested as an intervention point to slow rural to urban migration as a preventative measure to fast population growth, as opposed to solutions in response to an already increased urban population.

Decentralisation of governance

The STWSSSP-2 model is developed around the decentralised governance structure. Provinces have autonomy to manage their own infrastructure, services, planning, finances, and policies, which has both advantages and disadvantages. States are more likely to understand their specific infrastructure needs than the central government, and will be able to make more informed decisions about allocation of resources. However, regional inequalities can form as some states have the capability to implement better services than others, which can trigger further disparities.

The C-CLD shows that decentralisation of decision-making power increases provincial autonomy over implementation and management of infrastructure and services, which increases decentralised services. This increases access to services, which simultaneously increases use of services and decreases the service needs gap. As use of services is increased, so too is population welfare. However, the trade-offs in these relationships are that an increase in decentralisation of decision-making power can increase disparities between provinces, and provincial autonomy of implementation and management of infrastructure and services can increase regional inequality. These relationships are mostly between highly influential variables with strong connections, and are shown below in Figure 49.



Figure 49 - The relationships between governance structure, social factors, and infrastructure and services.

Despite the trade-offs, a suggested intervention point is to allocate a degree of autonomy to districts to manage their own infrastructure, with faith that regional and local governments will have a better understanding of the real needs of the region, whilst maintaining central oversight to mitigate resultant high regional inequality.

Institutional capacity

Strengthening institutional and management capacity is one of the primary objectives of the project, reflected by the PA results which indicate that dedicated managerial infrastructure is poor. The C-CLD shows that growth and capacity building of local government increases institutional capacity, which increases skills available for O&M; one of the largest failures of the project. If skills available for O&M are increased, infrastructure becomes more easily operated and maintained, which ensures services are available. Available services simultaneously increase access to service and decrease the service needs gap. The initiatives implemented under STWSSSP-2 reflect an understanding of this causal pathway and the same intervention points as shown in the C-CLD to improve institutional capacity: increased skills in the workforce, increased engineering and management expertise, and increased internal national engineering and management capability.

Skills and management expertise

Skills and management expertise were generally poorly performing areas in the project, as indicated by the PA. Engineering and management expertise and technical support were not always available, skills required were not always aligned with locally available capacities, appropriate skills were not always available for O&M, and training was not always given. This is indicative of a national skills and education gap.

Figure 50 shows the variables and connections in the C-CLD which will help increase skills and management expertise, and improve overall performance in this area. Use of international consultants and contractors increases engineering and management expertise, which increases internal national engineering and management capability. It also increases skills transfer, which subsequently increases internal national engineering and management capability and available for O&M. Internal national engineering and management capability goes on to increase institutional capacity, increase skills available for O&M, and completes a balancing loop as it decreases use of international consultants and contractors. Vocational training also increases skills available for O&M. This network of connections presents two leverage points for improvement of skills: increase use of international consultants and contractors, and increase vocational training.

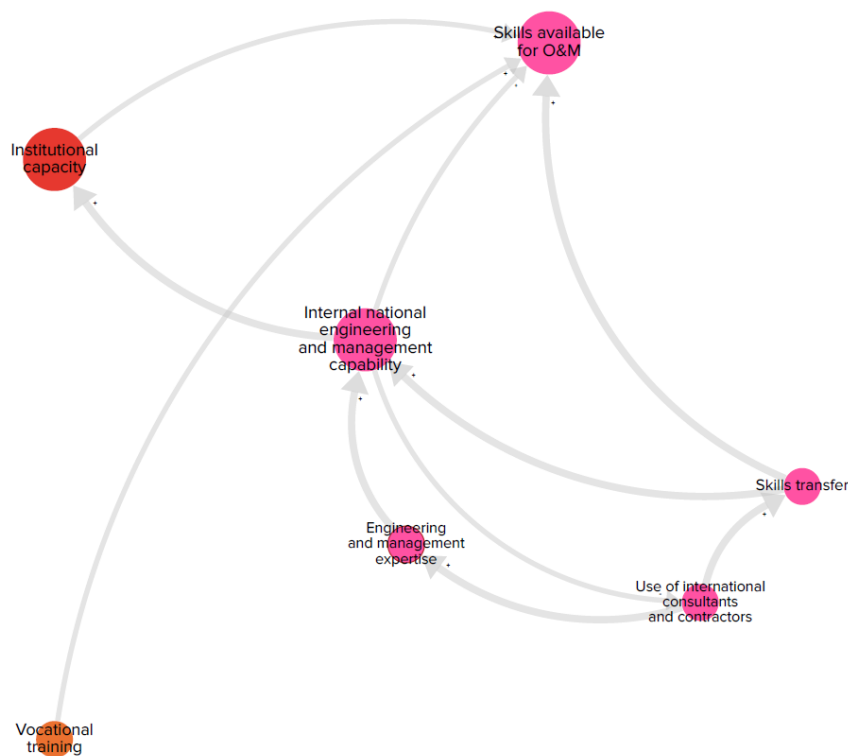


Figure 50 - Factors that influence skills capacities.

Development plan and socially motivated development agenda

Nepal has a development plan in place with targets including infrastructure provision, although no specific infrastructure development plan. However, the 15th development plan is attributed with moving Nepal's focus from economic growth to social development and improvement of population wellbeing and welfare. The PA results show that all criteria within the *service contributes to social development* goal are met, which reflects the government's efforts in this area. Figure 51 shows some key relationships.

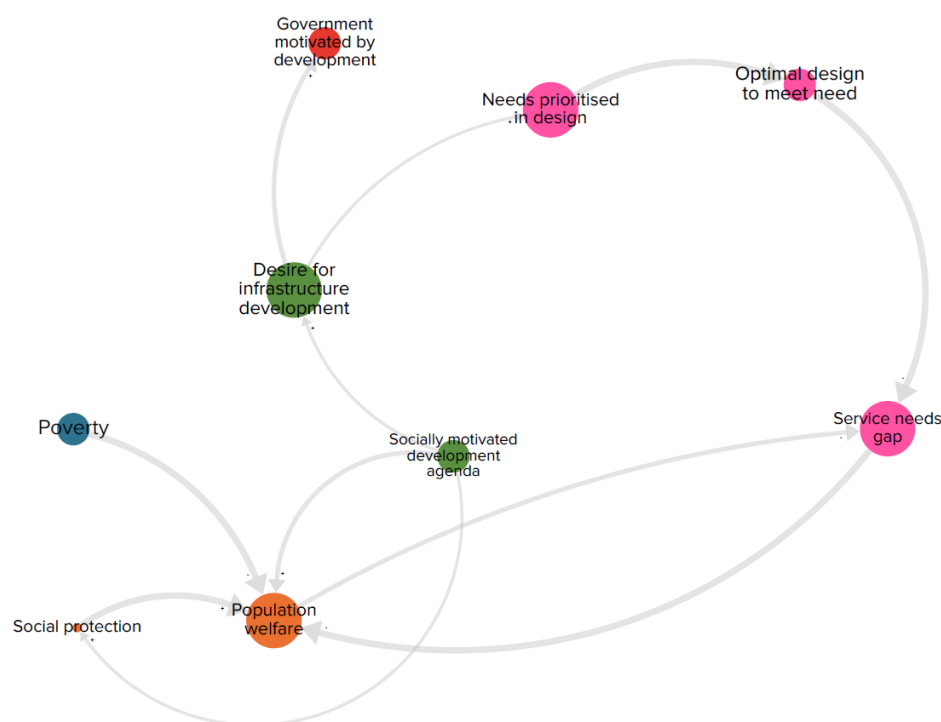


Figure 51 - Relationships between the development plan and social outcomes.

The C-CLD shows that a socially motivated development agenda increases population welfare, social protection, and desire for infrastructure development. The latter creates a proactive attitude towards infrastructure, and encourages government motivation and a prioritisation of need. When needs are prioritised, design will optimally reflect need, which will reduce the service needs gap. This forms a balancing loop with population welfare. To increase population welfare, social protection measures can be put in place. However, even if the government is motivated towards development, a standalone infrastructure development plan would be beneficial to target specific needs, supported by broader goals within the holistic national development plan.

Poverty

Poverty is widespread in Nepal and is one of the drivers of the project. Poverty contributes to migration as people migrate to cities in search of better employment opportunities, it decreases population welfare, increases risk to livelihoods, and increases the service needs gap as the poor are unable to access services. The C-CLD shows that poverty forms a reinforcing loop with wealth divide: as one increases so too does the other. Therefore, measures to break this cycle are essential. The project's OBA scheme to ensure access to water and sanitation for the poorest is one effective way to address this. Also, efforts to balance regional inequality, reduce migration to cities, and improve rural services and livelihoods, as discussed above, is suggested as another possible leverage point.

Summary

The STWSSSP-2 project can be summarised as driven by meeting basic needs, but at the collective level to improve conditions for all demographic groups, rather than only the very poor. Internal

migration and urbanisation are at the heart of STWSSSP-2, and the M-CLD supports that this is a potentially impactful intervention point. Notably, multiple interventions are targeted at high-level change, such as through governance and policy.

Suggested focus points for intervention are listed in Table 48.

Table 48 - Suggested leverage points and their intended outcomes.

Suggested leverage point	Intended outcome
Improve access to infrastructure and services and improve employment opportunities in rural areas.	Reduced and slowed migration to cities, so that the strain on existing services reduces, and authorities have more time to better plan and implement new services. Lessen the urban/rural divide, regional inequality, and the wealth divide.
Decentralisation of governance to authorise decisions regarding infrastructure and service provision to provinces.	Provinces are more likely to better understand the acute needs of the regional population, and therefore are more informed to make decisions to allocate resources. This should more effectively improve population welfare as infrastructure is aimed at meeting specific needs. (However, there is risk that regional inequalities can increase, which should be managed.)
Employment of more experienced organisations to educate and transfer skills to responsible government departments.	Improved institutional capacity at the government level. Government departments tasked with overseeing service provision to be highly competent.
Provision of thorough education to increase skills capacities within community groups responsible for managing services, such as WUSCs.	Improved institutional capacity, and improved financial knowledge and ability to collect tariffs and manage funds better. Better maintained infrastructure to ensure services are available for the long-term.
Implementation of an infrastructure development plan.	Specific infrastructure targets established including clear pathways to achieve them.

5.10. Urban governance and infrastructure improvement project 2

5.10.1. The enabling environment

The enabling environment in Bangladesh can be found in Section 5.4.1.

5.10.2. Background and project description

The Urban Governance and Infrastructure Improvement (Sector) Projects (UGIIP) are a series of three projects to improve infrastructure provision and strengthen institutions within municipalities, known as pourashavas, across Bangladesh, which were previously failing to provide infrastructure and services to their citizens (INT-8). Each project has built on the progress made by the previous phase, with the addition of a small number of new pourashavas each time.

The UGIIP projects were aligned with Bangladesh's National Strategy for Accelerated Poverty Reduction (2005) (the relevant regulation during the project planning stages), the initiatives within which are now represented in the PP2041 (ADB, 2017).

The Pourashava Act of 2009 (also known as the Local Government Act of 2009) was implemented during the UGIIP-2 project, and was the culmination of much work done under UGIIP-1 with support from ADB. The Act intended to strengthen local institutions and increase autonomy for decision-making. (ADB, 2012a)

The overall project objectives were to improve 'sustainable human development, economic growth and poverty reduction' (ADB, 2022a).

This objective was broken into two goals:

- To increase economic opportunities and reduce vulnerability to poverty and environmental degradation and hazards through improved urban infrastructure.
- To strengthen capacities of urban municipalities and increase accountability to ensure proper delivery of services.

(ADB, 2012a)

UGIIP-2 was carried out between 2008 and 2016 (ADB, 2012a).

5.10.3. Need for the project

Bangladesh was experiencing rapid urbanisation, which created a demand for urban infrastructure and services, and governance to support its implementation and management (ADB, 2022a).

Prior to the UGIIP projects urban infrastructure was inadequate and unsuitable for the needs of the population including a lack of housing, safe and adequate water, and sewerage systems (ADB, 2012a), as well as an inadequate road network to meet urban mobility needs (ADB, 2017). There was a lack of

access to basic services for the poor, and a lack of participation and representation of citizens (ADB, 2008).

Pourashavas lacked the funding, skills capacity, urban planning capacity, and delivery mechanism to implement the necessary work to improve conditions, and most failed to have an infrastructure plan in place (ADB, 2017). Rapid urbanisation and migration to cities was increasing this strain (ADB, 2008).

5.10.4. Infrastructure implemented

Physical infrastructure

The UGIIP-2 scope was split into seven sub-projects: municipal transport, including roads, bridges, and traffic equipment; drainage, including newly constructed drains and rehabilitation; solid waste management, including waste recycling plants and improved landfill sites; water supply, including an improved pipe supply, provision of hand wells and tube wells; sanitation, specifically provision of latrines; municipal facilities, including community centres and markets; and basic services to slums, including drainage, toilets, and water sources (ADB, 2017; ADB, 2022a).

Institutional development

Areas of focus were: enhancing citizen participation, achieved through establishment of community groups; improved urban planning, including recruitment of experienced planners and implementation of development and O&M plans; enhanced female participation, including implementation of a Gender Action Plan (GAP); increased participation of the urban poor, including in community groups; improved accountability of finance management, including tightened control over tax; and improved administrative transparency, achieved through organisational plans and a new reporting mechanism (ADB, 2017).

A PMO and PIU was established within each pourashava, responsible for overall management and delivery of the works (ADB, 2017). These were supported by new community-based organisations, and recruitment of staff to meet skills gaps (ADB, 2017).

Social infrastructure

Social infrastructure included the establishment of ward level coordination committees (WLCCs) and town level coordination committees (TLCCs) with representation from all socio-economic groups (ADB, 2008).

The Poverty Reduction Action Plan (PRAP) was prepared to ensure participation of the poor and development of pro-poor policies and infrastructure (ADB, 2017).

A GAP was developed to promote equal female participation in committees and community groups, and consider gender specific needs in infrastructure (ADB, 2008).

5.10.5. Delivery

Organisations and responsibilities

The PMOs and PIUs sat within the Local Government Engineering Department (LGED). The inter-ministerial steering committee from UGIIP-1 remained involved in UGIIP-2 to provide guidance. (ADB, 2017)

International consultants were an important part of project delivery as a means of strengthening governance and capacities within the pourashavas through outside expertise (ADB, 2022a).

WLCCs and TLCCs were established as the management mechanism at the local level. The WLCC allowed community members to raise issues regarding development, and encouraged high representation from women. The TLCC comprised representatives from all stakeholders, include government officials and townspeople, and served as a parliament for the pourashavas. (ADB, 2012a)

The LGED led the technical design, and had general responsibility for providing technical support to local governments and leading technical design of urban infrastructure (ADB, 2012a).

Programme and budget

UGIIP-2 was carried out from 2009 to 2016; taking six months longer than planned. The programme overrun was due to recruitment delays in sourcing consultants for management and design, and overrun of civils works contractors due to political unrest, unfavourable weather conditions, and fluctuating cost of materials. Some delays were recovered by efficient project management. (ADB, 2017)

Finance was provided by an ADB loan, constituting approximately 50% of the budget, a grant from the Government of Germany, the GoB, and from the pourashavas themselves. The cost at completion was USD 168.41 million. (ADB, 2017)

Performance based funding

Project funding was released using a performance-based fund allocation strategy, intended to incentivise pourashavas to achieve the delivery targets and create long-term sustained change (ADB, 2008). Performance was measured at three points, and had to pass the performance requirements of each to receive further funding (ADB, 2012a).

Performance criteria related to improved citizen participation and urban planning processes, implementation of measures to encourage gender equality, inclusion of the urban poor, maintenance of financial records, and administrative transparency (ADB, 2018). The performance-based approach was deemed an integral part of project success, and particularly the monitoring of time-bound activities to measure this performance (ADB, 2018).

Ongoing funding of services

The pourashavas were responsible for funding and carrying out O&M (ADB, 2008). Following reform of the taxation system, all 47 pourashavas were able to generate sufficient revenue to cover the O&M costs of all project infrastructure (ADB, 2017). Responsibility for monitoring of services fell to the LGED, and primarily the PMOs and PIUs (ADB, 2018).

Although most of the implemented infrastructure is non-revenue generating (ADB, 2017), a small tariff was applied for water use, which raised the risk of affordability for the poorest citizens (ADB, 2008). This was mitigated by ensuring only a small fee in line with the income level of users (ADB, 2008).

Consultation with stakeholders and communities

Participatory workshops were carried out to identify pourashavas and projects for inclusion in UGIIP-2, which included consultations with communities, socio-economic surveys, and discussions with the WLCCs and TLCCs, involving ward committee members, communities directly affected by the proposed projects, NGO representative, and representatives of local government agencies (ADB, 2015).

UGIIP-2 was intended to be a community driven development project, and ADB required stakeholder consultation to include involvement in planning and design, and community control over key decisions (ADB, 2012a). Participation of the poor as equal stakeholders was ensured through representation of poor communities and citizens in TLCCs, WLCCs, and slum improvement committees (SICs) (ADB, 2017).

The delivery mechanism was designed to employ local organisations throughout construction and for O&M thereby generating employment opportunities (ADB, 2017). ADBs Procurement Guidelines 2007 were used to enforce this, and to ensure fair and transparent procurement throughout the project (ADB, 2022a).

5.10.6. Output and outcomes

Overall, UGIIP-2 successfully delivered a range of physical and facilitating infrastructure, led by a government motivated towards development.

The major project outputs and outcomes are shown in Table 49.

Table 49 - UGIIP-2 project outputs and outcomes.

	Output	Outcome
Physical infrastructure	Successfully delivered infrastructure across all seven targeted sectors: municipal transport, drainage, solid waste management, water supply, sanitation,	Improved transport reduced road congestion, reduced travel time to city centres, and increased access to economic opportunities such as markets. (ADB, 2017)

	municipal facilities, and basic services in slums. (ADB, 2015)	
		Water management improved: water and sanitation infrastructure access increased, including in slums, and drainage infrastructure reduced the number of houses at risk of flooding. (ADB, 2017)
	Pro-poor infrastructure aimed at improving conditions for the poor and slum populations. (ADB, 2017)	Improved employment opportunities and conditions for the slum population, reducing overall poverty levels. (ADB, 2017)
		Overall improvement in economic conditions through increased household assets and increased income. (ADB, 2012a)
	Infrastructure targeted towards improving conditions for women. (ADB, 2017)	Increased safety and security for women, contributing to progress towards gender equality. (ADB, 2017)
Urban governance	Positive and strengthened institutional and organisational changes. (ADB, 2017)	PMOs and PIUs established in each pourashava within the LGED. (ADB, 2017)
		Increased skills capacities, increased public involvement and representation, and improved financial management. (ADB, 2017)
		Improved planning processes, and transparent administrative processes. (ADB, 2012a)
	Establishment of local committees to manage infrastructure and governance, such as TLCCs and WLCCs. (ADB, 2017)	Increased community participation and ownership of infrastructure and services. (ADB, 2012a)
		Increased awareness in communities of their responsibilities, and a closer relationship with local government. (ADB, 2012a)

		Increased representation of women in committee positions, and progress towards gender equality. (ADB, 2017)
		A requirement for citizen representation on committees has been made a statutory requirement. (ADB, 2008)
	Revised and computerised tax collection process. (ADB, 2012a)	Increase in tax collected, and more funds available for reinvestment in infrastructure and services, and for O&M. (ADB, 2017)
	Implementation of the GAP. (ADB, 2017)	Increased female representation in governance committees, contributing to progress towards gender equality. (ADB, 2017)
Performance based targets	31 of 35 pourashavas that begun UGIIP-2 graduated to the third phase. (ADB, 2017)	Funding released to complete further sub-projects under UGIIP-3. (ADB, 2017)
	Pourashavas achieved UGIAP phase targets ahead of programme. (ADB, 2017)	Motivated leadership which helped achieve long-term sustainable change, and increased the efficiency of achieving outcomes. (ADB, 2017)
	The target approach provided a clear strategy for success. (ADB, 2012a)	Other municipalities were motivated to achieve the same outcomes, resulting in applications for inclusion in further stages of UGIIP2. (ADB, 2012a)

5.10.7. Findings

Table 50 details influences from the enabling environment identified in the UGIIP-2 project, how they shape the enabling environment, the impact to infrastructure and services, and the effect on need.

Table 50 – UGIIP-2: Linkages between key influences, the effect on infrastructure and services, and need.

Influence	How does this shape the enabling environment?	How does this effect infrastructure services and implementation?	How does this effect ability to meet need?

Institutional capacity	· Pourashavas were not being governed effectively, development was not progressing, and finances were uncontrolled.	· A failure to effectively collect taxes reduced the finances available for capital investment and maintenance of infrastructure projects.	· Strong leadership required, or resources will not be directed to end user.
	· Taxes were not being collected fully, so the pourashava had very limited finances for investment.	· A long-term infrastructure plan is unlikely to be in place.	· A tax structure to fund services may render services unaffordable for the poor.
	· Poor institutional capacity did not provide the necessary skills to support a strong economy.	· A lack of engineers and qualified and experienced staff in the infrastructure sector compromises delivery.	
	· Weak governance in pourashavas worsened by little public participation, and most failed to have an infrastructure plan in place.		
Decentralisation of governance	· Provincial government and institutions had more power and authority to make decisions in the best interest of their district.	· Infrastructure planning is done at the provincial level meaning projects can be prioritised depending on specific local needs.	· Needs are more likely to be met as leaders are close to the communities requiring the services.
	· Funding was allocated to provinces and pourashavas to manage internally.	· Infrastructure and services are more likely to differ between provinces across the country, which increases potential for inequality depending on location.	· If regional differences emerge in infrastructure and services available, needs are likely to be met to varying degrees depending on where the individual in need lives.
	· Those able to make decisions and initiate change were closer to the communities, and therefore more likely to understand their real needs.		· Leaders in each province are likely to prioritise infrastructure differently. Therefore, needs might be met in different ways in each province.

