# A Framework for Greening Universities in Knowledge Based Economy, Botswana

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GIVING UP
by Wayne Visser

I'm giving up –
Not on life, but on those actions that threaten life
Not on living, but on those habits that distract from living
Not on loving, but on those fears that get in the way of loving

I'm giving up
Food that forges a chain of suffering and death
Clothes that weave a garment of exploitation and shame
Fuels that are harbingers of cancer and climate catastrophe

I'm giving up –
Not on people, but on the poor choices that people make
Not on freedom, but on the complacency that cripples freedom
Not on hope, but on the sense of impotence that kills all hope

I'm giving up
Words that break down rather than build up others
Work that lacks a larger purpose of improving society
Products that leave a trail of misery and waste in their wake

I'm giving up –
For the good of myself and those who have less than I do
For the good of the planet and those who share its blue-green bounty
For the good of the children and those who will inherent what we leave behind

I'm giving up
All these things and more –
In my best and brightest and bravest moments –
For good

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Shantha Indrajith Hikkaduwa Liyanage

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# Declaration

I, Shantha Indrajith Hikkaduwa Liyanage, declare that this thesis entitled: **A Framework for Greening Universities in Knowledge-Based Economy, Botswana** and the work presented in this thesis are both my own and generated by me as a result of my original research. It is submitted in fulfillment of the Doctor of Philosophy in Economics and Management Science requirements with Business Administration at the Business School, North-West University. To the best of my knowledge and belief, no material was previously published or written by another person except where due references are made and contained in this thesis.

Shantha Indrajith Hikkaduwa Liyanage

21st May 2021

# Abstract

Developmental activities that were carried out since the industrial revolution have resulted in an unsustainable world. The adverse impact of unsustainability has led to a global response consensus for a sustainable globe codified as Millennium Development Goals, subsequently the 2030 Agenda for 17 Sustainable Development Goals (SDGs), and the Paris Climate Agreement. Under these universal packages, economies around the world have put together programs towards attaining sustainability goals.

In this endeavor, Botswana as an economy operates under the neo-classical economic model. The neo-classical economic theories founded on profit maximization do not recognize sustainability beyond the market forces. Knowledge-Based Economies (KBEs) enable bridging the gap by endogenous factors such as knowledge and innovation, technology, and human capital. Human capital needed for sustainable development means ethical human capital. Hence, Botswana now steers the economy as a Knowledge-Based Economy (KBE) through Botswana Vision 2036. It provides, among other things, that Botswana endures achieving prosperity of all generations by balancing three pillars of sustainability.

The knowledge and innovation meant for sustainability by Botswana Vision 2036 are branded as green knowledge and innovation/ethical human capital, blended with the natural system as modeled by the Quintuple Helix Model of Innovation. However, due to bureaucratism, rationalism, myths and ceremonies, isomorphism, and legitimacy, conventional universities in Botswana produce knowledge and innovation in the sense of traditional disciplinary knowledge, which would not be adequate to meet the goals of sustainable development although new institutional logics and agency of actors support green knowledge and innovation.

Hence, this study aims to ascertain a complete set of requisites for greening a university and integrate them pragmatically to be used by universities as a blueprint to be a green university. Such a blueprint supports the Botswana Vision 2036 as stipulated that the vision identifies the necessity of creating a conducive environment by policy, institutional, and legal and regulatory framework to place adequate structures and resources for sustainable development. The multi-method qualitative exploratory and descriptive research founded on grounded theory were used as strategies of inquiry under an interpretivist approach to reach the study aim.

The research inquiry was first carried out as an exploratory research followed by a descriptive research. The exploratory research is warranted in this research because the study's scope is new or unclear in the beginning of the research. Another aspect is that other researchers have not adequately explored the scope of the research. For example, there is an incomplete description of a green university and identify a green university as one principle and three dimensions. The one principle that they refer to the concept of the green university, and the three dimensions refer to ***(i) Green education (teaching/curriculum), (ii) Green research, and (iii) Green campus***. Consequently, this study intends to make clear the blurred areas of the green university.

Hence, exploratory research began collecting qualitative data from documents, already published multidisciplinary, interdisciplinary, and transdisciplinary research articles related to the green university. Secondary data from a sample of 97 research articles subject to the saturation point were collected first. After the axial coding, document analysis founded on grounded theory enabled theory development by abduction. Nine requisites of the green university were found as theory.

After the exploratory research, the descriptive research began with the theory developed in the exploratory research. The descriptive research describes the issues defined in the exploratory research. Consequently, the theory developed in the exploratory research was used as a priori codes to collect interview data. A sample of 57 participants subjected to saturation point from professors, senior lecturers, academic managers, non-academic managers, and undergraduate and graduate students was used to collect data. After that, axial coding thematic analysis assisted with grounded theory enabled the development of further theory by abduction. Finally, the descriptive research found a model; how a green university produces green knowledge and innovation.

The model of green university developed as a system in this study can be adopted by the conventional universities. They can transform their universities into green universities, producing green knowledge and innovation in the mainstream knowledge production process. Such a process results in providing benefits to stakeholders of the university at the micro-level. At the macro level, the green knowledge and innovation so created would enter the main circulation flow. After that, it blends with the other knowledge systems, namely, the natural environment of society, economic system, media-based and culture-based public and civil society, and political system continuously developing in a never-ending process until sustainable development is achieved for all beings (utopia) under prudential anthropocentrism.

**Key Words:** Green University, Quintuple Helix Model of Innovation, Neo Institutionalism, Green Knowledge and Innovation, Knowledge-Based Economies (KBEs), Doughnut economics, Nine ecological boundaries.

# List of Abbreviations & Acronyms

| | |
|---|---|
| KBEs | Knowledge-Based Economy/Economies |
| SDGs | Sustainable Development Goals |
| CO2 | Carbon dioxide |
| CFC | Chlorofluorocarbons |
| UV | Ultraviolet |
| GDP | Gross Domestic Products |
| ESG | Environmental, Social, and Governance |
| Glocal | Global and Local |
| ESD | Education for Sustainable Development |
| RQ | Research Question |
| IQ | Interview Question |
| AIQ | Additional Interview Question |
| HEIs | Higher Education Institutes |

# Chapter 1: Background of the Study

## 1.1 Introduction

To achieve higher living standards and wellbeing of people, Botswana's economy operates on some fundamentals of neoclassical economic models that determine the country's output level by the free-market forces of demand and supply. However, neo-classical economic models do not recognize the importance of natural resources and sustainability beyond the market forces. However, neo-classical economic models believe that natural resources are finite, but a decrease in natural resources is offset by the increase of capital produced by society in never-ending economic growth (Mulder & van den Bergh, 2008). This tenet operates in the free market, creating a division between natural capital and economic capital, protecting economic capital by legal and ethical standards not to reduce it after it is employed.

In contrast, natural capital is not so protected but is allowed to be protected merely by the neoclassical economic model's invisible hand (Storm, 2017). The invisible hand is an unseen or unobservable mechanism. It has been able to look at the literal meaning of natural capital but not the metaphorical meaning of natural capital, God's hand, since the first industrial revolution.

Capital means capital beyond economic capital. It consists of five types of capital of an economy required for sustainable development (Carayannis & Campbell, 2010). These five types of capital consist of; (i) Ethical capital blends the morality necessary for sustainable development, (ii) Natural capital mobilizes natural resources, (iii) Economic capital mobilizes financial capital, (iv) Political and Legal capital mobilizes political ideology. Finally, (v) Social capital mobilizes civil society resources (Carayannis et al., 2012). However, various types of capital may be available in an organization, and the mixture may be different from one organization to another organization (Bull et al., 2010), but an economy needs all of these five types of capital.

The conventional economic capital approach appears unsatisfactory and cannot answer the adverse global issues, such as global warming issues and 17 SDGs. Moreover, four of the planetary boundaries out of nine aforementioned have already been encroached by

anthropogenic developmental activities since the first industrial revolution (Rockstrom et al., 2009).

The neo-classical economic model needs a better economic model for achieving higher living standard and wellbeing of people by increasing the economic growth in economies. In this respect, it is apparent that a newer economic growth model, 'Knowledge-Based Economies' (KBEs) play a vital role (Svarc & Dabic, 2017). Schiliro (2012) expressed that the transformation of existing economies to KBEs is taking place globally, in all advanced industrialized countries and many developing countries.

