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Evaluation of Experience from Using SuRe® Standard in Infrastructure Projects: A Case Study of the Northern Collector Tunnel (NCT) Phase I Water Project

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Declaration

I **Kimonye Eva Muthoni** hereby declare that this thesis represents my personal work, realized to the best of my knowledge. I also declare that all information, material and results from other works presented here, have been fully cited and referenced in accordance with the academic rules and ethics.

Abstract

The concept of sustainable development has evolved since the Brundtland Report of 1987 but the principles of ensuring environmental, social and economic balance in the face of development remain the same to this day. Numerous tools for sustainability assessment have been developed to help policy and decision makers decide which actions should be taken towards achieving a more sustainable society. One of these tools is the SuRe® Standard which is a voluntary sustainable and resilient infrastructure rating tool developed by the Global Infrastructure Basel Foundation (GIB) in 2015. The rating tool has been used to assess infrastructure in China and India and is now gaining momentum in developing and emerging economies.

The SuRe® Standard has been used to assess over 200 infrastructure projects globally but there have been no studies carried out to determine the sustainability and resilient benefits a project obtains from using the standard compared to using a business-as-usual approach. The aim of this thesis therefore is to evaluate the SuRe® Standard rating tool through the experience of assessing the Northern Collector Tunnel (NCT) Phase I water project in Kenya, which is a developing country. The NCT Phase I project is considered to be one of the largest water projects in Kenya making it a good case study to evaluate the experience and the benefits from using the SuRe® Standard.

The objectives of this study are to review the cost incurred by projects from using the SuRe® Standard in reference to time and money. The study also assesses whether there are additional sustainability benefits a SuRe® certified project stands to gain compared to only fulfilling the minimum compliance requirements such as Environmental and Social Impact Assessment. In addition this study seeks to establish the relevance of the SuRe® Standard in achieving the Sustainable Development Goals (SDGs).

The results of this study show that there are tangible benefits that a project stands to gain from using the SuRe® Standard since it gives the project a holistic approach to sustainable and resilient issues. In addition, the results show that the SuRe® Standard can contribute greatly to the achievement of the SDGs and act as a tool to track the milestones achieved at the local and national level. However, the cost and resources associated with the SuRe® Standard assessment process may hinder project owners from using the rating tool since they have to incur other mandatory licensing costs such as those associated with processes such as Environmental Impact Assessment.

In conclusion, the results of this study provide a deeper understanding on how infrastructure-rating tools assess projects and the benefits that project owners stand to gain from this process. This can be used as a reference point for project owners when deciding on whether to use rating tools or use the business-as-usual approach.

Key words: sustainability, resilience, rating systems, Sustainable Development Goals

Résumé

Bien que le concept du développement durable ait évolué depuis le Rapport Brundtland en 1987, les principes qui garantissent une balance environnementale, sociale et économique en face de développement sont restés les mêmes jusqu'au présent. Nombreux outils d'analyse de durabilité ont été développés pour soutenir la politique et les décideurs afin de choisir les actions à prendre en faveur d'une société plus durable. Entre ces outils, il y a le Standard SuRe®, qui est un instrument volontaire pour l'évaluation de la durabilité et résilience des projets d'infrastructure. Cet instrument a été développé par la Fondation Global Infrastructure Basel (GIB) en 2015. Le standard a été employé aux projets d'infrastructure en Chine et Inde. Actuellement, SuRe® est rendu public aux économies en voie de développement et d'émergence.

Le Standard SuRe® a été utilisé pour analyser plus que 200 projets de par le monde, mais ils manquent des études sur les avantages en termes de durabilité et résilience d'un projet qui emploit le standard comparé à une approche conventionnelle. C'est pourquoi l'objective de cette thèse est l'évaluation du Standard SuRe® par l'analyse du Northern Collector Tunnel (NCT) Phase I projet d'eau au Kenya, qui est un pays en voie de développement. Le projet NCT Phase I est un des projets d'eau les plus grands au Kenya, ce qui le rend une bonne étude modèle afin d'évaluer l'expérience et les avantages de l'utilisation du Standard SuRe®.

Le cible de cette étude est la revue du coût d'application du Standard SuRe® mesuré en temps et argent. De plus, l'étude examine s'il y a des bénéfices de durabilité additionnels dont un projet certifié par SuRe® peut profiter comparés à l'accomplissement des exigences minimums comme ceux de l'analyse des effets environnementales et sociales (Environmental and Social Impact Assessment). Par ailleurs, la relevance du Standard SuRe® pour atteindre les Buts de Développement Durable (Sustainable Development Goals, SDGs) et examinée dans cette thèse.

Les résultats de cette étude montrent qu'il y a des avantages solides dont un projet peut profiter en employant le Standard SuRe® parce qu'il permet une approche holistique aux aspects de durabilité et résilience. En outre, les résultats pointent que le Standard SuRe® peut bien contribuer à l'obtention des SDGs et sert comme un outil pour prendre en compte les jalons atteints aux niveaux locaux et nationaux. Pourtant, le coût et les ressources associés avec la procédure du Standard SuRe® pourraient empêcher les développeurs de

projet de l'appliquer car il y a aussi des autres coûts obligatoires de licence comme ceux des procédures de l'analyse des effets environnementales (Environmental Impact Assessment).

En conclusion, les résultats de cette thèse offrent une compréhension plus profonde de l'analyse des projets d'infrastructure par des outils de mesure et des avantages de cette procédure pour un développeur de projet. Cela peut être utile comme point de référence pour les développeurs afin de décider d'appliquer un outil de mesure ou une approche conventionnelle.

Mots-clés : durabilité, résilience, outils de mesure, Buts de Développement Durable

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List of Abbreviations and Acronyms

AWSB	Athi Water Services Board
BREEAM	Building Research Establishment Environmental Assessment Method
CEN	European Committee for Standardization
COP21	Conference of Parties in Paris
CSD	Commission on Sustainable Development
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMS	Social Management Systems
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management Systems
GIIP	Good International Industry Practice
IPCC	Intergovernmental Panel on Climate Change
IPE	Independent Panel of Experts
ISEAL	International Social and Environmental Accreditation and Labeling Alliance
ISO	International Organization for Standardization
NCT Phase 1	Northern Collector Tunnel Phase I
NEMA	National Environment Management Authority
OECD	Organization for Economic Co-operation and Development
SDGs	Sustainable Development Goals
WEF	World Economic Forum

Chapter 1. INTRODUCTION

In September 2015, more than 150 states adopted the 2030 Development Agenda "Transforming our World: the 2030 Agenda for Sustainable Development" at the UN General Assembly (United Nations, 2017). The aim was to set clear timelines and targets for sustainable development that ensured social, environmental, economic and political inclusiveness, sustainability and development. Goal 6 was to ensure clean water and sanitation for all by the year 2030 with an acknowledgement from all parties that this could only be actualized through investment in adequate infrastructure and technologies, protecting and restoring water related ecosystems (United Nations, 2015). The attainment of this goal was further supported by goal 9 which recognizes financial and technological investment in infrastructure and innovation as playing a vital role in driving world economic development and promoting human well being, calling for the building of sustainable infrastructure that is resilient, reliable and environmentally sound (United Nations, 2015).

Globally, the demand for infrastructure is growing at a rate of 7% per year and this is attributed to population, economic growth and urbanization. However, the gap between demand and supply is widening rapidly. As a consequence, USD15-20 trillion is required for the next 15 years to close this gap (Amar Bhattacharya, 2016). According to the Organization for Economic Co-operation and Development (OECD) and the World Economic Forum (WEF), "investment in infrastructure projects in emerging and developing countries are estimated to account for the vast majority of the total incremental financing required to meet the Sustainable Development Goals."

For developing countries the challenge lies in investing in new infrastructure and putting non existing structures in place to promote economic growth and accommodate rapid population growth while developed countries have to invest in maintenance and modernization of existing infrastructure (WEF, 2014,). The total amount of money required towards the investment in infrastructure differs from one source to the other. However, WEF estimates that an investment of USD5trillion will require to be made (WEF, 2013, p. 4), while the United Nations Conference on Trade and Development (Unctad) gives a global estimate of between USD5 to 7trillion and an estimate of between USD3.3 and 4.5trillion for infrastructure development in developing countries if they are to meet the Sustainable Development Goals (SDGs) (Unctad, 2014, p. 140).

The general consensus on the need for sustainable and resilient infrastructure has led to the development of sustainable infrastructure assessment methods. Many of these assessment methods in the market today are voluntary techniques meant to promote the sustainability and resilience of different infrastructure projects. Though voluntary, the assessment methods are gaining popularity as governments, financiers and project developers seek to prove that their projects qualify to be called sustainable by addressing environmental, social and economic dimensions. According to the International Federation of Consulting Engineers (2012), these standards are seen as rating system for infrastructure and are developed by reputable governmental and non-governmental institutions, and sometimes with the input of the academia.

Among the many sustainability assessment methods there are those that evaluate infrastructure projects which include water supply systems, dams, energy supply, transportation, food systems, mining sites, communication networks, solid waste and social infrastructure among many others. The SuRe® Standard falls under this category and is consensus driven. This method of assessment is voluntary based and provides a label of third party certification to show a project conforms to the sustainability standards they have developed (Global Infrastructure Basel (GIB), 2017). The developers of these standards define the criteria that define the industry standard of sustainable infrastructure. The standard is founded on the Good International Industry Practice (GIIP) and a score is awarded where the infrastructure meets or exceeds the criterion set. According to International Finance Corporation (2012) GIIP includes exercising professional skill, diligence, prudence, and foresight that is expected from professionals that are experienced and engaged in the same undertakings at a global, regional or local level.

The biggest challenge for using SuRe® and other standards in the market is the need to balance between a comprehensive assessment of infrastructure and remaining practical enough to be applied in real time infrastructure (Ziabakhsh & Bolhari, 2012). This requires the simplification of sustainability issues, an approach that has faced criticism as promoting “fake greenery” (Yigitcanlar & Dur 2010). In addition sustainability is a complex issue that not only involves different stakeholders ranging from public sector, financial actors, project developers and local communities but one that also changes over time from one country to the other depending on their infrastructural needs. Even though controversial, these methods are accepted as playing an important role in driving the research for defining sustainability performance indicators used in the measurement of

sustainable infrastructure. Consequently, international bodies have been established to regulate and control the development of these standards. For example, the International Social and Environmental Accreditation and Labeling Alliance (ISEAL) works to strengthen sustainability standards systems for the benefit of people and the environment all over the world (ISEAL, 2017).

1.1 Problem Formulation

The concept of sustainable infrastructure has gained momentum since its origin in the Brundtland Report of 1987. There are different standards that have been developed to assess different infrastructure projects and they greatly vary in structure and approach (Egan, 2004). These standards target different stakeholders ranging from governments, project developers and financiers. The most recent of these standards is the SuRe® Standard launched into the market in 2015 for the purpose of promoting sustainable and resilient infrastructure in developed, emerging and developing economies (GIB, 2017). However, there are no studies that have been carried out yet to determine what benefits an infrastructure project obtains in terms of sustainability and resilience by using the standard compared to using a business-as-usual approach. Therefore this thesis aims to study the impact of using the SuRe® Standard on infrastructure projects.

1.2 Objective

The objectives of this thesis are:

- Review experience from SuRe® assessed project and additional sustainability benefits the assessment gives to projects compared to using normal standards
- Identify the costs and resources required for a SuRe® Standard assessment
- To preliminary assess the "sustainability relevance" of SuRe® Standard to achieve the Sustainable Development Goals (SDGs).

1.3 Delimitations

The SuRe® Standard assesses all types of infrastructure projects in developed, emerging and developing economies. This thesis however will only focus on the use of the SuRe® Standard rating tool within the water sector. This report will also be restricted to the analysis of only one case study and some generalization can be expected since the interviews have experience from other infrastructure projects as well.

1.4 Outline

The second chapter "Sustainable development" explains the concept of sustainability in general including its different spheres. The chapter also includes a discussion on sustainable assessment tools, which include rating tools and the need for global rating tools. The third chapter "SuRe® Standard rating tool" describes the tool, how it was developed and how it functions in its assessment of infrastructure projects.

The fourth chapter is on "Methodology" which provides a description of how the research was carried out and how the information was analysed. This will be followed by the fifth chapter "Northern Collector Tunnel Phase I water project" which provides a background of the Kenyan water status, the description of the case study together with the challenges that its development has faced.

Chapter six "Analysis from the SmartScan assessment" provides the results of the Northern Collector Tunnel Phase I water project after it is assessed through the SuRe® Standard SmartScan. The focus is on the "exceeding good performance" and the "bad practice", the benefits of using the SuRe® Standard SmartScan and finally comparing the SuRe® Standard to normal practice.

Chapter seven "SuRe® Standard and Sustainable Development Goals" looks at the relevance of the SuRe® Standard towards the attainment of the SDGs. This is followed by chapter 8 "Conclusion" before coming to an end with chapter 9, which is "Recommendations".

Chapter 2. SUSTAINABLE DEVELOPMENT

This chapter aims to explain the general concept of sustainable development and introduces sustainability assessment tools going a step further to explain why there is a need for a global rating tool.

Since its origin in the Brundtland Report of 1987, which described sustainable development as "*development that meets the needs of the present without compromising the ability of the future generations to meet their own"* the concept has witnessed a shift in meaning (WCED, 1987)? The report's main focus was on the development and environmental dimension but this has however changed as almost always sustainability is considered to cover the social, environment and economic dimensions (Morelli, 2011; Springett, 2009).

These dimensions are embodied in the United Nations Agenda for Development: "Development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development and environmental protection are interdependent and mutually reinforcing components of sustainable development (United Nations, 1997)." However, it is important to note that the concept of sustainable development is wide and can therefore not be limited to a single definition. Yet it offers an approach that is holistic and scientific even under different contexts (Waas, Huge, Verbruggen &Wright, 2011).

During the 1992 United Nations Conference on Environment and Development sustainability was endorsed as a development model through Agenda 21 with 27 sustainability principles marking its recognition in the global arena. The concept of sustainable infrastructure also embraces the three dimensions of social, economic and environmental sustainability. In this concept these dimensions are described as (Horvath & Matthews, 2004):

- Social sustainable infrastructure: is inclusive and adheres to human rights. It therefore meets the needs of the poor and marginalized in the community by increasing their access, contributing to poverty reduction and reducing climate change vulnerability. It also involves the inclusion and consultation of different stakeholders in the decision making process and in all the development stages of infrastructure projects (design, implementation and operation);

- Environmental sustainable infrastructure: refers to infrastructure that is resilient to climate change and is resource efficient and does not contribute to pollution of water or soil.
- Economic sustainable infrastructure: refers to infrastructure that offers an opportunity to communities to develop their capacity and does not burden the government with debt. Economic sustainable infrastructure also seeks to eliminate the possibility of the public including those living below the poverty line; minorities and indigenous communities from paying high tariffs associated with accessing infrastructure for example expensive water tariffs.

2.1 Systems Theory and Systems Thinking

Systems theory is an interdisciplinary theory about the systems in nature, in the society and in the scientific field with which we can investigate or view a phenomenon from a holistic approach (Capra, 1997). The systematic theory originates from Aristotle's claim that knowledge is from the understanding of the whole and not an isolated part (Bertalanffy, 2015; Laszlo, 2002). The theory argues that breaking a phenomenon into single parts does not offer the chance to fully comprehend it but instead a holistic approach offers a better perspective (Bertalanffy, 2015). Focusing on the interactions and relationship between different elements therefore helps in the understanding of a system or phenomenon way of functioning and the expected outcomes (Mele, Pels & Polese, 2010).

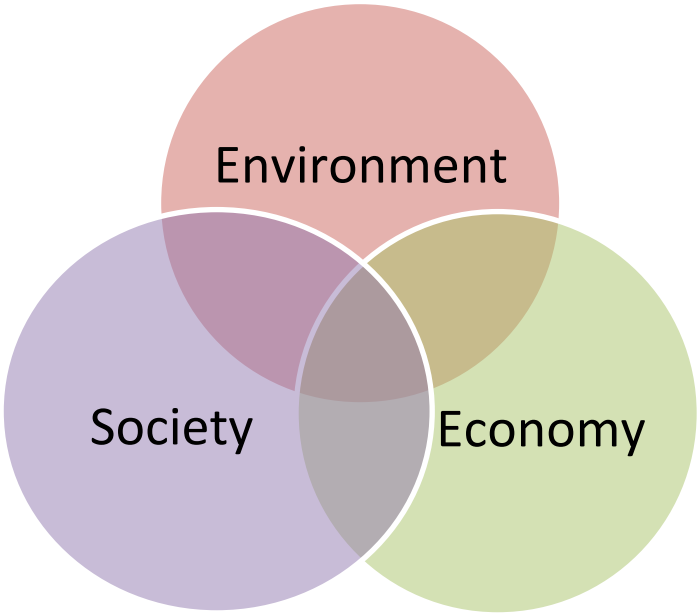

Figure 2.1 A holistic approach to sustainable development based on (Boucher, 2015).

If sustainability is to be achieved it requires practitioners and public institutions to have a system approach in developing appropriate actions and solutions. Systems thinking makes it extremely efficient to solve problems, for instance in addressing environmental conservation and issues of sustainability that depend on dependence on past and present actions of others (Baumgartner & Korhonen, 2010). Here the challenges between the environmental, social and economic interests are revealed and this can result to the implementation of long-term sustainable development actions (Mele et al., 2010; Porter & Córdoba, 2009). This approach also helps in identifying the understanding of different stakeholders' interests and expectations and how their conflicting interests can be resolved in order to achieve sustainable development.