	· Decentralisation can exacerbate disparities between provinces as priorities are distributed differently.		
Active communities and community engagement	· A move towards citizens groups to ensure government accountability and a more direct impact from the public themselves.	· Community participation in the design and planning phases leads to infrastructure that better meets the wants and needs of the community; is aligned with community skills for construction and O&M; and encourages positive views, investment, and ownership of the services.	· Needs are expressed and therefore known by decision makers and infrastructure designers, and subsequently infrastructure is more likely to meet need.
	· Community participation and voice encourages action and accountability from policy-makers.	· Local people and companies can be employed and participate fairly in the tender process.	
	· Participation of the community improves the capacity of the pourashava to deliver, through public skills and financial ‘buy-in’.		
Policy and regulation	· Bangladesh has rigorous development policy in place: PP2041 sets out development goals, and previous 5-year plans have helped Bangladesh achieve good economic development.	· Infrastructure quality and construction safety was comparable to international best practice.	· Quality standards include provision that services must be designed to meet need.
	· UGIP-2 worked within international policy set by ADB and national policy.	· Design and construction processes were more rigorous which can increase cost and budget for implementation.	· Safety regulations mean services are safe for the end user.

	· Safeguarding policy and mitigation measures were in place to protect the public and particularly the poor.	· Infrastructure ensured little impact on safeguarded groups including indigenous people and the environment.	· Safeguarding measures protect the public, without which people might be exposed to unjust treatment or marginalisation which can result in increased needs.
Gender issues	· Traditional gender roles and subsequent disempowerment of women provided the cultural backdrop within which the project was delivered.	· Female roles can be established in community groups which balances the traditional gender roles with involvement in the project.	· Women were represented in the project through community forums and committee quotas.
		· Although interventions were made as part of the programme to encourage participation and equality for women, the project had to work respectfully within the cultural norms regarding gender.	· It is difficult for women to express their needs in a culture resistant to outspokenness of women.
Poverty	· There was a widespread lack of access to basic services.	· Social infrastructure is required to support the poor.	· Higher rates of poverty mean that the needs gap is higher.
	· High levels of socio-economic inequality including income, opportunities, and welfare, and a rural/urban divide.	· Basic services are required to meet the basic needs of the poor, particularly services for the urban poor in slums.	
Internal migration and urbanisation	· Migration to cities is increasing, in part due to low agricultural wages and higher wages and more opportunities in cities.	· Infrastructure and services in cities must respond to increased demand.	· Urban services are stretched; the ability of existing services to meet need is decreasing; and the needs gap is growing.
		· Infrastructure construction and service delivery can offer employment opportunities in cities.	· Employment opportunities and promise of increased wages can help decrease needs gaps of poor families.

5.10.8. Data analysis

5.10.8.1. Project appraisal (PA)

Performance by criteria

The appraisal reveals good overall performance: 79% of criteria are met, 7% are met exceptionally, and zero criteria are unmet.

The poorest performing criteria are shown in Table 51, although all are still partially met.

Table 51 - UGIP-2: Lowest performing criteria; partially met.

Dimension	Goal	Criteria	
Governance	Service has dedicated managerial infrastructure.	A long-term management plan is in place including contingency planning.	3
Financing	Sustainable funding and financing.	Sufficient funds are available to repay any loans.	3
Financing	Sustainable funding and financing.	The provider is free from substantial financial risks, debts or cost constraints that may threaten service delivery.	3
Infrastructure	Infrastructure is reliable.	Infrastructure network has suitable redundancy.	3
Service delivery	Contingency plans are in place to cope with service disruptions.	Alternative services are available to temporarily meet demand in the event of failure.	3
Service delivery	Monitoring and evaluation is in place.	Data collection and reporting mechanisms are in place to monitor the service.	3
Service delivery	Monitoring and evaluation is in place.	Regular inspections, testing and maintenance is carried out to ensure full operation.	3
Service delivery	Service is maintained.	Spare parts are available and affordable.	3
Service delivery	Delivery milestones are met.	Project was delivered to programme.	3
Contribution to development	Lessons learned benefit future projects.	Project is being evaluated post-completion.	3

Five criteria showed exceptional performance, shown in Table 52 below.

Table 52 – UGIIP-2: Highest performing criteria; scoring exceptional.

Dimension	Goal	Criteria	
Governance	Service has dedicated managerial infrastructure.	Provider has suitable authority and autonomy to manage service effectively.	5
Governance	Stakeholders are fairly represented.	Community and those served by services are involved, represented and empowered.	5
Service delivery	Universal access to services.	Infrastructure increases service coverage.	5
Social value	Alignment with local culture and values.	Community and end users have been consulted.	5
Contribution to development	Lessons learned benefit future projects.	Lessons learned are being applied to future work.	5

Performance by goal

Performance by goal is shown in Figure 52.

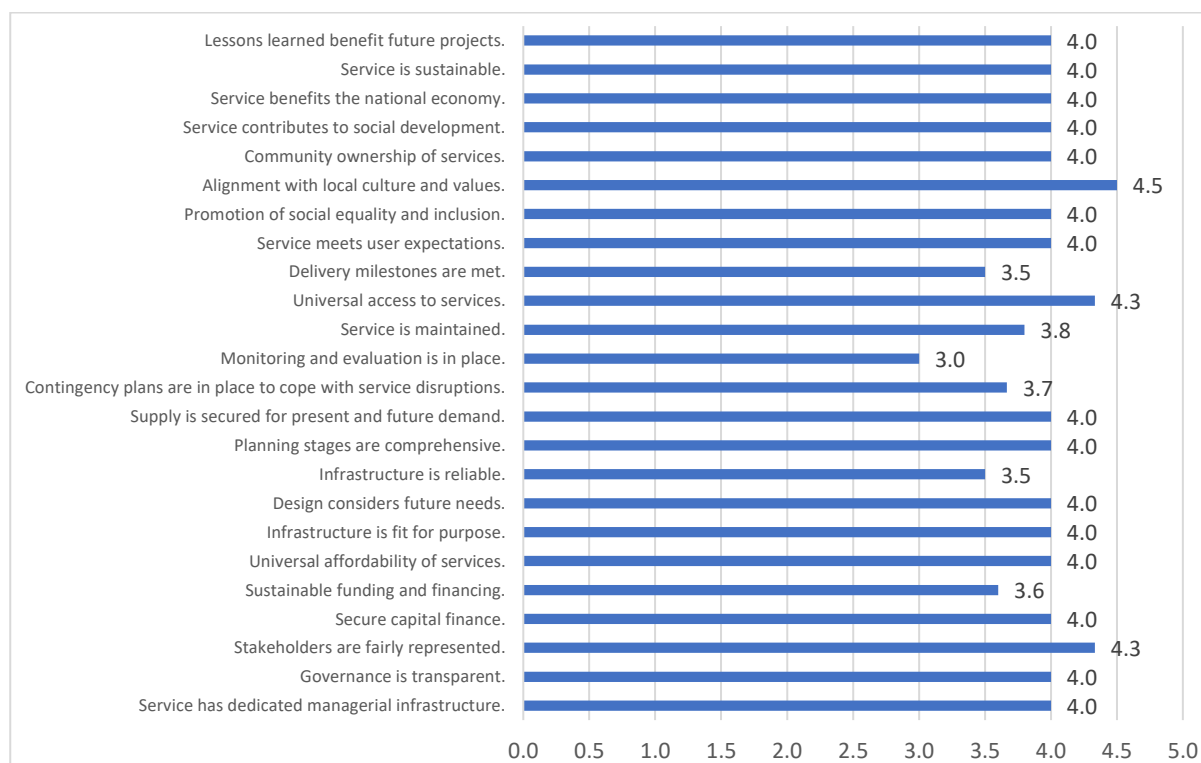


Figure 52 - UGIIP-2: Bar chart showing performance score of each goal, calculated by the average of component criteria.

Most goals are met, and only six goals score less than an average of four.

Performance by dimension

Table 53 shows performance by dimension, shown as percentage of total points achieved.

Table 53 - UGIIP-2: Performance by dimension in descending order.

Dimension	Percentage score
Social value	82
Governance	82
Contribution to development	80
Infrastructure	78
Service delivery	76
Financing	76

All dimensions perform well, although *social value* and *governance* perform best, scoring 82%. This is reflective of the governance related nature of the project, driven by social objectives.

5.10.8.2. Enabling environment appraisal (EEA)

The completed EEA in Table 54 shows influences within the enabling environment scored as low, medium, or high.

Table 54 - UGIIP-2: EEA results table. Variables scored on a scale through low, medium, and high, structured by dimension.

Institutions and governance		Economic	
Alignment between actors	L	Ability of states to self-generate income	M
Centralised policy	H	Aid	N/A
Civil liberties	N/A	Borrowed finance	M
Clear vision for the future	H	Capital finance	M
Clientelism	L	Economic globalisation	N/A
Closeness of inter-national relationships	N/A	Economic growth	N/A
Collaborative inter-organisation relationships	H	Economic stability	M
Conflict	N/A	Economic strength	N/A
Conflicting stakeholder motives	L	Employment opportunities	M
Consistent behaviour	L	Grants	H
Corruption	L	Household income	N/A
Decentralisation of decision making power	H	International trade	N/A
Decentralisation of governance	H	Investment in research	N/A
Decentralised policy	H	Investment opportunities	N/A
Deliver manifesto	N/A	Investor confidence	N/A
Democracy	N/A	Investor interest	N/A
Disparities between provinces	M	Loans	H
Electorate influence	N/A	Local economic growth	L
Fair political and policy decision making	M	Local industry	M
Free media	N/A	Local resources	N/A
Geographical advantage	N/A	National industries	N/A
Geographical proximity to other countries	N/A	Poverty	H
Government motivated by development	H	Private investment	N/A
Growth and capacity building of local	H	Private property rights	N/A
Institutional capacity	H	Privatisation	N/A
Inter-government collaboration	N/A	Provincial financial autonomy	H
Political change	L	Public funds	H
Political parties incentivised to align with public opinion	N/A	Public investment in infrastructure and services	H
Political self-interest in inter-national relationships	N/A	Public revenue	M
Political stability	L	Reliance on other economies	N/A
Power struggles	N/A	Remittances	N/A
Provincial autonomy over implementation and management of infrastructure and services	H	Risk for investors	N/A
Public confidence in institutions and	N/A	Unemployment	N/A
Resistance to integration of government	L	Value of personal assets	N/A
Rules and regulations followed	L	Wealth divide	L
Rules and regulations in place	M		
Sectoral policy	L		
Shared natural resources	N/A		
Social unrest	N/A		
Stable government	M		
State capture	N/A		
State stability	N/A		
Strategic location for trade and protection	N/A		
Strong leadership	M		
Transparency	M		
Votes	N/A		
Voting rights	N/A		
		Development	
		Desire for infrastructure development	H
		Economically motivated development agenda	N/A
		NGO support	L
		Respect for human rights	N/A
		SDGs met	N/A
		Socially motivated development agenda	H
		Trickle-down development policies	H
		Trickle-up development policies	N/A

Social	
Access to better paid work	M
Behaviour change	N/A
Brain drain	N/A
Caste system	N/A
Changing role of women in society	H
Citizen's power	L
Community and family resilience	N/A
Community engagement	M
Demographic changes	M
Diaspora	N/A
Educated population	N/A
Employment in agriculture	N/A
Empowerment	M
Engrained social behaviours	N/A
Gender equality	H
Human capital	L
Informal sector employment	N/A
Internal migration and urbanisation	H
International migration	N/A
Investment in education	N/A
Marginalisation of vulnerable and minority groups	M
Population welfare	H
Regional inequality	M
Religion	N/A
Resettlement	L
School enrolment	N/A
Skilled workforce	M
Social equality	M
Social protection	N/A
Strong social relationships	N/A
Traditional culture	N/A
Urban/rural divide	M
Vocational training	N/A
Worker's rights	N/A

Natural environment	
Available natural resources	N/A
Climate change	N/A
Climate migration	N/A
Commodifiable crops	N/A
Consistent agricultural production	N/A
Environmental degradation	N/A
Food security	N/A
Likelihood of extreme weather events	N/A
Physical limits of service provision	L
Pollution	N/A
Risk to livelihoods	N/A
Variable climate	N/A
Vulnerability of geographical location	N/A
Vulnerability to weather related disasters and shocks	N/A
Water availability	L
Water security	L

Infrastructure and service delivery	
Ability to adapt to external shocks and stresses	N/A
Access to services	M
Accurate up-front cost and programme estimation	M
Affordable services	M
Aligned business culture and communication	L
Available technology	N/A
Availability of resources and materials for construction	N/A
Risk of budget overrun	L
Changing service needs	M
Clear project scope	M
Community managed infrastructure	H
Construction cost	N/A
Cost of consultants and contractors	N/A
Cost of labour	N/A
Cost of materials	N/A
Decentralised services	L
Design options	L
Efficient delivery	H
Engineering and management expertise	H
Fair procurement	M
Feasibility studies	H
Financial return	H
Financially motivated stakeholders	N/A
Funding available for O&M	H
Infrastructure output	H
Internal national engineering and management capability	H
Knowledge sharing	M
Easily maintained and operational infrastructure	M
Monitoring and evaluation	M
Needs prioritised in design	M
Opportunities for local businesses	L
Opportunities to leapfrog	N/A
Optimal design to meet need	M
Participatory consultation with communities	H
Payment of services through tariffs	L
Planned infrastructure pipeline	L
Achievable programme	M
Project budget	M
Quality of infrastructure and services	M
Redundancy in design	M
Reliance on international supply chain	N/A
Resilient infrastructure	N/A
Service needs gap	H
Services available	H
Skills available for O&M	M

Infrastructure and service delivery (cont.)	
Skills transfer	M
Social infrastructure	L
Subsidised services	L
Supplier monopoly	N/A
Sustainable funding model	H
Sustainable services in the long-term	M
Thorough planning	H
Use of international consultants and contractors	H
Use of public or PPP delivery model	N/A
Use of services	M
Workers available	N/A

Summary

Dimension		Institutions and governance	Economic	Social	Natural environment	Development	Infrastructure and service delivery	TOTAL
Applicable	H	10	6	4	0	3	14	37
	M	6	7	9	0	0	19	41
	L	10	2	3	3	1	9	28
Total applicable		26	15	16	3	4	42	106
Percentage variables applicable		55	43	47	19	50	75	54
Non-applicable		21	20	18	13	4	14	90
Total		47	35	34	16	8	56	196

5.10.8.3. Case study CLD (C-CLD)

The UGIIP-2 C-CLD is shown in Figure 53.



Figure 53 - The C-CLD for the UGIIP-2 project, adapted from the M-CLD. Size of circles show level of influence on a low-medium-high scale; larger circles show higher influence. Thickness of connection lines show strength of relationship on a 1-2-3-4 scale; 4 indicates the strongest relationship.

5.10.9. Discussion

Of the 196 variables in the M-CLD, 54% are present in the UGIIP-2 C-CLD, constituting 106 variables. The C-CLD shows that the variables within the *natural environment* dimension are mostly not present; only three have low influence. Alternatively, the *infrastructure and service delivery* dimension has the highest representation of variables; 75%.

The overall shape and presence of variables in the C-CLD suggests that the project is characterised by the amount of infrastructure provided, but also heavily influenced by the governance and finances surrounding the implementation of infrastructure. The following discussion explores this, including influences shared by the M-CLD and C-CLD, and those unique to UGIIP-2.

Policy and governance

The *institutions and governance* dimension has a high proportion of variables present compared to other dimensions, including many variables of high influence. The institutional arrangement and the government attitude towards development show to have influenced the outcome of the project.

One of the drivers for the project is a lack of physical infrastructure. The C-CLD shows that a socially motivated development agenda increases the desire for infrastructure development. This increases the likelihood that needs are prioritised in infrastructure design which increases the likelihood of infrastructure being optimally designed. In turn, this decreases the service needs gap. These factors are also identified influence points in the M-CLD.

One of the positive project outcomes is that physical infrastructure was successfully delivered. The PA shows particularly high performance in increased service coverage and universal access to services. The C-CLD shows that this would have been influenced by the government's development outlook. Indeed, Bangladesh has high ambitions for its development, reflected by the government's commitment to the UGIIP-s project alongside development initiatives such as PP2041.

A second related influence is poor institutional capacity. One of the objectives of UGIIP-2 was to address this, which, according to the completion report, was successfully achieved. This was achieved by implementation of community groups and infrastructure management organisations, increasing skills capacities within communities responsible for running services following project completion, and improved planning processes. These are recommended as valuable intervention points for future work.

Decentralisation of decision-making power

Unique to UGIIP-2 is the decentralisation of decision-making power at the time of the project implementation, which shows to have had a particularly positive influence on outcome. As local authorities are given more power, they are likely to have a fuller understanding of the needs of the local population, which increases the likelihood of services meeting need. These variables do not appear in any loops in the C-CLD, however the following causal pathway demonstrates the positive influence it has on meeting service needs, and also reflects the high PA performance for increased service coverage and universal access to services.

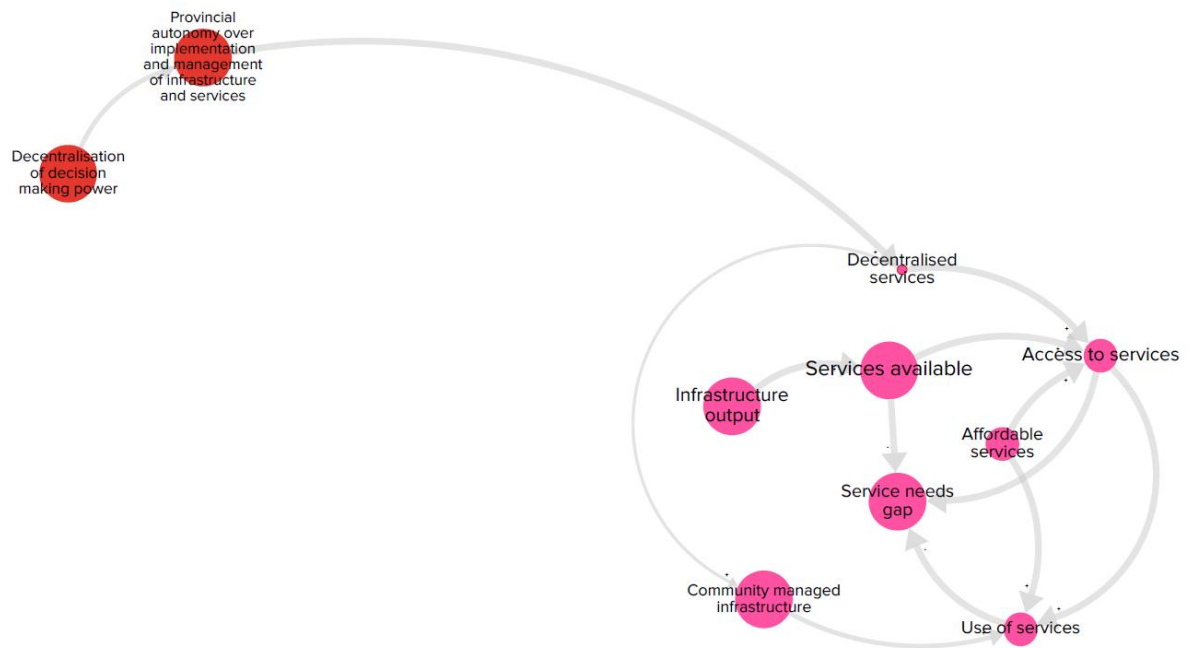


Figure 54 - The relationship between decentralisation of decision-making and infrastructure and services.

Figure 54 shows how decentralised services, whether at a local or regional level, trigger feedback loops amongst variables which contribute to meeting service need.

However, there is a risk that decentralisation and provincial autonomy creates regional inequalities. As shown in Figure 55, decentralisation increases provincial autonomy over implementation and management of infrastructure and services, which increases regional inequality, which then creates a reinforcing loop: increase regional inequality increases urban migration and urbanisation as people seek better conditions, which increases the urban/rural divide, which once again increases regional inequality.