In this trend, Botswana was recently mandated to be a KBE by its Vision 2036 (Government of Botswana, 2016). Vision 2036 stipulates that Botswana promotes the use of science, technology, and innovation to increase the benefits of efficiency in the socio, economic, and business sectors. It further provides that Botswana endures achieving prosperity of all generations by balancing three pillars of sustainability. In this respect, the vision identifies the necessity of creating a conducive environment by policy, institutional, regulatory, and legal framework to place adequate structures and resources.

These KBEs worldwide are meant to be "economies which are directly based on the production, distribution, and use of knowledge and information" (OECD,1996). Accordingly, KBEs achieve their economic growth by investing in human capital, knowledge, and innovation to produce skilled, creative, innovative, ethically bound people and organizations that can address global sustainability issues in KBEs.

The production of skilled, creative, innovative people and organizations by the KBEs without ethical capital makes KBEs vulnerable in the long run. Hence, the inherent gap between ethical and physical capital is now bridged by the Quintuple Helix Model of Innovation by adding the natural environment of society as the fifth subsystem to the Quadruple Helix Model of Innovation (Carayannis & Campbell, 2010). The model was developed extending the Quadruple Helix Model of Innovation (Carayannis & Campbell, 2009), which was extended on the Triple Helix Model of Innovation (Etzkowitz & Leydesdorff, 1995).

The Quintuple Helix Model of Innovation and Mode 1, 2, and 3 Knowledge Production more fully described how to create strategic knowledge and innovation together with nature for a

new quality of life in KBEs. After the Quintuple Helix Model of Innovation was introduced (Carayannis & Campbell, 2010), two universal top-down policies in 2016, the Paris Climate Agreement and the 2030 Agenda for 17 Sustainable Development Goals (SDGs) with 169 targets 320 plus indicators mandated economies, including Botswana, to link their economic activities with the sustainable development.

The vision and mission of these two universal packages and the Quintuple Helix Model of Innovation were based on enlightened anthropocentrism. These packages and the Quintuple Helix Model of Innovation bridge the gap made by the planet's naturalness's inability to be resilient for distortions caused by business as usual. Hence, the sustainable world's success story depends on the production of green knowledge and innovation. The scientific discourse on the knowledge and innovation developed with the nature of sustainable development in this study refers to green knowledge and innovation, among other endogenous factors of KBEs. For example, among other things, SDGs-Goal 04: Quality Education mandates the universities to make sure that the learners gain the necessary knowledge and skills to foster sustainable development. Carayannis and Campbell (2011) point out that the nature and scope of the knowledge meant for sustainability to be understood in the context of Glocal (Global and Local) Knowledge Economy and Society (Carayannis & von Zedtwitz, 2005; Carayannis & Campbell, 2006).

Hence, Botswana as a KBE enables bridging the gap of green knowledge and innovation by setting its goals, among other things, creating ethical and natural capital (Jednak & Kragulj, 2015). In the same line, the 2030 Agenda for 17 SDGs (Barcellos-Paula et al., 2021), the Paris Climate Agreement (Liyanage & Netswera, 2021) with Nationally Determined Contribution (Mizan et al., 2020) of Botswana (NDC), Nine safe operating environmental processes (Rockstrom et al., 2009), and Doughnut economics also advocate ethical and natural capital. Thus, the Quintuple Helix Model of Innovation is the strategy that can be used in this respect.

In this endeavor, sustainability's culture is to be developed at the organizational and national levels with all types of organizations and people, enabling alignment of the behavior of organizations and people with necessary values and beliefs for sustainable development. Schein (2004:17) defines organizational culture as "the patterns of shared basic assumptions learned by the organization as it solves its problems of external adaptations and internal

integration." These shared assumptions are unexpressed and operate subconsciously but deeply implanted and integrated with the values and beliefs system of the organization. However, they are reflected by the behavior of people in the organization. In other words, the shared assumptions of the organization can be understood by observing the behavior and interpreting them.

In the mission of sustainable development in KBEs, universities as organizations, which are leaders, models, and catalysts in education and innovations (Clarke & Kouri, 2009; Moore, 2005), are expected to play a vital role leading by example in promoting sustainable development practices at their universities (Amaral et al., 2015). In this endeavor, universities possess a unique place to be catalysts and leaders to foster global sustainability because of resources and their influence (Finlay & Massey, 2012). For example, Yuan et al. (2013) bring to the attention of power of higher educational institutes for sustainable development, stating that there were more than 2198 universities and colleges with more than twenty-five million students in China. This strength is the same for all other countries, depending on the country's demographical factors.

Accordingly, universities are institutions that are strongly interconnected with KBEs and Sustainability. Liyanage and Netswera (2021) argue that a credible institution is a precondition for KBEs (and sustainability) because it provides a stable structure for human interaction with less uncertainty. It is an autonomous reality that provides an independent structure for guiding the behavior and knowledge creation process (Schiliro, 2012). There are various legal systems in this respect. Klettner et al. (2014) point out that the corporate governance system based on the Anglo-American legal system protects shareholders' interests as a priority. European and Japanese legal traditions give more rights to the employees and creditors.

The Organization for Economic Co-operation and Development (OECD) in 1996 introduced a hybrid model to protect all stakeholders' diverse interests by converging both legal systems mentioned above. Accordingly, the OECD incorporates sustainability into corporate governance, enabling it to embrace the Quintuple Helix Model of Innovation. In the context of Botswana, King IV: Code of Corporate Governance (Institute of Directors Southern Africa, 2016), even though not legislative in nature, is a part of a recommended practice of the corporate world, including universities. The underlying philosophy of the code embraces

leadership, sustainability, and corporate citizenship. Furthermore, it urges accountability not to confine to the financial bottom line but to focus on its ecological impact. In other words, it advocates integrative thinking to interconnect and to be interdependent with various factors that affect its value creation. Accordingly, King IV: Code of Corporate Governance (Institute of Directors Southern Africa, 2016) requires that universities be corporate citizens as part of society and ecology. It further stipulates stakeholder inclusivity, including ecology, sustainability, and integrated reporting for ethical and natural capital accumulation.

Hence, beyond the myths and ceremonies, sustainability has gained legitimacy for creating green knowledge and innovation in universities within the definition of legitimacy. Legitimacy is defined as "A generalized perception or assumptions that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Ginzel et al., 1992; Neilsen & Rao, 1987; Perrow, 1970 as cited in Suchman, 1995:574).

However, in these circumstances, it is noted here that the existing policy framework, Research, Science, Technology, and Innovation applicable to higher education including universities in Botswana for the creation of green knowledge and innovation relating to sustainability is not credible and appears to be unsatisfactory (Moremi et al., 2015). There are many reasons for this. Every university is a part of the organizational field. Myths and ceremonies, bureaucratization, and rationalization in universities are characteristics that operate to slow the changes demanded in the environment. However, institutional logics were mandated by the 2030 agenda for 17 SDGs (Barcellos-Paula et al., 2021), the Paris Climate Agreement (Liyanage & Netswera, 2021), nine safe operating environmental processes (Rockstrom et al., 2009), Quintuple Helix Model of Innovation (Carayannis & Campbell, 2010), and Doughnut economics (Raworth, 2017) to accelerate sustainability changes.

Hence, this research aims to develop a framework to transform an unsustainable university into a green university within the said institutional logic of KBEs. It is because the current structure of universities is not conducive to sustainability. Therefore, a fundamentally different structure is required to produce green knowledge and innovation (Dale & Newman, 2005; Farley & Smith, 2014; Weisser, 2017).

In search of a framework for creating green knowledge and innovation by universities in Botswana as a KBE, it appears that the universities around the world have already been initiating to take increasing responsibility for fostering sustainability. However, sometimes claiming that their universities as 'green universities' despite their small contribution to sustainability (Cartwright & Craig, 2006). This small claim of the so-called green university is evident by Zhao and Zou (2015) that a green university is one principle and three dimensions. **The one principle that they refer to the concept of the green university, and the three dimensions refer to *(i) Green education (teaching/curriculum), (ii) Green research, and (iii) Green campus***. Even Though this explanation gives an idea about a green university for its stakeholders, this explanation is a preliminary design that demands identifying and integrating a complete set of dimensions.