2.2 The fourth sphere

A fourth sphere can be added to the three spheres of sustainability (economic, social and environment). This is because these spheres do not operate or relate to each other in a vacuum and therefore the need for governance and political organization (O'Connor, 2006). The government plays an important role in creating an enabling environment through policy formulation and implementation under different institutions that help in the interaction and relationships between and within the three spheres. This sphere has also been recognized by the United Nations as being an important pillar in the achievement of the sustainable development goals at the global, regional, national and local level

(Sustainable Development Solutions Network (SDSN), 2014). Since sustainable development is the sum action of all people, governance provides coordination and an avenue for stakeholder participation in decision-making, policy formulation and implementation.

2.3 Sustainability Assessment Tools

There exist many sustainability assessment techniques in the market today all developed by different decision makers for international, regional and local application. These techniques vary widely in their intention and approach and their field of application ranging from buildings, transport and infrastructure in general. A number of tools and frameworks have been developed to aid in the development of better sustainability assessment techniques for infrastructure projects including water. Sustainability assessment is seen as a solution to how sustainability implementation can be measured especially for products and processes (Finkbeiner et al., 2010; Shortall, Davidsdottir & Axelsson, 2015).

Numerous tools for sustainability assessment have been developed to help policy and decision makers decide which actions should be taken towards achieving a more sustainable society (Shortall, Davidsdottir &Axelsson, 2015). The need for sustainability indicators which act as assessment tools is stated in Agenda 21: "*indicators of sustainable development need to be developed to provide solid bases for decision-making at all levels and to contribute to a self-regulating sustainability of integrated environment and development systems.*" (Agenda 21, Chapter 40). The indicators should therefore be holistic and include all the dimensions of sustainability and be flexible to time and context (Dimitri Devuyst, 2001). This is because infrastructure projects have significant impacts on sustainability and each project could require the development of a framework that is suited for its development (Shortall, Davidsdottir & Axelsson, 2015).

Hacking and Guthrie (2008), consider sustainability assessment as a term that includes indicator development, product related assessments and integrated assessments such as impact assessments. However, another school of thought supported by Bond *et al.* (2011), consider sustainability assessment to fall under impact assessment, which is widely known and used for example, environmental impact assessment, strategic environmental assessment and risk assessment. Such differences on how sustainability assessment is viewed can be attributed to the diverse fields involved in sustainability assessment.

This thesis is detailed on the SuRe® Standard assessment tool which is a commercially available technique and functions on voluntary based use. A third party, who is responsible for the issuing of the label, does the certification of projects assessed under this standard. This infrastructure rating system is employed as a technique that supports the decision making process at different project phases including planning, design, construction, decommissioning and operation.

2.4 Background to Rating Tools

The use of rating tools in the assessment of sustainable and resilient infrastructure is a recent development and one that is only starting to gain momentum (Mehdizadeh & Fischer, 2012). The development of rating tools goes back to the 1900s with the launch of the Building Research Establishment Environmental Assessment Method (BREEAM), which was established for the assessment, rating, and certification of sustainable buildings (Awadh, 2017; Berardi, 2013). Over time, other tools like Leadership in Energy and Environmental Design (LEED), Green Star Australia and New Zealand were established in 2002, in 2003 and 2007 respectively.

All these rating tools focused on the sustainability assessment of buildings and over time it became clear that there was a need to develop rating tools that assessed horizontal infrastructure (Mehdizadeh & Fischer, 2012; Andreas et al., 2010). This led to research in developing the right indicators, frameworks and approaches that would make these tools applicable and easy to use. Dasgupta and Tam for example, developed a multi-criteria decision support tool to help different stakeholders find the most sustainable solutions to the infrastructure challenges they faced (Dasgupta & Tam, 2005). Their argument was that horizontal infrastructure presented its own unique social and environmental challenges compared to buildings. Ugwu, Kumaraswamy, Wong & Ng (2006) raised an important question on the ability of project developers and owners to use sustainability rating tools, recommending that capacity development in this field was imperative.

Research also contributed greatly in the development of frameworks for rating tools. The work of researchers such as Andreas et al. (2010) was used in the development of the Envision tool in 2012 which addressed important social issues such as quality of life, health and safety, local skills and capacity, leadership among many others. Continuous studies led to the development of a framework assessing sustainability and resilience performance of oil sands projects by Poveda and Lipsett (2011). Their work highlighted

the importance of stakeholder identification and engagement during the process of indicator selection in the development of rating tools. Further work saw some researchers concentrate in developing sustainable assessment tools for transport systems (Jawad, 2013) and as a result, Greenroads tools were developed in 2011 by researchers from the University of Washington establishing the concept of third party assessment and certification (Anderson & Muench, 2013).

There is a building consensus between different researchers and stakeholders that any existing tools or those under development need to be practical enough to meet the needs of the market and flexible to adapt to the changing needs and demands in the market (Awadh, 2017). There is therefore need for identification of the interconnectedness of infrastructure and the implications of its development on the social, economic and environmental spheres.

The advancement in research has seen the emergence of more rating tools in the market including CEEQUAL, Envision and the SuRe® Standard. These rating tools are used in the measurement of sustainable and resilient infrastructure projects based on their environmental, social and economic performance. CEEQUAL was launched in the United Kingdom in 2003 while Envison was launched in 2012 in the USA and the SuRe® Standard was launched in 2015 during the Conference of Parties (COP21) in Paris,France. This study focuses on the most recent assessment tool in the market, the SuRe® Standard and evaluates how its use gives additional benefits to infrastructure projects compared to using normal standards.

2.5 Global Rating Tools

As already discussed, the important role of sustainable development in achieving economic, social and environmental balance has been disputed since the Bruntland Report (WCED, 1987) and has only now gained momentum due to emerging scientific and economic findings. These findings have proven that a “business as usual” approach towards development in relation to resource use, greenhouse gas emissions, pollution will eventually lead to a global economic and environmental crisis. In addition, the Intergovernmental Panel on Climate Change (IPCC) prediction on the impacts of climate change on infrastructure has contributed to the urgent need of adopting sustainability within the built environment in order to increase their resilience.

As a result, many scientists and professionals have come to an agreement on the need to take action and mitigate climate change through the adoption of sustainable and resilient practices (Reed & Wilkinson, 2008). The importance of sustainable and resilient environment for the built environment has since then become a hot topic of discussion among international taskforces (Egan, 2004; Dixon et al., 2008) and the need to put sustainability as the heart of all economic, social and environmental activities.

Studies show that there is an increased effort by the public sector and project developers to make a "business case" for sustainable development infrastructure in order to be able to attract financiers (Upstream, 2003; Sayce, Ellison, & Smith, 2004). These studies have also shown that the inclusion of sustainability in development lowers the financial risks for the infrastructure and therefore a business model created around it attracts lower interest rates from financiers. Globally, there is an increased demand for improved risk management and better governance from the public sector, project developers and financiers in order to deal with economic and environmental risks in the infrastructure industry.

Currently, there is no consistent method for describing and assessing sustainable infrastructure even though there is increased effort in the market to define a standardized requirement for the assessment of sustainability in infrastructure. Globally, the International Organization for Standardization (ISO) and the European Committee for Standardization (CEN) have been active in defining the requirements for standardizing sustainability in infrastructure development. These organizations address sustainability by putting into consideration the three pillars: environment, social and economic dimensions.

However, sustainability assessment is not only shaped by these international drivers but also by international, regional and national frameworks, academia, project owners, financiers, nongovernmental organizations and other affected actors (Awadh, 2017). This means that each group of stakeholder has its own concepts and definitions of what sustainable infrastructure development should include. The question also remains on the applicability of these standards in emerging and developing countries where there is an urgent need for an effective sustainable development framework so that environmental, social and economic dimension is given the same considerations (Horvath & Matthews, 2004).

According to a report published by BRE (2016), there are more than 600 tools available in the market today for the evaluation of social, environmental and economic aspects of sustainability. These evaluation tools can be used to assess the lifecycle of an infrastructure

project, use and management of natural resources, energy efficiency, human rights, and labour rights through the project phases (design, construction, decommissioning and operation). Envision is one of the commonly used tools in the American market and is equivalent to SuRe® Standard and CEEQUAL which are used and designed for the global market. These assessment tools cover issues relating to global and internal environments and can be used in the assessment of existing or new infrastructure projects.

These tools and many others in the market have been developed to check if the development of an infrastructure project is sustainable and whether the capacity to ensure sustainable development and use of infrastructure throughout its lifecycle exists. These tools utilize a set of indicators that are used to set the parameters that can be measured to show the current condition of a project (Yigitcanlar & Dur, 2010). In a nutshell sustainability indicators help us to determine where we are, where we are going and how far we are from where we want to be as far as sustainability is concerned (Zavrl & Zeren, 2010).

These indicators are used in the assessment tools to pin point the weak links between the dimensions of sustainability in order to be able to implement corrective measures. In 1995, the Commission on Sustainable Development (CSD) approved its working program on indicators of sustainable development and as a result the first two sets of CSD indicators of sustainable development were developed between 1994 and 2001 (United Nations, 2007). These indicators among many others developed by the World Bank and OECD have been incorporated within the assessment tools in order to broaden their field and impact.

These indicators vary in scope, content, measurement method of sustainability and in the presentation and interpretation of the results (Zavrl & Zeren, 2010). However the challenge, especially for developing countries has been in deciding which assessment tool includes the set of indicators that suits their scenarios and needs based on the finances available and the human capacity. Yigitcanlar and Dur (2010) argue that ideal sustainability indicators should cover all the dimensions of sustainability but remain practical enough such that the parameters are quantifiable making the assessment possible. The bottom line however is that any indicators used for sustainability assessment tools should be guided by the principles of sustainable development (Waas et al., 2011).

There are many advantages attributed towards the use of assessment tools and their ease of use. For example, the SuRe® Standard has a quick tool referred to as the SmartScan which projects can use to carry out a preliminary assessment of their project and determine

whether a full assessment is necessary or not. The SmartScan requires a day or two in the assessment of a project before generating a report (GIB, 2017). The biggest role played by sustainable assessment tools is in contributing to capacity development and raising the awareness of different stakeholders in the infrastructure industry on environmental, social and governance issues. It also encourages the public sector, project developers and financiers to comply with Good International Industrial Practice (GIIP) and stimulate the market for sustainable infrastructure development. The fact that these tools set criteria that go beyond national requirements and regulations sets a higher mark and expectations for projects and in how they are delivered. On a project level, assessment tools improve the management of the infrastructure throughout its life cycle.

Despite the advantages associated with the use of sustainable development tools there has been criticism from different fields on their shortcomings (Ziabakhsh & Bolhari, 2012). For example Envison is a broad based rating system that can be used for any infrastructure project but it is only applicable for pre-design and design phases of the project and its complexity does not allow it to be used for smaller projects (Vargas &Thornton, 2013). The biggest challenge associated with sustainable assessment tools such as Envision, CEEQUAL and the SuRe® Standard is the fact that they are voluntary based and projects are under no legal obligation to use them.

Overall, these tools seek to continuously increase their relevance and applicability and as such are under continuous development and assessment (GIB, 2017; Envision, 2017). In summary, all evidence points towards the acceptance of sustainable development agenda among different stakeholders in developed and developing countries, which may mean an increased use of assessment tools even though they are voluntary, based.

2.6 Output and Mechanisms of Assessment Tools

As discussed above, assessment tools operate on voluntary basis and developers are under no legal obligation to use them. For organizations that however choose to use them, the assessment result is a certificate showing compliance, label or rating. These assessment outputs are what differentiate assessment tools from other sustainability techniques and give an overall picture of how an infrastructure project is performing with regards to sustainability and resilience to different stakeholders. Stakeholders can use these outputs as a clear indication of their commitment towards sustainable infrastructure development. They therefore reflect how an organization or government has been able to connect the

demand for environmental conservation and social responsibility in the decision making process (Banerjee & Solomon, 2003).

Project owners can use certification as a communication tool for making the efforts put to achieve sustainability tangible. Together with labels they can be used to make a business case for sustainable infrastructure to different stakeholders including financiers, investors, government regulators and insurance companies. According to the World Business Council for Sustainable Development (2002) this could mean that project owners are able to access easy credit with lower interest rates, lower insurance premiums and exemption from certain types of government taxes.

The assessment process involves different types of stakeholders and they must all be able to understand the assumptions and data requirements that influence the outcome of the assessment and therefore, rating of different infrastructure projects.

2.6.1 Certification

International Organization for Standardization (ISO) 1400 family of standards provides tools for different stakeholders for environmental management (ISO, 2017). The environmental management system under ISO 9001 forms the basis for certification. It is here that the definition of "Third Party Assessment" can be found as it guides the way to a project being certified. ISO 14024 defines certification in relation to the products and as a process in which a third party provides a written assurance that a good or service is in line with specified requirements.

In other words, third party can be defined as the assessment conformity activity that is carried out by a body that is independent of the organization that provides the assessment tool and is not the user of the tool (Clark, 2011). For the certificate to be issued, a set of requirements has to be fulfilled. The major benefit of certification of an infrastructure project is that it enhances its credibility and can be used as a way of attracting financiers and promoting social acceptability.

2.6.2 Labeling

Labeling consists of the displaying of a written or graphic mark on a product. Globally, there are 432 labeling schemes with the most popular including Fair Trade, Rainforest Alliance and various carbon index schemes (Grunert, Hieke & Wills, 2014). These labels

can only be used if a product conforms to their stipulated requirements, which in this case are conforming to sustainable standards. The labels are associated with trust and transparency and increase the value of the product under consideration (Liu, Yan & Zhou, 2017). It can therefore be also used to promote social acceptability of a product with those that hold the label being considered above average and above similar products that do not possess the label.

2.6.3 Rating

Rating can be traced back to financial management industry especially under credit rating and investment funds (Crawley & Aho, 1999). This method though not unique to the financial industry is different to labeling and certification that is issued based on what has been achieved in comparison to a set of requirements. Rating systems however, provides information on how a product is doing in relation to other related products. For example the overall result for SuRe® Standard is bronze, silver or gold (GIB, 2017).

2.7 Summary

Sustainability tools can be sometimes complex and involve the incorporation of different decision support tools such as cost-benefit analysis, multi-criteria decision analysis and calculators which include indicators such as OECD pressure-state-response framework, world development indicators by the World Bank and sustainable development goals indicators by the United Nations (OECD, 2003; World Bank 2107; United Nations, 2007). The output of these tools is a certificate, label or rating, which gives the affected stakeholders information about the sustainability level of the infrastructure project.

Chapter 3. SuRe® STANDARD RATING TOOL

This chapter discusses the SuRe® Standard, the sustainable and resilient infrastructure rating tool that is being evaluated in this thesis. The first thing to be addressed will be the development and the foundation of the standard followed by the reasons why project developers should use this standard and the benefits derived from it. There will also be a description of the questions set for the assessment of infrastructure projects and finally a review of the assessment process and the resources that are required.

3.1 Development of the SuRe® Standard

The SuRe® Standard for sustainable development is a voluntary global tool used in the assessment of new and existing infrastructure projects developed by the Global Infrastructure Basel (GIB), a not for profit Swiss foundation. The standard was launched in 2015 during the Conference of the Parties (COP21) in Paris (GIB, 2017). The standard was developed through the collaboration and support of environmental, social and governance experts from the public, financial and private sector. The standard development was also carried out through the engagement of other sustainability rating tools such as Equitable Origin and Envision infrastructure rating scheme. In addition the standard was based on internationally recognized treaties, protocols and conventions such as the Sustainability Development Goals, International Labour Organization Standards, UNFCCC Framework Convention on Climate Change, Transparency International Business Principles for Countering Bribery and Sendai Framework for Disaster Risk Reduction among many others (GIB Guide to SuRe®, 2015, p. 8).

Since its launch in 2015, the standard has been used in the assessment of over 200 infrastructure projects through its rapid assessment tool, the SmartScan, in developed and developing countries. Currently, version 0.3 of the standard is under review for an upgrade with an expected launch date in November 2017 during the Conference of the Parties (COP23) in Bonn, Germany (GIB, 2017). The standard is constantly under review and development so that it can be in line with the requirements of ISEAL (GIB, 2017). The standard encourages the attainment of environmental, social and governance excellence in infrastructure project through its life cycle (SuRe® Handbook, 2015).

The standard is based on three dimensions of sustainability – social, environmental and governance – and indirectly addresses economic issues as well. The standard includes 14

themes, which cover 63 criteria seeking to establish a common understanding of sustainability and resilient issues between the public sector, financial actors and project developers (GIB & Natixis, 2016). The SuRe® Standard builds on existing global international industry practice with the requirement that the projects fulfill the local laws and regulations within its boundaries of operation.