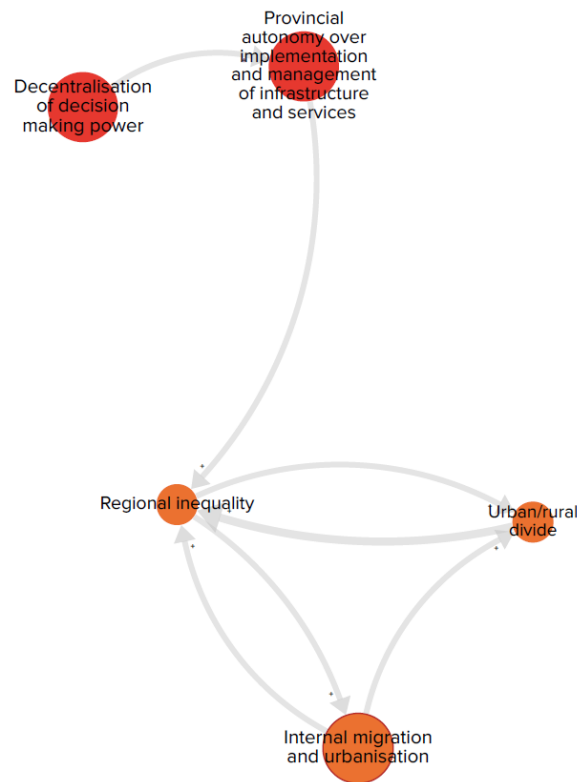


Figure 55 - The relationships between decentralisation of decision-making and an increase in inequalities.

Decentralisation of decision-making power is suggested as an intervention point to improve service provision providing caution is taken to mitigate a possible resultant increase in regional inequality and disparities. This could be done through centralised policy which decreases disparities between provinces. A second intervention point may be to reduce urban migration and urbanisation. As more people migrate to cities, the demand to services increases, and so too does the service needs gap. UGIIP-2 is specifically targeted at urban areas, however investment and provision of better services in rural areas may reduce migration, reduce the strain on existing urban infrastructure, and therefore reduce the urgency of new infrastructure provision.

Delivery model and funding

Infrastructure output is one of the three objectives of UGIIP-2, reflected by a high influence variable in the C-CLD. According to the completion report, physical infrastructure was successfully delivered across all seven targeted sectors. Figure 56 shows how increased infrastructure output reduces the service need gap.

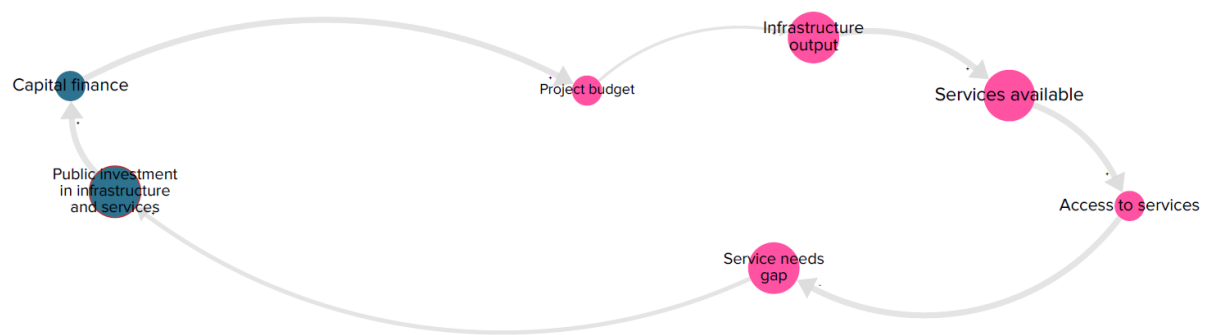


Figure 56 - Loop showing the relationship between infrastructure output and the service needs gap.

Infrastructure output increases the services available, which increases access to services, and subsequently reduces the service needs gap. In turn, this reduces public investment in infrastructure and services, which reduces capital finance and subsequently project budget, which limits infrastructure output, forming a reinforcing loop. Therefore, to maintain infrastructure output as required to meet need, finances must be sufficient and secure.

The revised tax collection process successfully increased revenue and funding available for the O&M of services. The C-CLD shows that public revenue increases public funds, which increases public investment in infrastructure and services. In similar environments and projects, it is recommended that failings in existing tax collection and public funding mechanisms be reviewed to ensure efficiency in the process of raising funds, and optimisation of budget allocation thereafter.

With respect to capital finance, the performance-based funding allocation attached to the ADB loan proved to maintain momentum in delivery and ensure infrastructure met international quality standards. This model worked particularly well for a programme of projects, as it encouraged other pourashavas to apply for the scheme which increases the security of funding.

The PA results indicate secure capital finance, but weakness is the ability of the project to repay loans, and exposure to financial risk which could threaten future service delivery. Therefore, it is suggested that in similar circumstances a performance-based funding strategy be employed to ensure secure capital finance, and measures to improve tax collection and security of public funding be explored to strengthen funding for O&M.

Community involvement

A central component to UGIIP-2 was close involvement of communities. As shown in Figure 54, community managed infrastructure increases use of services, which reduces the service needs gap. This serves as an intervention point of the reinforcing loop shown in Figure 56: if community managed infrastructure is increased, the service needs gap is reduced, triggering reduced investment. There is therefore both a positive and negative resultant effect by intervention. To mitigate the negative side-effect of reduced investment, the necessity for measures to ensure sufficient and secure capital finance as discussed above is reinforced.

Gender

A shared influence point in the M-CLD and C-CLD is gender equality, which is of high influence in UGIIP-2. UGIIP-2 implemented programmes aimed at women to increase overall community engagement through participation of a demographic that had not previously been represented. Further measures which helped achieve increased female participation were establishment of gender committees to protect women, a quota of female members on TLCC and WLCC committees, and implementation of the GAP. This in turn increased the capacity and capabilities of infrastructure management groups.

The project performs well for promotion of social equality and inclusion, and alignment with local culture and values, which is pertinent given the traditional role of women in society and necessary respect for these social norms. The C-CLD shows that increased empowerment, reduced marginalisation, and the modernisation of women's role in society can help achieve gender equality. The M-CLD also shows that a more educated population and addressing detrimental traditional cultures which limit the ability of women can be addressed as a means of intervention. It is suggested that in similar projects and contexts measures to increase participation of women in community groups will expand the capabilities and capacity for infrastructure management to improve service delivery.

Summary

Interestingly, UGIIP-2 is driven at the government level, yet interventions are suggested at the local level. For example, strengthening of community groups, and improved services in rural areas. This suggests that government motivation, which is also an influence point identified in the M-CLD, can trigger change at multiple levels.

Suggested intervention points are listed in Table 55.

Table 55 - Suggested leverage points and their intended outcomes.

Suggested leverage point	Impact on outcome
Increase institutional capacity, including strengthening of community groups, increased participation of all societal groups, improve planning, and improved financial accountability and processes.	A skilled workforce improves delivery and management of services through increased knowledge, and skills and knowledge is increased by extending participation to previously unrepresented groups. Ongoing management processes are more efficient and finances more likely to be managed responsibly.
Decentralisation of decision-making regarding infrastructure provision to the regional level.	Regional authorities have a better understanding of the infrastructure needs of the local population, which makes the needs gap easier to address and project outcomes more likely to meet need. However,

	an unintended secondary outcome may be increased regional inequality.
Reduce migration to urban areas by improving quality of and access to services in rural areas.	Reduced urban population and rate of population increase reduces strain on existing urban services and urgency to increase provision. The needs gap is reduced so that existing and new services can meet demand better.
Use performance-based funding allocation to incentivise delivery institutions to meet objectives and deliverables.	Better quality infrastructure is delivered as performance targets require it to meet international best standards.
Ensure tax collection processes and other measures to secure public funds are efficient and optimised.	More public funding is available for infrastructure projects, which increases infrastructure output.
Enhanced community participation in infrastructure management groups, and responsibility for O&M.	Community is more motivated to maintain operational infrastructure. However, appropriate education and skills transfer is intrinsic to ensure communities have necessary capabilities, to ensure this intervention works.
Introduction of women into infrastructure management groups and community organisations to introduce a previously unrepresented demographic.	Capacity and capability of community groups is increased, and more equal treatment of women holistically is achieved, contributing to overall development goals.

5.11. Chapter summary

This extensive chapter explores seven case studies, and reveals interesting insights into how different factors within the enabling environments affect each project in different ways. The case studies perform differently against the PA, have very different C-CLDs, and have different suggested leverage points which will achieve varying outcomes dependent on the project.

The case studies are explored as a group, compared, and analysed in the following chapter.

6. ANALYSIS

This chapter examines the results from all seven case studies for trends and insight. It considers the results of the PA, CLD analysis, and suggested leverage points.

6.1. Review of case study characteristics

Table 5 in Section 5.1 lists the fundamental characteristics of each case study, and contributes to the collective body of knowledge and findings of the case studies. Insight gained from their similarities and differences, and in light in the findings of the case study chapters, is discussed in the following sections.

6.1.1. Project scale

In this study all authority-led projects are centralised; all community-led projects are decentralised. Similarly, the development bank funded projects are centralised; and all consultancy and NGO projects are decentralised.

Centralised projects tend to operate at the larger scale, involving governments and high-profile funding bodies, and requiring greater investment. However, these organisations require complex procedures and processes, which can reduce efficiency of delivery.

Alternatively, decentralised projects can facilitate more local control over delivery. Decentralised projects showed to meet their objectives and end user need, which might be due to this local control and a direct exposure to need.

The decentralised projects tended to perform better for *social value* than centralised projects, including overall aggregated performance and criteria that are *exceptionally* met in the PA scores. The best performing criteria relate to involvement, representation, and empowerment of communities and those served by services; the community and end users have been consulted; and the infrastructure is appropriate in context. Decentralised projects tend to have a close relationship with the communities they serve, which may contribute to strong performance in social objectives.

A trend between centralised projects is their high performance in their ability to increase service coverage, and in that the provider has suitable authority and autonomy to manage services effectively. However, overall, Indravati performs differently to STWSSSP-2 and UGIIP-2, suggesting either that being a centralised project is not a deterministic characteristic, or that another characteristic is also at play. STWSSSP-2 and UGIIP-2 were part of wider government programmes, whereas Indravati was

not. Economies of scale might be a relevant factor; lessons can be learned and applied to sequential projects in a programme, offering opportunity to improve outcomes.

6.1.2. Mandated targets and incentives

There were two types of goal driven delivery models in the case studies: mandated targets and incentives. Mandated targets have negative consequences if not met, whereas incentives offer rewards for meeting targets.

Two of three authority-led projects funded by development banks, STWSSSP-2 and UGIIP-2, were driven by mandated targets. Conversely, Indravati, which was funded by the World Bank, did not impose mandated targets. Projects with mandated targets showed overall better performance, and particularly performed better at financial and safeguarding measures, reflective of related targets.

Lifewater, an NGO project, used incentives: widespread community behaviour change must have been evident before physical infrastructure was constructed. Subsequently, the project performed well for criteria relating to community involvement, consultation, and wellbeing.

It follows that targets or incentives may be useful to achieve a specific desired outcome, which can be incorporated into the targets or incentives.

STWSSSP-2 and UGIIP-2 performed well and consistently across all themes in the PA. Indravati, however, did not. Suggesting that the characteristic of incentivisation may be a differentiator, rather than the shared characteristic of centralised infrastructure.

6.1.3. Motivation for project implementation

Governments initiated five of the seven projects, motivated by a number of different reasons.

The government of Bangladesh was forced to act in response to climate and natural threats, resulting in support for BGP and CDSP-IV. Similarly, the government was responding to an increasingly urgent need for urban infrastructure and governance which led to STWSSSP-2 and UGIIP-2. The government motive for Indravati in India was stated as increased electricity from hydro-power and increased irrigation for the local population, although primarily in urban areas. However, the true level of motivation for irrigation infrastructure is questionable as this project component was not completed or prioritised.

The Sabre NGO was self-motivated to improve the educational conditions in Ghana, and the project was not initiated by the government. At the outset, the government was little involved in Sabre's work, failing to align them with other organisations working in the education sector. However, Sabre's lobbying increased government attention, which has resulted in a close relationship and joint efforts to overhaul education policy in Ghana.

Therefore, although it may appear that need is greater if the project is implemented at the government level, this is not always the case. In some cases, the government are unaware of the problem and extent of need, or perhaps unable to act.

Projects delivered due to motivation from NGOs show to achieve their outcomes successfully. Being ‘closer to the ground’ is likely strong motivation to deliver effectively when infrastructure can be seen by staff to impact communities directly. Conversely, staff delivering government-initiated projects are less likely to be personally motivated or emotionally invested in the project’s success.

6.1.4. Community education and management of infrastructure

BGP and CDSP-IV prioritised both community education within the project design, and establishment of community groups to manage infrastructure following project completion. This combination evidenced the most long-term behaviour change. They performed exceptionally well in that services were accessible to the poorest, vulnerable and minority groups. However, neither project was delivered to programme or budget, and sufficient capital was unavailable at the beginning of the projects.

STWSSSP-2, and UGIIP-2 formed community groups to manage infrastructure, although did not include a community education component. Without this, long-term behaviour change was not observed in UGIIP-2. The projects with community management of infrastructure alone showed poor performance due to a lack of data collection and reporting mechanisms to monitor the service; a lack of redundancy or ability to provide alternative services in the event of failure; and a lack of technical support available. This suggests that passing responsibility for maintenance and ongoing management purely to community groups may not be suitable, particularly without a strong educational component within the programme.

All four projects involved a social component and high community engagement. All projects showed an improvement and high performance for gender equality and a changing role of women in society. There is evidently a trend between high community engagement, and socio-economic development. However, community education within the programme seems necessary to ensure long-term behaviour change and competency within communities to manage infrastructure following project completion. Community education is the defining characteristic.

6.1.5. Trends not observed

The project sector does not appear to influence project outcome. However, most projects are multi-sectoral and have overlaps between them. This makes it difficult to determine whether sector is an influential factor, and it cannot be discounted. More case studies that work within a single sector are required to enable better analysis regarding the influence of sector on outcome.

Delivery organisation does seem to affect project outcome, but this is via the characteristics previously discussed. For example, projects delivered by development banks tend to be centralised, government-

led, and often driven by targets. It is these characteristics that affect outcome, rather than the delivery organisation itself. Notably, the three projects delivered by development banks do not share sectors.

It was expected that country and regional environments would form a group with behavioural similarities. The case studies do not show this, although notably it is difficult to draw these conclusions with case studies in only two regions. Also, some projects within the same country, such as BGP and CDSP-IV, share many other characteristics, and therefore it is difficult to finitely judge the deterministic factor of their outcome.

Funding mechanism did not seem to affect outcome. Projects delivered by development banks and consultancies had a more secure funding mechanism than NGOs, for example pre-agreed loans in contrast to variable donations. However, projects delivered by NGOs performed well and were not affected by funding issues.

6.2. Project appraisal (PA) performance

The project performance varied across dimensions, as shown in Figure 57. The methodology used to achieve the scores can be found in Section 3.5.1.1.

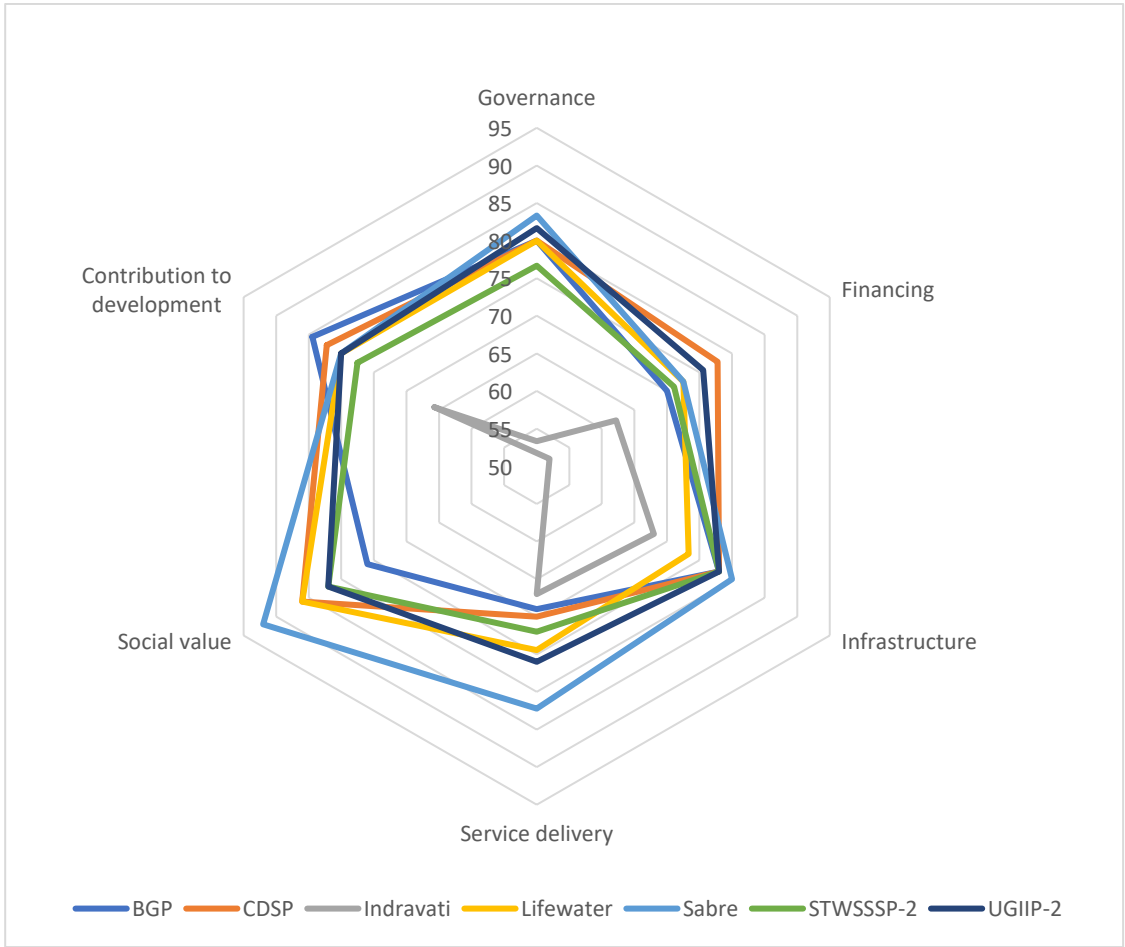


Figure 57 - Performance of projects by dimension, shown as percentage scores on a scale from 50% to 95% for visual clarity.

Indravati is a clear outlier, and performed very poorly compared to all other projects, and particularly badly in the *governance* and *social value* dimensions. STWSSSP-2 also performed worse than most other projects in several dimensions.

Sabre performed significantly better than all other projects in the *social value* and *service delivery* dimensions, and also highest in the *governance* and *infrastructure* dimensions. Arguably, Sabre had the best overall performance.

A breakdown of performance by goal is shown in Figure 58, which helps interpret the performance scores by dimension.

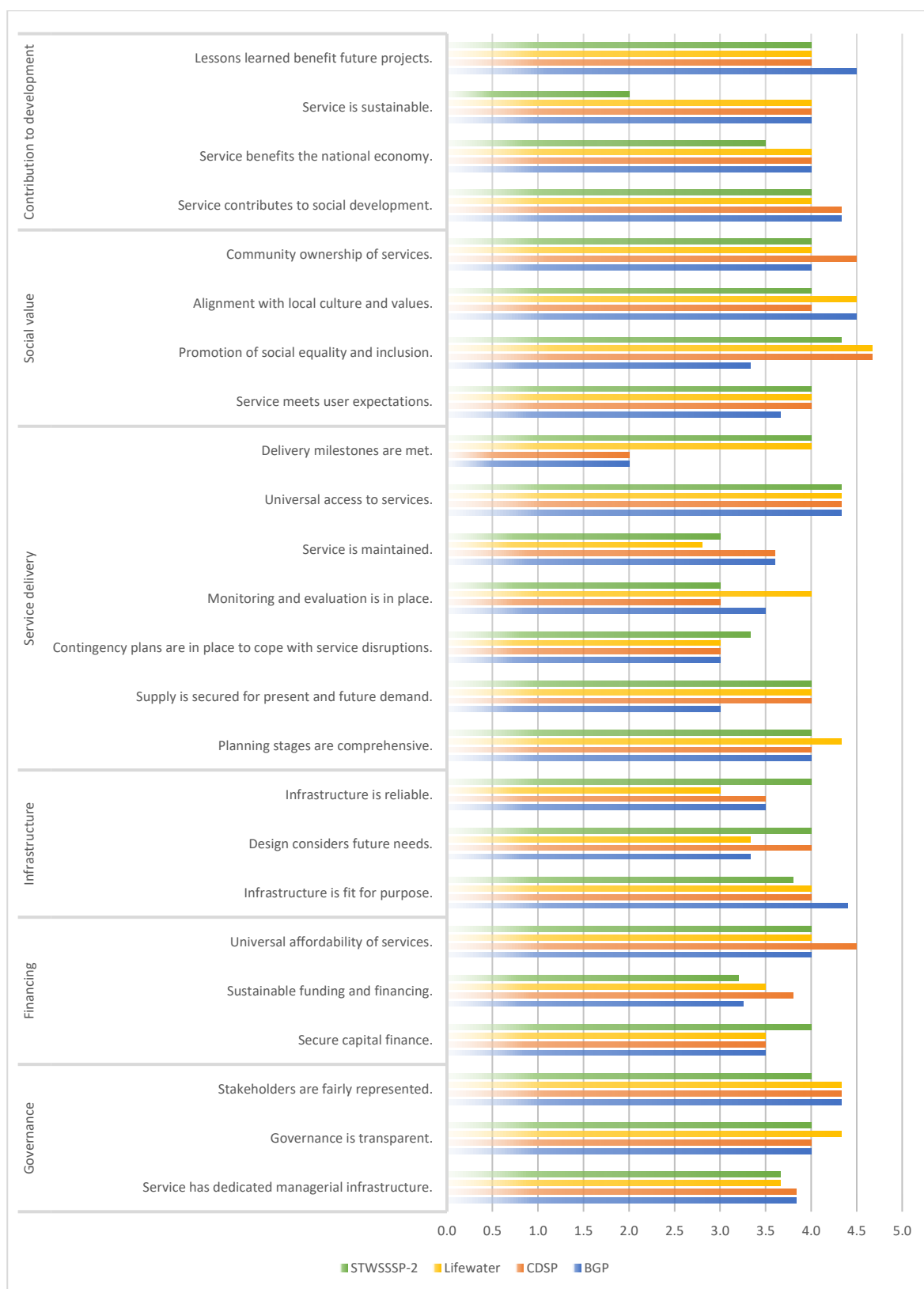


Figure 58 - Performance of projects by goal, calculated as averages of criteria scores within each goal.