Hence, a curiosity arises to explore various related concepts and metaphorical language such as green university in search of a complete set of requisites/dimensions/subsystems of a green university. Such exploration is vital to pragmatically design by integrating them so that green universities enable their fair contribution to global sustainability. Cartwright and Craig (2006), who qualitatively assessed corporations' corporate governance, concluded that the current design for organizations' corporate governance (including universities) could not contribute to global sustainability fairly.

The threshold of global sustainability meant by Cartwright and Craig (2006) can be explained (without prejudice to the broader green knowledge and innovation) by a numerical example with CO2 concentration in the atmosphere. The Keeling curve depicts that the atmospheric CO2 concentration was below 300 ppm during the 800,000 years until 1958. After that, it has increased to 400 ppm by 2013 and now 410 ppm in 2020, causing the highest CO2 ppm in history. Most of the CO2 concentration in the atmosphere is human made by burning fossil fuels. Suppose the tipping point of CO2 ppm is 450/550 ppm. In that case, every organization must fairly contribute not to move beyond the 450/550 ppm as a threshold to keep the ambitious level of global temperature below $1.5^0$ C; Otherwise, the target is $2^0$C from the preindustrial levels (UNDP, 2020) as concurred by 189 nations in the Paris Climate Agreement. For example, if a university consumes electricity produced with renewable energy in its operation, the university internalizes CO2 emission. In that case, it contributes to sustainable development by creating ethical and natural capital required for sustainable development; otherwise, it contributes to increasing CO2 ppm, resulting in adverse global and local impact.

## 1.2 Scope of Green Knowledge & Innovation

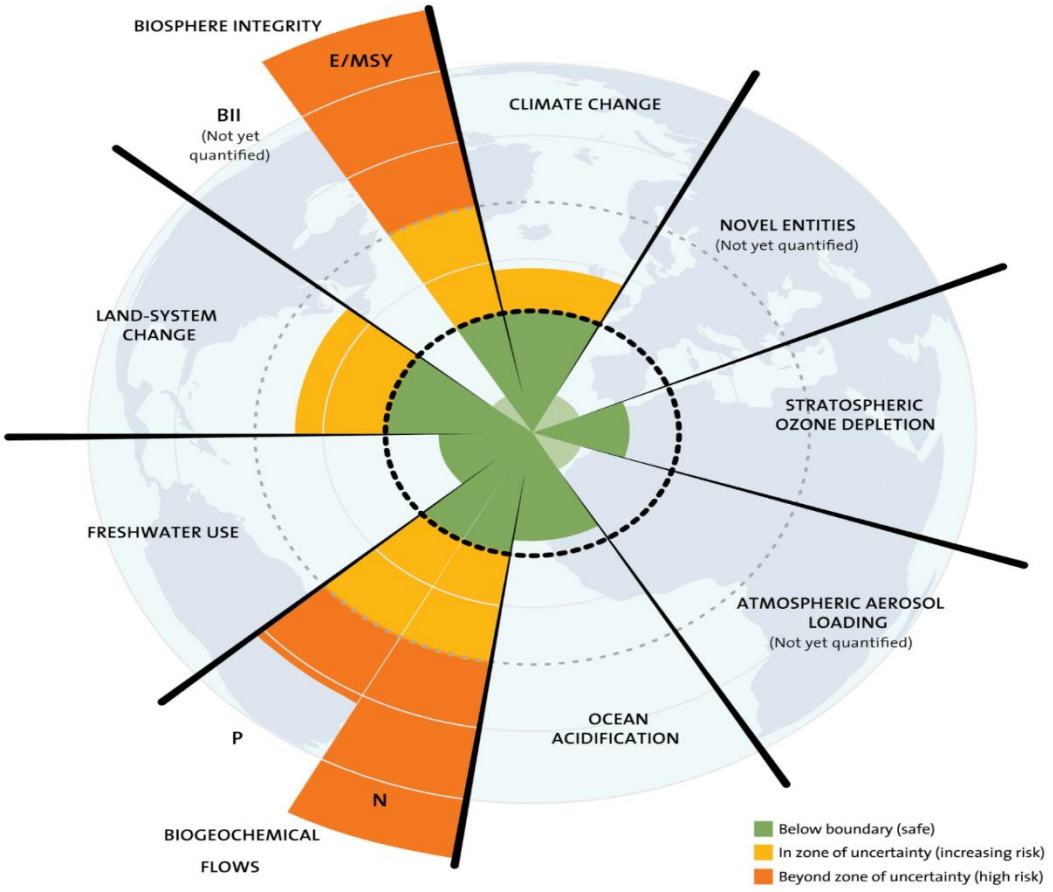
The purpose of the green university is to produce green knowledge and innovation needed for sustainable development. For example, the green education/teaching/curriculum for architects, engineers, and other graduates enables carrying out their professional activities, fostering sustainability if sustainable criteria and values are taught in their disciplines (de Ciurana & Filho, 2006). Hence, Nine Planetary Boundaries for Safe Operating Spaces, Doughnut Economics, the 2030 Agenda for 17 SDGs, and the Paris Climate Agreement together with Nationally Determined Contribution are fundamentally determined by the green knowledge and innovation scope.

### 1.2(i) Nine Planetary Boundaries

Climate Change is only one of the nine environmental processes identified and quantified by the Stockholm Resilience Centre. The former center director, Johan Rockstrom and his group of 28 internationally renowned scientists ascertained nine environmental processes which regulate the stability and resilience of the ecological system of the planet (Rockstrom et al., 2009).

These nine environmental operating spaces are (i) Stratospheric ozone depletion, (ii) Loss of biosphere integrity (biodiversity loss and extinctions), (iii). Chemical pollution and the release of novel entities, (iv) Climate Change, (v) Ocean acidification, (vi) Freshwater consumption and the global hydrological cycle, (vii) Land system change, (viii) Nitrogen and phosphorus flow to the biosphere and oceans, and (ix) Atmospheric aerosol loading as shown in figure 1

Figure 1: Nine Ecological Boundaries




Source: Rockstrom et al. (2009)- Nine Ecological Boundaries

i. The stratospheric ozone layer in the atmosphere enables ultraviolet (UV) radiation from the sun to the Earth. Unless the Ozone layer filters the UV rays, they can cause skin cancer in humans and damage the marine biological system. The ban of chlorofluorocarbons (CFC) by the Montreal Protocol has gradually recovered the damaged ozone layer discovered in the 1980s.

ii. The biosphere integrity is damaged by the continuously increasing consumption of food, water, and natural resources causing biodiversity loss. Moreover, the intensity of increasing consumption due to the increasing population is at an alarming stage of extinction on the land, water, and marine ecosystem. However, innovative solutions enable reducing the pressures on lands, waterways, and marine ecosystems required to protect biodiversity, such as an integrated aquaculture system for producing algae, mussels, and fish.

iii. Aerosol pollution occurs by air polluting industries, forest fires, agricultural burning, and Chemical pollution, releasing novel entities (tiny particles) into the environment. They are harmful to both land and marine species. For example, synthetic organic pollutants, heavy metal compounds, and radioactive materials are novel entities. They are toxic and long-lived substances. They can reduce fertility and permanent genetic damage. As a result, bird populations decrease dramatically. Further, they can impair reproduction in marine mammals. However, most of these aerosol pollutants can be eliminated by a policy framework.

iv. Climate change resulting from increasing CO2 concentration has increased the global average temperature from the preindustrial period to nearly $1^0$ C. The Paris Climate Agreement agreed to maintain the global average temperature at an ambitious target of $1.5^0$ C, otherwise below $2^0$ C by the end of the century (UNDP, 2020). The Paris Climate Agreement targets can be achieved by limiting carbon emission by generating electricity with renewables, introducing the carbon tax, and using energy efficiency measures. Otherwise, irreversible adverse impacts that would cause by encroaching climate change boundaries will directly or indirectly affect many other boundaries.

v. The increased ocean acidification by absorbing CO2 beyond the threshold increases the acidity of seawater. As a result, the shells and skeletons of some marine species already dissolve in the more acidic seawater. Also, acidification affects the organism's growth and survival, such as corals, shellfish, and plankton. As a result, the fish stock and it has ramification to the whole ecological system. However, de-carbonization and efficient use of fertilizer enables mitigating the adverse impact.