Table 3.1 Overview of SuRe® dimensions and themes

3 Dimensions	14 Themes	63 Criteria	+ 2	
ENVIRONMENT	Climate	19	Materiality Assessment	Reporting & Impact Assessment
	Biodiversity and Ecosystems			
	Environmental Protection			
	Natural Resources			
	Land Use and Landscape			
SOCIETY	Human Rights	25		
	Labour Rights and Working Conditions			
	Customer Focus and Inclusiveness			
	Community Impacts			
	Socioeconomic Development			
GOVERNANCE	Management and Oversight - Financial Sustainability	19		
	Sustainability and Resilience Management			
	Stakeholder Engagement			
	Transparency and Accountability			

Source: (GIB & Natixis, 2016)

3.2 SuRe® Standard Definition of Sustainability

The SuRe® Standard's goal is to promote sustainable and resilient infrastructure which is anchored in the guidelines found in Agenda 21. Sustainability in the SuRe® Standard is interpreted as "a set of environmental, economic and social conditions in which all of society has the capacity and opportunity to maintain and improve its quality of life indefinitely without degrading the quality, quantity or the availability of natural resources and ecosystems (GIB & Natixis, 2016)". This definition dictates the content and compliance requirements for the 63 criteria found in the SuRe® Standard.

3.3 Why Use the SuRe® Standard

SuRe® compliments any legislative requirements a project is expected to fulfill within its boundaries for environmental and social compliance. The aim of the standard is to integrate sustainability and resilience into infrastructure development through initiating dialogue between different project stakeholders and providing guidance on how to manage

risks and harness the benefits of a project. According to the Guide to SuRe® (2015) the objectives of the standard are:

- Establish a common language and understanding of sustainable and resilient infrastructure projects between project developers, financiers, local authorities and end-users
- Provide guidance on how to manage sustainability and resilience aspects of an infrastructure project, both from a risk management and a benefit creation perspective and starting as early as possible in the life cycle of the project.

3.3.1 Benefits of using the SuRe® Standard

SuRe® target groups are project developers, financial actors and the public sector institutions. The standard therefore seeks to assist these actors through all project phases to make decisions, optimize resource use and to get value for their money by managing the risks associated with infrastructure projects. The reported benefits of using the SuRe® Standard include (GIB Guide to Sure®, 2105, p.9-10):

- It provides a tool for financiers to identify sustainable and resilient infrastructure investment opportunities through consideration of environmental, social and governance issues hence reducing costs and risks.
- It helps the public sector in allocation and efficient use of limited public resources and promotes transparency and accountability during the project procurement process.
- It is a self assessment tool for project developers to check how environmental, social and governance issues are addressed through the project cycle and guide the decisions that are made when relating to employees, suppliers and local communities among other stakeholders.

3.4 SuRe® Standard Assessment and Certification

The assessment of infrastructure projects using the SuRe® Standard is done against 14 themes consisting of 63 criteria 21of which are referred to as the red criteria (to be explained in Section 2.5 below). The standard is comprised of performance criteria (PC), which are result oriented, and management criteria (MC), which are commitment oriented. The PC's are assessed using 3 different performance levels (PL) with the minimum compliance rated as PL1 and the highest as PL3. If a project does not meet PL1 the score is

put at zero, while scoring the minimum level PL1 earns one point. On the other hand PL2 carries 2 points and the maximum points of 3 are awarded under PL3 (SuRe® Handbook, 2015, p. 15). However, MC's have only one performance level, which is considered as the minimum compliance level.

Table 3.2 Different levels of performance criteria

PERFORMANCE LEVEL	PL 1: "COMMENDED"	PL 2: "EXCEEDING"	PL 3: "LEADING"
DEFINITION, PERFORMANCE REQUIREMENTS	The performance requirements of this level are defined in a way to constitute a minimum baseline of sustainable and resilient practice.	The performance requirements of this level significantly exceed minimum sustainability requirements (e.g. by implementing innovative solutions or expanding the project owner's responsibility).	The performance requirements of this level constitute leading practice. Projects reaching this level are industry leaders and innovators in this area.

Source: SuRe® Handbook (2015)

Project owners can carry out a self assessment by using the SuRe® Standard tool SmartScan but assessment for certification is done by an independent auditor and the verification done by a third party appointed by GIB. The certification of projects is done globally and it can be carried out on a broad number of infrastructure projects that include water, energy, solid waste, transportation, communication, food systems, social infrastructure and mining projects (GIB Guide to SuRe®, 2015, p.5). Depending on the performance of a project after a successful assessment and scoring there are three levels of certification which include: SuRe® Bronze, SuRe® Silver and SuRe® Gold. The scoring of projects is done through using the performance level.

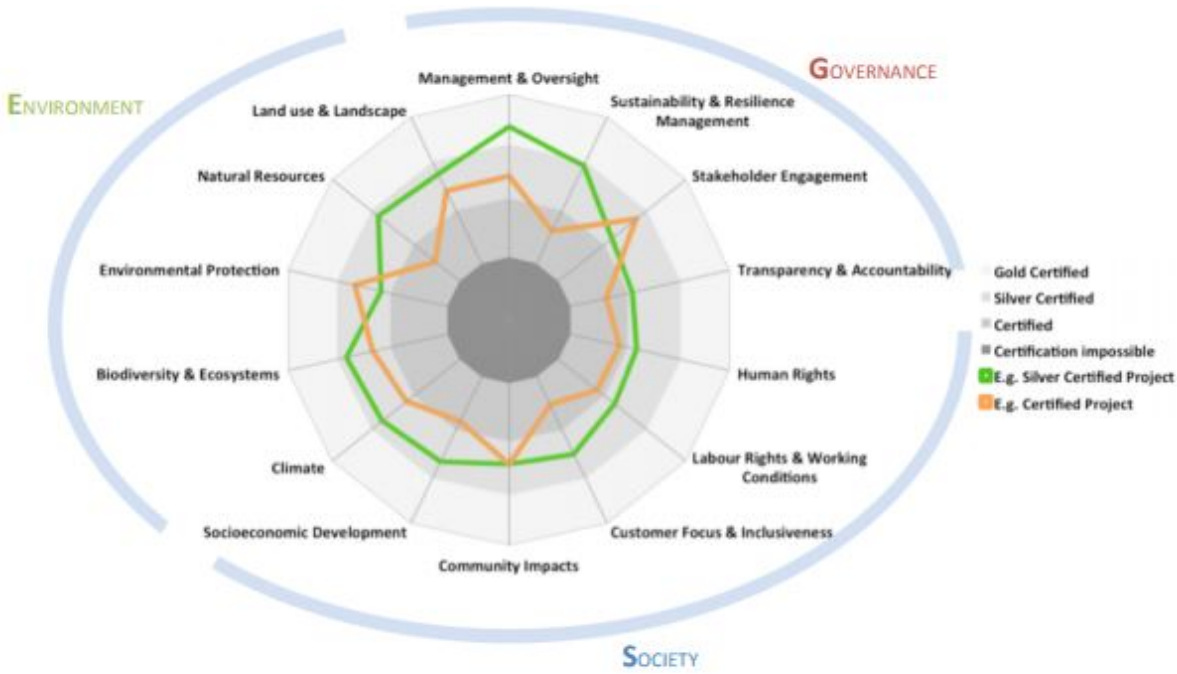

Figure 3.2 An overview of the SuRe® certification approach (GIB Guide to SuRe®, 2015)

3.5 Red criteria

The red criteria simply refer to the criteria in the SuRe® Standard that must be met by all projects regardless of size or location. Consequently, a project must meet the minimum requirement (PL1) for a project to be considered for certification (GIB Guide to SuRe®, 2015, p. 12-13). The red criteria are distributed across the three SuRe® dimensions where governance has six, social has 7 and environment has 8. The red criteria are summarized in Table 3.3 below;

Table 3.3 Overview of the SuRe® Standard red criteria

Red Criteria
Governance
Legal Compliance and Oversight
Environmental and Socio Management System (s)
Stakeholder Identification and Engagement Planning
Public Grievance Redress Mechanism
Anti-Bribery Management System
Financial Transparency on Taxes and Donations
Social
Human Rights Commitment
Human Rights Complaints and Violations
Non-discrimination
Forced Labour and Child Labour
Minorities and Indigenous People
Resettlement
Public Health and Safety
Environment
Greenhouse Gas Emissions
Climate Resilience and Infrastructure Adaptability
Biodiversity and Ecosystem Management
Habitat and Ecosystem Conservations
Forest Restoration and Conservation
Pollution
Resource Efficiency
Preservation of Water resources

Source:(GIB & Natixis, 2016)

3.6 SuRe® Standard Full Assessment

There are two types of assessment under the SuRe® Standard, self-assessment that is a quick assessment done by a member of the project and the full assessment, which is carried out by a certified auditor. The full assessment is approximated to take between one to two months inclusive of auditing, reporting, and the issuance of the SuRe® certificate. According to the SuRe® Standard it is best to do the assessment from the design phase of the project in order to incorporate sustainability and resilience measures through the project cycle. The steps to getting certified according to Your Guide to Certification under SuRe® (2017) include:

- Registration: This is where the project owner registers the project for SuRe® certification providing the project information.
- Gap analysis: The certification body conducts a preliminary review and assessment of the project documents to determine the performance of the project and develop a road map and timeline for certification. Here, corrective actions can also be recommended based on the preliminary assessment results.
- Independent audit: After the review of the submitted documents the certifying body makes a site visit where applicable and gathers more information which helps in the generation of a draft report showing the performance of the project against the standard. The auditor also identifies the relevant stakeholders who play a vital role in the certification process.
- Public review and draft reporting: This gives an opportunity to the identified stakeholders and general public to comment on the generated draft report and raise any issues and concerns relating to the project and the report. Private data such as financial data is not disclosed to the public and client confidentiality is maintained.
- Final report and determination: After integrating all the submitted comments a final report is generated detailing the final recommendation of the certifying body. This report is submitted to the SuRe® Secretariat, which determines whether the project qualifies for certification, or not.
- Certification: On the event that the SuRe® Secretariat approves the assessment report the project becomes SuRe® certified. The certification body is then required to publish a public certification report including the

action plans required for improvement in the performance of the project. The certification of a project also means that the project owner can start using the SuRe® label and promoting their certification status.

The certification status of a project lasts for 5 years during which time the project is required to implement the recommended corrective actions and receive surveillance audits. The audits are meant to ensure that the project continues to adhere to the requirements of the SuRe® Standard. The expiry of the SuRe® certificate requires a project to apply for re-certification in order to continue using the SuRe® label.

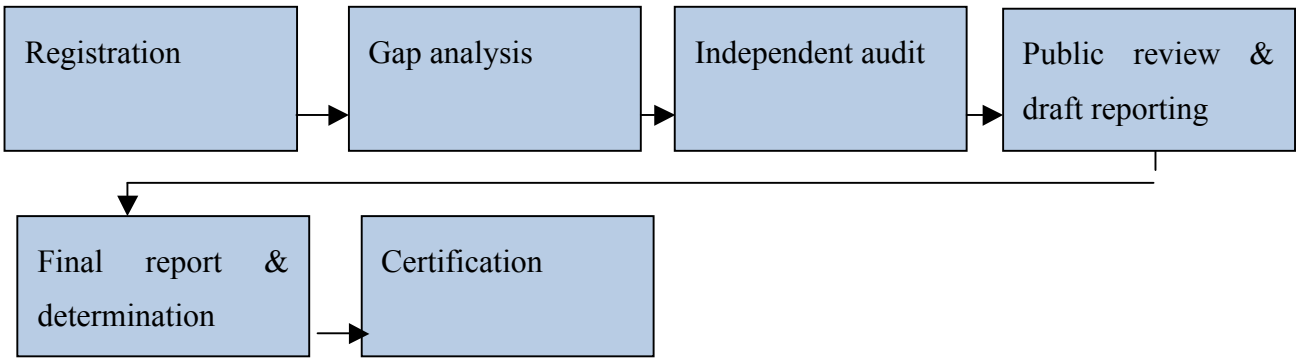

Figure 3.3 The assessment and certification process for SuRe® Standard based on "Your Guide to Certification under SuRe®, 2016"

3.6.1 Cost and time for SuRe® full assessment

The cost of the assessment and certification process is dependent on the size, complexity, and stage of development and availability of information relating to the infrastructure project in question. The project auditors are charged with the responsibility of setting the assessment and certification price. However, GIB provides a guide that approximates the cost of the process depending with the CAPEX of the project. The minimum fee is USD30, 000 for projects with a CAPEX between USD10 to 50 million during the design stage and USD40, 000 during the built stage. The highest fee is charged to projects with a CAPEX higher than USD100 million, which are approximated at USD50, 000 at the design stage and USD60, 000 at the built stage (FAQ, 2017).

On the other hand the time it takes to carry out the certification process is approximated as between one to two months but is largely dependent on the type of project, auditor's level of experience, and the level of support the assessor receives from the project team in terms of availability and access to project information and data.

3.7 SuRe®SmartScan

The SuRe® SmartScan is a rapid assessment-rating tool under the SuRe® Standard used to assess the sustainability and resilience of infrastructure projects. The project owner carries out the assessment while the results are assessed by GIB experts and feedback on the project performance on environmental, social and governance issues is provided for corrective action (SuRe® Handbook, 2015, p. 14). It is therefore a tool that can be used by projects to identify risks and financing opportunities for their projects.

The SmartScan relies on the SuRe® Standard definition of sustainability and resilience to assess whether an infrastructure project is exceeding, neutral or requires corrective action compared to international best environmental, social and governance practice (SmartScan, 2017).

3.7.1 SmartScan question set

The SmartScan is laid out in 3 sections (governance, social, and environment) with a total number of 75 questions as demonstrated in Figure 3.4.Each question weight is embedded in the scores awarded to each of the questions. The weightings are based on the consultation between the SuRe® Secretariat, SuRe® Standard Committee and Stakeholder Council and experts from different fields. Each of the 3 sections (governance, social, and environment) is explained below with a question from the SmartScan to show what is under assessment.

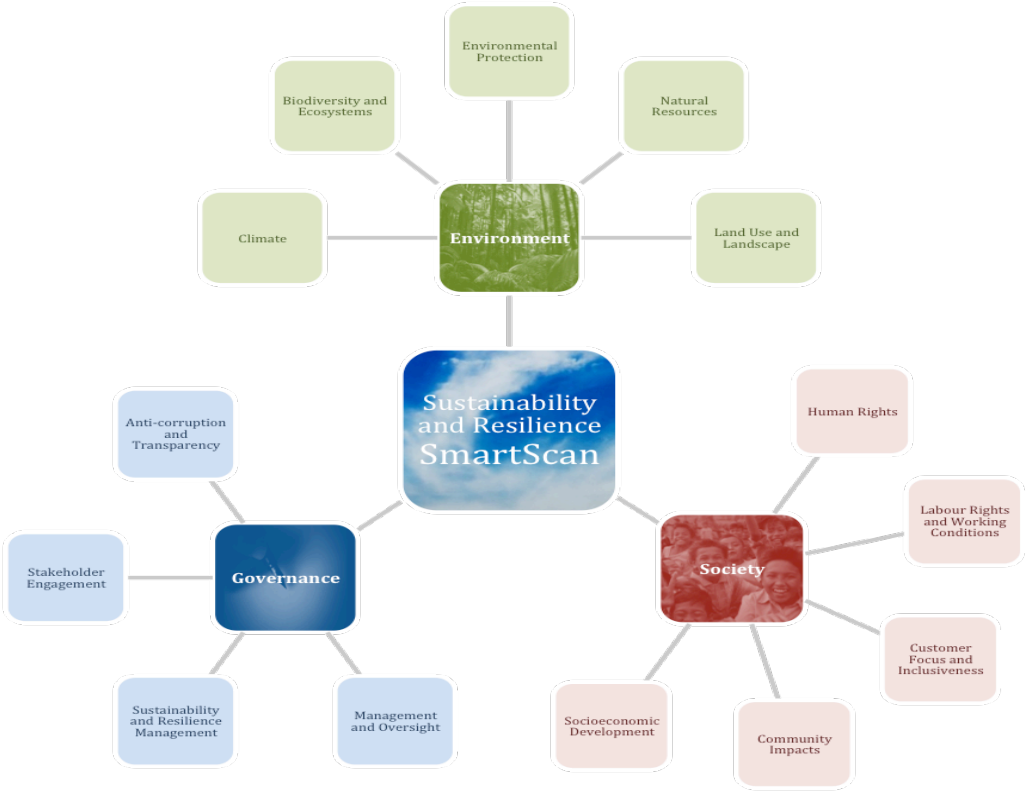

Figure 3.4 Overview of the SuRe® SmartScan question set derived from the SmartScan (2017)

3.7.2 Governance

Governance considers how the project is run and managed including identification and involvement of different stakeholders. It puts an emphasis on the fact that sustainability and resilience needs to be embedded at the core of infrastructure projects. Therefore, clear systems to achieve these sets of objectives and targets need to be established at the project level. The questions in this section are divided into 4 subsections, which include: sustainability and resilience management, stakeholder engagement, management and oversight, anti-corruption and transparency (GIB Guide to SuRe, 2015).

Sustainability and resilience management subsection seeks to establish whether the project has carried out a comprehensive environmental impact assessment and social impact assessment and established an environmental and social management system. Here, a life cycle approach is emphasized in order to ensure sustainable and resilient practices such as emergency preparedness, and adherence to sustainable supply chain systems throughout the life cycle of the infrastructure project. For example the project is expected to demonstrate how in its planning for future climate change impacts it has incorporated the

Intergovernmental Panel on Climate Change (IPCC) climate change scenarios into the designs of the project (SmartScan, 2017).

Stakeholder engagement requires the project owner to recognize that for a project to be successful different stakeholders need to be identified and involved from the planning phase of the project. It therefore calls for the involvement and participation of stakeholders and affected communities including indigenous communities in identifying project impacts and implementing the mitigation measures. In addition, the project owner is required to establish a grievance mechanism, which shows the complaints and resolution procedure (SmartScan, 2017).