The highest performing projects by goal are generally CDSP-IV, Lifewater, and Sabre. Indravati performs worst, including very poor scores for most goals within the *social value* dimension, for a failure to meet delivery milestones, for insecure capital finance, and for goals within the *governance*

dimension. Sabre averaged 5.0 in the following goals: community ownership of services and alignment with local culture and values. This score was not achieved in any other goals or by any other projects.

Table 56 below details the strengths and weaknesses of each project, with particularly high or low scores that have significantly impacted the average goal scores.

Table 56 - Strengths and weaknesses of each project as identified by the project appraisal.

Dimension	Goal	Criteria	BGP	COSP-IV	Indravati	Lifewater	Sabre	STWSSSP-2	UGIP-2
Governance	Service has dedicated managerial infrastructure.	Provider has suitable authority and autonomy to manage service effectively.							
Governance	Service has dedicated managerial infrastructure.	A long-term management plan is in place including contingency planning.							
Governance	Governance is transparent.	Feasibility assessments and planning consider need over stakeholder gain or alternative motives.							
Governance	Stakeholders are fairly represented.	Community and those served by services are involved, represented, and empowered.							
Financing	Secure capital finance.	Sufficient capital is available to finance the project.							
Financing	Secure capital finance.	Funding is secure.							
Financing	Sustainable funding and financing.	Sufficient funds are available to repay any loans.							
Financing	Universal affordability of services.	Service is affordable to the poorest, vulnerable or minority groups.							
Infrastructure	Infrastructure is fit for purpose.	Infrastructure is appropriate in context.							
Infrastructure	Infrastructure is fit for purpose.	Infrastructure meets codes, standards, and regulations.							
Infrastructure	Infrastructure is reliable.	Infrastructure network has suitable redundancy.							
Service delivery	Planning stages are comprehensive.	Project delivery and construction consider local context, skills, and resources.							
Service delivery	Contingency plans are in place to cope with service disruptions.	Resources are available for timely response to failures.							
Service delivery	Contingency plans are in place to cope with service disruptions.	Alternative services are available to temporarily meet demand in the event of failure.							
Service delivery	Monitoring and evaluation is in place.	Data collection and reporting mechanisms are in place to monitor the service.							
Service delivery	Monitoring and evaluation is in place.	Regular inspections, testing and maintenance is carried out to ensure full operation.							
Service delivery	Service is maintained.	Spare parts are available and affordable.							
Service delivery	Service is maintained.	Technical support is available.							
Service delivery	Service is maintained.	Necessary skills and resources are aligned with locally available capacities.							
Service delivery	Universal access to services.	Service is accessible to poorest, vulnerable or minority groups.							
Service delivery	Universal access to services.	Infrastructure increases service coverage.							
Service delivery	Delivery milestones are met.	Project was delivered to programme.							
Service delivery	Delivery milestones are met.	Project was delivered to budget.							
Social value	Promotion of social equality and inclusion.	Service serves all community members equally.							
Social value	Promotion of social equality and inclusion.	Service enhances wellbeing of communities and users.							
Social value	Alignment with local culture and values.	Cultural preferences and barriers have been considered in design.							
Social value	Alignment with local culture and values.	Community and end users have been consulted.							
Social value	Community ownership of services.	Community and end users feel ownership over services.							
Contribution to development	Service contributes to social development.	Service supports local livelihoods.							
Contribution to development	Lessons learned benefit future projects.	Lessons learned are being applied to future work.							

BGP, CDSP-IV, Lifewater, and Sabre have more strengths than weaknesses, whereas Indravati, STWSSSP-2, and UGIIP-2 have many more weaknesses.

The *social value* theme has primarily strengths, and weakness is only experienced in the *social value* theme by Indravati. The *contribution to development* theme has only strengths. Conversely, the *finance* theme has a majority of weaknesses. All projects show weakness in the *service delivery* theme.

Overall, STWSSSP-2 and UGIIP-2 share many of the same strengths and weaknesses, and appear most similar. They show some weakness in the *governance*, *financing*, and *infrastructure* themes, but most in *service delivery*. These weaknesses relate to a lack of a long-term management plan, contingency planning, sustainable funding and financing, and redundancy, and poor monitoring and evaluation, and a failure to meet programme. These weaknesses are categorised by a lack of planning for the future. Their shared strengths relate to increasing service coverage and application of lessons learned to future projects.

BGP and CDSP-IV share many of the same strengths and weaknesses. Their strengths are categorised by a focus on meeting the needs of communities and end users. Their shared weakness relate to a failure to meeting programme and budget delivery milestones; and a lack of contingency planning.

CDSP-IV, Lifewater, and Sabre have many strengths in the *social value* theme. All projects scored highly in each goal within the social value dimension, showing that the projects supported community ownership of services, promoted social equality and inclusion, met user expectations, and consulted communities as part of their work.

Indravati appears different to all other projects. Only one criteria recognised as a project strength: infrastructure is appropriate in context. BGP, Lifewater, and Sabre also perform well for this criteria. Weaknesses relate to a lack of consideration for the community and beneficiaries, insecure finances, and a failure to meet delivery milestones.

6.3. CLD analysis

6.3.1. Structure, shape, and dimensions

This section compares the C-CLDs: the presence and absence of variables, weighting of variables, influence of dimensions, and the M-CLD.

The graphs in Figure 59 and Figure 60 indicate the presence of variables in each C-CLD by percentage, shown by project and dimension respectively.

Figure 61 shows the adjacent C-CLDs for comparison, and shows presence of variables in each dimension, in addition to influence represented by the size of circle. Larger figures can be seen in Chapter 5.

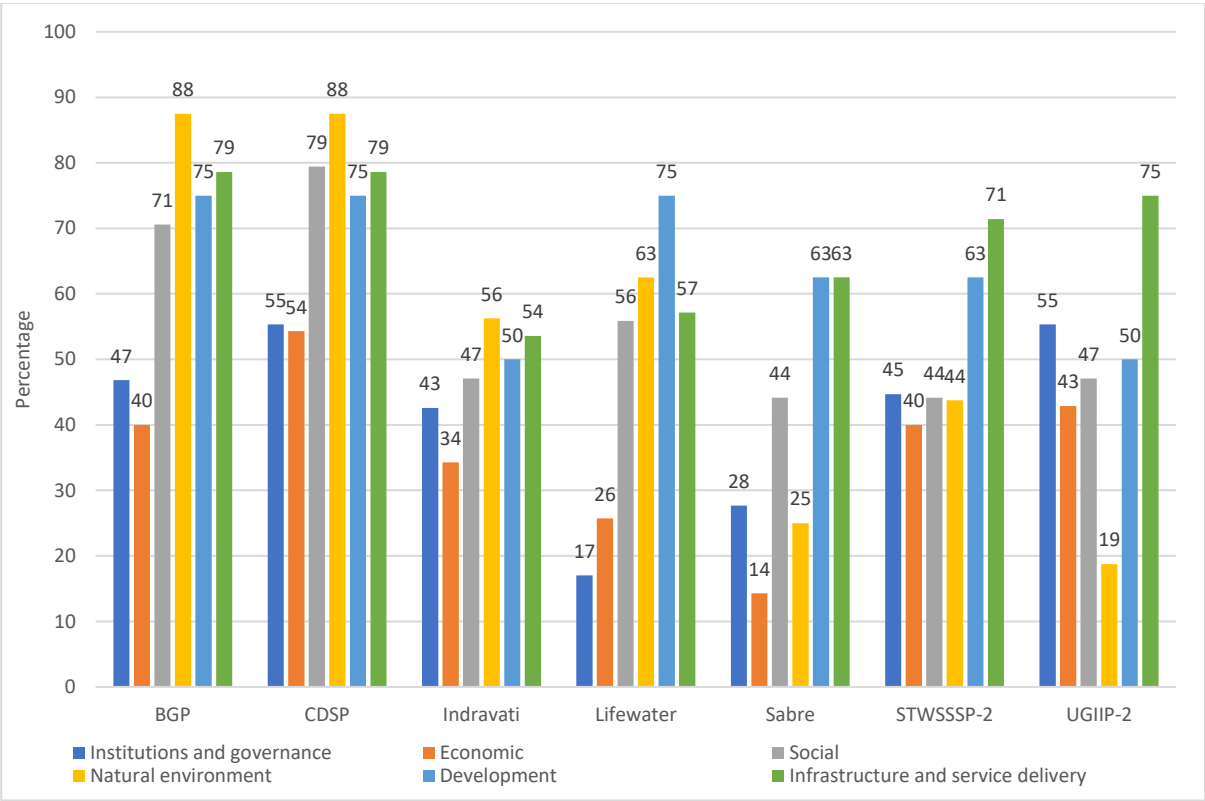


Figure 59 - Graph showing the percentage of variables present in each dimension by project.

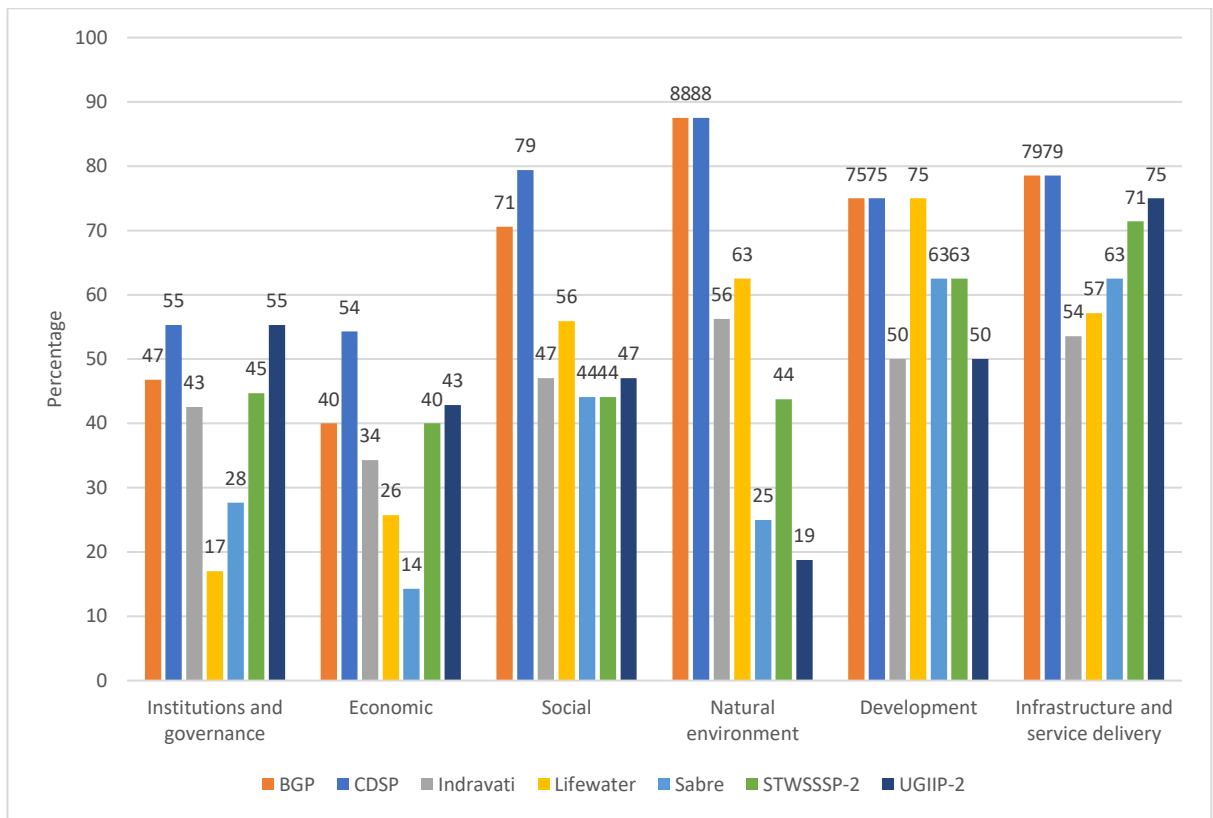
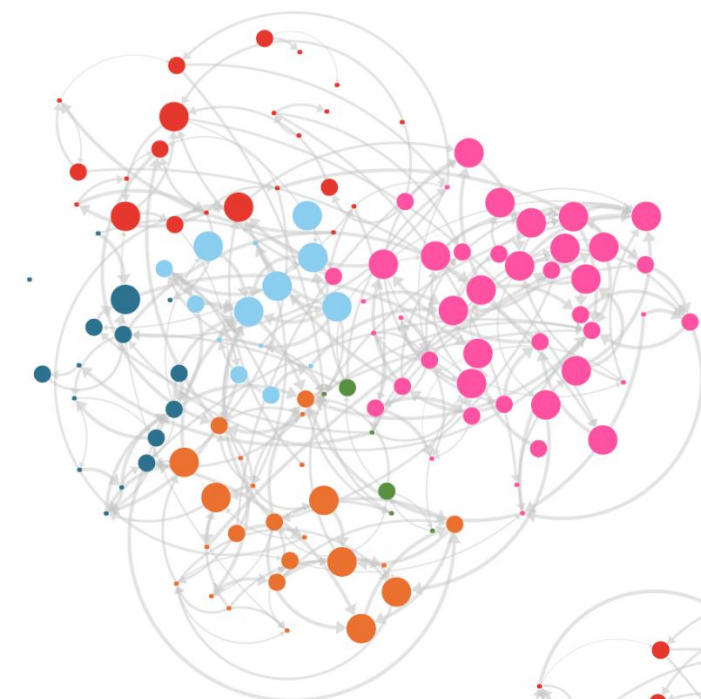


Figure 60 - Graph showing the percentage of variables present in each project by dimension.



BGP



CDSP-IV



Indravati



Lifewater



Sabre



STWSSSP-2



Figure 61 - All CLDs for comparison.

6.3.2. Visual comparison of C-CLDs

The number of variables present gives a rudimentary indication of the number of influences from the enabling environment that affect the project. A greater number of influences signifies a greater number of potential leverage points and loops.

BGP and CDSP-IV have the highest percentage of variables present than all other projects: 63% and 69% respectively (see Table 13 and Table 20 respectively) . Many variables within CDSP-IV are of high influence, indicated by the high density and number of large circles in the C-CLD. BGP however has a higher percentage of low influence variables, which results in a visually different C-CLD. All other projects have markedly fewer variables present.

Sabre has a visually unique structure. Although it shares a pattern of low influence from the *institutions and governance* and *economic* dimensions with Lifewater, and a lack of representation of the *natural environment* dimension with UGIIP-2.

Indravati and STWSSSP-2 have a more balanced presence of variables between dimensions as shown in Figure 3, and both have a balanced mix of low, medium, and high influence variables.

6.3.3. Review by dimension

The dimensions are discussed individually below.

Institutions and governance

The *institutions and governance* and *economic* dimensions tend to be the least represented across most projects. However, CDSP-IV and UGIIP-2 have the highest number of variables present. Within these projects, the variables are of much greater influence in UGIIP-2, shown by larger circles in the C-CLD. High influence variables typically relate to institutional capacity and governance structure, reflecting the governance focus of the project.

Lifewater and Sabre have fewer variables present from this dimension compared to other projects, which is expected given that both projects constitute decentralised infrastructure delivered at the local level, with less involvement from authorities. The variables present and of highest influence relate to policy and regulation, and government motivation and capacity.

Conversely, the Indravati, STWSSSP-2, and UGIIP-2 C-CLDs contain a relatively high percentage of variables, within which many are of high influence, likely reflective of their status as government-led projects.

Economic

Sabre and Lifewater are little influenced by the *economic* dimension, likely as these projects are NGO run and mostly funded by community members, and therefore funding from external sources and the wider economic context was less influential.

Overall, there seems to be a relationship between the presence of *institutions and governance* variables and *economic* variables. This is particularly evident in the BGP, CDSP-IV, and STWSSSP-2 C-CLDs, which show similar number of variables present for each dimension. However, the variables are of higher influence in CDSP-IV, evident in Figure 61. Similarly, Sabre and Lifewater both show low presence and influence of variables in both dimensions.

Social

Visually, the C-CLDs do not show obvious similarities in the *social* dimension, although there is a high number of variables present in most C-CLDs. This indicates that all projects have high influence from the *social* dimension, but with different influences.

BGP and CDSP-IV have the highest influence from the *social* dimension, although variables are of higher influence in CDSP-IV. Many of the initiatives in CDSP-IV were socially targeted and included a large educational component, and mostly given more importance than physical infrastructure interventions. The *social* dimension was also significant in Lifewater, which also included education.

All projects, with the exception of Indravati, have high influence from the *social* dimension from predominantly positive influences. Indravati has a similar number of variables present from this

dimension, but mostly due to the lack of consideration of *social* factors and therefore variables have negative influence.

Natural environment

BGP, CDSP-IV, Indravati, and Lifewater have the highest influence from the *natural environment* dimension. These results are intuitive, given that BGP and CDSP-IV were implemented in response to needs created by the natural environment, and Lifewater and Indravati relied on natural water availability to achieve the project objectives.

STWSSSP-2, Sabre, and UGIIP-2 have comparatively low influence. There is a particularly noticeable in the UGIIP-2 C-CLD, which has a large gap where variables from this dimension would be.

Development

Projects are split into three groups for this dimension, which is predictable as there are only eight variables within the category. Therefore, drawing conclusions must be done with caution, and inferred for each case individually. The most common variables are a desire for infrastructure development which occurs in all case studies; and a socially motivated development agenda which occurs in six case studies. Only Indravati shows to be motivated by economic development.

Infrastructure and service delivery

Overall, the *infrastructure and service delivery* dimension is visually dominant in all C-CLDs in Figure 61, with high presence of high influence variables across all projects. However, Indravati is the most different, with fewer variables present including fewer high influence variables than other projects.

BGP, CDSP-IV, STWSSSP-2, and UGIIP-2 have similar variables present in the C-CLDs, although the split between high, medium, and low influence differs.

Indravati, Lifewater, and Sabre have fewer variables present. The variables themselves are similar for Sabre and Lifewater, whereas Indravati differs. However, proportion of high influence variables is greater in the Lifewater C-CLD.

6.4. Leverage points

Suggested leverage points and their intended outcomes are identified at the end of each case study in Chapter 5. Analysis reveals that these can be grouped into the following seven categories.

- Government-led change
- Physical infrastructure output
- Investment and funding
- Delivery mechanism
- Socio-economic development

- Community engagement
- Environmental risk

Figure 62 shows a summary matrix indicating which case studies have leverage points in each category.

	BGP	CDSP	Indravati	Lifewater	Sabre	STWSSSP-2	UGIIP-2
Government-led change							
Physical infrastructure output							
Investment and funding							
Delivery mechanism							
Socio-economic development							
Community engagement							
Environmental risk							

Figure 62 - Matrix indicating leverage points applicable to each case study.

Leverage points can be both barriers or opportunities, and intended to either increase, decrease, improve, or reduce outcomes. An explanation can be found in Table 57.

Table 57 - Explanation of leverage points.

Leverage points	Barrier or opportunity	Response	Explanation/Actions
Government-led change	Opportunity	Increase	A government that is motivated by development, with population welfare and socio-economic development at the heart of infrastructure decisions. Introduction of policy to increase and reinforce social protection measures, to reduce vulnerability of poor and marginalised populations, and enforce human rights. Creation of a collaborative environment between organisations and government departments with clear delineation of responsibilities, in order to foster an environment for skills and knowledge transfer to strengthen institutional capacity. Award regional governments more decision-making power and authority to manage services for projects delivered at the local level.
Physical infrastructure output	Opportunity	Increase	Increase amount of physical infrastructure as a priority, as in most cases this is fundamental to reduce the needs gap, regardless of supporting programmes. Ensure design and budget are clear prior to commencing the project to ensure all scope is delivered. Increase available skills to facilitate knowledge and skills transfer to develop institutional capacity. Implement an O&M plan to ensure that services continue to work after project completion, and that the necessary skills and resources are available.