vi. Freshwater consumption and the global hydrological cycle have also been affected by anthropogenic activities such as human modifications to the water bodies and land-use change. Some of these changes are irreversible and have created water-stress countries around the world. Since agriculture consumes 70% of the water from the rivers and groundwater, various innovations such as drip irrigation, zero tillage systems can be used for water harvesting.

vii. Land system change has taken place all over the world. The conversion of forests, grasslands, and wetlands into agricultural lands and residential purposes has reduced biodiversity, water flows, and carbon's biochemical cycle. In order to manage the land systems, Satellite and online tools are available to track deforestation. For example, voluntary ethical behavior adopted by Multinational Companies, Unilever, which contributes to 3% of the global supply chain of palm oil, agreed to buy their need of palm oil only from traceable sources.

viii. Both nitrogen and phosphorus are required for plant growth, but excessive amounts flow to the biosphere and oceans by the industrial and agricultural processes when not appropriately managed. As a result, the overuse of fertilizer, nitrogen, and phosphorus is rained out, polluting the aquatic system. They ultimately enter the sea and create dead zones worldwide, such as the decline of shrimp harvest in the Gulf of Mexico's dead zone caused by the excessive flow of nitrogen and phosphorus into the rivers of Mexico US Midwest. However, the availability of new technology to apply fertilizer with pinpoint accuracy is a part of double green farming.

ix. Atmospheric aerosol loading, namely, solid and liquid particles in the air such as dust, smoke, and haze, is increased by pollutant gases and land-use change. When these pollutants interact with the water vapor, they affect the hydrological cycle and affect cloud formation, regional and global patterns of atmospheric circulations such as monsoon system change.

**Thresholds for Safe Operating Space:** These nine planetary boundaries are considered safe operating spaces for human beings with thresholds exceeding which large-scale abrupt or irreversible environmental changes occur. Business as usual, the planet would not be resilient for a safe operating space for all beings in a few decades. Steffen et al. (2015) contended that four of the nine planetary boundaries have already encroached. They are the extinction rate,

deforestation, carbon dioxide level in the atmosphere, and nitrogen phosphorous flow as fertilizer into the ocean. In other words, these four environmental operations have entered the zones of uncertain areas by crossing the boundaries through economic growth, consumption, and technology. They further argue that these four zones of uncertainty give decision-makers a last chance with a danger warning so that they could take appropriate actions before being delayed for corrective measures. Otherwise, nobody knows what will happen on the planet beyond the zones of uncertainty because of no precedents for such planetary conditions except the ozone hole. Hence, the impact seems to be a rather exponential adverse impact rather than a linear adverse impact.

However, national and global leaders' collective human-made actions and decisions can cure all these human-made hazards. The cure of the ozone hole of the ozone layer caused by CFC is the best precedent. Since the 1930s, they were released into the atmosphere. Then, they destructively reacted with the ozone layer, the protective layer of the UV, and made a hole in Antarctica. The exposure of human skin to harmful levels of UV rays causes skin cancer and eye damage. In 1987, the global leaders signed the Montreal Protocol on substances that deplete the ozone layer. They banned the human-made chemicals, chlorofluorocarbons, well known as CFC used for refrigerators and air conditioners, aircraft halon, and aerosol sprays, which caused the ozone hole (Gray & Stein, 2019). Since banning the damaged ozone layer over Antarctica is gradually recovering, it is expected to return to the 1980s by 2070 (Gray & Stein, 2019).

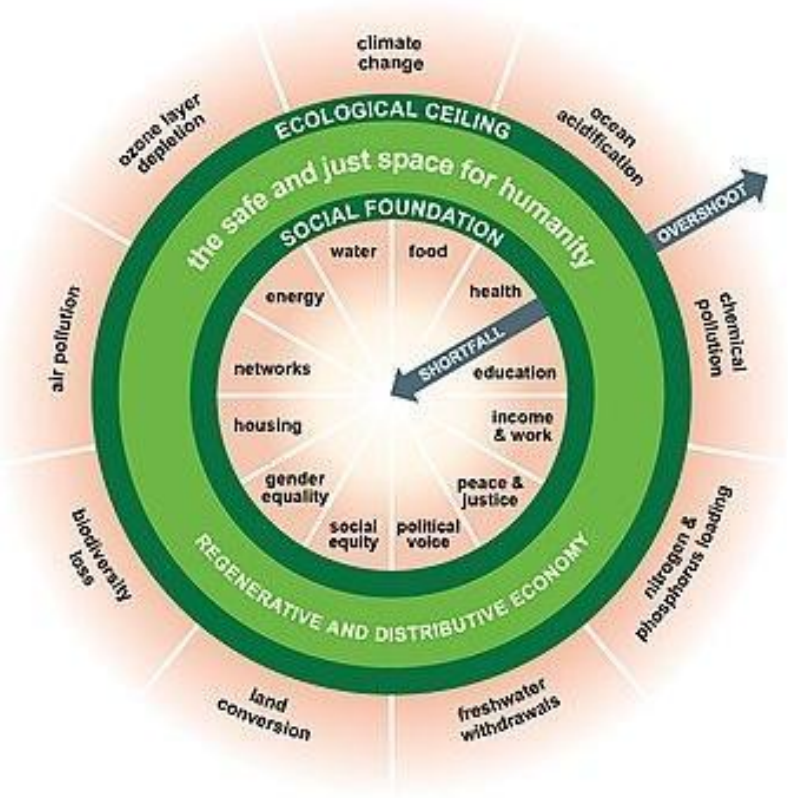
Accordingly, it is noticeable that safe operating spaces can be maintained. In this respect, nine earth system processes as nine planetary boundaries, their control variables together with the current level of controllable variables, their zones of uncertainty have been quantified by Steffen et al. (2015). What is left is now to design systems and structures to have sustainability practices that are adequate to contribute to global sustainability equitably. However, current sustainability practices are not adequate to maintain safe operating space. Climate change, the land systems, biogeochemical flows, and genetic loss of biodiversity are also about to cross the thresholds. Ocean acidification, freshwater use, novel entities are at imminent risk of being crossed (Steffen et al. (2015).

## 1.2(ii) Doughnut Economics

The developmental activities that have been carried out since the industrial revolution underlying neo-classical economic theories founded on profit maximization result in social inequality, explained by nine ecological boundaries. Rockstrom et al. (2009) quantified ecological boundaries within which human beings can thrive in their developmental activities for generations to come. They reveal that the safe operating spaces for biosphere integrity and their biochemical flows are now at risk by encroaching the boundary. They further explained that the safe operation spaces for climate change and land system change are now at an uncertainty zone, increasing risk by encroaching the boundaries. The other operating spaces are also on the verge of encroaching. The social inequalities created by unsustainable developmental activities are now reflected and agreed upon as global issues addressed by the 2030 Agenda for 17 SDGs.

Doughnut economics depicted in Figure 2 shows how environmental degradation and social inequality are economically addressed for sustainable development so that no one should fall into the hole in the middle of the doughnut (Raworth, 2017). The doughnut economics model argues that the economies' goal should move to economic growth and social growth from Gross Domestic Products (GDP). It is because the development in terms of GDP growth rate and GDP per capita does not correlate with people's increased health, happiness, and wellbeing. Further, GDP is misleading about poverty, malnutrition, other social inequalities, and environmental degradation.

Figure 2: *Doughnut Economics: A 21st Century Compass*




Source: Raworth (2017)

Hence, it is argued that profit maximization as a business usually depletes the environment and creates social inequalities unless impact investment is created. The impact investment, whose primary motive is to make profits and social and environmental justice, enables sustainable development within the safe operating space. Therefore, the blend of economic profit, social and environmental justice is called the 3 Ps, People, Profit, and the Planet. In other words, the triple bottom line/three pillars of sustainability.

The investors are now expected to achieve their financial performance, such as shareholder wealth, dividend per share, earning per share, as well as the positive impact on Environment, Society, and Governance (Ahmad et al., 2021). Such investments are called impact investments because they address Environmental risk, Social risk, and Governance risk (ESG) in the corporate world. Many variables can be used to measure ESG performance. According to Sila and Cek (2017), variables such as emission reduction, product innovation, and resource conservation can measure environmental performance. Social performance can be measured

by product responsibility, community services, protection of human rights, maintaining diversity, creating opportunity for all, maintaining employment quality by their health and safety, and training and development. Governance performance can be measured by the board's functions, the structure of the board, fair compensation policy, vision, mission, strategy, and leadership. Zhao et al. (2018) manifest that the ESG performance has a positive impact on the corporation's economic performance. In the same vein, Ahmed et al. (2021), who investigated a sample from FTSE (Financial Times Stock Exchange) 350 companies, found that firms with high ESG performance have a better economic performance than firms with low ESG performance.