On the other hand management and oversight puts an emphasis on the organizational structure and management, requiring the project to have a clear separation of roles and duties, which are matched correctly to the staffs' skills and qualifications (SuRe® Handbook, 2015). It also makes clear that compliance with the SuRe® Standard requires the project to comply with the relevant local and international laws and regulations. As part of promoting sustainability, projects are required to demonstrate how their development is contributing to infrastructure interconnectivity through questions like "*what degree of systems thinking has gone into the design and operation of the project to ensure infrastructure interconnectivity and identifying sociotechnical challenges and opportunities now and in the future?"*(SmartScan, 2017). Other aspects covered under this theme include determining the financial viability of the project, making the project's social and environmental policies public and demonstrating how the project owner identifies and manages environmental, social and economic risks.

The last theme on the governance section is anti-corruption and transparency. The project owner is required to show how he is promoting accountability throughout the project cycle from the planning to operational stage (SuRe® Handbook, 2015). This includes developing an anti-bribery management system, disclosing financial donations publicly defining the terms of engagement for any project staff members considered to be politically exposed. In addition, the project owner is required to refrain from the engagement of corrupt activities during the procurement process with contractors and suppliers (SmartScan, 2017).

3.7.3 Society

This section of the SmartScan assesses how an infrastructure project is creating long-term benefits for the socioeconomic development and improving the quality of life of the local

communities. This section has 5 themes that include human rights, labour rights and working conditions, customer focus and inclusiveness, community impacts and socioeconomic development (GIB Guide to SuRe, 2015).

A focus on human rights seeks to establish if the project owner is committed and operating according to the requirements set out in the Universal Declaration on Human Rights (UDHR, 1948). The project owner is expected to demonstrate how the violations of human rights are addressed by establishing a complaints procedure that protects the victims and for accountability reasons he is also expected to disclose any past human right violations. Additionally, the project operation should promote gender equality in relation to the staff and the end user of the infrastructure project (SmartScan, 2017).

The project owner is expected to recognize and respect the labour rights of the project staff throughout the life cycle of the project, which include fair wages, right to collective bargaining, retrenchment and promotion of a safe working environment. In addition to this the established employment policy is required to promote gender equality and prohibit any discrimination based on gender, race or religion (SmartScan, 2017).

Customer rights and inclusiveness includes the end infrastructure to meet the needs of the society without any discrimination. The project owner and developer are required to make sure that the infrastructure project is physically accessible to all including people living with disabilities and develop a complaint procedure mechanism in order to be able to continuously improve on their service delivery (SmartScan, 2017). For example the project is supposed to show how it reacts to complaints in order to maintain adequacy of infrastructure and improvement of services. Under this theme, the infrastructure project is required to meet the basic services such as access to water and energy at an affordable rate (GIB Guide to SuRe, 2015).

The community impact of the project should be to the development and benefit of the project area including indigenous people and historically disadvantaged groups. Where negative impacts cannot be avoided, the project owner is expected to develop mitigation measures that promote negative impacts minimization, restoration and compensation (SmartScan, 2017). Under this section the project should in the planning stage develop a resettlement action plan for the project displaced persons and develop a guideline on how to protect the cultural heritage and safety of the surrounding communities.

On the socio-economic development the project is expected to contribute to long-term socio-economic development and improve the quality of life of the surrounding communities. To this effect the project is required to show if they have carried out a poverty assessment of relevant measures such as project tariffs and subsidies. This can be demonstrated through showing the evidence of the number of local staff that have been trained and hired and how the project aligns itself with the national or international development goals such as the Sustainable Development Goals (GIB Guide to SuRe, 2015).

3.7.4 Environment

One of the requirements of the SuRe® Standard is that the project should be designed and operated in a way that protects and promotes the conservation of the environment. This section is divided into 5 themes and determines the impacts of an infrastructure project on climate, biodiversity and ecosystems, environmental protection, natural resources and land use and landscape (GIB Guide to SuRe®, 2015).

The SuRe® Standard recognizes that infrastructure projects are not developed or operated in a vacuum but rather affect the different aspects of their surrounding environment (SuRe® Handbook, 2015). One of the biggest challenges of our times is climate change and projects are expected to contribute towards the efforts of reducing the greenhouse gases through carrying out regular assessment of their emissions and aligning their efforts with the national emission reduction targets. Furthermore, the project designs should be able to withstand future risks and hazards caused by the impacts of climate change. To promote energy efficiency a project is expected to perform energy audits and invest in renewable energy as part of reducing reliance on fossil fuels (SuRe® Handbook, 2015).

To protect the biodiversity and the ecosystems projects are required to carry out high conservation values assessment approach and develop restoration measures where negative impacts cannot be avoided for example if a project cannot achieve “zero net loss” of forest the project owner is required to carry out reforestation efforts through the project cycle of the project (SuRe® Handbook, 2015). This section also requires the project owner to work together with the local communities and local authorities in protecting the natural habitat and monitor the introduction of alien species into the project area (SmartScan, 2017).

Environmental protection on the other hand assesses how a project owner manages the waste produced during the life cycle of the project. Pollution prevention measures relating

to noise, light, and vibration are determined during the construction and operation phases of the project (SuRe® Handbook, 2015). The project owner is therefore required to employ preventive principles and measures in order to minimize the effects on human well-being and the environment. On the other hand the theme on natural resources requires projects to show how they have been able to promote resource efficiency in the consumption of energy, water and how they have been able to sustainably source raw materials. This section also covers how the project is able to use, re-use and recycle materials and explore by product synergies during the different phases in order to reduce the amount of waste generated (SmartScan, 2017).

Land is scarce and the section on land use and landscape assesses how the land is used and encourages project owners to utilize grey field instead of green field land. This section also assesses how the project owner has been able to manage the risks posed due to a project's location such as flooding, erosion and landslides. The project owner is also expected to conserve the surrounding project landscapes and incase of loss of natural features such as trees and soil carry out restoration efforts upon completion of the project (SmartScan, 2017).

3.8 Weighting and Scoring in the SmartScan

The 75 questions under the SmartScan have different levels in show of compliance where a project is required to pick the level that best defines their current practice. There are four levels of compliance, which are between levels 0 to level 3 (GIB Guide to SuRe®, 2015). The levels also determine how many answers are in each criterion with the choices of show of compliance ranging between 2 and 4 as shown in the Tables 3.4, 3.5 and 3.6 below. An important note to make is that regardless of the level of answers the Not Applicable (N/A) category is neither counted nor weighted (SmartScan, 2017).

The following Tables 3.4,3.5 and 3.6illustratethe SmartScan showing the different number of levels of compliance the project owner can chose from:

Table 3.4 An example of a question with 2 levels of answers

G4.3 Have the ultimate beneficial owner(s) of enterprise(s) winning public tenders for the development of the project been publicly disclosed?	
Level 0	The relevant project entity has either not identified or not disclosed any beneficial owner(s) of enterprise(s), which have won public tenders.
Level 1	The relevant project entity has identified and disclosed beneficial owner(s) of enterprise(s) which have won public tenders
N/A	There has been no public tender.

Source: (SmartScan, 2017).

Table 3.5 An example of a question with 3 levels of answers

G3.3 Does the relevant project entity assess employees' social and environmental sustainability skills, and provide training as needed?	
Level 0	Assessments are not systematically carried out for all employees.
Level 1	Employees are assessed and provided with the training required to improve their sustainability skills.
Level 2	In addition to the Level 1 requirements, the relevant project entity also carries out assessments and provides training to contractors and third parties.
N/A	Not applicable/other

Source: (SmartScan, 2017).

Table 3.6 An example of a question with 4 levels of answers

E1.4 To what extent does the project maximise energy efficiency	
Level 0	There has been no formal assessment of energy usage and no identification of energy efficiency improvements.
Level 1	There has been a formal assessment of energy efficiency and actions have been taken to improve energy efficiency.
Level 2	The project is designed to achieve international best practice for energy efficiency.
Level 3	The project is designed to achieve energy efficiency of more than 20% beyond international industry best practice.
N/A	Not applicable/other.

Source: (SmartScan, 2017).

On project scoring using the SmartScan, the level of compliance determines the number of points awarded to the project on a specific question before the project total is calculated as demonstrated in Table 3.7 below. The lowest score that a project can attain is 0 which is categorized as bad practice and shows that a project does not comply with the minimum requirement either because the project owner is not implementing the minimum measures required for project sustainability or in rare cases because they are unaware these minimum requirements need to be met.

On the Other hand, a score of between 0.3 and 0.7 is considered as partial good practice where a project is considered to be putting effort in meeting some measures towards sustainability and resilience but not in all of them. On the other hand a score of 1 represents good practice, which implies that a project is implementing and integrating sustainable practices throughout the different project cycles. The highest possible score is between 1.2 and 1.4, categorized as exceeding good practice, which shows that the project owner has implemented the minimum, required measures and in addition to this, he has gone beyond the project boundaries to ensure that sustainability and resilience are part of the project (SmartScan, 2017).

Table 3.7 An overview of the SuRe® Standard weighting and scoring system

		Level				Explanation
		Level 0	Level 1	Level 2	Level 3	
No. Answer Levels	2	0	1			This is yes or no. Yes should be best practice, and no more.
	3	0	0.5	1		This is where level 1 partially achieves best practice, and level 2 is best practice
		0	1	1.2		This is where Level 1achieves best practice, and level 2 exceeds best practice in scope or quality
	4	0	0.3	0.7	1	This is where Levels 1 and 2 are partial best practice and Level 3 is best practice
		0	0.5	1	1.2	This is where Level 1 is partial best practice, Level 2 is best practice, Level 3 exceeds best practice in scope or quality
		0	1	1.2	1.4	This is where Level 1 is best practice, Level 2 exceeds best practice in scope or quality, Level 3 exceeds best practice in scope AND quality

Source: GIB Guide to SuRe (2015).

3.9 Cost and Time of the SuRe® SmartScan

Unlike the SuRe® Standard full assessment the SmartScan takes between 2 to 5 days to complete depending with the size of the project (SmartScan, 2017). The fee structure is divided into 4 categories depending on the level of support a project owner requires from GIB experts. These categories include:

- Self-assessment: This package costs approximately USD270 and it includes the project owner completing the assessment questions in the SmartScan and submitting it to the GIB sustainability expert for analysis. The output of this package is a report giving the summary of the results.
- SmartScan Plausibility Review: At approximately USD1000, this package includes the GIB team reviewing the results of the SmartScan and identifying any anomalies and the weak areas of compliance. As an output, the project owner receives a summary of the assessment analysis and recommendation on the corrective measures that can be implemented to make the project more compliant with sustainable and resilient measures.
- SmartScan Evidence Review and Project Interview: This package with a price of approximately USD3000 allows for more interaction between the project owner and the GIB sustainability expert. The GIB expert interacts with the project team to get more clarity on the high areas of concern in the project performance. In some instances, more project documentation may be required before a final report is presented to the project owner.
- SmartScan On-site Support: With a cost of approximately USD7400, this involves the GIB sustainability expert traveling to the project site for a period of 3 to 5 days to help the project owner to correctly fill the SmartScan tool questions and identify areas of improvement and capacity building.

Chapter 4. METHODOLOGY

This chapter will discuss the methodology for the study. The research approach and the working process will be explained followed by information about the selection of the case study. Finally, the chapter will end with how the information was analyzed.

4.1 Research Approach

The research for this master thesis is based on qualitative focused case study. According to Holme and Solvagn (1997) case studies are "*an intensive, holistic description and analysis of a single entity or phenomenon"*. In addition this approach was selected because it is in line with the objectives of this thesis, which is to review the experience of using SuRe® Standard in an infrastructure project. Through the use of Northern Collector Tunnel (NCT) Phase I water project as a case study it will be possible to evaluate how the standard influences sustainability and resilience in a project and the benefits derived from the assessment.

This thesis is divided into four phases that include: literature review, case study, processing of information and analysis of the information. The case study was used to gather information about the SuRe® Standard and the information gathered was analysed to answer the objectives of this study.

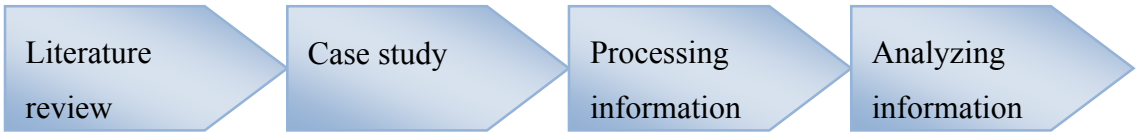

Figure 4.5 The working process

4.2 Literature Studies

The literature studies conducted for this master thesis was concentrated around sustainable development, SuRe® Standard and the Northern Collector Tunnel (NCT) Phase I water infrastructure project as the case study. The information collected on the theoretical framework was mainly based on the "*Our Common Future"*report which is commonly used and referred to by many sources when referring to sustainable development (WCED, 1987).

The section on background of rating tool, the need for global rating tools and output and mechanism of assessment tools is based on the work of different authors who have reviewed and evaluated existing infrastructure rating tools and their relevance and

application in the global market. On the other hand, information on the SuRe® Standard was obtained from the GIB website, the SuRe® Standard, Guide to SuRe® and the SuRe® Handbook. Information on the selected case study was retrieved from the Athi Water Services Board website (Athi Water Service Board, (AWSB) (2017).

4.3 Case Study

The case study is the Northern Collector Tunnel (NCT) Phase I water project in Murang'a, Kenya, which was commissioned by the Athi Water Service Board (AWSB, 2017). The decision on what project to use for my case study was undertaken in consultation with my thesis and GIB internship supervisors. My internship supervisor Louis Downing provided the knowledge and information on past projects that have been assessed using the SuRe® SmartScan.

The choice of the case study was also based on the fact that the Northern Collector Tunnel (NCT) Phase I water project has generated a lot of media and political attention in Kenya raising debates and concern on whether the project is sustainable or not. In addition to these concerns there have been court proceedings to address the grievances raised by project affected persons including the convening of a World Bank panel to address the social and environmental complaints raised in relation to the project.

4.4 Interviews

The case study was visited in January 2017 in preparation of the master thesis research and to establish contact with the project consultant. After the beginning of the research process, telephone and email conversation was maintained with the Assistant Resident Engineer in charge of the project who liaised with the project environmental safety officer and environmental officer to provide more information on the project.

Table 4.8 An overview of the interviews carried out during the research process

Name	Title	Company	Project Role	Type
Vincent Rono	Assistant Resident Engineer-NCT Phase I Project	SMEC International	Assistant Engineer	Phone and email interview
Eunice J Cherutich	Environmental Officer	Athi Water Services Board	Environmental Officer	Email
Jonathan Olwangu	Environmental and Safety Officer	China Ghezouba Group Company	Environmental and Safety Officer	Email

4.5 Processing and Analyzing Information

The information gathered and the analysis process was done in line with the objectives of the thesis:

- Review experience from SuRe® assessed project and additional sustainability benefits the assessment gives to projects compared to using normal standards
- Identify the costs and resources required for a SuRe® Standard assessment
- To preliminary assess the "sustainability relevance" of SuRe® Standard to achieve the Sustainable Development Goals.

4.6 Rating the Benefits of Using the SuRe® standard-SmartScan

The telephone and email interviews carried out during the project assessment process revealed some of the benefits experienced using the SuRe® Standard assessment tool SmartScan. The NCT Phase I project Assistant Resident Engineer and AWSB Environmental Officer and China Ghezouba Group Company Environmental and Safety Officer gave the following benefits from using the SmartScan:

- The SmartScan gave the project a structure to work with in matters relating to sustainability and resilience.

- The project was able to pin point the efforts and work that has been put towards achieving sustainability.
- The project was able to identify the weak links and start work on employing corrective measures.
- The project was able to identify new project areas that they did not think related to sustainability and resilience.

The Assistant Resident Engineer working closely with the other officers was asked to rate the benefits above from their experience. The rating was ranked from 1 to 5 with 5 representing the highest scored benefit. The ratings are presented in the Chapter 6 "Analysis of Results from the SmartScan Assessment" based on the mean value.

Chapter 5. NORTHERN COLLECTOR TUNNEL PHASE I

This chapter provides a background on the challenges faced by the growing Kenyan population in accessing clean safe drinking water and sanitation hence necessitating the construction of the Northern Collector Tunnel (NCT) Phase I water project. This is followed by the description of the NCT Phase I project by giving the design details and a discussion of the sustainable practices implemented during the project construction. Lastly, the challenges threatening the sustainability of the project are discussed with clear examples.

5.1 Background

Kenya, one of the countries that adopted the Sustainable Development Goals has an economy that is mostly reliant on its natural resources (Kanda et al., 2013). Water plays a central role in ensuring continuity of life for domestic, economic, environmental and agricultural development (Marshall, 2011). It is for this reason that the Kenya Constitution (2010) under the Bill of Rights, Article 43 (1) (d) confers on every person the right to clean and safe water in adequate quantities setting a background for the realization of goal 6 of the SDGs.

The situation on the ground in regards to access to clean and safe water is however different with Kenya ranked as a water scarce country with an annual renewable fresh water supply of 647m^3 per capita against the United Nations recommended 1000m^3 (Ministry of Water and Irrigation, 2007). Water scarcity is expected to rise due to impact of climate change and variability, population increase and increased water demand from industries and agriculture and hence necessitating a need for sustainable water use and development (K'Akumu, 2007; AfDB, 2015).