Investment and funding	Opportunity	Increase	
			Increased capital would increase limits of what can be delivered to improve overall project outcome.
			Public investment should be explored initially as a means of the government maintaining control of the project, to decrease reliance on grants and donors, and to reduce potential debt.
			Private investment, loans, and grants should be explored as potential options if public funding is insufficient.
			Funding must be secure, and exposure to financial risk should be closely managed.
Delivery mechanism	Opportunity	Improve	Improve the planning process through more thorough feasibility studies and better consideration of need for services.
			Consider access and affordability in service provision, particularly when balanced with the need for financial return for investors or to repay loans.
			Increase participation of communities through responsibilities for O&M and management of ongoing service delivery.
			Nurture close relationships between delivery organisations and communities.
			Employ international organisations to provide expertise if necessary, with the aim of transferring skills to national and local organisations to increase institutional capacities.
			Explore use of incentives and targets within the delivery mechanism to encourage high performance.

Socio-economic development	Opportunity	Increase	Increase provision of social programmes to encourage socio-economic development, such as education of vocational skills and managing finances. Measures should be taken to reduce wealth inequality and regional inequality, including provision of employment opportunities in rural areas, increased access to services, and ownership of assets for the poor. Measures should be in place to ensure social security, particularly for the poor, vulnerable and marginalised populations. Gender equality and increased female participation is necessary to achieve social equality and increase potential household income. A focus on ways to reduce overall poverty and increase general population welfare.
Community engagement	Opportunity	Increase	Communities should be engaged to ensure bottom-up development and self-driven change, to result in more sustainable change and strengthened communities. Engage local communities in the design of infrastructure, and employ local people and communities in infrastructure construction, operation, and management. Provide the necessary education for communities to manage, operate, and maintain infrastructure. Involve women in community groups and provide education targeted towards women's needs and achieving gender equality.
Environmental risk	Barrier	Reduce	Design infrastructure specifically to withstand harsh environmental conditions. Construct sustainable infrastructure to reduce environmental and climate impact further. Increase community and family resilience through socio-economic development, which enables people to rebuild livelihoods faster following environmental disasters. Implement community disaster response protocol for early alert and response.

Figure 62 shows that government-led change shows to be applicable to six of the seven projects, except for BGP. Suggested interventions include: improvement of social protection measures and policy to improve livelihoods and reduce vulnerability of the population; increased institutional capacity and collaboration between government departments responsible for delivery; more regulated policy, codes and standards to deliver safe, quality infrastructure while protecting the local population from adverse impacts of from the project; strengthened development plans to improve and maintain increased and improved access to services in the future; and allocation of more responsibility to regional governments which are more likely to understand real needs of the local populations.

Physical infrastructure output is an influential variable to BGP, CDSP-IV, Sabre, and STWSSSP-2. In each project, the amount of infrastructure constructed showed related directly to the project outcome and successes. Therefore, intervention to simply increase provision is recommended to improve project outcomes.

BGP is the only project where increased investment and funding is identified as a leverage point, reflecting a limitation in delivery and therefore an opportunity to improve outcome. Intervention at this leverage point can directly facilitate increased physical infrastructure provision, and limit design constraints in place due to funding restrictions.

Changes to the delivery mechanism are recommended leverage points in five of seven case studies. Suggested interventions are: use of a performance-based funding mechanism to encourage projects to meet delivery milestones; more thorough social, economic, and environmental impact assessments to reduce unintended detrimental outcomes; development of an infrastructure blueprint for faster implementation of new projects; and procurement of international and more experienced organisations to increase knowledge, transfer skills, and increase institutional capacity.

Socio-economic interventions were found effective in six of seven projects, with the exception of Indravati. Interventions include: social programmes to further support families in addition to infrastructure provision, such as financial support and skills transfer; increased asset ownership to reduce risk to livelihoods and increase resilience; education to increase income earning potential to encourage self-driven socio-economic growth; increased gender equality to increase female representation in society and women's rights; education to support infrastructure use, such as WASH behaviour change; and improved access to service in rural areas to balance the rural/urban divide and reduce urgency for projects in urban areas.

Although some of the most negative outcomes of Indravati related to social factors, government-led policy changes and changes in the delivery mechanism to improve project planning and safeguarding are recommended as the most efficient way of addressing these socio-economic shortcomings.

Community engagement is an effective leverage point in four projects: BGP, CDSP-IV, Lifewater, Sabre, and UGIIP-2. Community engagement showed to have positive influence on the outcome in all

projects where it was used. Suggestions are: increased participation of women in community groups to increase gender equality and involve a previously underrepresented demographic in decisions; employ local members of beneficiary communities to encourage adoption of infrastructure and behaviours; involve community in the planning stages so that needs are reflected by the design; and increase community participation in infrastructure management groups to ensure community ownership over services and allocate responsibility for O&M.

Intervention to reduce environmental risk would benefit BGP and CDSP-IV. These projects share high risk from the natural environment and high risk to livelihoods. Measures to reduce these factors would reduce the need for the project, rather than outcome post implementation.

6.5. Archetypes

This section seeks to explore trends and categorise behaviours observed between projects, and their interaction with the enabling environment. Categories are formed to distinguish project types that exhibit characteristics and behaviours when delivered in given contexts. These categories are termed ‘archetypes’.

Archetypes allow new projects to be categorised according to their characteristics, and thus identify strengths, weaknesses, barriers, and opportunities likely to be experienced. Subsequently, leverage points can be applied to direct change to achieve and improve the desired outcomes.

6.5.1. Archetype 1: Projects designed and implemented in response to threats and needs generated directly by the natural environment.

There are noticeable similarities between the BGP and CDSP-IV projects. Both projects have similar characteristics shown in

Table 5, and were conceived in response to threats caused by a changing climate and the natural coastal environment within Bangladesh.

The PA shows that BGP and CDSP-IV share many of the same successes and failures. Shared successes are that communities and those served by services and involved; the service is accessible to the poorest, vulnerable, and minority groups; and the service supports local livelihoods. Both projects incorporated significant social programmes, including community education and establishment of community groups, which helped to achieve these successes. Shared failures were a lack of alternative services in the event of failure, and a failure to deliver to programme and budget.

The C-CLDs also share similarities. All except one variable in the BGP C-CLD are present in the CDSP-IV C-CLD. The projects are most similar in the characteristics of the *natural environment* dimension, relating to climate change, consequent vulnerabilities, and risk to livelihoods. The shared

influences in the findings tables also relate to the natural environment, poverty and the economic environment, and risks to livelihoods.

The natural environment reflects climatic influences, vulnerability to extreme weather and related shocks, and a vulnerable coastal location. High levels of poverty entrench these vulnerabilities and increase risk to livelihoods, which are typically reliant on agriculture and subsequently climate. In the case of BGP, economic influence refers to income from agriculture. Whereas in the case of CDSP-IV, influence of the economic environment refers to limited development expenditure.

Reducing environmental risk is a suggested leverage point for BGP and CDSP-IV. Reduced risk would reduce the need for infrastructure delivered specifically to address natural environmental risks, however it is difficult to make the drastic changes required to the climate. However, infrastructure resilience would be effective at reducing the risk of detrimental impacts from the environment, and can be increased with a greater focus on resilient design.

Physical infrastructure is identified as a leverage point for both projects. To mitigate the influence of detrimental environmental factors, investment should target preventative physical infrastructure, rather than in response to environmental events such as flooding retrospectively. This can be feasible through additional investment, or reallocation of funds in lieu of the need for additional funds, but requires the institutional capacity to make this change. Figure 62 shows that BGP can achieve this through revision of investment and funding, whereas government-led change, including capacity building, would be a more affective leverage point in CDSP-IV. Socio-economic development is another shared leverage point, which is necessary to provide a social safety net in the event of disaster and limit risk to livelihoods.

The results suggest that projects driven by threats and needs generated by the natural environment have positive outcomes related to community involvement, accessibility, and support for local livelihoods; and negative outcomes related to a lack of alternative services and failure to deliver to programme or budget. However, if the leverage points in the wider enabling environment are used, negative outcomes can be mitigated or resolved, and positive outcomes can be reinforced.

In summary, the similarities between BGP and CDSP-IV relate to projects in existence due to a driver from the natural environment, leading to Archetype 1. However, similarities are to be expected given similar project characteristics (see

Table 5). Therefore, an archetype is recommended cautiously.

6.5.2. Archetype 2: Government-led projects delivered at the regional level, in response to demographic change and changing service needs.

Both STWSSSP-2 and UGIIP-2 score exceptionally high in that the infrastructure increases service coverage. Other high-performance areas relate to social factors: communities and involved, represented,

and empowered; service enhances the wellbeing of communities and users; the community and end users have been consulted; and that lessons are being applied to future work. Their weaknesses are shared also, relating to ongoing management of services: a poor long-term management plan; financial risks that may threaten service delivery; poor maintenance of services; and spare parts are not available or affordable.

The C-CLDs also show similar structures, particularly the number and influence of variables in the *infrastructure and services* dimension. The following variables are present and of high influence in the *institutions and governance* dimension of both case studies: decentralisation of decision-making power, governance, and policy; provincial autonomy over implementation and management of services; and institutional capacity building. These align with the shared influences found in the findings tables, in addition to the political and policy environment, and internal migration and urbanisation. The projects also share a low influence of the *natural environment* dimension compared to most other projects.

Of all projects, Indravati is most like STWSSSP-2 and UGIIP-2. These are all centralised, government-led projects, with high influence from the *institutions and governance* dimension; projects which benefit from public investment, with outcomes influenced by infrastructure output and thoroughness of planning.

Leverage points shared between Indravati, STWSSSP-2 and UGIIP-2 relate to government-led change, and the delivery mechanism. STWSSSP-2 and UGIIP-2 also share socio-economic development as a leverage point. Interventions for government-led change include decentralisation of decision-making power to regional authorities, strengthening development policy, and increasing institutional capacity including that of community groups. A motivated government is central to the enabling environment for projects within this archetype.

With respect to delivery mechanism, both STWSSSP-2 and UGIIP-2 are driven by mandated targets, mostly financial and milestone targets, which appear to have had positive influence on the projects meeting their objectives. Interventions to promote socio-economic development include improving rural services to reduce the strain on urban services, and to increase equality between rural and urban populations.

This archetype is characterised by projects delivered at the government level with some decentralisation of power to regional authorities, in response to changing service needs often driven by a changing demographic.

6.5.3. Archetype 3: Projects with a focus on community development, including community-led project components and community managed infrastructure following project completion.

Lifewater and Sabre have various similarities; most distinctly from other projects, they are NGO-led. An important influential characteristic of NGO-led projects is the closeness of involvement of recipient communities. However, CDSP-IV also works very intimately with families and communities, although it is a larger project delivered by larger organisations. These projects perform considerably higher than others in the *social value* dimension of the project appraisal. The characteristic in common is that CDSP-IV, Lifewater, and Sabre all include a very strong social component within their project objectives.

The primary similarities relate to high involvement, representation, and empowerment of the communities and those served by services; promotion of social equality and inclusion; and alignment with local culture and values. However, these projects also perform poorly in the same areas. Their weaknesses relate to management and service delivery following completion of the project, including a lack of a long-term management plan; a lack of redundancy in the network; and a lack of resources in the event of failure.

However, the C-CLDs are markedly different, suggesting that the behaviour of the broad enabling environments is different, although resulting in some of the same outcomes. Lifewater and Sabre are most similar, with considerably fewer variables present than CDSP-IV in every dimension. However, some key variables are the same: all score high influence for community engagement and participation of communities, infrastructure output, and a focus on prioritising and understanding need. Other areas of influence, reflecting poor performance, are a lack of engineering and management expertise and knowledge sharing, a lack of sustainable services in the long-term, a lack of access to services, and a lack of easily maintained and operational infrastructure.

Shared leverage points are intervention by government-led change, socio-economic development, and community engagement. Suggested interventions to encourage government-led change relate to strengthening of social security measures to protect communities, a strengthened development plan, and increased government engagement. Suggested interventions related to increased socio-economic development are: more community education programmes and encouraged behaviour change, increased female participation and gender equality, increased skills transfer and knowledge sharing. Increased community engagement is suggested in the delivery stages of the project, to strengthen capacities for management and O&M.

Community buy-in is central to the success of projects in this archetype, and must be part of the enabling environment. Without this, measures such as educational programmes will not be used; detrimental practices, such as water and sanitation practices, will not change; and traditional gender biases will not reduce.

The overall trend is between heavily community-led projects, and poor management and service delivery following project completion. The outcome of intervention at the suggested leverage points in this archetype are explained in

Table 58.

Notably, other similarities between these projects are that they are part of longer-term programmes. However, this characteristic is also shared by STWSSSP-2 and UGIIP-2, which do not exhibit the other behaviours discussed above. Therefore, belonging to a wider programme is not considered to be influential to the outcome of projects in this archetype.

6.5.4. Archetype 4: Projects motivated by socio-economic development, improvement of overall population welfare, and providing universal access to services.

BGP, CDSP-IV, Lifewater and STWSSSP-2 performed exceptionally well in securing increased access to services; one of the fundamental objectives of the projects. The fundamental characteristics vary between the four projects, and any trends identified are unlikely to stem from these characteristics.

The PA results show that all projects ensure universal access to services, represent stakeholders fairly, align with local culture and values, involve and empower communities, and enhance the wellbeing of communities and users. With respect to weaknesses, all projects show a lack of contingency plans, and all but Lifewater delivered to programme. All projects perform well in the *social value* dimension, but show weaknesses in the *service delivery* dimension.

The BGP and CDSP-IV C-CLDs are most similar, and have the highest number of variables present of all projects, both with a high number of high influence variables in the *natural environment* dimension. BGP, CDSP-IV, and Lifewater show similar trends in the *social* dimension, and show high positive influence of factors including: the changing role of women in society, gender equality, community and family resilience, community engagement, and population welfare. High influence and importance of these factors is likely because all projects were motivated by poverty, and a central component was to reduce overall poverty and improve wellbeing of the poor.

The C-CLDs also show that a socially motivated development agenda and a desire for infrastructure development are highly influential to the project enabling environments in all projects. Further similarities are the influence of the following variables in the *infrastructure and service delivery* dimension: changing service needs and a desire to prioritise needs in the design; community managed infrastructure; funding and skills available for O&M; infrastructure output to fill the service needs gap; internal engineering and management expertise; easily maintained and operational infrastructure; participatory consultation with communities; social infrastructure; a sustainable funding model; and sustainable services in the long-term. However, it must be noted that all projects performed poorly in the *service delivery* dimension in the PA. This suggests that although factors are high influence, they

do not perform in their optimal state, which suggests that intervention can be made at these variables across all projects.

All projects in this archetype also have similar suggested leverage points related to socio-economic development. Suggested interventions include social programmes to support vulnerable community members, education to increase service adoption and encourage behaviour change, education to increase community skills capacities, and increased female participation and gender equality. Government-led change is also suggested in CDSP-IV, Lifewater, and STWSSSP-2, including measures to strengthen social security policies and development plans, and allocate power to local municipalities which have a greater understanding of local needs.

This gives rise to a broad archetype relating to projects with a heavy focus on social development and population welfare, with the aim of ensuring universal access to services to achieve this.

6.5.5. Archetype 5: Projects which are part of a government-led programme of projects, and require government support and public resources to be delivered.

CDSP-IV, STWSSSP-2, and UGIIP-2 were part of ongoing programmes of work. Although Lifewater and Sabre were also not standalone projects; the infrastructure was designed to be replicable, rather than implemented as a programme.

The PA shows that these projects successfully ensured universal access to services, typically involved communities, and contributed to development. However, they shared common weaknesses, mainly in the service delivery dimension, including poor contingency planning and a failure to meet programme milestones. STWSSSP-2 and UGIIP-2 perform well for applying lessons learned from their previous project components.

The C-CLDs show that these projects have high influence from the *social* dimension. All projects prioritised community engagement, population welfare, and reducing regional and social inequality. STWSSSP-2 and UGIIP-2 were reliant on public investment and funds and a desire for infrastructure development, and are challenged by a lack of funding available for O&M. Infrastructure delivery itself was influential in this category; infrastructure output, a large service needs gap, and a lack of internal national engineering and management capability were highly influential upon the project design and outcome. All projects also had a water infrastructure component, although this does not appear relevant to the outcome.

Government-led change, and socio-economic development are shared leverage points. A supportive government motivated by development is a key component in the enabling environment for the success of projects in this archetype. Award of more power to communities at the decentralised level is encouraged, institutional capacity building in regional and localised institutions, and increased skills capacities within recipient communities are suggested interventions. These interventions can be best

driven by the government, using government resources and power to maintain oversight of the programmes. Measures to improve general socio-economic development can support the outcomes of long-standing government projects, as they develop in tandem over the long-term.

6.5.6. Other trends

Incentive driven projects

STWSSSP-2 and UGIIP-2 include mandated targets as part of their delivery mechanism. Similarly, the Lifewater delivery model uses incentives to ensure progress before physical infrastructure is constructed. Lifewater has a markedly different C-CLD and PA scores, however, all achieve positive project outcomes attributable to the target and incentivisation approach. Therefore, although insufficient evidence is available to draw archetypes from these limited projects, this relationship is suggested for further research.

Centralised versus decentralised infrastructure

BGP, CDSP-IV, Lifewater, and Sabre involve decentralised infrastructure, whereas Indravati, STWSSSP-2, and UGIIP-2 infrastructure and service delivery is centralised. However, there appears to be no relationship between this, the enabling environment, and the project outcomes. It was expected that the *institutions and governance* and *economic* dimensions would have high influence on centralised projects, which has not shown to be the case.

With respect to the centralised projects, STWSSSP-2 and UGIIP-2 share the same weaknesses relating to poor sustainability of funding, and poor monitoring and evaluation, and the same strengths relating to application of lessons learned from their previous project components. These findings differ significantly from the positive and negative outcomes of the Indravati project. Therefore, there is no evidence of a relationship between projects characterised as centralised infrastructure.

Use of international resources

Literature suggests that use of international resources, such as organisations and skills, can contribute to capacity building within the country. All projects except Lifewater employed international expertise; it is therefore difficult to distinguish whether this affected project outcome. This relationship should be explored further with the consideration of more projects which did not employ international resources.

6.6. The interaction between leverage points and archetypes

This section considers how the leverage points in the enabling environment, identified in Section 6.4, can influence the behaviours of projects in each archetype, identified in Section 6.5.

Figure 62 shows that government-led change shows to be applicable to six of the seven projects, except for BGP. Suggested interventions include: improvement of social protection measures and policy to

improve livelihoods and reduce vulnerability of the population; increased institutional capacity and collaboration between government departments responsible for delivery; more regulated policy, codes and standards to deliver safe, quality infrastructure while protecting the local population from adverse impacts of from the project; strengthened development plans to improve and maintain increased and improved access to services in the future; and allocation of more responsibility to regional governments which are more likely to understand real needs of the local populations.

Physical infrastructure output is an influential variable to BGP, CDSP-IV, Sabre, and STWSSSP-2. In each project, the amount of infrastructure constructed showed related directly to the project outcome and successes. Therefore, intervention to simply increase provision is recommended to improve project outcomes.

BGP is the only project where increased investment and funding is identified as a leverage point, reflecting a limitation in delivery and therefore an opportunity to improve outcome. Intervention at this leverage point can directly facilitate increased physical infrastructure provision, and limit design constraints in place due to funding restrictions.

Changes to the delivery mechanism are recommended leverage points in five of seven case studies. Suggested interventions are: use of a performance-based funding mechanism to encourage projects to meet delivery milestones; more thorough social, economic, and environmental impact assessments to reduce unintended detrimental outcomes; development of an infrastructure blueprint for faster implementation of new projects; and procurement of international and more experienced organisations to increase knowledge, transfer skills, and increase institutional capacity.

Socio-economic interventions were found effective in six of seven projects, with the exception of Indravati. Interventions include: social programmes to further support families in addition to infrastructure provision, such as financial support and skills transfer; increased asset ownership to reduce risk to livelihoods and increase resilience; education to increase income earning potential to encourage self-driven socio-economic growth; increased gender equality to increase female representation in society and women's rights; education to support infrastructure use, such as WASH behaviour change; and improved access to service in rural areas to balance the rural/urban divide and reduce urgency for projects in urban areas.

Although some of the most negative outcomes of Indravati related to social factors, government-led policy changes and changes in the delivery mechanism to improve project planning and safeguarding are recommended as the most efficient way of addressing these socio-economic shortcomings.

Community engagement is an effective leverage point in four projects: BGP, CDSP-IV, Lifewater, Sabre, and UGIIP-2. Community engagement showed to have positive influence on the outcome in all projects where it was used. Suggestions are: increased participation of women in community groups to increase gender equality and involve a previously underrepresented demographic in decisions; employ

local members of beneficiary communities to encourage adoption of infrastructure and behaviours; involve community in the planning stages so that needs are reflected by the design; and increase community participation in infrastructure management groups to ensure community ownership over services and allocate responsibility for O&M.

Intervention to reduce environmental risk would benefit BGP and CDSP-IV. These projects share high risk from the natural environment and high risk to livelihoods. Measures to reduce these factors would reduce the need for the project, rather than outcome post implementation.

Archetypes indicate the most appropriate intervention to achieve the intended change and outcome in a project of a given archetype. However, each leverage point will influence the outcome of projects of any archetype, as any change will propagate the enabling environment due to its system behaviour. Furthermore, each leverage point will have different influence and achieve a different outcome when applied to each archetype. The impact of applying each leverage point to each archetype is detailed in Table 58.

Table 58 - The impact of applying leverage points to each archetype.