The impact investment reached $30.7 trillion at the beginning of 2018 in six major countries, the United States, Canada, Europe, New Zealand, Australia, and Japan. The impact investment was 428.3 billion in the middle of 2018 in Africa, but most of the assets, $ 399.9 billion, were contributed by South Africa. Nigeria and Kenya are the other notable countries in Africa (GSIA, 2019). However, there is no significant contribution from Botswana (Bertha Centre-UCT GSB, 2017). The contribution from Japan was $ 2.18 trillion in 2018. Although there is considerable growth in some Asian countries such as China, Singapore, and Hong Kong (GSIA, 2019), the remaining Asian countries do not satisfactorily contribute to the impact of the investment.

Doughnut Economics model further explains the role of technology and argues that digital inequalities have been created by the digital divide. It gives an example of a concentration of power among a few monopolies such as Google, YouTube, Facebook, and Amazon. Another aspect of technology is the rise of Robots, which will deprive 5 million jobs by 2020 (Raworth, 2017).

Hence, Doughnut Economics advocates knowledge collaboration for a good life for all by 2050 (Ceil, 2020). The knowledge referred to the good life for all means green knowledge and innovation for sustainable development. Knowledge collaboration is essential in many respects. It could be among individuals, intra-organizational and inter-organizational (Talab et al., 2020), which is the best example of the Quintuple Helix Model of Innovation.

## 1.2(iii) 17 Sustainable Development Goals

The General Assembly of the United Nations adopted the 2030 Agenda for 17 Sustainable Development Goals (SDGs) in September 2015 within 15 years on a fast track but now just completed five years since then. The blueprint has been built on the principle “Leave no one behind.” It is an urgent call from all nations. They must collaboratively act for the peace and prosperity of the people and planet (UNDP, 2020).

The 2030 Agenda for 17 SDGs in Figure 3 are global goals to create a better world by 2030. In this respect, all governments, private sectors, civil society, and the public are mandated to meet life-changing zero zones such as no poverty, no hunger, no discrimination among other global issues, climate change, clean water and sanitation, and affordable and clean energy.

Figure 3: 17 Sustainable Development Goals

Source: UNDP (2020)

The facts and figures of the global issues represent the importance of producing green knowledge and innovation to address them. Table 1 refers to the nature and extent of the global problems under the 2030 Agenda for 17 SDGs, reflecting the seriousness of the global issues. Since these global issues vary from country to country, knowledge parameters must be tailor-

made for the respective country. In other words, the 2030 Agenda for 17 SDGs can be domesticated because these issues are global, but solutions are local. The knowledge so created is called Glocal knowledge. Glocal means localized global knowledge. For a simple example, Botswana is a landlocked country with no access to seas, and therefore, life below water means water other than seawater such as dams and perennial rivers. Hence, Glocal knowledge must be produced, considering three pillars of sustainability with necessary trading off. Consequently, Botswana has domesticated its SDGs.

**Table 1: Facts and Figures for Glocal Green Knowledge & Innovation**

| **Goal No. 1: No Poverty-End poverty in all forms everywhere** |
|---|
| **Facts and figures:** There are 736 million people who live in extreme poverty. It has come down by 36% compared to 1990 level. However, it is 10% of the world population. In other words, one person in every ten people lives in poverty. However, 50% of people who are living in poverty are below 18 years old. Moreover, 8% of the people who earn less than $1.90 per day live in Sub-Saharan Africa and South Asia. On the other hand, the multidimensional poverty level claims 1.3 billion people. |
| **Goal No. 2: Zero Hunger-End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.** |
| **Facts and figures:** The malnutrition level of people reached 821 million in 2017, out of which 63% of them are from Asia. Children who are below five years represent nearly 151 million. One in every eight adults is suffering from obesity. One in every three women who are of reproductive age are suffering from anemia. One in every four employees is employed in agriculture. |
| **Goal No. 3: Good Health and Wellbeing** |
| **Facts and figures:** People who have no primary health care are at least 400 million. 40% of them have no social protection. People who live in countries that could not deliver essential health services exceed 1.6 billion people threatening global health significantly. There are 21.7 million people who were receiving antiretroviral therapy treatment for HIV. However, 15 million people who are affected by HIV are waiting to receive treatments. People aged between 30 to 70 die due to non-communicable diseases such as cardiovascular disease, |

chronic respiratory disease, diabetes, or cancer. In addition, the deaths of seven million people happen because of their exposure to air pollution. One-third of women have been subject to sexual or physical violence at some point in their lifetime. As a result, they encounter short or long-term reproductive, sexual, mental, or physical health.

**Goal No. 4: Quality Education-Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all**

**Facts and figures:** Even though 91% of the developing countries have enrolled in primary education, some students in the age of primary education do not receive primary education. They are about 57 million out of them, more than fifty percent represent from Africa. More than fifty percent of them live in conflict-affected areas. In addition, 25% of the girls in developing countries are not schooling. One hundred three million youth worldwide do not have adequate literacy skills, out of which sixty percent represent women. In addition, 60% of the children and adolescents do not achieve the minimum reading and math proficiency level.

**Goal No. 5: Gender Equality-Achieve gender equality and empower all women and girls.**

**Facts and figures:** Women are poorly paid than men for the same work performed at their workplaces. They earn 33% less than the men. Women who experience sexual and physical violence at their workplaces are 35%. Women and girls who are married before the age of eighteen are 750 million today. However, 66% of the developing countries have achieved gender parity in their primary education. In addition, there is a marginal increase in the representation of national parliamentarians from 11.3% to 24% by 2018.

**Goal No. 6: Clean Water and Sanitation-Ensure Availability and Sustainable Management and Water and Sanitation for all**

**Facts and figures:** Even though seventy percent of the global population have been able to safely manage drinking water in 2015, some of the worldwide population, 844 million, encounter difficulties even to access drinking water. However, 2.9 billion people of the global population have safe sanitation in 2015, but 2.3 billion people do not have access to basic sanitation. Eight hundred ninety-two million people have the practice of open

defecation. 80% of wastewater is not recycled and mixed with waterways. 2 billion people affect water stress. Moreover, 20% of the countries have not been able to lay a foundation for an integrated water resource management system. Seventy percent of the natural wetland have been extinct.

## Goal No. 7: Affordable and Clean Energy- Ensure Access to Affordable, Reliable, Sustainable, and Modern Energy for all

**Facts and figures:** One in seven people in the global population still has access to electricity. Most of them live in the rural areas of developing countries. Since most energy is produced with fossil fuels, it represents sixty percent of greenhouse gases. Nevertheless, fourteen percent of the electricity consumption can be reduced if the energy efficiency standards for building and industry could be followed. However, three billion people, 40% of the global population, use unhealthy and polluting cooking fuels. However, renewable energy enables generating power more than twenty percent, and the renewable energy sector employed more than ten million people in 2017.

## Goal No. 8: Decent Work and Economic Growth-Promote Sustained, Inclusive and Sustainable Economic Growth, Full and Productive Employment, and Decent Work for All

**Facts and figures:** Although some people, approximately 700 million, are employed, they live in moderate and extreme poverty in 2018. Their earnings per day are less than $ 3.2. One hundred and seventy-two million of the global population lived without work in 2018, increasing by one million every year. Even though 75% of the men are employed, only 48% of the women are employed. 61% of the global workforce, namely, two billion employees are attached to the informal sector in 2016. Many women are underutilized than men at work.

## Goal No 9: Industry, Innovation, and Infrastructure-Build Resilient Infrastructure Promote Inclusive and Sustainable Industrialization and Foster Innovation

**Facts and figures:** Infrastructure facilities such as water, electricity, internet are essential to the day today's life and business. Low-income developing countries such as some African countries encounter difficulties improving infrastructure and inhibiting business productivity

by 40%. 2.3 billion people of the global population have no adequate access to sanitation. Some developing countries cannot continuously supply electricity for 2.6 billion people. Four billion of the global population do not have access to the internet. The agricultural products in developing countries do not subject to industrial processing, whereas it is 98% in developed countries. There is progress in the renewable energy sector in which 2.3 million people have been employed, but it will go up to twenty million by 2030.