Kenya's population is approximately 46million and out of which 63% has access to improved drinking water and 30% have access to improved sanitation services. Out of this proportion, rural areas account for 57% in access to improved water sources and 28.8% to improved sanitation compared to the urban areas with 82.7% and 31% respectively (World Health Organization (WHO), 2015). According to the Joint Monitoring Programme for Water Supply and Sanitation, it is estimated that the access to improved water sources in urban areas decreased from 92% in 1990 to 82% in 2015. This recorded deficiency in public water supply and sanitation has driven more households, commercial and industrial

units in urban areas to make their own arrangements (Marshall, 2011). Currently the Government of Kenya estimates that the water deficit in Nairobi stands at 125,000m^3/day causing chronic water shortages to a city that is considered as the international, regional, administrative and economic hub of Kenya (AWSB, 2017).

Scarcity of water in Kenya and unreliable water supply has not only impacted negatively on domestic water use but also on agriculture, which is the main source of revenue and also on livestock and industries. Consequently, different regions of the country including urban areas are faced with challenges of meeting their water demand causing them to lag behind in social and economic development (Marshall, 2011). To close this gap and to meet the demand for water and sanitation the Government of Kenya under its development blueprint Vision 2030 (2007) identified one of the challenges in ensuring access of water and sanitation for all as inadequate water harvesting and infrastructure for water storage and supply, low level of infrastructural development, weak institutions and lack of social inclusiveness (World Bank, 2016).

The development blueprint therefore encourages the development of innovative community based methods and technologies for water harvesting and water conservation structures for the Arid and Semi-Arid areas in Kenya. This is further supported by the National Water Master Plan 2030 which estimates that USD14billion in water supply and USD5.2billion for sewer infrastructure and rehabilitation will be needed for the development of sustainable and resilient water infrastructure if water access and sanitation for all is to be achieved (World Bank, 2016).

As a result the Government through the Ministry of Water and Irrigation has implemented different water infrastructure projects in the country to meet the increasing water demand between competing users. One of these projects is the Northern Collector Tunnel (NCT) Phase I, which is located in Murang'a County in the central region of Kenya approximately 60km north of Nairobi. It is estimated to have an average production capacity of 1.6m^3/sec or 140,000m^3/day (AWSB, 2016) on completion. The water will then be diverted to Thika water reservoir, Ndakaini dam and eventually supplied to Nairobi County.

5.2 Project Description

The NTC Phase 1 project, which is estimated to cost approximately USD65million, started in 2015 and is estimated to last for 42 months. It consists of an 11.8km tunnel, which will transfer water from intakes at Maragua, Gikige and Irati Rivers to an outlet at the Githika

River, which drains, into the Ndakaini dam in Thika before being supplied to residence in Nairobi County (AWSB, 2017).

According to the design of the project, the principle features include: transfer of water: transfer of water from Maragua River, Irati River and Gikie River to Ndakaini dam, construction of raw water gravity main from Ndakaini dam to the proposed water treatment plant 6km downstream of Ndakaini dam and construction of 44km treated water gravity main up to Kabete reservoirs via Ngethu and Gigiri water treatment plants (GIBB International, 2014).

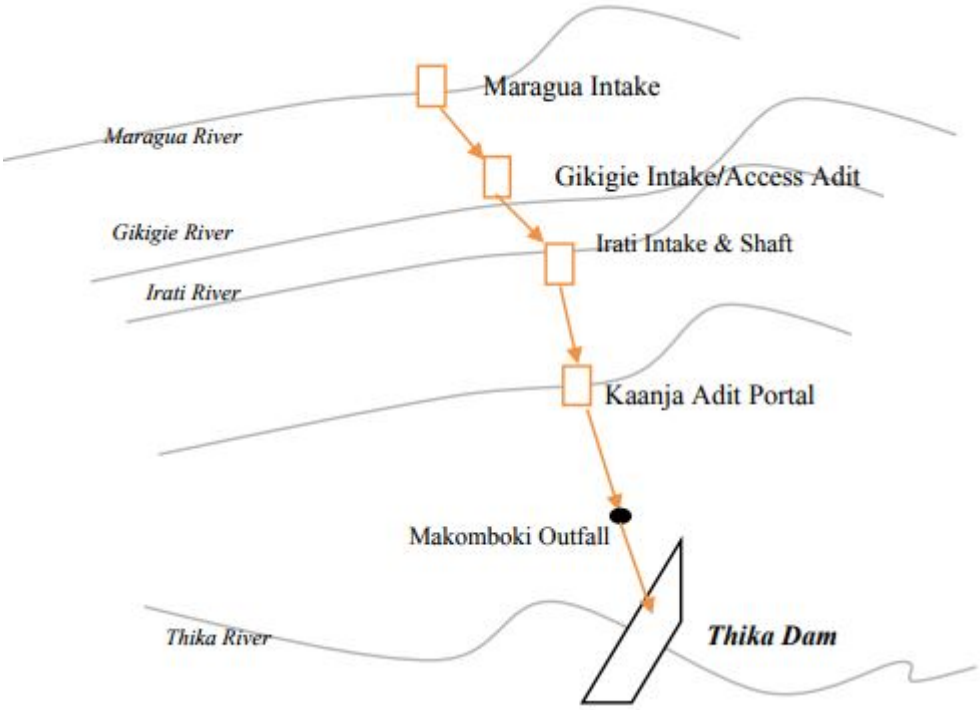

Figure 5.6 Diagram showing the project schematic (AWSB (2017)

5.3 Sustainable Development within the NTC Phase I

The NTC Phase I project is delivered under the Kenya law and the relevant international conventions. According to the Environmental Management and Coordination Act (EMCA, 2015), projects considered to have any social and environmental impact are required to go through an environmental and social impact assessment (ESIA) and propose measures on how to mitigate the negative impact. This process is overseen by the National Environment Management Authority (NEMA), which requires projects to submit an ESIA report that is used as a basis to issue a license for the commencement of the project.

NEMA was established under EMCA, (1999) which is the framework law on environmental management and conservation. The Act provides for environmental protection through requiring projects like NTC Phase I to undergo environmental impact assessment, environmental audit and monitoring and environmental restoration orders, conservation orders and easements. In addition, the project is funded by the World Bank which classifies it as category A meaning the project was likely to have significant adverse environmental impact that were sensitive and diverse (World Bank, 2013)

Against this background, the NTC Phase I project implements the proposed mitigation measures proposed in the ESIA against environmental and social impacts. The project also has an Environmental and Social Management Plan (ESMP) whose aim is to show the responsibilities of the different project stakeholders in implementing the mitigation measures (GIBB International, 2014). According to the project ESIA report the aims of the ESMP are to:

- Prevent and mitigate environmental and social negative impacts by implementing mitigation measures and monitoring their enforcement during the construction and operation phases of the project.
- Provide a link between the impacts of project activities and the mitigation measures and responsibilities proposed to minimize these impacts and enhance positive impacts.
- Guide the environmental and social monitoring to ensure that mitigation measures are implemented and are effective.

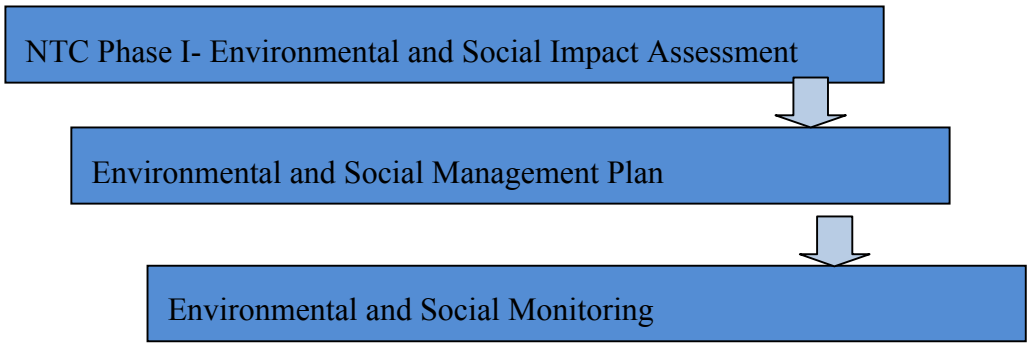

Figure 5.7 NTC Phase I environmental and social management systems (GIBB International, 2014)

5.4 Challenges Facing NTC Phase I project

Despite the projected benefits of the NTC Phase I project it has not been without controversy. The project has been faced with opposition from some political leaders and project affected persons who have expressed fears that the diversion of water from the rivers would cause a shortage for domestic and agricultural activities downstream. In response to this the Murang'a County Government commissioned a comprehensive assessment study of the NTC Phase I project to determine the impacts of the project on the residents of Murang'a including the environment (Murang'a County Government, 2015).

The findings of the committee responsible for the assessment process came up with the following findings:

- The Athi Water Board mislead the public and stakeholders by indicating that only flood water would be tapped.
- The project activities began in September 2014 while the NEMA issued the environmental license in February 2015 that was against the Kenyan statutory requirements.
- The project would lead to the closure of irrigation schemes downstream which would cost Murang'a County an annual loss of approximately USD22million.
- It would lead to the loss of 14MW installed on Wanji and Mesco-hydroelectric power stations and render any future projects unfeasible.
- There would be no compensation benefits for the people of Murang'a for their soil and water conservation efforts.
- The 0.074% of the total project budget set aside to fund mitigation measures was not enough for environmental management.

As a result the committee recommended the following corrective measures among many others:

- The NTC Phase I project should be halted until the water requirements of Murang'a County were incorporated in the final design and masterplan.
- The environmental license issued by NEMA should be reviewed to address the unresolved social and environmental issues.
- A technical committee should be set up including the AWSB and the Murang'a County Government.

- Murang'a County would develop a bulk water provision service to Nairobi and other Counties in order to be able to benefit from its own resources.

Following the concerns raised by the Murang'a County technical committee, the Ministry of Water and Irrigation and AWSB agreed to form a joint technical team which led to the signing of a consensus document in 2016 "Technical Consensus on the Northern Collector Tunnel Project" which would see the implementation of the recommendations made in the report (AWSB & Murang'a County Government, 2016). These measures would be implemented between 2015 and 2018 and would see the two entities working together.

In July 2015, a motion was filed in High Court of Kenya by the AWSB and NEMA seeking to prohibit an applicant by the National Environmental Tribunal at Nairobi from hearing any proceedings under the Tribunal Appeal No. NET 139/2015-Joseph KuriaMwangi vs. NEMA and AWSB.Mr Joseph KuriaMwangi sighted the concerns raised by the Murang'a County Government technical committee sighting that the project was not sustainable. However, in this case the High Court ruled in favour of AWSB and NEMA and prohibited the National Environmental Tribunal from hearing, entertaining or conducting proceedings under the Tribunal Appeal No. 139/2015.

To further their efforts to address the concerns raised about the NCT Phase I project, AWSB established an Independent Panel of Experts (IPE). The role of IPE is to provide independent assessment, review technical, environmental and social issues concerning the project and give guidance and recommendations to AWSB (IPE, 2016). One of the issues addressed in their November 2016 report was the impact the abstraction of water would have on Irati, Gikige and Maragua Rivers in addition to groundwater. They argued that the abstractions would have no consequence on the agricultural and industrial activities downstream since it would only happen after the flow requirements in the three Rivers had been satisfied (IPE, 2016). On the impact on groundwater and its effect on the community wells, IPE recommended the monitoring of the wells in order to monitor if there were any fluctuations in the groundwater.

Their findings also found that public consultation with different stakeholders had been organized between August and October 2014 as part of the ESIA requirement. In addition to this, they argued that the project had adhered not only to the national laws and regulations but also with the World Bank environmental and social guidelines. Regarding the raised concerns on the impacts of the project on the aquatic life and Aberdare forest

cover, the panel upon the review and updating of the project design concluded that these impacts were negligible. However, the panel urged AWSB to regularly update their Register of License to ensure compliance and to ensure both environmental and safety audits were undertaken. It is important to note that the IPE is still in existence today to address any concerns that may be raised concerning the NCT Phase I project (AWSB, 2017).

However, this did not mark the end of the controversy surrounding the NTC Phase I project and in November 2016, the World Bank received a request from 47 project affected persons who claimed that the Bank had failed in its duty to ensure its environmental and social policies were implemented during the project planning, design and construction phase (World Bank Inspection Panel, 2017). As a result a Panel team visited Kenya in 2017 and met with the complainants, Bank staff, and government and project officials in order to resolve the issues raised. Among the issues raised were: the lack of disclosure of project information and community participation, lack of a comprehensive environmental and social impact assessment, Ndakaini dam did not have the capacity to absorb the additional water from the NCT Phase I and the project would cause a shortage in water supply for domestic, agricultural and industrial use in Murang'a County.

The Panel in reviewing the information submitted by all the stakeholders involved concluded that the project proponent had fulfilled its obligations both under the Kenyan law and the World Bank social and environmental requirements. The panel also suggested that the project be operated in a transparent manner that ensured the project affected persons had access to information about the abstractions and flows upstream and downstream of the tunnel. This according to the Panel would dispel the concerns of the local communities and promote the project acceptability. The Panel's recommendation to the World Bank Board of Directors indicated that there was no need for further investigations but future complaints would be accepted based on new evidence (World Bank Inspection Panel, 2017).

Chapter 6. ANALYSIS OF RESULTS FROM THE SmartScan ASSESSMENT

The results of the sustainability and resilience assessment of the NTC Phase I using the SmartScan are presented in this chapter. The results covering the governance, society and environmental dimensions will be demonstrated using graphs, tables and the "spider web diagram". The next section will discuss if the SuRe® Standard through the SmartScan has any impact on the sustainability performance of an infrastructure project or whether the implementation of normal practice is sufficient.

6.1 Results from the NCT Phase I

The total score of the NCT Phase 1 project based on the evaluation of governance, social and environmental dimensions in the SmartScan was 54.3% out of the possible score of 86.6 (Total Topic Score/Topic Total Possible Score * 100). On breaking down the scoring the governance dimension scored 16.2 out of the possible 30 points, society scored 13.3 out of 23.8 while the environmental dimension scored 17.5 out of the possible 32.8. The results are summarized in the Table 6.9 below.

It is to be mentioned that the SmartScan considers a project as sustainable and resilient once the criteria achieve a score of at least 1, which counts as "good practice". As explained above, a project can go beyond "good practice", that is, to "leading practice" which yields a score of 1.2 in the corresponding criterion. The total possible score thus exceeds the score that is needed for "good practice". The total score needed for "good practice" is 69 (which is given by the number of answered questions multiplied by a score of 1 for each question). If the NCT Phase 1 project score is related to the benchmark of "good practice" (as the SmartScan does), the project's score achievement is 65.2%.

Table 6.9 Summary of results from the SmartScan

Dimension	Topic Score	Topic Total Possible Score	Topic N/A	Topic No. of answered questions	Topic Total No. of Questions
Governance	16.2	30	0	26	26
Society	13.3	23.8	5	16	21
Environment	17.5	32.8	0	28	28
Total	47	86.6	6	69	75
Total in % of total possible score			54.3%		
Total in % of "good practice"			65.2%		

A further breakdown of the results can show us the score attained by each theme of the 14 themes as the Table 6.10 below demonstrates;

Table 6.10 Score summary of the SmartScan themes

Dimension	Theme	Topic Score	Topic Total Possible Score
Governance	Management and Oversight	7.6	12.8
	Sustainability and Resilience Management	4.4	8
	Stakeholder Engagement	3.2	4.8
	Anti-corruption and Transparency	1	4.4
	Total Score→	16.2	30
Society	Human Rights	1.5	3.2
	Labour Rights and Working Conditions	4.9	6.4
	Customer Focus and Inclusiveness	0	2
	Community Impacts	3.2	5.2
	Socioeconomic Development	3.7	7
	Total →	13.3	23.8
Environment	Climate	4.5	9.8
	Biodiversity and Ecosystems	2	3.4
	Environmental Protection	3.7	4.8
	Natural Resources	3.8	9.2
	Land Use and Landscape	3.5	5.6
	Total→	17.5	32.8

6.1.1 The SmartScan "spider web diagram"

A further analysis of all the answers submitted about the project compliance to sustainable and resilient practices can be shown using the spider web diagram. The spider web diagram shows the 14 themes covered in the SmartScan by giving the mean of the score of the criteria under each theme. According to the figure 6.8, the theme that scores between 0 and 0.5 is considered to be underperforming or bad practice and lower than what would be considered for a sustainable project. For example the NCT Phase I project is underperforming in the climate theme and transparency, which has a score of 0. A score of between 0.5 and 0.7 is considered reasonable or partial good practice meaning the project is meeting the minimum sustainable and resilient requirements. Figure 6.1, shows that the NCT Phase I project has achieved a reasonable score for example in the management and oversight and stakeholder engagement theme which score between 0.5 and 0.6 points.

The score of between 0.7 and 1 is referred to as commended or good practice meaning that the project has performed above what is reasonably expected. The NCT Phase I project scores highly on the environmental protection and working conditions and socioeconomic development meaning that the project is not only implementing the national requirement in Kenya but also the Global International Industrial practices (GIIP).