	ARCHETYPE 1	ARCHETYPE 2	ARCHETYPE 3	ARCHETYPE 4	ARCHETYPE 5
	Projects designed and implemented in response to threats and needs generated directly by the natural environment.	Government-led projects delivered at the regional level, in response to demographic change and changing service needs.	Projects with a focus on community-led project components, and community managed infrastructure following project completion.	Projects motivated by socio-economic development, improvement of overall population welfare, and providing universal access to services.	Projects which are part of a government-led programme of projects, and require government support and public resources to be delivered.
Leverage point					
Government-led change	• Social protection policy can protect families and communities vulnerable to environmental and climatic disaster. • Enforced engineering codes and standards can ensure infrastructure meets the quality standards appropriate for environmental protection. • Policy can help shift the focus from responsive infrastructure to preventative.	• Allocation of decision-making power to local or regional authorities will help address local needs. • Measures to reduce or slow demographic change, such as provision of services in rural areas, can help slow urban migration.	• Government must allow decentralised power to local communities and groups to manage infrastructure as they see fit. Social security measures and policy can be used to achieve this. • Ensure technical and skills support is available from the relevant government departments if needed.	• The government must be motivated by development with the will to understand the real needs of the population. • Government to use influence to engage the necessary organisations.	• Government commitment is required over the long-term. • Must maintain a high-level view of the purpose of the project throughout the programme, to ensure fundamental needs are being met. • Award of authority to regional governments, whilst maintaining central oversight, can help deliver projects of this scale.

Physical infrastructure output	• Protective physical infrastructure can increase safety and reduce exposure to adverse environmental conditions, to protect people and homes directly. • Physical infrastructure should be easily maintained and repairable in case of damage due to environmental conditions. • Suitable design for the context can include resilient infrastructure.	• Infrastructure designed at the regional level can better understand and respond to regional needs. • Increased provision tailored to localised need can reduce inequalities between regions. • Rural infrastructure and service provision will reduce or slow urban migration, thereby reducing urgency	• Infrastructure designed to be managed, operated, and maintained within the capabilities of communities is likely to function for longer. • More infrastructure generates increased scope and responsibilities for community management groups, thereby requiring more skills and a more refined management model.	• More infrastructure increases access, which directly reduces the service needs gap, which increases population welfare and socio-economic development.	• Targets for infrastructure output can be applied as a condition to progress from one part of the programme to the next.
Investment and funding	• Increased preventative infrastructure is possible, rather than funding in response to environmental disaster, which is more cost-effective.	• Further investment and funding can facilitate increased urban and rural infrastructure provision. • Infrastructure can be designed to meet future demographic predictions and service needs.	• Sufficient capital to fully cover construction and delivery costs reduces the cost burden placed on communities following completion.	• Grant, philanthropic, or charitable funding can be explored, which is driven by a desire for socio-economic development.	• Funding and investment must be secure, to ensure that funds are available throughout the duration of the programme.

Delivery mechanism	· Thorough feasibility studies and planning can help predict the likelihood of future events to design accordingly. · Infrastructure must be designed and located according to environmental risk. · Infrastructure should be designed to be operational and maintainable by local communities so that if damage occurs it can be quickly repaired.	· Use of mandated targets or performance incentives can help ensure development is consistent between regions and does not exacerbate inequality. · Use of international organisations and organisations with expertise can increase government capacity and capabilities. · A funding model that makes services affordable is necessary to ensure access to people locally, and reduce need to migrate to access services elsewhere.	· Community involvement in design and delivery will ensure familiarity with the infrastructure. · A robust funding model must be in place for communities to manage service funding themselves. · The funding model must ensure that services are affordable to communities and end users.	· Thorough planning stages and feasibility studies can reveal real need to best achieve socio-economic development. · A sustainable funding model ensures universal access and affordability of services in the long-term.	· A robust planning process is necessary to meet long-term targets and needs. · Ensure skills capacity within the country, or plan to build skills capacity, to reduce costly reliance on international organisations. · Incentivisation can be used to allow progression from one part of the programme to the next. · PPP models can be explored to support government capabilities.

Socio-economic development	· Security of livelihoods and resilience can be increased to enable people affected by natural disasters to rebuild their lives faster.	· Balanced socio-economic development across all regions reduces disparities in service needs. · Positive social development and strengthened community relationships will reduce demographic change and people movement.	· Holistic socio-economic development can increase community and personal assets, and gender equality. · Overall improvements in the standard of education, including vocational training, prepares communities for ongoing service delivery.	· Apply all options for socio-economic development: improved access to services; affordability of services; educational programmes; supportive social groups; strong community relationships; improve gender equality through female participation and employment. Implement all measures to improve holistic population welfare and thereby remove constraints to further development.	· Ensure other measures to improve socio-economic development, such as employment and education programmes, align with the long-term programme, which can take many years to implement and is vulnerable to changing parameters.

Community engagement	· Involvement of communities can encompass education of emergency protocol.	· Community engagement can help understand changing service needs, for regional authorities and organisations in power to be able to respond to them accordingly. · Engagement from all social groups can help limit regional and social inequality.	· Communities should be closely involved throughout the construction process to encourage skills transfer and ownership over services. · Community groups must be established to manage, operate, and maintain infrastructure. · Increased involvement of women to encourage gender equality and female representation.	· Engage community to ensure access, affordability, and uptake of services is universal to ensure all people benefit equally. · Consideration of local cultures and values to ensure infrastructure meets specific needs related to these.	· Implement educational programmes at the community level to support high-level government programme and infrastructure.
Environmental risk	· Reduced risk reduces the need for infrastructure.	· Climate migration would be reduced if environmental risk decreased. · Increased family resilience in affected areas, and subsequent reduced desire to migrate.	· Less focus required on infrastructure driven by environmental needs, so that community groups can focus on other needs.	· Decreased vulnerability of populations, and reduced likelihood of development and livelihoods being undermined by natural disasters and environmental shocks.	· Fewer infrastructure programmes and resources would be needed to address environmentally driven needs for infrastructure.

6.7. Chapter summary

This chapter brings together the case studies in Chapter 5 to explore the findings as a complete data set. It firstly compares the project characteristics, PA performance, and C-CLDs. Subsequently, leverage points are identified, and archetypes are formed.

The case studies have some obvious similarities, such as when delivered in the same country or environmental context. However, the analysis also revealed less obvious insights, such as a generally low influence from the *institutions and governance* and *economic* dimensions across all case studies, which may not have been predicted from the literature review.

The seven leverage points identified in Section 6.4 are the most effective of all variables in the M-CLD to instigate change, when assessed against the potential to influence at the objective systems level, within each case study, and within each archetype. Government-led change and socio-economic development are suggested leverage points in six of the seven projects, and the delivery mechanism and community engagement also show to be broadly impactful. Notably, each leverage point will affect each project and archetype in a unique way.

The archetypes successfully categorise the projects to understand the broad effects of interventions at the high-level. The five archetypes identified are novel; achieved by consideration of the full enabling environment. This renders the approach useful for consideration in the early stages of new projects, to foresee opportunities and barriers for early intervention.

Projects can sometimes be classified under multiple archetypes, in which case leverage points from both archetypes may be appropriate. Also, although five archetypes are identified, it is prudent to note that this thesis does not claim the five archetypes to be conclusive. The research was limited to seven case studies, and it is only possible to draw conclusions from the data provided within these. As more projects use the framework, more archetypes may be identified, and the existing ones may be refined.

The next chapter reflects on these findings further.

7. DISCUSSION

This chapter discusses the key outcomes of the study and how this contributes to the theoretical and practical knowledge in the field. Firstly, it reflects on the key findings, including leverage points and archetypes, the role of the enabling environment, and project design. The value and implications of the findings are discussed, and further insight that they offer to the field.

Secondly, a reflection on the methodology reveals added value from the combined methodologies, yet similar successes and failings of the framework and case studies as existing research that has previously employed these approaches. However, a reflection on the systems approach used shows uniqueness and exciting opportunities for future research.

Thirdly, a discussion of the limitations reveals similarities to those experienced by previous researchers. Lastly is a discussion on the contribution to knowledge, novelty, and recommendations for future work.

7.1. Reflection on research findings

7.1.1. Reflection on leverage points and archetypes

The application of archetypes

The archetype approach contributes to the range of tools available to categorise environments discussed in Section 2.6.1. The archetypes identified strengthen the available selection by including all dimensions associated with infrastructure and the enabling environment into one tool, rather than limited coverage of themes as evident with other tools.

The relationship between archetypes and need

Table 58 shows that each of the seven leverage points have different intended outcomes depending on the project archetype they are applied to. Therefore, it cannot be said that a leverage point aligns with a specific outcome, but instead that leverage points align with specific outcomes when considered within each archetype.

Projects that fit within Archetype 1 are responsive to need rather than proactive, and are directed towards meeting basic needs more than long-term development. Retrospective action to meet basic needs is common, but the suggested leverage points lean towards proactive intervention, for example resilient infrastructure constructed in advance to protect against threats. These proactive interventions

would reduce the basic services needs gap both prior and following an event, reduce the urgency for provision and action following an event, and typically are more cost effective.

Projects described by Archetype 2 are similarly responsive, however intervention contributes to long-term development. Projects in this archetype would better meet need through proactive planning, and governments and decision-makers hold the necessary power to implement such measures, such as a long-term infrastructure plan and robust financial model. Projects in this archetype typically have a large basic needs gap due to rapid demographic change. Therefore, a focus on basic needs and accessibility to services is suggested.

Projects in Archetype 3 aim at strengthening communities for self-driven change and long-term development, and address the capabilities and opportunities definition of need outlined in Section 2.2.1. Projects in Archetype 3 would benefit from interventions focused on socio-economic development and community engagement.

Archetype 4 addresses the fourth definition of need discussed in Section 2.2.1 which includes the need for equality as a base to achieve social and economic progress, and highlights poverty reduction as means to reduce inequality. These projects require all actors to be genuinely motivated towards development, which will ensure all projects are aligned to the same goal. A combination of physical infrastructure and socio-economic development is critical for these projects.

Projects in Archetype 5 are aimed at long-term national development and are less focused on immediate need, often serving national economies. These projects are driven by the government and require commitment for investment and resources over the long-term, and are implemented over a long period which can help meet long-term needs sustainably.

Places to intervene

Meadows (1999) discussed leverage points to intervene in a system in depth, see Section 2.7.1.2. The seven leverage points identified in this study impact the system at different levels or scales, which can be compared to Meadows' twelve places to intervene, shown in Figure 63.

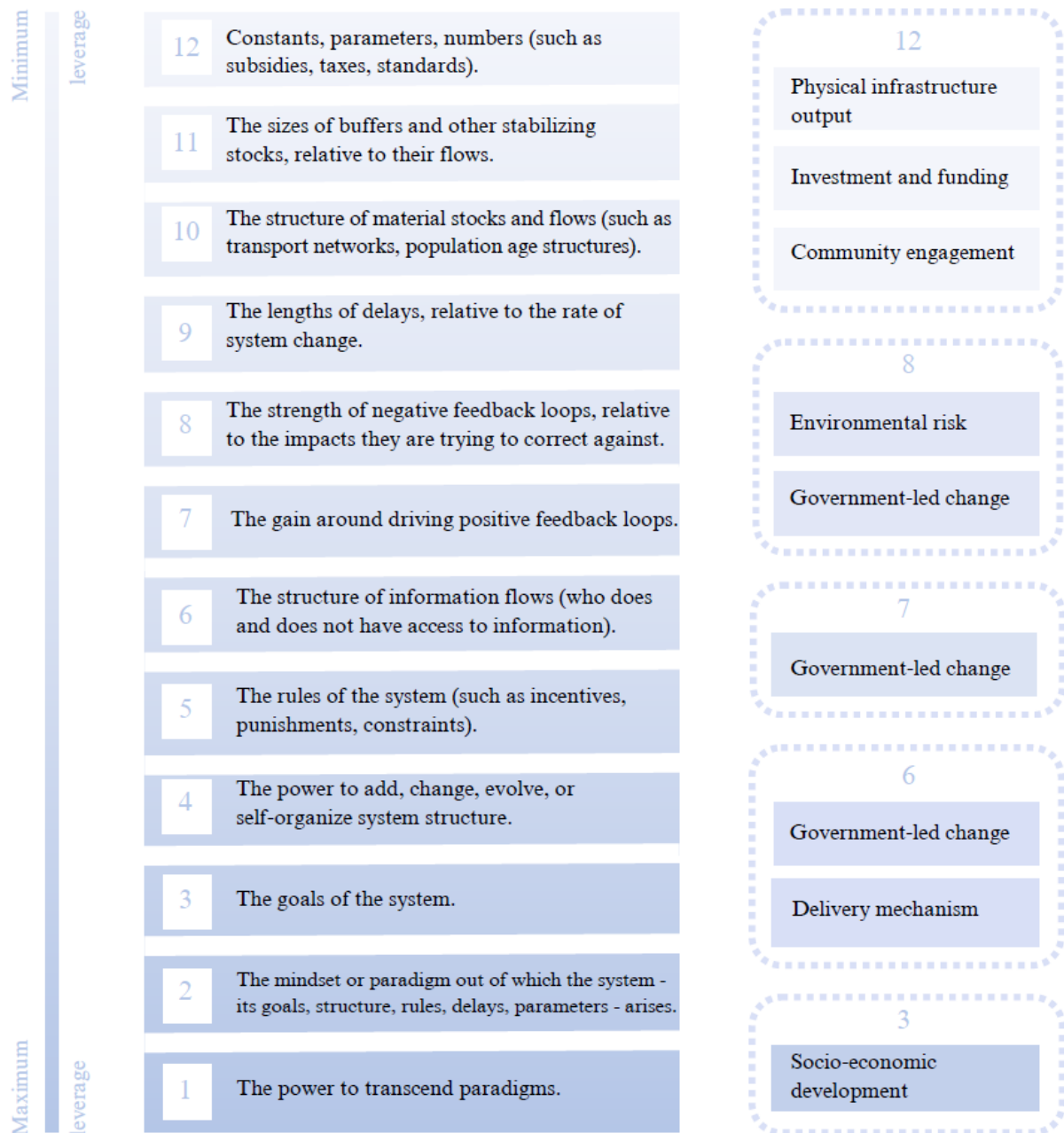


Figure 63 - Identified leverage points compared to Meadows' places to intervene.

Physical infrastructure output, investment and funding, and community engagement align with Meadows' twelfth place to intervene: constants, parameters and numbers. These interventions initiate less impact on the holistic system than those higher up the scale. Environmental risk and government-led change align with Meadows' eighth leverage point, indicating the ability of these interventions to maintain stability in the system. However, government-led change also aligns with Meadows's seventh place to intervene, indicating that intervention here can also drive exponential change in the system in a positive feedback loop, and the sixth place to intervene, indicating that governments have a significant level of power to alter information flows and ultimately system behaviour. The influence depends on the intervention itself. Delivery mechanism aligns with Meadows' sixth place to intervene, showing that changing the delivery mechanism changes the structure of information flows with significant

impact on holistic system behaviour. Lastly, socio-economic development aligns with Meadows' third place to intervene, indicating that it is the most effective of the seven leverage points at influencing holistic system behaviour, and the closest to being able to change system behaviour at the paradigm level.

Meadows (1999) suggests that the most powerful interventions are at the paradigm level. To achieve a paradigm shift the underlying belief set and worldviews which underpin how individuals engage with the system must be altered. In the context of this study, infrastructure and services for development would have to be at the centre of society and prioritised above all else, so that all political, economic, social, and other decisions are directed at achieving this over-arching goal.

There is a balance between interventions at the levels in the system. Interventions that fall into the *constants, parameters, numbers* group are likely easier to implement, but unlikely to have as much influence as those at the paradigm level. Whereas interventions at the paradigm level will likely be more resistant and difficult to change, although intervention is likely to have greater impact. This suggests that measures to leverage socio-economic development would be most effective. However, the most appropriate leverage point must be chosen with consideration for the specific behaviour of the system and desired outcome.

A related point is the question of who is able, or is best placed, to intervene at a leverage point. Section 7.1.4 argues that the government and those in power are most easily able to implement interventions, and generally have the furthest reach. However, the findings show that they are not always best placed and that other actors may be able to reach a specific area more effectively. For example, an engineer might be able to most influence infrastructure but not governance, whereas government might be able to most influence policy but not design of infrastructure.

The question of when to intervene follows. Drastic changes over a short period of time risk undermining system stability. Change must be sustainable with consideration for the intended and unintended effects. Fast change also risks breaking connections and relationships quickly when new connections have not had time to develop. Coping strategies can be lost and change can be irreversible.

Intended and unintended outcomes

Leverage points allow intended interventions to be made to achieve intended outcomes. However, given such a complexly interlinked system, it is likely that an intended change will also cause unintended and unpredictable consequences, which may or may not be conducive towards the desired goal. For example, the M-CLD shows that increased public investment increases infrastructure output, thereby achieving the desired outcome. However, this requires reallocation of public funds from other areas, which may suffer as a result, thereby causing an unintended and undesirable secondary consequence.

These changes, whether intentional or unintentional, propagate around the full system with compounding impact. The interconnectedness and loop structure mean that the system is therefore in constant flux, which results in an ever-changing enabling environment.

This concept has been previously raised in literature by Meadows (1999) and Bureš (2017), as discussed in Section 2.7.1.2, however the impact of potential consequences in real-world contexts has not been explored in sufficient detail. This research evidences that there is need for additional research into this area given the extent of unintended consequences possible. The best possible mitigation is to understand the potential consequences of intervention in as much detail as possible, in order that informed decisions can be made. CLDs are effective tools to aid this understanding as causal pathways are visualised.

Timing

The study found that timing has a threefold influence: the time which intervention is made, the time to take effect, and the longevity of delivery.

Firstly, the enabling environment will be in a certain condition state when an intervention is made. If the enabling environment has been thoroughly assessed and understood, intervention can be consciously made at an optimal time to target a given outcome. However, if timing of intervention is not properly considered, adverse effects can occur.

Secondly, the time that the intervention takes to have affect is influential. For example, the findings showed that the natural environment was highly influential to many projects, yet intervention to change factors within it can take decades or longer. Appropriate leverage points must be reasonably practicable within the time frame of project implementation. The same challenges are raised by Meadows (1999) in her ninth leverage point, *the length of delays relative to the rate of system change*.

Thirdly, some infrastructure and services will be longer lasting than others, but do not necessarily have longer-term impact. For example, physical infrastructure implemented by BGP was designed for 25 years, whereas hygiene education delivered by Lifewater lasted several weeks. However, hygiene education and resultant behaviour change has potential to last longer and cause more permanent changes than physical infrastructure. This supports research previously carried out by Whaley and Cleaver (2017), as discussed in Section 2.5.4, where interventions that ‘work with the grain’ are promoted to achieve longer lasting behavioural change.

Consideration of timing is therefore critical. The M-CLD created in this study does not account for this, as not all projects will experience the same effects of time. It is suggested that the temporal impacts are considered for each project individually as the methodology is applied in the future.

7.1.2. Understanding the enabling environment

The study has clearly evidenced that the unique characteristics within enabling environments impact the outcomes of infrastructure projects. However, an understanding of the full enabling environment and its behaviour as a highly interconnected system, rather than its unique components, is most critical to be able to understand its impact on project outcomes.

Representation of a holistic enabling environment including infrastructure is novel, and framing of infrastructure itself as an enabling environment is alluded to in literature, but this research explicitly argues the value in doing so. The enabling environment baseline is a novel concept, not previously identified in literature, which has emerged from the assumption that change is required from an initial state, and therefore that there is an initial state to measure.

Representation of the holistic enabling environment

This study successfully brought together all elements of the enabling environment which had not been previously done in literature. Existing frameworks typically focused on other areas besides infrastructure, or the combination of infrastructure and another field such as sustainability, but did not extend to include the full enabling environment around infrastructure delivery. However, existing frameworks were valuable to ensure all important areas were considered and included, and to inform the relationships between variables.

There is high confidence that the representation of the enabling environment produced in this study is accurate, given peer review and quantitative analysis to test system randomness. It is therefore presented as a solid foundation for future studies.

Infrastructure as an enabling environment

Variables related to infrastructure and service delivery itself also showed to have significant impact on project outcomes. The variables within this dimension are highly interconnected, suggesting that intervention in this dimension alone would trigger significant change. Literature lacks consideration of infrastructure and the project ecosystem itself as an enabling environment, within a larger enabling environment. This should be reframed so that in broader complex contexts which are difficult to change at leverage points in the wider environment, there may still be opportunities to improve outcomes by intervening within the project system itself, whilst maintaining an understanding of influences from the wider system. The findings highlight that it is incorrect to assume that the most effective interventions to improve project outcomes should be made in the broader enabling environment, and reinforces that some of the most effective leverage points may be within the delivery mechanism itself.

The enabling environment baseline

A challenge is understanding the baseline status of the enabling environment, which is necessary for this approach to add value. The projects examined in this study benefited from a retrospective view,

where it was possible to understand the status of factors at a given time. This luxury is not available for new projects, where influences in the surrounding context are in flux. To exacerbate this challenge, the analysis stages of determining the enabling environment, and the planning and implementation stages of a project, are time consuming and can last many years, during which time the enabling environment can change dramatically, particularly in volatile contexts seen in developing countries.