## Goal No 10: Reduced Inequalities-Reduce Inequality Within and Among Countries

**Facts and figures:** The unequal distribution has increased in every part of the world. The lowest increase could be seen in Europe and the highest in the Middle East. The wealthiest 10% earn more than 40% of the global income, but the poorest 10% earn only 2 to 7% of the global income. Sound policies are required to decrease the disparity by including all disputes of ethnicity, race, sex, etc. The global solution could contribute to reducing the widening gap. International development assistance, foreign direct investments facilitating safe migration and mobility of people are vital.

## Goal No 11: Sustainable Cities and Communities-Make Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable

**Facts and figures:** The cities play an essential role in the global economy. Their contribution to the GDP is 80%. Further, most of the people live in cities. It is 55% and 4.2 billion people. It will increase to 6.5 billion by 2050. Even though cities utilize only three percent of the global land space, cities consume sixty to eighty percent of the worldwide energy consumption. However, 820 million people occupy slums, and it will increase further.

Furthermore, the number of megacities is increasing. It was ten with 10 million people in 1990, but it has increased to 28 by 2014 and 33 by 2018. Thus, future urban development will take place in developing countries.

## Goal No 12: Responsible Consumption and Production- Ensure Sustainable Consumption and Production Patterns

**Facts and figures:** Two billion of the global population suffer from malnutrition or hunger, but there is a wastage of food every year. It is more than 1.3 billion tons. The contribution

of greenhouse gas emissions from the food sector is twenty-two percent, but most greenhouse gas emissions occur when converting forest lands into farmlands. Obesity claims two billion people. Drinkable water is only three percent of the world's freshwater reserve, but people utilize them faster than replenishment. Energy efficiency is vital for responsible consumption. If energy-efficient bulbs are used everywhere, the world enables saving more than 120 billion dollars.

## Goal No 13: Climate Action-Take Urgent Actions to Combat Climate Change and its Impact

**Facts and figures:** Human unsustainable development activities have increased global warming by 1.0°C based on the preindustrial levels. As a result, the intensity of the adverse effect of climate change is increasing. For example, the sea level rises eight inches since 1880. It will further rise to one to four feet by the year 2100. The only effective way to control global warming is to cut down CO2 emissions by 45% by 2030 and zero by 2050. The members of the United Nations have agreed by their Paris Climate Agreement to cut down the CO2 emission to keep the global average temperature to 2.0°C or a more ambitious level of 1.5°C by 2100. Renewable energy is the alternative energy to cut down CO2. It will create eighteen million new jobs by 2030.

## Goal No 14: Life Below Water-Conserve and Sustainably Use the Oceans, Seas, and Marine Resources for Sustainable Development

**Facts and figures:** The earth's surface embraces 75% with the ocean covering 99% percent of the world's living space by volume. The diversity of the species of the ocean have been identified by nearly two hundred thousand. The pollution has affected 40% of the ocean, endangering the depletion of fisheries, depletion of coastal habitats, and human activities. The ocean is vital as the buffer to absorb CO2 produced by human activities. It is further essential to more than three billion people dependent on their livelihood based on marine and coastal biodiversity. Furthermore, its contribution to the global GDP is 5%, namely, three trillion dollars per annum.

## Goal No 15: Life on Land-Project, Restore and Promote Sustainable Use of Terrestrial Eco-systems, Sustainably Manage Forests, Combat

| |
|---|
| **Decertification, and Halt and Reverse Land Degradation and Halt Biodiversity Loss** |
| **Facts and figures:** Mountains generate 60 to 80% of the freshwater of the earth. Forests are essential for more than 1.6 billion people's livelihoods based on forests, and they provide the home for more than 80% of the terrestrial species of animals, insects, and plants. It is further essentials to absorb CO2 by one-third by 2030. The ecosystem contributes 125 trillion per annum to the livelihood and prosperity of people. |
| **Goal No 16: Peace, Justice and Strong Institutions-Promote Peaceful and Inclusive Societies for Sustainable Development, Provide Access to Justice for All, and Build Effective, Accountable and Inclusive Institutions at All Levels** |
| **Facts and figures:** Conflicts, violence, persecution, and human rights violations have forcibly displaced 68.5 million people in 2017. Stateless people whose nationality and their related rights have been deprived are nearly ten million people. Developing countries incur a loss of more than $ 1.26 trillion per annum because of corruption, tax evasions, and theft. There is a lack of laws to protect women in forty-six countries. One billion people cannot prove their identity. Among them, 625 million children below 14 years old whose births have never been registered. |
| **Goal No 17: Partnerships for the Goals-Strengthen the Means of Implementation and Revitalize the Global Partnership for Sustainable Development** |
| **Facts and figures:** The UNCTAD estimate that SDGs need seven trillion dollars annually. Even though there is an agreement to contribute point seven (.7) or above on the gross national income to official development assistance, only six countries have met their commitment. The responsible investment is instrumental in infusing capital for achieving SDGs. The responsible investment has reached $ 18.6 trillion by 2016. The green bond is a vital source of finance for responsible investments. Global green bonds have been able to reach still only 15.5 billion dollars in 2018. It is an increase of 78% compared to the previous year. |

Source: Author's Elaboration based on United Nations Development Programme (UNDP, 2020)

## 1.2(iv) The Paris Climate Agreement

According to the Paris Climate Agreement, the target to maintain temperature increase at $2^0$ C by the end of this century, but the ambitious target is to keep the average global temperature $1.5^0$ C. In this respect, it is required to maintain the tipping point of CO2 to be 450/550 parts per million. When considering the present CO2 parts per million in the atmosphere, 410 in January 2020 (CO2.earth, 2020) and the annual deposit of 40 billion tons of CO2 business as usual into the atmosphere, the current increase of two parts per million cannot be decreased without cutting down carbon emissions made by the burning of fossil fuels. Hence, the Paris Climate Agreement member countries have now agreed to decarbonize their countries by their Nationally Determined Contributions. In this respect, these countries need to invest in climate mitigation projects, such as renewable energy projects and climate adaptation projects, such as efficient energy use.

Hence, the implementation of the Paris Climate Agreement by meeting Nationally Determined Contributions is vital because Botswana is the most vulnerable African country other than Namibia encountering the adverse impact of climate change. Botswana as a semi-arid country already experiences low rainfall, unreliable rain, a high evaporation rate, and constant drought. The negative impact of global warming is depicted in Table 2. Accordingly, among other things, the global warming of $1.5^0$ C reflects $2.2^0$ C in Botswana. On the other hand, global warming at $2^0$ C reflects $2.8^0$ C in Botswana. It is expected that under these two scenarios, annual rainfall decreases by 5% and 9% respectively. In addition, the dry days increase by ten days and seventeen days (New & Bosworth, 2018).

Further, heatwaves and extreme weather events increase by fifty days and seventy-five days respectively. As a result, maize yields decrease by 20% and 35% respectively (New, 2018). Furthermore, the hotter and drier future climate makes less water for agriculture and health and hygiene. These estimates indicate that urgent actions for climate mitigation actions and climate adaptation actions are needed.

**Table 2: What Global warming of $1.5^0$ C and Higher means for Botswana**

| Local Impacts in Botswana | | | Global Warming above Pre-Industrial Level | | | |
|---|---|---|---|---|---|---|
| | | | **1.5$^0$ C** | **2$^0$ C** | **2.5$^0$ C** | **3$^0$ C** |
| **Projected Climate Change** | **Climate** | **Mean Temperature ($^0$C)** | Increase By 2.2 | Increase By 2.8 | Increase By 3.5 | Increase By 4.2 |
| | | **Heat Waves (days)** | Increase By 43 | Increase By 72 | Increase By 105 | Increase By 136 |
| | | **Annual Rainfall** | Decrease By 5 | Decrease By 9 | Decrease By 10 | Decrease By 11 |
| | | **Heavy rainfall (days)** | Decrease By 2 | Decrease By 3 | Decrease By 4 | Decrease By 4 |
| | | **Dry days** | Increase By 10 | Increase By 17 | Increase By 24 | Increase By 28 |
| **Estimated Impact** | **Water** | **Okavango River (Stream Flow)** | Decrease By 6% | Decrease By 12% | Decrease By 18% | Decrease By 24% |
| | | **Limpopo Catchment (runoff)** | Decrease By 26% | Decrease By 36% | Decrease By 46% | Decrease By 56% |
| | | **Maize (yield)** | Decrease By 23% | Decrease By 35% | Decrease By 46% | Decrease By 58% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Agriculture** | **Sorghum (yield)** | Decrease By 11% | Decrease By 17% | Decrease By 23% | Decrease By 29% |
| | | **Water for Lives Stock (Cost of Pumping)** | Increase By 15% | Increase By 19% | Increase By 22% | Increase By 24% |
| | **Health** | **Malaria (Malaria months of risk)** | Decrease By 12% | Decrease By 16% | Decrease By 29% | Decrease By 29% |
| | | **Heat Stress (No of Days of Exposure)** | Increase By 20 | Increase By 20 | Increase By 40 | Increase By 40 |

Source (New & Bosworth, 2018a; New & Bosworth, 2018b).