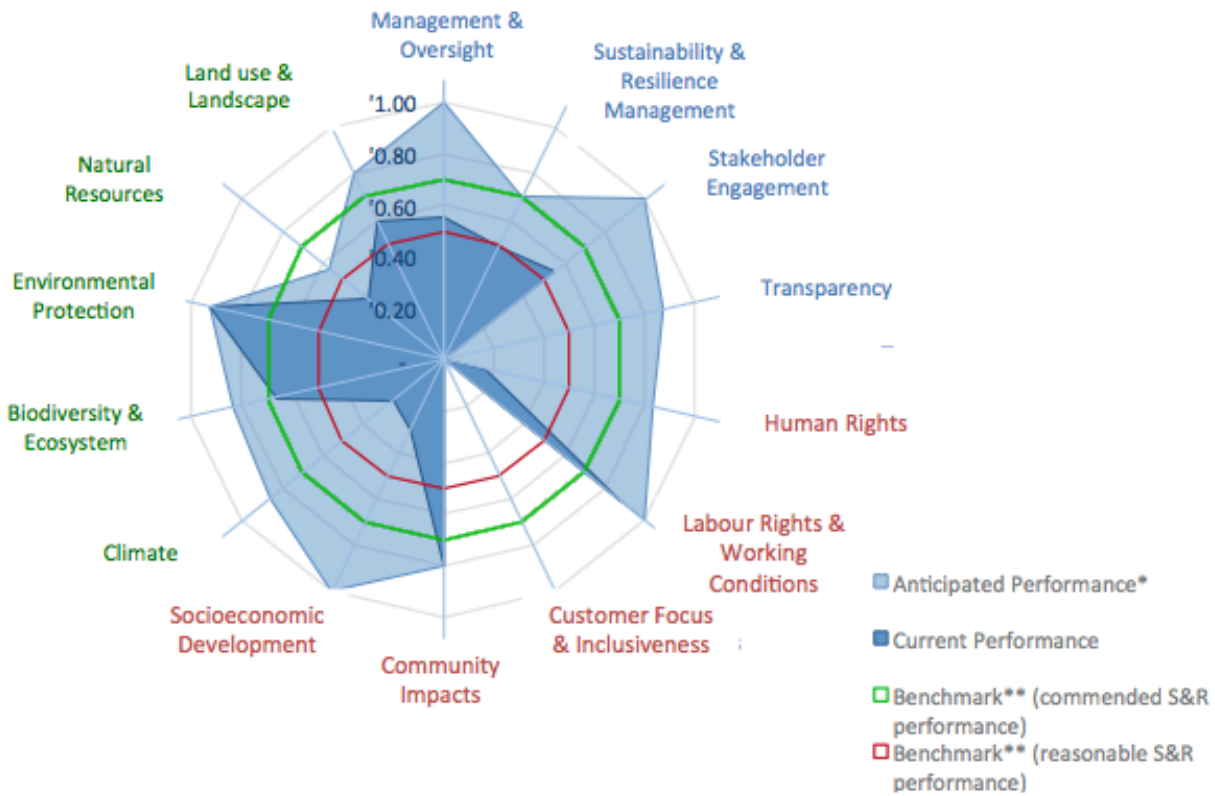

Figure 6.8 Spider web showing the project performance on the SmartScan assessment tool

The leading or exceeding good practice is denoted by a score of 1 or more on the "spider web diagram". The NCT Phase I project scores highly in labour rights and working conditions providing a suitable environment for sustainable and resilient infrastructure water project.

The legend on figure 6.8 shows the current and anticipated performance of the NCT Phase I project. Here, current performance (dark blue area) shows the practices that are being implemented as provided by the Project Assistant, Environmentalist and Health and Safety Officer. On the other hand, the anticipated performance (light blue area) shows how the project would perform if the project was to adhere to all the minimum sustainable and resilient requirements in the future.

This was generated when I went through the SmartScan questions together with my internship supervisor Louis Downing and suggested the corrective actions that the NCT Phase I project would need to implement in order to achieve sustainability. The basis for our recommendation is based on the interviews held with the project team and access to project documents to determine what would be reasonably achieved by the NCT Phase I project in the future.

6.1.2 SmartScan results based on the NCT Phase I score

According to the results generated by running the NCT Phase I project through the SmartScan the project has achieved high scoring of 1.2 in some criteria and some areas of concern were also observed meaning the score was 0. The Table 6.11 below shows the break down in the ranking of the project performance based on the 75 questions posed in the SmartScan.

Table 6.11 Summary of results of the SmartScan based on NCT Phase I score

Summary of results based on performance		
Category	Score	No of Questions in the SmartScan
Exceeding good practice	1.2-1.4	10
Good Practice	1	20
Partial good practice	0.3-0.7	30
Bad Practice	0	9
Un answered due to lack of relevance to the NCT Phase I project	N/A	6

This study will only restrict itself to the discussion of the questions that exceed good practice (score of above 1.2) in scoring and those under bad practice (score of 0). The result discussion will be divided into the three dimensions of governance, environment and society. The assumption taken here is that the questions attaining good practice and partial good practice meet the minimum legal and industrial requirements and therefore do not need to be discussed.

On the other hand 5 of the unanswered questions fall under social dimension in the theme of “Customer focus and community involvement” because the NCT Phase I project does not supply water to the people in Nairobi but instead to the Ndakaini dam in Thika. The other 1 of the unanswered question falls under the environment dimension under the climate theme and it does not apply because the project will use gravitational force once in operation and therefore requires no energy. This is because the materiality assessment

carried out by the project team showed that the criteria under these dimensions were not relevant to NCT Phase I project.

6.1.2.1 Exceeding good practice

As shown on Table 6.11, there are 10 criteria where the NCT Phase I project shows exceeding good practice or leading performance earning it a high score above 1. The reason as to why the project scores highly on these criteria is explained below:

Governance

SmartScan QuestionG1.1: *Has the relevant project entity committed to sustainability management, carried out an Environmental and Social Impact Assessment (ESIA) and does it maintain Environmental and Social Management Systems (ESMS)?*

The project owner has carried out an ESIA, which is one of the minimum sustainability and resilience requirements in Kenya. Proof of this is the publication of the ESIA report on the AWSB website which gives the project details, positive and negative environmental and social impacts of the project and how to mitigate (AWSB, 2017). In addition to this, the project has gone a step further and implemented the Environmental and Social Management Systems (ESMS), which allows for the monitoring of the implementation of the mitigation measures relating to negative environmental and social impacts. The ESIA and ESMS enable the project to identify environmental, social and economic opportunities through the identification and exploitation of the positive impacts of the project. This shows that the project fully complies with the requirement earning it a score of 1.2 that is categorized as exceeding good practice.

SmartScan Question G1.2: To what extent does the project apply life cycle thinking when planning and operating the project?

The project has also applied life cycle thinking which includes a life cycle assessment. This is demonstrated through the identification of the positive and negative impacts through the project cycle and proposing mitigation measures. The NCT Phase I project Environmental and Social Management Plan goes a step further to give a detailed account on the parties responsible for implementing the different mitigation measures. Internal and external monitoring and evaluation ensure that the project complies with the legal requirements in order to minimize negative environmental and social impacts (GIBB International, 2014).

SmartScan QuestionG2.1: How does the project identify stakeholder engagements?

Another high scoring point that exceeds good practice is in the stakeholder identification and engagement planning. Despite the challenges that have faced the NCT Phase I project including the convening of the World Bank Panel, formation of the Murang'a County Technical Committee and IPE the results show that the project owner has implemented the recommendations made by the three entities (AWSB, 2017). This is demonstrated by the fact that the project has identified and engaged the affected communities and created a stakeholder engagement plan to guide interactions throughout the project cycle.

SmartScan Question G3.7: How does the project entity identify and manage environmental, social and economic risks?

This section is closely tied to *G 1.1*, *G 1.2* and *G 2.1*all of which the project scored highly on. Through the ESIA process the project was able to identify the environmental, social and economic risks involved in the implementation of the project. These risks were weighed against the benefits that would be foregone if the project were not implemented and recommendations done (GIBB International, 2014). In addition to this, the involvement of various stakeholders at different stages of the project ensures that their concerns on cumulative impacts of the project are identified and addressed.

SmartScan Question: G3.8: What degree of "system thinking" has gone into the design and operation of the project to ensure infrastructure interconnectivity and identify sociotechnical challenges and opportunities now and in the future?

According to AWSB (2017), the first feasibility study for the NCT Phase I was carried out in 1998. Even though the project was shelved, the AWSB commissioned new Feasibility Study and Nairobi Water Master Plan for Developing New Water Sources for Nairobi and Satellite Towns up to 2035. The development of this Master Plan was concluded in 2012 and the NCT Phase I was part of it. In addition, the project is in line with Kenya's economic development blueprint Vision 2030, which aims to provide the population of Kenya with access to clean drinking water. To this effect therefore, the project is part of many other projects, which ensures infrastructure interconnectivity thus making it easier to identify the synergies to other water projects and save cost.

Society

SmartScan Question S2.4: How does the project manage occupational health and safety?

On the management of occupational health and safety the project showed it exceeds good practice and hence a score of 1.2. NCT Phase I project poses a lot of safety and health risks for the workers and the surrounding communities. In recognition of these dangers the AWSB requires the project contractor to appoint accident prevention officer who is responsible to ensure protective measures are employed during the project cycle. The contractor is also required to have onsite ambulances, first aid kit and training for every team and access to a clinic near the site office. In addition to these the contractor has developed a Construction Safety and Health Policy, which has been approved by the AWSB and the Directorate of occupational safety, and health (GIBB International, 2014).

SmartScan Question S2.5: Does the relevant project entity provide fair and non-discriminating employment terms and conditions including: fair working hours; rest days; mandated leave; grievance mechanisms; fair wage; free access for employees to their employment documents; non-discrimination based on gender, age, and/or origin; transparency in retrenchment / dismissal policy?

The project also complies with the Kenya employment standards, which include regulations on working conditions, termination of work contract, collective bargaining, and gender equality (GIBB International, 2014) giving them a score of 1.2 in this requirement. The project has provided employment opportunities for both men and women to provide skilled and unskilled labour. In addition, workers are free to join trade unions and engage the employer to submit their grievances concerning wages or living conditions.

SmartScan Question S5.3: Will poverty impact assessments of relevant measures (projects, tariffs, subsidies, etc.) be carried out?

There was a high score on the question of poverty impact assessment of relevant measures being carried out. The results show that the project had carried out a systematic assessment during the project design phase and will do so after the project completion earning them a score of 1.2. During the ESIA study in 2014, a socio-economic survey was carried out in the project areas focusing on the project affected persons in consultation with the local leaders. The survey was based on establishing the employment rate in the area, sources of income; land tenure; access to water; health care; and energy sources. This survey

informed the AWSB corporate social responsibility water projects for communities living near the project area (AWSB, 2017). The ESIA study also recommended that another survey be carried out during the operation of the project to establish the socio and economic impacts the project has on the local communities (GIBB International, 2014).

SmartScan Question S5.5: How does the project support local skill and capacity development?

The project also scored highly on supporting of local skill and capacity development. AWSB has partnered with Murang'a University to facilitate the knowledge transfer in tunnel construction. The project contractor is also expected to carry out HIV-AIDS awareness program in coordination with the local public health centers for the project staff and the local communities. This is to be done through monthly Information, Education and Communication (IEC) campaigns focusing on prevention, screening, and diagnosis and counseling (GIBB International, 2014).

Environment

The project does not have any exceeding good practice in any of the criteria under the environment dimension.

6.1.2.2 Bad Practice

As shown in table 6.10 above, there are 9 different criteria that the project does not meet the minimum requirement. These are areas of concern especially because 3 fall under the red criteria and hence disqualifying the project for certification until at least the minimum requirements are met. The 15 criteria are broken down below and discussed under the governance, social and environmental dimensions.

Governance

SmartScan Question G1.6: What measures have the relevant project entity taken to ensure the project's supply chains are sustainable?

The NCT Phase I project has not implemented measures to ensure that the sub-contractors and suppliers comply with sustainable and resilient measures and hence a score of 0. Sub-contractors and suppliers play an important role in all the project phases and their responsibility to ensure sustainability and resilience should therefore not been downplayed. They should be held accountable on issues regarding human rights, labour rights and working conditions and environmental protection (SuRe®: The Standard for Sustainable

and Resilient Infrastructure, 2016). The project owner should therefore require these third parties to submit information and documentation of their sustainable practices as part of the procurement process.

SmartScan Question G3.3: Does the relevant project entity assess employees' social and environmental sustainability skills, and provide training as needed?

The lack of environmental and social sustainability assessment know-how of employees in the NCT Phase I project poses a challenge in ensuring compliance. A score of 0 in this criteria shows that sustainability and resilience has not fully been integrated into the planning, design and construction phases of the project which could pose potential challenges in the operation phase (SmartScan, 2017).

SmartScan Question G3.4: How does the project share sustainability knowledge generated throughout the project?

The lack of a systematic process of documenting and sharing sustainability lessons from the project earned the project a score of 0 under this criterion. This means the management has not provided a clear picture on what the sustainability goals of the project are and the role the employees play in meeting them. This can be tied to G3.3, which notes the lack of employees training or know-how on sustainability and resilience matters (SmartScan, 2017).

SmartScan Question G4.2: Has the relevant project entity assessed the risks associated with its interactions with Politically Exposed Persons (PEPs)?

According to the Financial Action Task Force (FATF) (2013), PEPs are individuals who are entrusted with prominent public functions, for example Heads of States, politicians, judicial officials and civil servants. The lack of any assessment on the project staff including sub-contractors and suppliers to determine if they have any financial relationship with the PEPs or their family members and close associates earns the project 0 point on this red criterion. This leaves the project exposed to corruption and bribery practices which are against GIIP.

SmartScan Question G4.3: Have the ultimate beneficial owner(s) of enterprise(s) winning public tenders for the development of the project been publicly disclosed?

This criterion ties to transparency during the procurement process and the right to access of information for the general public. The lack of publicly disclosing the tendering process

exposes the process to influence from third parties such as PEPs and corruption. This promotes unaccountability in service delivery and can even result in the inflation of the project cost (SmartScan, 2017).

Society

The NCT Phase I project was able to meet at least all the minimum requirements for all the criteria falling under the social dimension.

Environment

SmartScan Question E1.4: To what extent does the project maximize energy efficiency?

According to the SmartScan assessment the NCT Phase I project has neither carried out an assessment to determine the energy usage nor has it identified any energy efficiency improvement earning it 0 point in this criterion. This means that these options were not explored during the project planning and construction and if they were the relevant bodies have not followed up implementation (SmartScan, 2017).

SmartScan Question E1.5: To what extent has the project been designed to minimize embodied energy?

This requirement ties up to *E 1.4* which the project also failed to meet its minimum requirement. According to IPCC (2007), embodied energy in building materials needs to be put into consideration if the lifecycle energy of infrastructure projects is to be reduced. The project owner needs to carry out a holistic analysis to determine whether the raw materials being used contain more embodied energy compared to the operating energy since the project will utilize gravitational force during operation.

SmartScan Question E2.3: To what extent does the project minimize the risk of introducing invasive alien species?

The project has not given any consideration to invasive species hence earning 0 point on this criterion. During the construction, the project activities such as transportation of raw materials and waste pose the danger of introducing alien species into the site (SmartScan, 2017). Therefore, the project owner should ensure that risk assessment and monitoring are regularly carried out in order to detect any alien species as a result of the project.

SmartScan Question E4.1: To what extent does the project maximize resource efficiency throughout its life cycle?

This is a red criterion and failure to meet the minimum compliance requirement has earned the project a 0 point. As discussed earlier under *E1.4* the project has not carried out any assessment on its energy use or explored any energy saving techniques (SmartScan, 2017). This criterion goes further to include water efficiency during the construction process, which the project has not been able to implement either.

6.2 Rating of Benefits from Using the SmartScan

This section presents the rating of the benefits experienced by assessing the NCT Phase I project using the SmartScan. The NCT Phase I project Assistant Resident Engineer, AWSBD Environmental Officer and the China Ghezouba Group Company Environmental and Safety Officer were asked to rate the following benefits according to their experience using the SmartScan. They were required to rank the benefits from 1 to 5 with 5 representing the highest benefit. Their individual ratings are as presented below:

Table 6.12 Rating of benefits for NCT Phase I project from using the SmartScan by the Environmental Health and Safety Officer

Rating	Benefits
4	The SmartScan gave the project a structure to work with in matters relating to sustainability and resilience.
4	The project was able to identify new project areas that they did not think related to sustainability and resilience.
3	The project was able to identify the weak links and start work on employing corrective measures.
2	The project was able to pinpoint the efforts and work that has been put towards achieving sustainability.

Table 6.13 Rating of benefits for NCT Phase I project from using the SmartScan by the Environmental Officer

Rating	Benefit
5	The SmartScan gave the project a structure to work with in matters relating to sustainability and resilience.
4	The project was able to identify the weak links and start work on employing corrective measures.
3	The project was able to pinpoint the efforts and work that has been put towards achieving sustainability.
3	The project was able to identify new project areas that they did not think related to sustainability and resilience.

Table 6.14 Rating of benefits for NCT Phase I project from using the SmartScan by the Assistant Resident Officer

Rating	Benefit
5	The SmartScan gave the project a structure to work with in matters relating to sustainability and resilience.
4	The project was able to identify the weak links and start work on employing corrective measures.
3	The project was able to pinpoint the efforts and work that has been put towards achieving sustainability.
3	The project was able to identify new project areas that they did not think related to sustainability and resilience.