Ways to overcome this challenge are limited, but shorter periods of planning and implementation reduce the likelihood of significant change occurring while the present status is being understood. As the study requires a known enabling environment, the most informed understanding must be set as a baseline. As a result, the approach moves towards a ‘best fit’ solution, to deliver the best infrastructure possible within the constraints of the environment.

Changing the enabling environment

There are two possible approaches to changing the enabling environment: work to adapt the present enabling environment, or create a new one. This study shows that the infrastructure enabling environment is extremely broad, and encompasses most factors within society. It is therefore impossible to create a full enabling environment from the ground up. The second more feasible option is to work within the existing context and make changes where possible, but which might include creating a small part anew.

Literature advocates the ‘working with the grain’ approach (Whaley & Cleaver, 2017), which would support the need to work within the existing context, making changes where possible. However, a particularly perverse environment could reinforce negative behaviours and require deep change that is unachievable within some of the present constraints, justifying creation of a new enabling environment to represent a small part of the full system. An example would be the overhaul of sectoral policy where all old policies are replaced with new, but where the new sectoral policy remains within the existing national policy framework.

7.1.3. Evolution of challenges

In addition to an enabling environment in flux, challenges can evolve and develop throughout the project. Unforeseen challenges emerged in all case studies, such as climate shocks and conflict, which could not be planned for.

Two types of challenges emerged: those that instigated the project, and those that emerged during the project. If the needs which instigate the project change, the project design must be revisited to ensure there remains a need for the project, and that the project responds to this need. Similarly, as challenges emerge and evolve during the project, the objectives must be reviewed to ensure the project remains of relevance.

The question arises whether problems can ever be solved with moving parameters, or whether problems are always changing and evolving. Although accurate mitigation for the unknown cannot be made, it would be prudent for those in power and those delivering the project to remain conscious of the risk. The study shows that the unknown could be considered in project design, through measures such as the addition of float to programmes, or flexible and adaptive design and management techniques. However, there was no evidence of consideration for the unknown changes that could arise in the enabling environment. The suggested mitigation would be to constantly revisit the enabling environment status and opportunities and challenges throughout the project, as well as the original need that the project aimed to address at conception to confirm whether this need remains or has changed. The need for rolling evaluation of context is widely acknowledged in the political economy analysis field but did not arise in the literature regarding the infrastructure and service delivery sector.

In partial response to sub-question 2, one of the greatest influences from the enabling environment on project design and delivery and outcomes is that it constantly changes the parameters in which the project must be delivered.

7.1.4. The role of institutions and government

In all archetypes the government and institutions have a central role in orchestrating and leading change, as a controller of power, and in alignment with North's (1990) definition of institutions as the rules which organise political, economic, and social interactions, as discussed in Section 2.5.3. However, the C-CLDs show low representation of the *institutions and governance* dimension compared to other dimensions, which suggests that at present the influence is underexploited.

Although supported by other organisations, such as development banks and NGOs, the findings show that government backing has a positive impact on project success. A government motivated towards development is more likely to implement policies and governance to support projects, and most critically is more likely to be driven by meeting the needs of the population.

However, notably, there is a difference between this and governments which are motivated towards infrastructure development but without the drive for wellbeing, as this motivation could be driven by ulterior motives, such as solely financial benefit or economic growth.

Also, governments must be willing to work collaboratively, both internally and with other organisations, to harness a culture of collaboration rather than competition. Adverse relationships were shown to hinder progress and divert attention from meeting real needs. Purpose must remain central to delivery.

However, this study also shows that institutional capacity is a weakness in many enabling environments, which limits development efforts despite willingness. This finding aligns with the literature review, which found that institutional capacity is central to effective development.

Although the *institutions and governance* dimension was not as influential as others in the EEA and C-CLDs, following analysis it is evident that government and institutions have the high-level power to initiate change to the other influences identified, and can therefore act as the central source of change across many areas. This aligns with the argument that Kovacevic (2010) made in literature. Furthermore, government-led change is a leverage point suggested in six of seven projects, indicating that the engagement of governments and strengthened institutional capacity is fundamental to initiate change in many areas of the enabling environment.

7.1.5. Infrastructure and project design

Types of infrastructure

The study examines three forms of infrastructure: physical, facilitating, and social. The findings show that all three influence project outcomes, but that the weighting of influence differs dependent on the project and context.

Other frameworks examined in the literature review, see Section 2.6.1, typically focused on the physical infrastructure output, and awarded it greater value than facilitating or social infrastructure. This view may be because physical infrastructure is the most obvious output, it is often central to project design, or typically requires the most investment. However, this study challenges this approach, as the findings show positive results and successes attributable to facilitating and social infrastructure, and that these factors enhance the success of physical infrastructure.

The study concludes that all three forms of infrastructure must be considered in project design as a holistic system, and that the optimal outcomes can only be achieved when they work in harmony and equal value is given to each for its own merits.

Designing for need

The issue of predetermined engineering solutions arose from the findings, rather than design in response to identified need. For example, the Indravati project was conceived to use hydropower to generate electricity because water resources were readily available, and did not explore other solutions. When this occurs, it risks that infrastructure does not respond to actual need, and opportunities for a more suitable design can be missed. Although, conversely, it can be useful to accelerate the planning processes and speed up delivery to deliver output. This presents conflict between predetermined solutions and contextual engineering.

A further challenge is a poorly or incorrectly defined problem definition, and misalignment between need and project objectives. This can be the result of either a misunderstanding of need, or intentionally designing objectives to meet ulterior motives such as for power or financial gain. A misalignment can form a reinforcing detrimental effect, as those delivering the project aim to achieve the objectives and it is easy to lose sight of the real need.

In the case of unintentional misalignment between the objectives and real need, a mitigation measure might be to regularly revisit needs throughout the project, to ensure that the aims and objectives are focused on genuine needs of the end user.

Planning stages

Weak planning stages were consistently associated with negative project outcomes, including delays and cost overrun, increased change, and detrimental social consequences. This finding aligns with other research discussed in the literature review in Section 2.4.1, including Long et al. (2004), Locatelli et al. (2017) and McDermot et al. (2020).

The findings show that thorough feasibility studies, and social and environmental impact assessments, are linked to projects that better meet the needs of the end user. The findings also demonstrate the value of a thorough assessment of the enabling environment during the planning stages.

7.1.6. Determining need and outcomes

A significant challenge in answering the research question is the ability to accurately determine and measure need and outcomes.

Needs versus objectives and outcome versus output

The findings show that it is possible to have misalignment between needs and objectives, and output and outcomes. As discussed in Section 7.1.5, poorly defined needs can lead to incorrect project objectives, which can lead to incorrect conclusions of project success. There was a tendency in project documents to judge success against the project objectives, and post-project appraisals were particularly vulnerable to this.

Similarly, there is a risk of measuring outcome as output. Success might be measured as the amount of infrastructure produced, for example, but it is the impact of the infrastructure that determines outcome and how the infrastructure meets need. This study has looked beyond this in the case study discussions to explore both output and the outcomes it facilitates.

The impact is compounded if output is measured against project objectives, which themselves do not reflect real need. Ultimately, project success should measure outcomes against need.

This relates to the literature regarding Critical Success Factors, explored in Section 2.4.7, which highlights the challenges to accurately measure project success. However, the issues of needs versus objectives and outcomes versus output are not thoroughly explored in literature, and should be further researched to ensure projects meet real need, and that measures of success reflect real need rather than project management success factors.

Measuring outcomes

Though interviews with end users are the optimal method of testing whether needs have been met, this was not possible due to COVID-19 travel restrictions, and many of the projects themselves did not conduct surveys on completion. Project documents and staff interviews were used to determine outcomes, and therefore project success, which risked different findings compared to if end users had been interviewed.

Post-project evaluation with end user groups is suggested to assess real outcomes and project successes in all projects. However, it should be noted that bias will remain dependent on those asked within the end user groups, an issue raised in the literature by Alkire et al. (2015) and Merry (2011). For example, BGP infrastructure benefited landowners more than the landless, so their respective views as to whether services met need will likely differ, necessitating a balanced selection of interviewees.

Changing needs

Changing needs throughout the project are common, caused by factors such as environmental disasters and demographic change. As needs change the ability of the infrastructure and services to meet need also changes. However, it can be difficult to change the infrastructure design during delivery in response, as solutions are often complex and must be locked-in early.

The best possible mitigation is to continually monitor need, the needs gap, and the enabling environment throughout delivery, so that changes can be identified early and changes to delivery may be more feasible. This also advocates for flexible infrastructure design capable of adaptation.

The worldview of the individual or organisation

Need will be identified differently depending on who is asked and their worldview. It was found that projects initiated by the government were most often driven by needs determined by the government. Similarly, NGO led projects were more likely to be driven by needs as defined by the NGOs.

This suggests the presence of closed systems; unwilling or unable to take on external ideas or views. Consideration of the full enabling environment as a much larger system, as represented in this study, would help overcome this challenge.

7.2. Reflection on methodology

The three primary stages of the methodology are the frameworks, case studies, and systems analysis using CLDs. This section reflects on each stage and the methodology as a whole.

7.2.1. Frameworks

Consistency of input data

Completing the framework fields consistently across projects proved a challenge, because input data was not always directly comparable, results stated in reports were sometimes calculated differently between projects, and it was not always clear whether proxy data had been used to draw conclusions in documents such as completion reports.

Furthermore, the availability of information and comprehensiveness of documents varied, often reflective of the organisation. For example, there was typically less information available regarding the design, construction, or O&M for World Bank and ADB projects, compared to funding and governance documents. Although this risks consistency, it also provided valuable insight into the differing approaches of different organisations and their involvement across project stages.

Interviewees were able to provide some clarification, and particularly to fill information gaps. This helped select the most uniform data across projects for the most consistent comparison possible.

A further comment would be that all organisations should have greater exposure to all project stages, as availability of a full suite of information will help make informed decisions in all stages of delivery.

Framework design

Every effort was made to ensure robustness and comprehensiveness of the foundational framework questions, as Yin (2018) argues that this is the basis of good case study research. The frameworks were designed to be inclusive of all subjects and information formats, yet there remains the risk that data has been missed and a risk of reductionism. This was mitigated where possible by iteration of the frameworks throughout the study. On reflection, it is concluded that the frameworks were inclusive of all relevant factors.

A positive characteristic of the framework design is replicability, which is necessary for simple application to future projects. The simple structure is deemed to have successfully met the requirement for replicability, as application to each case study sequentially was a simple exercise.

A framework approach with criteria must also be cautious of language used; the angle or worldview from which the researcher and question originates will affect the framework construction and the findings of the study; a limitation previously noted in the literature by Yin (2018). Also, collection and interpretation of qualitative data is subjective, and depends on the views and intentions of the framework user. The frameworks were constructed from information objectively gathered from literature, which helps to mitigate subjective bias.

Calculation of scores

Scoring of the PA and EEA frameworks was subjective and vulnerable to researcher bias. Given that the scoring scales for the PA and EEA are arbitrary, the relative scores between case studies were arguably more important than the score itself, and offered greater insight. Therefore, the calibration exercise sufficiently limited the impact of subjectivity. This exercise was carried out numerous times throughout the study, which helped ensure quality and reliability of results.

7.2.2. Case study approach

The case study approach is deemed an appropriate method to answer this research question, as future projects will be more similar to real-world examples than an evidence based gained from literature alone. This approach also presents opportunity for the addition of more case studies in the future, which would strengthen confidence in the results.

Priya's (2020) ten fundamental elements of case study research were considered to ensure robustness in the approach, as discussed in Section 3.4.1.1. Similarly, Yin's (2018) principles of good case study research were followed, using carefully designed foundational questions and reflexivity throughout the research. By aligning the work with literature regarding proper case study practices, there is assurance that the process followed in this research is rigorous and the results can be trusted.

Number of case studies

Given the breadth of the enabling environment considered, the seven case studies did not constitute the full collection of the extensive range of projects possible. Inclusion of more studies was not possible within the time and resource constraints of the research, and the depth of research required. However, it is reasoned that a suitable representative sample was examined, with a range of characteristics as shown in

Table 5, to offer insight into the research question.

Even so, a larger sample size, including case studies with a broader spectrum of characteristics, would strengthen the study. A recommendation is that projects are added over time to strengthen the findings.

Snapshot in time

The concern that case studies represent a snapshot in time is raised in Section 3.4.1.1. However, this concern was alleviated by inclusion of projects which were part of broader programmes. Therefore, the lessons learned from previous project phases were incorporated into the design and delivery of the phase being studied, and in many cases were available in the project documents. Therefore, it was possible to achieve an understanding of the longer-term programme in addition to the individual case study, reducing the limitations caused by a snapshot view of one project.

A second related challenge is that a project might be considered successful or unsuccessful depending on when it is evaluated during the evolution of challenges and contexts, as discussed in Section 7.1.3. A project might be considered to be successful at one point, but unsuccessful at another when assessed against a new set of challenges.

A further point is that retrospective evaluation involves applying modern logic to events in the past, which may have been delivered under different circumstances. This should be considered during evaluation.

Gaps in information

One of the most significant challenges when sourcing case studies was missing data and gaps in information, as raised in Section 7.2.1. Conclusions that can be drawn are limited to the insights possible from the information available. Reasons for gaps in information were: the information did not exist or was not documented; the contact organisation did not have access to such documents because they were not directly related to their role; the interviewee or organisation contact did not have access to such documents in their position; or the data was not available in the public domain. In this case, any other closely relevant information was considered for insight.

7.2.3. Systems approach and the use of CLDs

CLD construction

CLDs proved to be an appropriate method to clearly map the interactions in the enabling environment for visual analysis, whilst also enabling quantitative network analysis. The disadvantages of CLDs aligned with those identified in literature: variables and connections were dependent on information found in the literature, and subjective to the researcher's interpretation. The first issue was mitigated by a thorough literature review using a comprehensive data collection framework.

Secondly, although quality checks were carried out, the M-CLD structure is inherently skewed towards the worldview of the researcher. The researcher makes the decisions of which variables should be represented and which connections exist. The level of granularity represented by each variable is also a highly influential factor; it might be decided to separate two subjects or incorporate them into one variable, the decision will affect the network structure and centrality results. Informed decisions were made by the researcher to ensure the most reliable M-CLD possible, however the risk remains and must be acknowledged.

Another concern in the construction of the M-CLD was oversimplification. Zucca et al. (2023) noted that risks of oversimplification could be mitigated by sourcing data from multiple sources, review of the CLD by independent parties, revisiting interviewees, and iterating accordingly. Each of these measures were taken to increase robustness and verify the model as much as possible.

Parameters and boundaries

The M-CLD boundaries reflect the anthropocentric nature of the research question. For example, environmental factors were considered for their effect on the human population, such as *risk to livelihoods*. This is acceptable as it reflects the research question. However, future applications of the M-CLD must also assume an anthropocentric angle for its use to be appropriate.

The boundary is considered to be sufficiently broad to answer the broad research question, yet the system representation remains at an interpretable level. Literature demonstrated that fields such as the political, social, economic, and cultural aspects of an enabling environment have an active impact on infrastructure and service delivery, discussed in Section 2.5, which justified the broad system boundary to include these themes. To further support this argument, analysis found influences in these dimensions.

However, the system boundary for each project can differ from the M-CLD. For example, the Lifewater C-CLD, as shown in Section 5.7.8.3, shows little influence of the *institutions and governance* dimension. This suggests that the boundary of the system which affects how infrastructure and services are delivered in the Lifewater project does not extend to significant institutional and governance issues. This is valuable knowledge for those planning future projects in a similar context, as it could be useful to refine the system boundary and look for interventions within the refined system.

The temporal dimension of systems

The CLDs constructed did not consider parameters for time delays. As discussed in Section 7.1.1, time can be a very influential parameter in systems behaviour. The M-CLD represents a generalised view of the enabling environment and its interaction with infrastructure and service delivery. Although some time frames of connections between variables will be constant in all scenarios, many are dependent on context. Also, time delays between variables is difficult to accurately predict, and it would be misleading to assign these in the generalised M-CLD. Therefore, temporal relationships were not mapped on the M-CLD or C-CLDs, but can be considered in the analysis of each project.

Systems thinking

A systems thinking approach was ideal for application to this research question, which required an understanding of complex interlinked relationships in order to reach the fundamental influences and leverage points related to infrastructure and service delivery. On reflection, it is considered a successful application of systems thinking, and this research contributes to the body of work on systems thinking in the infrastructure and service delivery field.

Network analysis

The application of network analysis in this study was intrinsic in achieving the results, and deemed a successful methodology that is recommended for future work. However, one of the major limitations

discovered was the application of network analysis to the C-CLDs. The study aimed to apply network analysis to both the M-CLD and C-CLDs, however unfortunately was unable to. Network analysis was possible on the M-CLD because the nodes were unweighted, and network analysis is possible on acyclic, weighted, directed networks, where weighting applies to edges (connections) only. However, the C-CLDs also include weighted nodes. An extensive study was conducted, but no literature was found, including in the mathematical and computer science disciplines, to indicate the network analysis could be carried out on networks with weighted nodes, in addition to the other characteristics, such as cyclical and directional, which added complexity. Consequently, the coding packages were also unavailable in R.

One of the recommendations made in this study is the need for further research into analysis of networks with both weighted nodes and edges to address this gap in literature. This would achieve an understanding of how both the characteristics of nodes and edges impact the network behaviour, such as strength or level of influence. In addition to this application, potential uses might be, for example, understanding transport hubs and networks, and online click-through conversions.

Similarly, as raised in Section 7.1.1, network analysis cannot compute for intervention at two points simultaneously, modelled by a change in weighting at two nodes at the same time. This is common behaviour of a real-world system, and therefore a limitation of the current network analysis capabilities, and is suggested for future research.

7.3. Chapter summary

The following key points have emerged from the discussion:

- A systems approach and the use of CLDs has proven to be an effective method of modelling the enabling environment, as the complex interconnectedness of the real-world environment can be represented.
- Archetypes are valuable for use in the planning stages of future projects, to assess opportunities and barriers likely to be experienced, to be able to address these in the early stages of the project when change is most possible.
- Implementing change is likely to achieve unintended or unforeseen outcomes. A systems approach is helpful to understand what these might be, and to identify other potential interventions to mitigate them.
- Timing of intervention has significant impact on outcome. The timing at which intervention is made and the time it will take to have effect should be carefully considered when deciding which actions to take.
- The difference between need and project objectives, and outputs and outcomes, is crucial when assessing project success. Projects should always be measured by whether outcomes meet need.

- Needs and the enabling environment are constantly changing, and challenges also evolve throughout the project. Consequently, judging which interventions to make is extremely difficult. Constantly revisiting the parameters is necessary throughout the project to ensure decisions reflect the problem and context at the time interventions are made.
- Institutions and government have a central role in the successful delivery of infrastructure and services. Most other interventions can benefit from government support to bolster their impact or ease of implementation.
- Infrastructure and services can be framed as an enabling environment themselves, with three equally important components that interact as a system: physical, facilitating, and social infrastructure.
- Weak planning stages have high correlation with project failures. The planning stage presents the best opportunity to tailor infrastructure and the delivery mechanism to context, and should include a thorough evaluation of the enabling environment.
- The methodology provides a replicable framework for application to future projects, including a verified M-CLD.
- Subjective bias is a recognised challenge, as in other research. This extends to bias of the researcher during the framework design and completion and development of CLDs, bias of interviewees in responses at interview, subjectivity in defining need, and subjectivity in defining outcomes and successes. The impact of these biases can be reduced by constant awareness and reflection throughout the research.

8. CONCLUSION

This chapter reflects on why a detailed understanding of the highly complex and interconnected enabling environment offers the key to delivering infrastructure and services that best meet the real needs of end users, and how this can be achieved.

The conclusions from the research are presented in this chapter. Firstly, a reflection on the central research question and sub-questions is presented. Following this, the main findings are discussed, and the purpose and value of the work is considered. The contribution to knowledge is discussed, alongside implications for actors. The limitations of the study are reviewed, followed by suggestions for further work. Lastly, the thesis concludes with final remarks.

8.1. Research question

The aim of the research was to identify methods to improve the outcome of infrastructure projects and service delivery to ensure the real needs of the end users are met. A central research question and three supporting sub-questions were employed to direct the research to achieve its goal.

Central research question

How can infrastructure and services be better designed to meet need in developing countries within the prevailing enabling environments?

Sub-question 1

How can need be determined?

Sub-question 2

How does the enabling environment influence infrastructure design and project delivery and outcomes?

Sub-question 3

Are there trends between project characteristics, the way the enabling environment affects project outcomes, and the interventions that can be made to change project outcomes?

Sub-question 1 was answered through examination of literature, including assessment of Sen's work as a master on the subject. The concepts of defining need and determining need were examined individually, acknowledging that definitions and approaches vary throughout literature. Ultimately, it

was concluded that there is merit in both bottom-up and top-down need assessment approaches, however a view was taken that some element of participatory needs assessment is required with those experiencing the needs gap to determine real need.

Sub-question 2 was answered by first understanding what is meant by the enabling environment through the literature review and case studies, and secondly by examining behaviour of the enabling environment as it interacted with infrastructure and services in the case studies. The CLDs evidenced systems behaviours, with many interlinkages between the enabling environment, infrastructure design, and project delivery and outcomes. Particularly influential factors were extracted through the analysis in Chapter 6, and the study ultimately identified seven leverage points in Section 6.4, which indicate areas in the enabling environment where leveraging change is likely to have most significant impact on the project outcomes.