Nationally Determined Contributions (NDCs) are central to the Paris Climate Agreement. By its Nationally Determined Contributions (NDCs), Botswana promised to meet the Paris Climate Agreement by cutting down CO2 emission level by 15% based on 2010. The cost estimated in this respect is $ 18.4 billion. In support, Vision 2036 of Botswana stipulated to be a net exporter of energy (Government of Botswana, 2016). Nevertheless, Botswana imports fossil such as petrol, petroleum gas, aviation gas, diesel, and paraffin fuel. A part of imports of fossil fuel is used to produce electricity. The remaining is used for transport and domestic use (Sekantsi & Timuno, 2017). Hence, in the presence of imports of fossil fuel, provision of subsidy of fossil fuel to the public, and the absence of producing electricity with renewable energy, the challenge for energy security is high while emitting excessively CO2 in producing electricity with fossil fuel (Sarangi et al., 2019).

Accordingly, renewable energy in Botswana enables playing a vital role in energy mix and security. When considering sun-drenched Botswana's situation, there is a conducive

environment to generate electricity with solar energy. Three hundred twenty and sunny days with 3200 sunshine hours per annum with average insolation of 2200 kWh/$m^2$ (6-6.5 kWh/$m^2$/day) are endowed to Botswana Mooiman and Edwin (2016). They further assert that Botswana receives one of the highest irradiation levels in the world. Further, bioenergy with cow dung is also available with a 2.2 million cattle population, but wind power is not strong enough to generate electricity at a large-scale project. Nevertheless, there are a few renewable energy projects with solar power and biogas digesters currently in Botswana.

## 1.3 Problem Statement

One hundred and eighty-nine countries, including Botswana, have ratified the paradigm shift for social and economic transformation expected by the 2030 agenda for sustainable development. The 2030 Agenda for sustainable development mandates member countries to achieve 17 SDGs, in addition, the Paris Climate Agreement mandates member countries to keep global warming below $2^0$ C or an ambitious target of $1.5^0$ C by the end of the century. As a consequence, these two universal packages invoke from member countries to create global and local (glocal) knowledge and innovation needed for sustainable development, failing which Botswana will have to face adverse impacts of unsustainability.

The Adaptation at Scale in Semi-Arid Regions (ASSAR) report explains how global warming targets are critical for Southern African countries, Botswana and Namibia. The report explains that the $1.5^0$C degrees Celsius target means $2.2^0$C and $2^0$C, respectively, for Botswana and Namibia. The target of $2^0$C will be $2.8^0$C and $2.7^0$C, respectively, for Botswana and Namibia. The higher local temperature makes these countries vulnerable by being hotter and drier countries for human health (rainfed) agriculture and water. The report further explains that even with $1.5^0$C global warming, maize yields could decrease by 20%, and with $2^0$C, the yields decrease by 35%. Under these two scenarios, the Limpopo catchment in Botswana declines by 26% and 36%, respectively (New & Bosworth, 2018a; New & Bosworth, 2018b).

No country can achieve the mandates alone due to the transformation's scope, scale, and complexity. Therefore, the mission is extended to all member countries of United Nations, their economies, organizations, including universities, societies, and individuals. All are expected to contribute fairly to achieving economic growth with sustainable development.

In achieving sustainable development, universities as a system are instrumental in creating green knowledge and innovation. The Triple Helix Model of Innovation, theorized by Etzkowitz and Leydesdorff (1995), uncovers that three subsystems, universities, industries, and governments, interact and create knowledge and innovation fostering economic and social development (Etzkowitz, 2003). In the interaction between university and industry, the university as a support structure provides education to students and transfers knowledge and innovation to the industry. In addition, the basic research conducted by universities is transferred to the industry, which commercializes them. In the government and industry relationship, the government regulates the industry and market where necessary.

Later one more subsystem, media-based and culture-based public and civil society, was added into the Triple Helix Model of Innovation and developed as the Quadruple Helix Model of Innovation by Carayannis and Campbell (2009). The media-based and culture-based public and civil society mean the public discourse by engaging the community at large. In other words, the public who act temporarily or permanently, such as Non-Governmental Organizations and Associations with media. The democracy-based knowledge and innovation introduced by the Quadruple Helix Model of Innovation enable making a knowledge society. Such democracy is important because creativity comes not only within the workplace, profession, classes but also from the public at large (Dubina et al., 2012). Further, Kolehmainen et al. (2016) argue that the Quadruple Helix Model of Innovation is superior to the Triple Helix Model of Innovation because innovation processes are open for various stakeholders' combinations by adding public discourse. The fourth helix's bottom-up approach enables getting engaged broader society in the production process of knowledge and innovation.

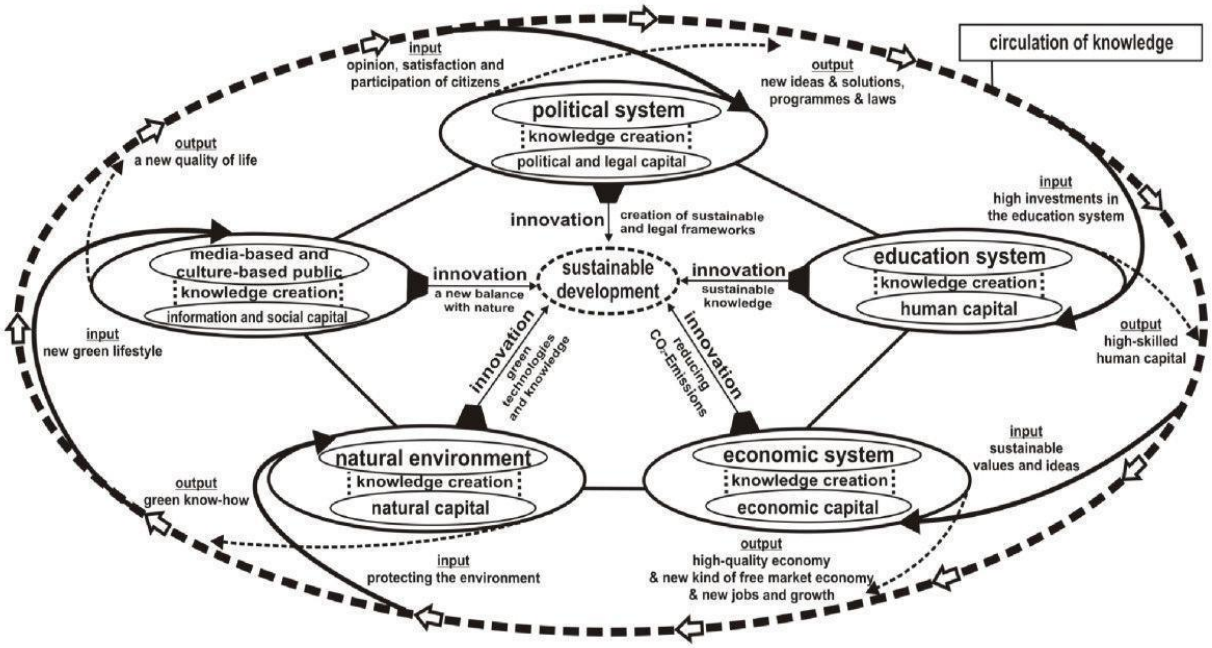
After developing the Quadruple Helix Model of Innovation, the timeliest helix model as an extension of the Quadruple Helix Model of Innovation, the Quintuple Helix Model of Innovation was developed by Carayannis and Campbell (2010) by adding the natural environment of society as the fifth subsystem. Quintuple Helix Model of Innovation is superior to Quadruple Helix Model of Innovation and creative destruction innovation model.