The ratings provided for the benefits in Tables 6.12, 6.13 and 6.14 can further be analyzed to get the mean score of each benefit based on the ratings done by the three project employees. Table 6.15 provides the mean ranking of the benefits below:

Table 6.15 Rating of benefits for NCT Phase I project from using the SmartScan

Benefit	**Mean Score**	**Environmental Health and Safety Officer**	**Environmental Officer**	**Assistant Resident Engineer**
The SmartScan gave the project a structure to work with in matters relating to sustainability and resilience	4.667	4	5	5
The project was able to pinpoint the efforts and work that has been put towards achieving sustainability	2.667	2	3	3
The project was able to identify the weak links and start work on employing corrective measures	3.667	3	4	4
The project was able to identify new project areas that they did not think related to sustainability and resilience	3.333	4	3	3

Using the mean from the results above in Table 6.15 we can rate the benefits of using the SuRe® Standard SmartScan from the highest rated to the lowest as shown below:

i. The SmartScan gave the project a structure to work with in matters relating to sustainability and resilience
ii. The project was able to identify the weak links and start work on employing corrective measures

iii. The project was able to identify new project areas that they did not think related to sustainability and resilience

iv. The project was able to pinpoint the efforts and work that has been put towards achieving sustainability

6.3 SuRe® Standard vs. Normal Practice

The impact of the SuRe® Standard on project sustainability and resilience is reliant on what the normal standards are throughout the life cycle of a project. The NCT Phase 1 is designed to be in line with Vision 2030 in improving access to safe drinking water to the Kenyan population. Over all, Vision 2030 as Kenya's development blueprint contributes to the attainment of the Sustainable Development Goals. This therefore calls for a new strategy that goes beyond fulfilling the requirements of EIA and promotes sustainability and resilience in the construction of infrastructure. According to Athi River Water Services Board, the NCT Phase I is rated to be one of the biggest water projects in Kenya giving it the capacity to act as a catalyst for sustainable construction practices across different sectors in Kenya.

6.3.1 SuRe® Standard and environmental impact assessment

According to the International Association for Impact Assessment (IAIA) (1999), environmental impact assessment refers to ''the process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of development proposals prior to major decisions being taken and commitments being made.'' Internationally, EIA has been integrated into legislations and guidelines to guide in the development process of private and public projects. For instance, Kenya, under the National Environmental Management Authority (NEMA) established the Environmental Management and Coordination Act (EMCA) in 1999 as part of its environmental regulation. Under the Act, NEMA has provided the Terms of Reference to which, if fulfilled, a license is issued for the commencement of a project. Before issuing the license, NEMA takes a variety of factors into consideration including the information provided in the EIA to determine the feasibility of an infrastructure project.

In Kenya, EIA is considered as a vital tool for the protection, conservation of the environment and for the promotion of sustainable development. EIA facilitates the consideration of environmental issues in a systematic manner during the decision making process. This is achieved through the identification of project related environmental

impacts and developing mitigation measures (Rees, 1988). Since EIA takes place before any concrete decisions are made regarding a project, it is easy to consider alternatives in cases where environmental impacts are too many or incorporate environmental considerations in the life cycle of a project (Rees, 1988; Pastakia & Jensen, 1998). EIA does not only critically look at the environmental impacts but it also puts into consideration the social and economic impacts of a project and the mitigation measures (Pathan, 2012). The environmental, social and economic mitigation measures are described in an Environment Management Plan (EMP) detailing how they will be implemented and the project entity responsible for the implementation process.

On comparing the two assessment methods it is clear to see where the similarities and differences lie. Both the SuRe® Standard and EIA have a certification process that requires the project owner to show how he has or will comply with environmental and social requirements. However, there is a difference in how the licenses are issued during the different project phases. For instance, the SuRe® Standard certification process starts from the design phase with the project owner expected to apply for recertification in the construction, decommissioning and operational phases of the project. On the other hand EIA is carried out before the beginning of the construction phase and once the license is issued the project owner is expected to submit environmental monitoring and auditing reports to NEMA throughout the construction phase. It is also important to note that the SuRe® Standard considers EIA as an important component for ensuring sustainable and resilient infrastructure. However, this is seen as one of the many other requirements that a project has to meet in order to be considered for certification.

According to the Environmental Assessment and Audit amendment Special gazette supplement number 137 in 2016, the EIA levy in Kenya for low risk projects is now 0.1% of the total project cost with a minimum charge of approximately USD100 and a maximum of USD29, 000. Medium risk projects are also subjected to a levy of 0.1% of the project cost with a minimum charge of approximately USD200 and a maximum of USD96, 000. On the other hand, high-risk projects are subjected to the highest levy of 0.1% of the total project cost with a minimum charge of USD480 and a maximum charge of USD385, 000. After meeting this mandatory requirement in order to obtain the EIA license, a project owner would have to decide if they want to incur the extra costs associated with the SuRe® Standard assessment as discussed in Chapter 3.

Whereas EIA is a mandatory assessment for projects predicted to have significant environmental and social impacts, the SuRe® Standard sustainability and resilience assessment is a voluntary practice and carries no legal obligation to carry out. However, the benefits derived as seen with the assessment of the NCT Phase I project cannot be downplayed or its benefits and contribution towards the SDGs ignored.

Chapter 7. SuRe® STANDARD AND SUSTAINABLE DEVELOPMENT GOALS

This chapter looks at the relevance of the SuRe® Standard and how it is contributing to the attainment of the Sustainable Development Goals (SDGs) through the promotion of sustainable and resilient infrastructure projects.

Sustainable development requires our society to make decisions and implement them in a way that does not compromise the future generation's ability to meet their own needs (United Nations, 2017). Infrastructure plays a big role in the achievement of the sustainable development goals but also poses negative impacts on society and environment during construction and operation (Shortall, 2015). However, when constructed in a sustainable and resilient way, it can generate positive impacts and hence acting as a vehicle to reach the sustainable development goals.

The Sustainable Development Goals (SDG's) cover a variety of goals that are interconnected to each other. For instance the construction of a water dam will contribute directly to the attainment of SDG 6 by providing the population with clean water and sanitation (United Nations, 2017). This could also lead to the achievement of other SDGs such as SDG 3. Good Health and Well Being, SDG 4. Quality Education, SDG 10. Reduced Inequalities and ultimately contribute to economic growth (United Nations, 2017).

An evaluation of the SuRe® Standard shows that the planning, designing, construction and operation of sustainable and resilient infrastructure generates positive economic, social and environmental impacts for the present and future generations (GIB & Natixis, 2016). The inter-linkage of the SDGs and how SuRe® applies in it is explained below:

SDG 5: Gender Equality: There are several kinds of discrimination, which hinder sustainable and inclusive social and economic development (United Nations, 2015). Within the SuRe® Standard, criterion 2.2.3 (non-discrimination) requires the infrastructure developers and operators to provide equal opportunity for usage of, access to and receiving benefits from the infrastructure as well as for employment at the facility (GIB & Natixis, 2016). This is to be in regardless of one's race, colour, gender, sexual orientation, language, religion, national or local origin, political as well as respecting others' opinion. The requirement of project developers and owners to develop recruitment policies that

demonstrate gender sensitivity with reference to local and international laws align the standard with SDG 5.

SDG 6: Clean Water and Sanitation: Access to clean water and sanitation is one of the basic human rights to live a fulfilling and dignified life (United Nations, 2015). Planning for effective water management systems and pollution control are covered in SuRe® criterion 3.3.2 (Pollution) and 3.4.2 (Preservation of Water Resources). Projects are required to use captured rainwater or recycled wastewater in meeting their outdoor water needs. In addition to this, a project is held accountable in ensuring that none of its activities contribute to the pollution of water resources. Project developers and operators are expected to treat wastewater before it is discharged and regularly monitor it to ensure no harm is posed to human health and the environment (GIB & Natixis, 2016).

SDG 7: Affordable and Clean Energy: Generating electricity by clean, renewable and sustainable production method has proven to have environmental, social and economic benefits the world over (United Nations, 2015). SuRe® criterion 3.1.3 (Renewable Energy) requires projects to adopt renewable energy and lessen the dependence on fossil fuels. The reduction of reliance in fossil fuels also contributes to the reduction of greenhouse gases, which is in line with the SDG 13. Climate Action. Investing in renewable energy sources not only promotes energy efficiency but it also is an avenue to save energy cost during the project construction and operation phases (GIB & Natixis, 2016).

SDG 8: Decent Work and Economic Growth: Planning, constructing, operating and decommissioning phases of infrastructure require both skilled and unskilled labour (United Nations, 2015). This is an opportunity for creating employment and SuRe® theme "Labour Rights and Working Conditions" covers the requirements of fair and safe employment conditions and a working environment. The theme requires the project owners, developers and operators to respect the rights of workers in accordance to the 1998 International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work. These fundamental principles and rights include: workers rights of association and collective bargaining; ensuring workers health and safety; prohibition against forced labour and child labour; establishing a transparent employee grievances mechanism; fair working hours and rest days; and fair wages for all workers without discrimination (GIB & Natixis, 2016).

SDG 9: Industry, Innovation and Infrastructure: The SuRe® Standard provides the guidelines to making infrastructure sustainable and resilient, which creates greater benefits to the economy, society and the environment (GIB & Natixis, 2016). The 14 themes on which the SuRe® Standard is built on create a conducive environment for the promotion of innovative technologies and inclusion of stakeholders in the development of infrastructure which is in line with SDG 9 (United Nations, 2015).

SDG 10: Reduced Inequality: The SuRe® Standard theme 2.3 on customer focus and inclusiveness ensures that users of an infrastructure project can access it without discrimination regardless of their gender, race, language, income or religion (GIB & Natixis, 2016). Where critical infrastructure is involved like access to safe drinking water or health care the project owner is expected to carefully explore all the available options to make sure the services are affordable for all. The project owner is also expected to ensure that during the design and construction phases the needs of the elderly and people living with disabilities are put into consideration so that they do not experience any problem when accessing the facilities (GIB & Natixis, 2016).

SDG 11: Sustainable Cities and Communities: This SDG goal is an outcome of implementing the SuRe® Standard in the development of sustainable and resilient infrastructure. The standard requires project to carry out risk and vulnerability assessment including how their project activities interact with other projects and develop short and long term mitigation measures. This ensures that cities and communities are well equipped to deal with environmental and social shocks and hazards making them sustainable (United Nations, 2015; GIB & Natixis, 2016).

SDG 12: Responsible Consumption and Production: Building and operating infrastructure consumes a vast amount of resources (United Nations, 2015). Therefore the requirements under SuRe® criterion 3.4.1 (Resource Efficiency) and 3.4.3 (Materials) asks for a commitment to sustainable procurement and responsible use of finite resources like water. Responsible consumption and production can only be achieved if projects are designed to maximise efficient use of materials throughout the lifecycle of an infrastructure project. The SuRe® Standard requires the project owners, developers and operators to desist from acquiring materials where they would pose social and environmental risks (GIB & Natixis, 2016).

SDG 13: Climate Action: The society needs to implement mitigation and adaptation measures against climate change (United Nations, 2015). SuRe® theme 3.1 on climate covers actions, which need to be taken by infrastructure developer and operators in order to avoid negative impacts on climate change, and create net positive outcomes wherever possible. One of the SuRe® Standard requirements is for projects to develop benchmarks in line with the UN Framework Convention on Climate Change (UNFCC, 1994), Montreal Protocol on Substances that Deplete the Ozone Layer (1989) and project country's National Determined Contributions (NDCs). In addition to these the infrastructure projects are also under the SuRe® Standard required to carry out vulnerability assessment and develop mitigation measures that would allow the project to withstand any shocks and hazards related to climate change (GIB & Natixis, 2016).

SDG 17: Partnership for the Goals: All and any of the goals cannot be attained without the collaboration of all stakeholders ranging from the top-level governments to local and indigenous communities (United Nations, 2015). SuRe® addresses stakeholder engagement (section 3.1) as the key to making infrastructure project inclusive, equitable, sustainable and resilient. Stakeholder engagement is key to making sure that the contribution and grievances of local communities, indigenous people and minorities are included in the decision making process throughout the life cycle of the project (GIB & Natixis, 2016).

Chapter 8. CONCLUSION

This chapter will provide an outlook of the objectives of this thesis and identify the areas that will require further research. The questions to be answered are:

- Do projects assessed with the SuRe® Standard stand to gain more benefits compared to using normal standards like Environmental and Social Impact Assessment (ESIA)?
- What would be the incentive for the public sector, developers and financiers to incur the extra cost of using the SuRe® Standard?
- Does the SuRe® Standard hold any relevance towards the achievement of the SDGs?

The need for sustainable infrastructure has never been greater especially in the face of the impacts of climate change, rapid population growth and urbanization. One of the objectives of this thesis was to review the experience and additional benefits derived from using the SuRe® Standard compared to normal standards such as ESIA. The benefits of using the SuRe® Standards are undeniable as demonstrated in the NCT Phase I project but it is still too early to tell what the long term benefits of using the SuRe® tools are compared to normal practice.

However, the global trend in the developing and emerging markets shows that there is a need for a standardized tool that monitors the compliance of infrastructure projects to GIIP. The SuRe® Standard is purposefully designed for developing and emerging markets because that is where the greatest infrastructure investment market lies. The SuRe® Standard provides a structure on which social, environmental and governance issues can be addressed some of which are only addressed at the surface during the ESIA process as illustrated above. However, it is up to the public sector, developers and financier to determine whether if the "business as usual" approaches are enough to propel infrastructure development in a sustainable and resilient manner.

One of the biggest challenges the SuRe® Standard may have to contend with is the willingness of the public sector, developers and financiers to incur the extra cost that comes with assessing the projects using this rating tool. Normally, projects are required to undergo through ESIA and a fee is paid to access all the relevant project licenses before the commencement of a project. Therefore, for infrastructure projects whose bottom line is profit making, the cost and time required to be invested in using the SuRe® Standard may

make the rating tool less attractive especially if they are only interested in meeting the minimum legal requirement at the national level.

The bottom line is that GIB needs to clearly demonstrate that using the SuRe® Standard saves project costs in the long-run which may be associated with disaster and emergency preparedness, climate change adaptation and mitigation and project cumulative impacts among others. Such a demonstration would provide a concrete business case for investing in sustainable and resilient infrastructure and as a result why projects should use the SuRe® Standard.

The results of this study show that there are tangible benefits that a project stands to gain from using the SuRe® Standard since it gives the project a holistic approach to sustainable and resilient issues. In addition, the results show that the SuRe® Standard can contribute greatly in the achievement of the SDGs and act as a tool to track the milestones achieved at the local and national level for developing countries. However, the cost and resources associated with the SuRe® Standard assessment process may hinder project owners from using the rating tool since they have to pay for licenses for other processes such as Environmental Impact Assessment.

In conclusion, the results of this study provide a deeper understanding on how infrastructure-rating tools assess projects and the benefits that project owners stand to gain from this process. This can be used as a reference point for project owners when deciding on whether to use rating tools or use the business-as-usual approach.

8.1 Further Studies

This thesis concentrated in the assessment of a single project to evaluate the experience of using the SuRe® Standard. There is therefore need to assess the benefits and experience derived by projects in other sectors because of using the SuRe® Standard. The use of the SuRe® Standard in a wide variety of projects will provide a clear picture on the applicability of the criteria found in the standard and identify the areas of improvement for the rating tool.

In addition to this, I believe it would be worthwhile for studies to be carried out to demonstrate how the SuRe® Standard can be used to make a business case for sustainable and resilient infrastructure and as a result attract more investors in order to close the infrastructure gap in developing and emerging markets. This would include demonstrating

how the SuRe® Standard can be used to reduce the uncertainties and financial risks associated with infrastructure investment and development.

Finally, more studies should be put towards evaluating how the SuRe® Standard can be used to inform policy at different levels at both the national and local governments and contribute towards the achievement of sustainable infrastructure and ultimately towards the achievement of the SDGs. The focus would be on identifying the loopholes associated with national regulations such as ESIA and how structural changes can be guided by the SuRe® Standard in order to close these gaps.

Chapter 9. RECOMMENDATIONS

My recommendation to the Global Infrastructure Basel (GIB) is to engage the public sector, developers and financiers especially in Africa in outlining the benefits of using the SuRe® Standard compared to normal practice such as ESIA. This is because the SuRe® Standard combines different assessment approaches to address different social, economic and environmental issues associated with infrastructure development resulting in sustainable and resilient infrastructure. Any project that goes through the SmartScan or the SuRe® Standard full assessment process stands to gain a deeper understanding of sustainability issues highlighted in both tools and can apply corrective measures based on the feedback from the assessment process.

The SuRe® Standard builds on approaches such as ESIA, Environmental and Social Management Systems (ESMS), life cycle analysis, Cumulative Impact Assessment (CIA) among many others and could be marketed as a tool that creates a benchmark for environmental, social and governance based on GIIP.

At a project level, NCT Phase I project has faced public and political backlash especially in the areas of stakeholder identification and consultation. My recommendation to AWSB is that using the SuRe® Standard and applying for future certification could act as a way of remedying the social and environmental issues raised by the public politicians and experts regarding the sustainability of the project and create acceptance of the project at the local and national level.