Subsequently, *Sub-question 3* was answered by examining trends in behaviours observed in the case studies. Five archetypes were identified in Section 6.5, showing that enabling environments and their behaviours can be categorised. Following this, Section 6.6 and

Table 58 goes on to evidence that the enabling environment indeed does change the influence and outcomes caused by a given intervention. This finding allows future projects to make more informed decisions in the planning stages to align with their individual circumstances. However, *Sub-question 3* was only able to be answered partially, and further case studies can be examined in the future to strengthen the archetypes and ensure reliability.

8.2. Main conclusions

The thesis identifies ways in which infrastructure can be better designed to meet need within the prevailing enabling environments, by presenting a model representation of the enabling environment and blueprint methodology to identify leverage points. This ensures that this crucial question can be answered during the design of future projects to produce services that meet end user needs. The following conclusions are the primary findings that emerged in the process of answering the central research question.

1. There is a need to be able to leverage change in the enabling environment, because at present infrastructure and services fail to meet many end user needs in developing countries and significant needs gaps remain.
2. The enabling environment has significant impact on the way in which projects are delivered, and presents both barriers and opportunities to implementing services that meet need. The enabling environment extends to institutional, economic, social, and environmental influences, as well as the infrastructure and services environment itself. There is opportunity to leverage change in these areas to change the outcome of infrastructure projects and service delivery, in

addition to changing the delivery mechanism of the project itself, which is the default approach. However, deciding how and when to intervene and the outcomes intervention will cause is challenging, as parameters constantly evolve as both the enabling environment and the needs that the services intend to meet change over time. Well planned timing of intervention is critical to optimise the parameters at the moment change is made, to achieve the intended outcome.

3. Leveraging change will have different impacts and outcomes depending on the project archetype and the holistic system behaviour of the enabling environment. Also, different barriers and opportunities are experienced in different enabling environments and projects, and consequently the purpose of intervention varies. Five novel project archetypes were identified by exploring the behaviours and interactions of projects within their prevailing enabling environments, but the seven leverage points identified generate different outcomes when applied to each. This adds new insight into the complexity of the challenge for future projects, and is the key to the value of this approach, as the most effective interventions can be identified early in the delivery of future projects.
4. Physical, facilitating, and social infrastructure must be considered of equal importance in the delivery of infrastructure and services. Emphasis and priority is too often focused on physical output, despite evidence demonstrating that advanced and suitable engineering technologies exist to fulfil most needs, but that the facilitating environment is typically the barrier to their success in developing countries. The study proved that supporting mechanisms and capabilities, and social and behavioural change, are critical to the success of projects in developing countries as well as the physical infrastructure itself.
5. A systems approach is a highly suitable method of visually representing the enabling environment, which facilitates a deeper understanding of the complexly interconnected real-world environment. The systems representation, in the form of the M-CLD, can be used to enhance the planning stages of future projects, as well as to gain a general understanding of the complex interactions between projects and their enabling environments.
6. Conscious interventions at variables in the enabling environment will almost always cause secondary effects, which can be intended or unintended, and desirable or undesirable. To leverage the enabling environment successfully to achieve the intended outcome, an understanding of these consequences is critical. The visual CLD representation is an effective tool to understand the possible consequences of interventions. This allows informed decision-making and implementation of mitigation measures where necessary. The concepts of intended and unintended, and desirable or undesirable consequences are not explored extensively in

literature, and the findings contribute additional evidence for the need for further research into this area.

7. The government and policy-makers are the most influential actors in the infrastructure and service delivery sector, as they hold most power to leverage change. Many leverage points were identified in this research, both in the holistic enabling environment and in the archetypes specifically. However, those in power with high-level oversight are best placed to influence the implementation of most interventions chosen, thereby making them the most effective source of leverage.

8.3. Contribution to knowledge

This thesis makes both practical and theoretical contributions to the field. The former includes the application of the methodology as a blueprint for future projects, use of archetypes and leverage points in the early stages of future projects, and advisory for institutions and policymaking. The latter extends to advancement in the subject area and methodological approaches.

The findings align with existing literature and what is already known on the subject, including the most effective interventions found in practice. However, this research contributes to the academic knowledge base of *why* these interventions are the most effective.

Archetypes and leverage points

Archetypes and leverage points identified can be immediately applied to future projects, adding immediate value to the field. In the conception and planning stages of a new project, organisations can examine the project against the archetypes mapped in this study, gain an understanding of the challenges and opportunities experienced by similar projects, and identify potential leverage points where changes can be made to improve outcomes. The archetypes provide a simple framework which can be consulted in isolation without prior completion of the frameworks. The approach contributes to an existing base of archetype and categorisation methods, however, the field of coverage and comprehensiveness of the archetypes is novel.

However, the contribution of archetypes is claimed modestly. The study is limited to only seven case studies, and in the context of research which aims to draw trends, larger sample sizes can provide more reliable and verifiable conclusions. However, as the framework is applied to more projects and results added to the analysis, the accuracy of the archetypes will strengthen. Therefore, the thesis contributes the foundations of the archetypal approach, with acknowledgment that it is not finite and can be developed in the future.

Blueprint for replicability

The thesis contributes a novel methodological blueprint available to other researchers in the field, and for practical replication in other projects. It can be broken into three parts: the data collection framework, data analysis framework, and CLD and systems analysis, forming a staged process for easy replication. Application of the full methodology provides an in-depth analysis of a project, in addition to or instead of direct consultation of the archetypes.

The potential application of the M-CLD also extends to projects in developed countries, which will likely achieve different results as the distribution of influence between variables will be very different to a developing context. Notably, as discussed in Section 8.5, the blueprint is suited to projects with an anthropocentric centre.

Advising institutions and government

Section 7.1.4 argues the role of institutions and government in orchestrating change and driving development. The findings from this research can be shown to policy-makers to initiate change and change attitudes towards a more conducive environment for development. This research provides an informative base for decision-making, indicating where changes can most effectively be made in different scenarios. The findings reinforce existing knowledge, contribute to the evidence base and strengthen the argument for a more prominent role of institutions and governments as promoters of change.

Subject area knowledge

Existing research has not yet examined the relationship between all factors within the enabling environment and the infrastructure and service delivery sector simultaneously. Instead, other studies typically examine the relationship between infrastructure and one or two other fields, such as sustainability. This research addresses this gap and consequently contributes novel findings.

Amalgamation of the full spectrum of influences from multiple disciplines is necessary, given that all influences are highly interconnected in the real-world context. Existing literature from multiple fields was integrated, and methodologies previously applied in other fields were novelly applied to the infrastructure and services sector.

Methodological advancement

The methodology, applied as one process, through a qualitative data collection framework; an appraisal framework for analysis; transformation into a CLD; translation of the CLD into a cyclic, directed, weighted network; and application of NA to examine the system behaviour, is novel. Literature found that each component has been used in other studies individually, or with one other stage, but not as a full framework.

The M-CLD is particularly valuable for future research due to its comprehensiveness and reliability, achieved through the novel application of ERGMs and CUG tests in this field.

The study successfully applies network analysis to CLDs, which had not previously been done in this specific subject area. It also strengthens the argument for the need for a mathematical solution to evaluate networks with both weighted nodes and edges, and adds to the evidence base of potential applications.

8.4. Implications for actors

Actors can apply the findings from this study to leverage their influence and improve the outcome of future projects.

Government and institutions

Governments and influential institutions, such as multilateral banks, have significant influence on the outcome of projects, and their commitment and motivation has proven critical for projects to be successful and respond to the needs of the population. Governments should use their power to observe and recognise the needs of the population, and design projects and create an enabling environment which facilitates optimal project delivery and outcomes. Institutions can support the government to provide the resources to bring these plans to fruition.

Consultants and designers

Infrastructure design should be adaptive and flexible to respond to the changing needs of the population, and changing enabling environment. These parameters are constantly in flux, so adaptive design can help avoid locking in solutions too early, and delivering infrastructure which fails to meet need at project completion.

Communities and end users

Engagement, proactiveness, and self-driven development is recommended to bolster the impacts and positive outcomes of infrastructure and services. Increased involvement in the design and delivery stages will ensure infrastructure is designed for purpose and tailored to end user needs. Other measures outside of infrastructure to improve overall welfare and socio-economic wellbeing will support the positive impact caused by services, and encourage sustainable development.

All actors

Infrastructure projects can be conceived and initiated by any of the actors above. In all cases, in the very early planning stages actors should consult the archetypes to understand the opportunities and barriers often faced by similar projects, to enable better preparation and an increased chance of achieving optimal outcomes.

8.5. Limitations of the research

The limitations experienced in this work were mostly also experienced by other researchers. Limitations are raised throughout the thesis and any possible mitigation measures stated, in order that issues are addressed as they arise. Three key points are reiterated below.

Methodological limitations

Limitations relating to the framework and methodology are discussed throughout Chapter 3, including but not limited to Section 3.6, and are further discussed in Section 7.2. These limitations include the design and completion of the framework, case study selection, and network analysis methods.

A second methodological limitation relates to making finite claims using case study research. Case studies have been used to develop a working theory of archetypes, but these cannot be claimed as a conclusive list given the use of only seven case studies to represent innumerable potential project and enabling environment combinations.

Practical limitations

In optimal circumstances a first-hand survey would have been carried out with end users to understand whether the services were perceived to have met real need. However, the case studies were carried out during COVID-19 when travel restrictions were in place, which meant visits and extended field work was not possible. Funding restrictions also made extensive travel unfeasible, and the time required to visit seven projects was also unrealistic within the timescales.

Research question

The research question is openly anthropocentric, and therefore the enabling environment is structured around factors which influence the human experience. This limits the use of the frameworks and CLDs to research that asks about human need. Although this limits application in other areas, it does not diminish the value of the approach for this specific purpose.

Similarly, the research focuses on developing countries, and archetypes should only be used to analyse other projects in developing countries. However, the same methodology could be applied to projects in developed countries to build up a separate set of case studies with their own archetypes.

8.6. Further work

New projects should be added to the seven projects already studied, to form a database of case studies. The M-CLD, archetypes, and leverage points will become refined and more reliable as more data is added. The value of the framework will increase over time if this were to be done.

As more projects are studied, it is recommended that variables in the framework are refined. The M-CLD represents the full enabling environment as understood from literature and seven case studies.

However, with new projects and the emergence of new literature, the M-CLD can be iterated and the accuracy increased.

The framework should be refined and specialised to reflect the unique country environment if policy-makers and institutions at the national level were to apply it repeatedly and heavily rely on it. At present, the M-CLD provides a solid yet generalised representation of the enabling environment. For optimal results, future users would adapt and refine the M-CLD for their precise context.

Policy-makers should be made aware of the integration between factors that affect the infrastructure and services sector, and potential intervention points. This would allow for faster and better-informed action.

8.7. Final remarks

This research addresses an important real-world problem and widespread societal challenge. Developing countries continue to experience extensive needs gaps, extending from a failure to meet basic needs, to stunted opportunities.

Infrastructure and services offer potential to alleviate these pressures and resolve these issues, and contribute to the overall well-being and development of developing countries.

Therefore, advancement of knowledge in this field is essential to address such a critical issue, and this research represents an incremental contribution to this understanding.

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APPENDICES

APPENDIX A: PROJECT DATA COLLECTION FRAMEWORK

Primary data categories	Case study characteristics
Background information	Introduction to project
	History and need for project
	Management
	Financing and funding
	Technical engineering and infrastructure
	Social factors
	Project outcomes
Data source information	Organisation name
	Organisation type
	Description of involvement in project
	Recognition for project
	What is the organisation's motive for involvement in the development sector?
	What planning stages are in place before project implementation?
	What work is already carried out to reflect on project efficacy?
	Interviewee characteristics (e.g. position, experience, access to information, personal motives and interests)
	Literature source characteristics (e.g. author, perspective, motives and interests)
Project overview	Project description
	Background
	Project aims and objectives
	Project governance
	Sources of finance
	Location
	Date
	Level of governance exercising control over the services
	What was the motivation for service upgrades?
Technical and infrastructure	Technical scope/physical infrastructure
	Enabling infrastructure
	Social infrastructure
	What was the level and condition of service provision prior to project implementation?
Social	Social drivers and themes
	Relationship to needs
	Are there poverty reduction strategies in place?
	Skills and education
	Date of service implementation

Project and service delivery	Contract value
	Was a feasibility study done?
	Financial strategy
	Contractual arrangement
	Risk
	Stakeholder and responsibilities
	Procurement process
	Consultation with public, stakeholders and communities
	Planning
	Design and technology
	Construction
	Operation and maintenance
	Sustainability and environmental consideration
	Exit strategy
	Available project documents
Project outcomes	Outcome: How successful was the infrastructure? What are the successes and failures?
	Outcome: What was the socio-economic benefit?
	Major project outcome
	How long ago did it finish?
	Are there any apparent positive or negative outcomes?
	What is the current level and condition of service provision?
	How are the services funded?
	Are the services in good condition and maintained well?
	How are the services managed?
	Is the service integrated with or dependent on others?
Other	What are the blockers to service delivery?
	Are there any other notable points for consideration?
	Defining features
	Questions
	Data sources used

APPENDIX B: ENABLING ENVIRONMENT DATA COLLECTION FRAMEWORK

Dimension	Theme	Component questions
Fundamental characteristics	Basic criteria	Country
		Region
		Income status
		National population
Governance	Government	What is the political and governmental structure? How institutionalised are the government, political parties and policymaking processes? Does the government assume accountability for citizens and the state? What governance mechanisms exist throughout sub-national levels of society? Are governmental processes transparent and free from corruption, bribery and nepotism? What are the rules that govern policymaking institutions? Are they followed? Is the justice system observed and followed widely? Does the country uphold the rule of law? Does the government have long term strategic vision for improvement of welfare for the poor and service provision? Does it execute these plans? Which political ideologies are in place? How do political ideologies affect public policy at both national and sub-national levels?
	Actors	What are the dominant institutions, organisations, and actors in political decisions (such as the military, religious groups, media and civil society)? How is power balanced across institutions and organisations? What are the expectations and motivations of each actor? What influence does the private sector have on policymaking and society? How do informal institutions influence society? Is public political influence related to socio-economic groupings?
	National and international relations	Do other nations have vested interests in the country? Why? Is the country in conflict, or has a history of political volatility? Does the country face external political threats? Do cultural hierarchies and traditions influence power dynamics? Do historical legacies and power relations (internal and external) persist as significantly influential factors in the national dynamic?
	Human rights	What support exists for protection of civil liberties and human rights? How easily can the public influence government and policymaking? Through what avenues?
	Public support	Is there widespread support for the government? Is the government perceived to be effective by the public? Are there high levels of activism?
Economic	Economic income	What are the main sources of national income? Does the government levy taxes widely and to what extent is the government dependent on taxpayers? Is the government dependent on external sources of income, including loans, donors, and foreign investment? What contribution does the diaspora have?
	Inequality and wealth distribution	What is the national income and wealth distribution profile (geographically, demographically)? Is wealth inequality a significant issue?
	Human capital	What forms of human capital does the country possess? What technical and managerial skills exist to manage services? How invested in research, innovation and technological development is the country?
	Natural environment	What natural resources does the country possess? What influence do the geographic position and natural resources have on national and international relations and trade? What is the climate?

Social	Demographic profile	What are the different socio-economic groups? What is the national educational distribution? What is the national employment distribution? Across which sectors? In what occupations? At which skills levels? What is the national ethnic composition? What is the national religious composition? Which languages are spoken? How large is the diaspora? Has there been demographic change over the last 50 years? Such as population growth, migration, and urbanisation.
	Social infrastructure	Do welfare state models and social protection policies exist? Are policies in place to support vulnerable, minority, disabled and disadvantaged groups? What health care exists for the public, and particularly the poorest? What educational opportunities are available to the public, and particularly the poorest?
	Societal behaviour	How does socio-economic status affect opportunities available to people, particularly the poor? Are traditional hierarchies present? How do they affect the national dynamic? Are there any unique cultural norms that significantly influence societal functioning? Are there any cultural values and ethical expectations that dictate governmental choices (either encourage or deter)? How open is society to other cultures, societies, and approaches? What influence does the media have? How free is the media?
	Inequalities	Are there wellbeing disparities across the country? Are there vast social disparities and inequalities? Is there discrimination against groups within society?
Infrastructure	Provision	How developed is national infrastructure? Are resources concentrated where there is demand? Are there any significant blockers to services and infrastructure? Which institution or sector is responsible for the management of infrastructure? How is the national demographic related to infrastructure access? Are basic services available to all citizens? Is this affected by socio-economic status? How highly regulated are the infrastructure, services, and construction industries?
	Funding	Is infrastructure investment a priority? Are suitable funds available for investment? How are services usually paid for?
Development	Development status	What is the current state of development? How highly is development prioritised on governmental agenda? What policy exists to promote development? Is development focused on the economy or welfare?
	Aid	Does or has the country received international aid? What role do aid organisations, NGOs and INGOs have in the country?
Other	Other themes	Are there any other dimensions, themes or questions that should be raised?

APPENDIX C: PROJECT APPRAISAL

Dimension	Goal	Criteria
Governance	Service has dedicated managerial infrastructure.	Accountability and liability for service delivery is clear.
		Responsibilities are clearly delineated.
		Provider has suitable authority and autonomy to manage service effectively.
		A long-term management plan is in place including contingency planning.
		Engineering and management expertise are available.
		Organisations work together collaboratively.
	Governance is transparent.	Feasibility assessments and planning consider need over stakeholder gain or alternative motives.
		Service delivery is free from corruption and bias.
		Procurement and the supply chain are transparent and fair.
Stakeholders are fairly represented.	All stakeholders are involved and consulted according to their respective roles.	
	Stakeholders are not marginalised.	
	Community and those served by services are involved, represented and empowered.	
Financing	Secure capital finance.	Sufficient capital is available to finance the project.
		Funding is secure.
	Sustainable funding and financing.	A financial strategy and funding mechanism is in place for the future.
		Sufficient funds or financial programmes are available to cover O&M costs.
		Sufficient funds are available to repay any loans.
		The provider has the capacity to generate new funds to cover additional capital costs.
	Universal affordability of services.	The provider is free from substantial financial risks, debts or cost constraints that may threaten service delivery.
		Service is financially accessible to those that require it.
		Service is affordable to the poorest, vulnerable or minority groups.
Infrastructure	Infrastructure is fit for purpose.	Infrastructure design is fit for purpose.
		Infrastructure is appropriate in context.
		Infrastructure meets codes, standards and regulations.
		Infrastructure is safe to use.
		Infrastructure meets quality standards.
	Design considers future needs.	Infrastructure has an appropriate design life.
		Technical design accounts for increased future service demand.
		Technical design can facilitate network extensions and service expansion.
	Infrastructure is reliable.	Infrastructure network has suitable redundancy.
Infrastructure is integrated with others where possible and advantageous.		
Service delivery	Planning stages are comprehensive.	Feasibility studies have been carried out in the planning stage.
		Scope, cost and timescales are considered in the planning stage to meet feasible and achievable targets.
		Project delivery and construction consider local context, skills and resources.
	Supply is secured for present and future demand.	Provider has future supply and demand estimates and plans in place to be able to meet these.
		Provision can be maintained and improved in the event of population density increase or population growth.
	Contingency plans are in place to	Resources are available for timely response to failures.
Any necessary permissions and authorisations are granted in advance to enable the provider to react immediately.		

	cope with service disruptions.	Alternative services are available to temporarily meet demand in the event of failure.
	Monitoring and evaluation is in place.	Data collection and reporting mechanisms are in place to monitor the service.
	Service is maintained.	Regular inspections, testing and maintenance is carried out to ensure full operation.
		Appropriate skills are available for operation and maintenance.
		Spare parts are available and affordable.
		Technical support is available.
		Training has taken place where needed.
		Necessary skills and resources are aligned with locally available capacities.
	Universal access to services.	Service is geographically accessible to those that require it.
		Service is accessible to poorest, vulnerable or minority groups.
		Infrastructure increases service coverage.
Social value	Delivery milestones are met.	Project was delivered to programme.
		Project was delivered to budget.
	Service meets user expectations.	User experience is positive.
		Service supports need as expressed by end users.
		Service is adopted and used as predicted.
	Promotion of social equality and inclusion.	Service serves all community members equally.
		Service discourages marginalisation of social groups.
		Service enhances wellbeing of communities and users.
	Alignment with local culture and values.	Cultural preferences and barriers have been considered in design.
		Community and end users have been consulted.
Contribution to development	Community ownership of services.	Community and end users feel ownership over services.
		Community and end users are considered in decision making.
	Service contributes to social development.	Service supports local livelihoods.
		Service encourages development and capacity of internal skills and resources.
		Service directly facilitates development in other areas.
	Service benefits the national economy.	Service directly enables economic opportunities.
		Internal national employment is prioritised and skills capacity is increased.
	Service is sustainable.	Environmental sustainability is considered in the design and delivery.
		Service is aligned with the SDGs.
	Lessons learned benefit future projects.	Project is being evaluated post-completion.
		Lessons learned are being applied to future work.