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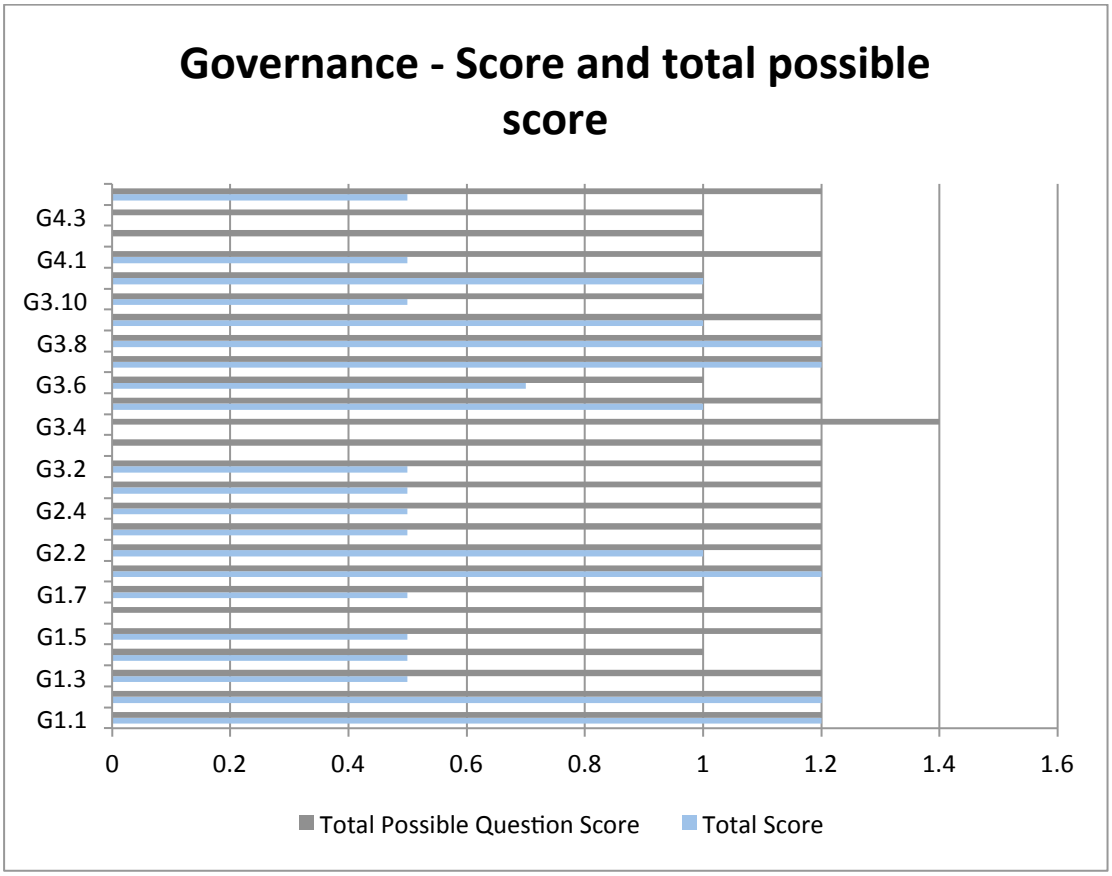
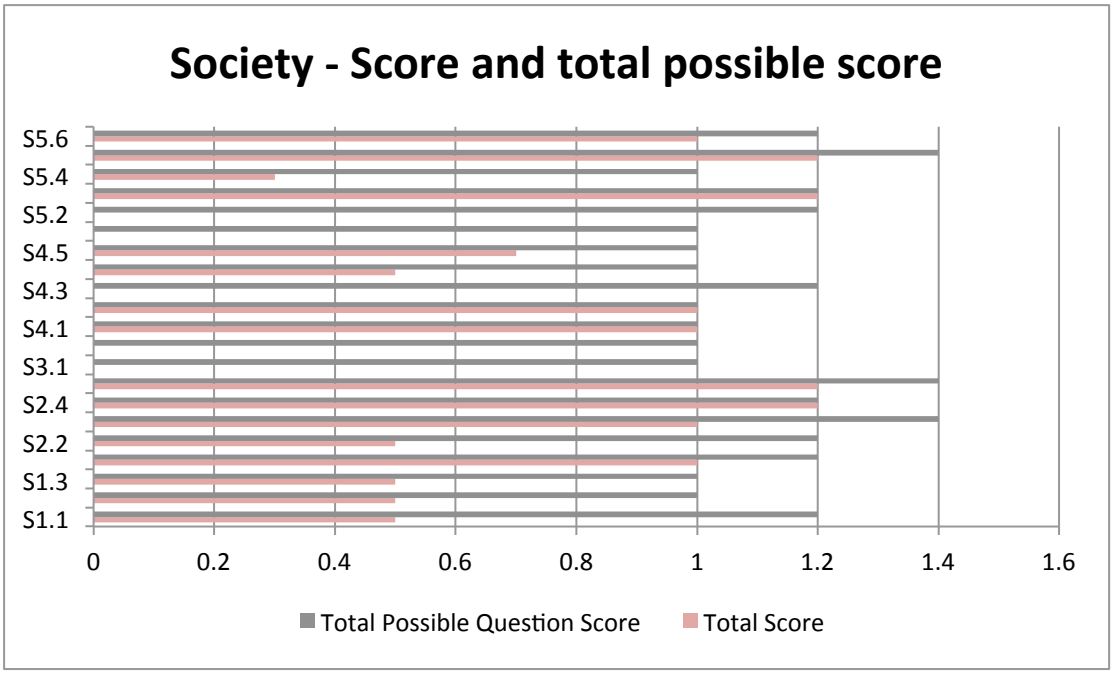
APPENDIX 1

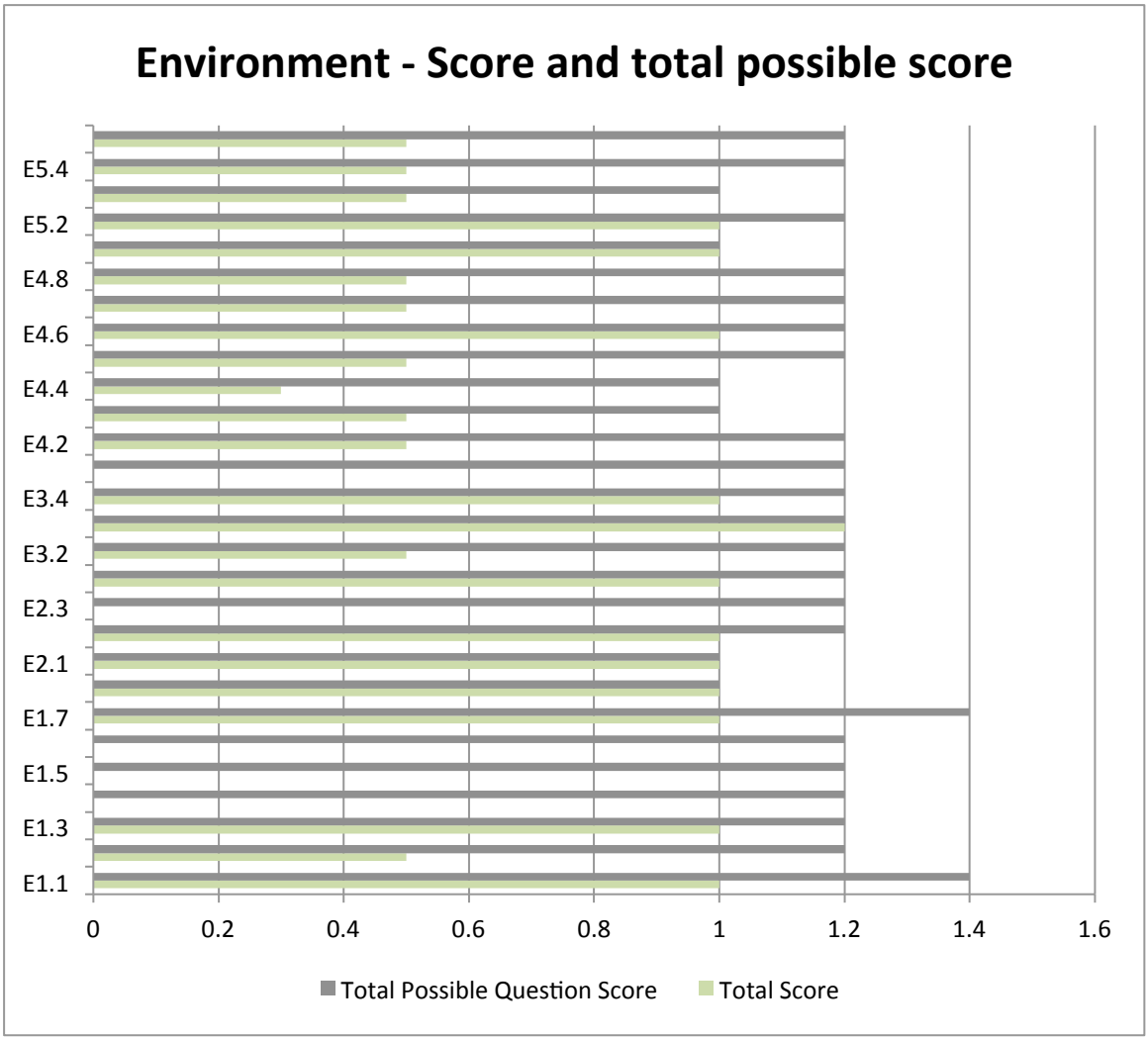
The following is the full result of the NCT Phase I project score based on the SmartScan assessment:



Graph 1: The NCT Phase I project score in the Governance dimension



Graph 2: The NCT Phase I project score in the Social dimension



Graph 3: The NCT Phase I project score in the environment dimension.

Table showing the NCT Project Phase I scores on governance, society and environment dimensions on the SmartScan

Question Number		Total Score	Total Possible Score	Not Applicable
Governance	Theme			
G1.1	[ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEMS]	1.2	1.2	0
G1.2	[LIFE CYCLE APPROACH]	1.2	1.2	0
G1.3	[RESILIENCE PLANNING]	0.5	1.2	0
G1.4	[RESILIENCE PLANNING]	0.5	1	0
G1.5	[RESILIENCE PLANNING]	0.5	1.2	0
G1.6	[SUPPLY CHAIN]	0	1.2	0
G1.7	[PRE-EXISTING LIABILITIES]	0.5	1	0
G2.1	[STAKEHOLDER IDENTIFICATION AND ENGAGEMENT PLANNING]	1.2	1.2	0
G2.2	[ENGAGEMENT AND PARTICIPATION]	1	1.2	0
G2.3	[PUBLIC GRIEVANCE REDRESS MECHANISM]	0.5	1.2	0
G2.4	[POLITICAL BUY-IN]	0.5	1.2	0
G3.1	[ORGANISATIONAL STRUCTURE AND MANAGEMENT], [TEAM QUALIFICATIONS, KNOW-HOW AND CAPACITY BUILDING]	0.5	1.2	0
G3.2	[ORGANISATIONAL STRUCTURE AND MANAGEMENT]	0.5	1.2	0
G3.3	[TEAM QUALIFICATIONS, KNOW-HOW AND CAPACITY BUILDING]	0	1.2	0
G3.4	[TEAM QUALIFICATIONS, KNOW-HOW AND CAPACITY BUILDING]	0	1.4	0
G3.5	[LEGAL COMPLIANCE AND OVERSIGHT]	1	1.2	0

G3.6	[RESULTS ORIENTATION]	0.7	1	0
G3.7	[RISK MANAGEMENT]	1.2	1.2	0
G3.8	[INFRASTRUCTURE CONNECTIVITY AND INTEGRATION], [ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEMS]	1.2	1.2	0
G3.9	[ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEMS]	1	1.2	0
G3.10	Public Disclosure	0.5	1	0
G3.11	[FINANCIAL SUSTAINABILITY]	1	1	0
G4.1	[ANTI-BRIBERY MANAGEMENT SYSTEM]	0.5	1.2	0
G4.2	[ANTI-BRIBERY MANAGEMENT SYSTEM]	0	1	0
G4.3	Public Disclosure	0	1	0
G4.4	[FINANCIAL TRANSPARENCY ON TAXES AND DONATIONS]	0.5	1.2	0
Society		36	37	38
S1.1	[HUMAN RIGHTS COMMITMENT]	0.5	1.2	0
S1.2	[HUMAN RIGHTS COMPLAINTS AND VIOLATIONS]	0.5	1	0
S1.3	[HUMAN RIGHTS COMMITMENT]	0.5	1	0
S2.1	[EMPLOYMENT POLICY]	1	1.2	0
S2.2	[RIGHT TO ASSOCIATION AND COLLECTIVE BARGAINING]	0.5	1.2	0
S2.3	[NON-DISCRIMINATION]	1	1.4	0
S2.4	[OCCUPATIONAL HEALTH AND SAFETY]	1.2	1.2	0
S2.5	[NON-DISCRIMINATION, EMPLOYEE GRIEVANCE MECHANISM], [WORKING HOURS AND LEAVE, FAIR WAGES AND ACCESS TO EMPLOYEE DOCUMENTATION, RETRENCHMENT]	1.2	1.4	0
S3.1	[PHYSICAL ACCESSIBILITY]	-	1	1

S3.2	[SERVICE IMPROVEMENT]	-	1	1
S4.1	[MINORITIES AND INDIGENOUS PEOPLE]	1	1	0
S4.2	[RESETTLEMENTS]	1	1	0
S4.3	[CULTURAL HERITAGE]	-	1.2	1
S4.4	[PUBLIC HEALTH AND SAFETY]	0.5	1	0
S4.5	[DECOMMISSIONING AND LEGACY: RISKS TO FUTURE GENERATIONS]	0.7	1	0
S5.1	AFFORDABILITY SOCIO-ECONOMIC DEVELOPMENT	-	1	1
S5.2	[INFRASTRUCTURE ADEQUACY, SERVICE IMPROVEMENT]	-	1.2	1
S5.3	[SOCIOECONOMIC DEVELOPMENT]	1.2	1.2	0
S5.4	[IMPROVING ACCESS TO CRITICAL INFRASTRUCTURE]	0.3	1	0
S5.5	HIRING AND TRAINING LOCAL STAFF	1.2	1.4	0
S5.6	[SOCIOECONOMIC DEVELOPMENT]	1	1.2	0
Environment		36	37	38
E1.1	[GREENHOUSE GAS EMISSIONS]	1	1.4	0
E1.2	[GREENHOUSE GAS EMISSIONS]	0.5	1.2	0
E1.3	[GREENHOUSE GAS EMISSIONS]	1	1.2	0
E1.4	[ENERGY EFFICIENCY]	0	1.2	0
E1.5	[ENERGY EFFICIENCY]	0	1.2	0
E1.6	[RENEWABLE ENERGY]	-	1.2	1
E1.7	[EMERGENCY PREPAREDNESS,	1	1.4	0
E1.8	[POLLUTION]	1	1	0
E2.1	[BIODIVERSITY AND ECOSYSTEM MANAGEMENT], [HABITAT	1	1	0

	AND ECOSYSTEM CONSERVATION]			
E2.2	[FOREST RESTORATION AND CONSERVATION]	1	1.2	0
E2.3	[INVASIVE ALIEN SPECIES]	0	1.2	0
E3.1	[WASTE]	1	1.2	0
E3.2	[POLLUTION]	0.5	1.2	0
E3.3	[PEST MANAGEMENT]	1.2	1.2	0
E3.4	[NOISE, LIGHT, VIBRATION AND HEAT]	1	1.2	0
E4.1	[RESOURCE EFFICIENCY]	0	1.2	0
E4.2	[PRESERVATION OF WATER RESOURCES]	0.5	1.2	0
E4.3	[PRESERVATION OF WATER RESOURCES]	0.5	1	0
E4.4	[MATERIALS]	0.3	1	0
E4.5	[MATERIALS]	0.5	1.2	0
E4.6	[MATERIALS]	1	1.2	0
E4.7	[MATERIALS]	0.5	1.2	0
E4.8	[CUMULATIVE IMPACTS]	0.5	1.2	0
E5.1	[LOCATION, PROJECT SITING AND DESIGN IN RELATION TO LANDSCAPE]	1	1	0
E5.2	[LOCATION, PROJECT SITING AND DESIGN IN RELATION TO LANDSCAPE]	1	1.2	0
E5.3	[LAND USE]	0.5	1	0
E5.4	SOIL RESTORATION	0.5	1.2	0
E5.5	LOCATION, PROJECT SITING AND DESIGN IN RELATION TO LANDSCAPE	0.5	1.2	0

APPENDIX 2

Table showing the list of documents from the NCT Phase I project used in the assessment by the project team

Studies, Agreements and Documents

Please indicate the documents, studies, and agreements which have been finalised:

→ Pre-Feasibility Study	Yes
→ Feasibility Study	Yes
→ Poverty and Social Assessment	Yes
→ Environmental Impact Assessment	Yes
→ Government Approval/Permits	Yes
→ Concession Deed/Agreement	Yes
→ Technical Report	Yes
→ Financial Plan	Yes
→ Geotechnical Report/ Surveys	Yes
→ Detailed Designs/ Drawings	Yes
→ Bill of Quantities	Yes
→ Bid Documents	Yes
→ EPC Contract	Yes
→ O&M Agreement	Yes
→ Shareholders Agreement	Yes
→ Off-Take Agreement	Yes
→ Supply Agreement(s)	Yes
→ Programme of Works/ Contractual Baseline Schedule	Yes