The Mode 3 with Quintuple Helix Model of Innovation is an alternative way of escaping Schumpeter's creative destruction (Carayannis et al., 2007). Creative destruction was the dominant theory for economic development since World War II, but it created negative impacts such as overconsumption of non-renewable resources, global warming, imminent

encroachment of ecological boundaries (Daniels et al., 2015), and unequal income distribution. Further, Carayannis et al. (2019) demonstrate that Schumpeter's creative innovation model based on free and open international trade has been weakened due to political changes espousing rising populist social movements, mercantilism, protectionism, and economic nationalism. Hence, they further argue that it is required to reconstruct national structures to prevent the adverse effects of Schumpeter's creative destruction. Consequently, they have introduced Triple Helix Model of Innovation to the Quintuple Helix Model of Innovation (Carayannis & Campbell, 2010).

There are five subsystems in Quintuple Helix Model of Innovation (Figure 4): the education system, Economic system, Political system, Media-based and culture-based public and civil society & Civil Society, and the natural environment of society. These five subsystems interact collectively in a circular flow of knowledge processing with each other's knowledge. Grundel and Dahlstrom (2016) point out that the natural environment of society is a driver, and the other four helices are actors in the creation of green knowledge and innovation. These five helices of the model enable provisions of more innovations than the four-helix model. However, Leydesdorff's (2012) advice is to be cautious when moving beyond three systems, stating that such a model would require substantive specifications and operationalization. Carayannis et al. (2012) explain by way of an example of how sustainable development could be achieved with targeted investment in the Education system (Figure 4).

**Figure 4: Quintuple Helix Model of Innovation-Effects of Investments in Education for Sustainability**




Source: Carayannis et al. (2012)

Accordingly, an education system's high investment enables producing high-skilled human capital with sustainable knowledge and innovation. After that, highly skilled human capital as the education system's output enters the main circulation of knowledge and blends with the existing knowledge making it green. After that, sustainable values and ideas enter the economic system, enabling them to produce economic capital. While being innovative for sustainable development, a high-quality economy, new kind of free-market economy and new jobs and growth as the economic system's output enter the main circulation of knowledge, which mixes with the existing knowledge influenced by high-skilled human capital then enters the natural environment of society.

This process results in creating natural capital. While being innovative for sustainable development, green Know-how as the output of the natural environment of society enters the main knowledge creation. Then blends with the previous outputs from previous subsystems and enters the media-based and culture-based public and civil society as a new green lifestyle where green information and social capital are produced by public discourse. While being innovative for sustainable development, the knowledge developed exists as a new quality of life as the output and enters the main circulation of knowledge. The quality of life then blends with the knowledge of the previous four subsystems in the main circulation of knowledge. After that, it enters the political system where knowledge creation produces political and legal

capital. While being innovative for sustainable development, new ideas & solutions, programs, and laws as the output of the political system enter the main circulation of knowledge in a never-ending continuously improving the quality of life on a sustainable planet.

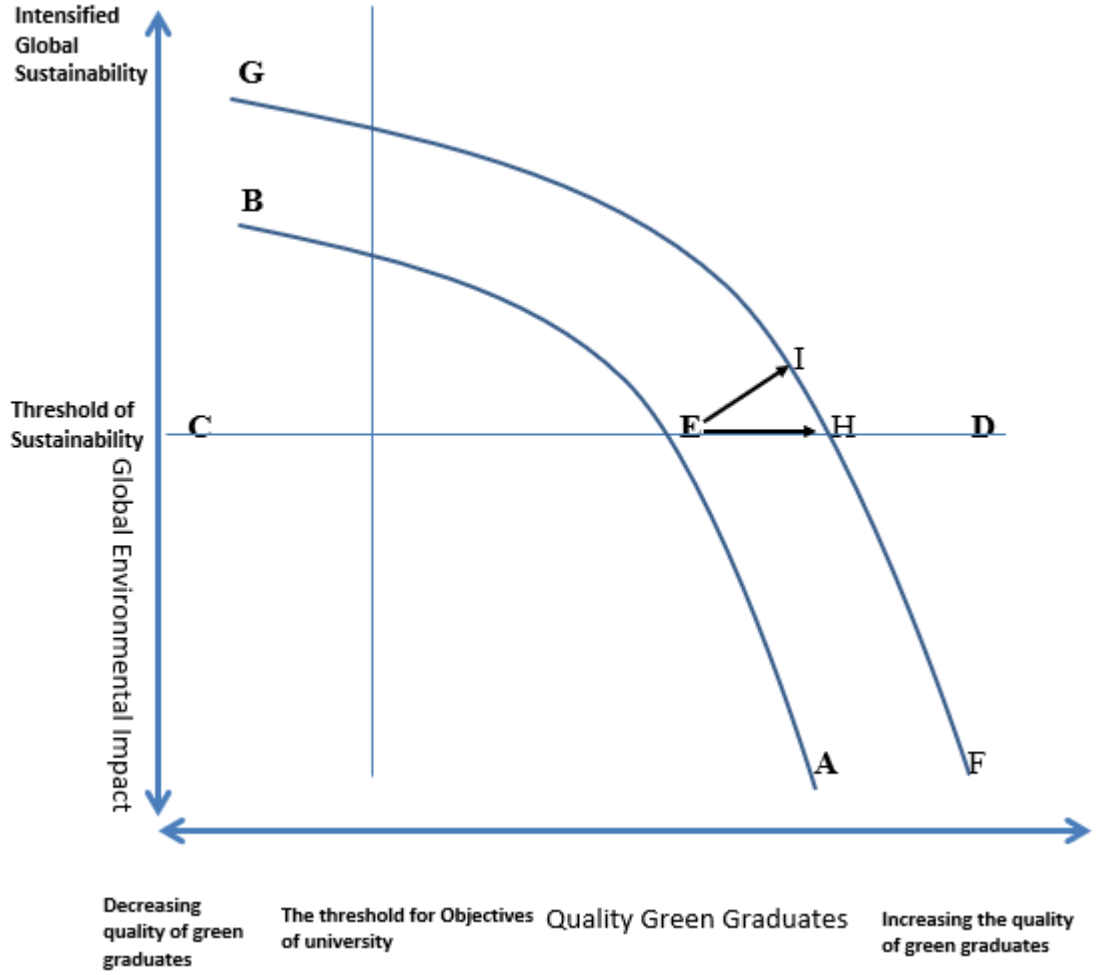
Consequently, Universities as leaders, models, and catalysts in education are expected to create green knowledge and innovation necessary for sustainable development. The Quintuple Helix Model of Innovation strategizes to produce collaborative, interdisciplinary and transdisciplinary knowledge and innovation needed for sustainable development at macro level. In other words, all universities as one university as a macro-level organization. However, the Quintuple Helix Model of Innovation does not deal with universities at the micro-level of how a university enables the production of green knowledge and innovation with the university's conventional existing structure/framework.

The existing conventional universities' framework for creating green knowledge and innovation relating to sustainability in KBEs is not credible and appears unsatisfactory. Filho et al. (2015) point out that even though universities should take a leadership to demonstrate sustainability practices, there are a few universities around the world which have sustainability practices. In the same vein, Kopnina and Meijers (2014) point out that universities struggle theoretical and practical challenges for greening the campus despite a considerable progress. In the same line, Sharp (2002) points out that many universities have succumbed to limiting characteristics of universities. For example, universities may carry out sustainable practices which are economically profitable such as water conservation, energy-efficient lighting systems but without adequate participation of students in their process of knowledge creation.

In other words, the existing framework of many universities around the world, including universities in Botswana, contributes directly or indirectly to aggravating the adverse global issues mentioned above by the non-production of green knowledge and innovation. For example, if universities produce knowledge and innovation without green education, green research, green community outreach, and green internal operations. Such universities are rather unsustainable universities than sustainable/green universities even though they are heading towards greening the campus with less progress (Filho et al., 2018) despite the urgency for greening ivory towers (Vaughter et al., 2013).

Cartwright and Craig (2006) qualitatively assessed the difference between sustainable organizations and unsustainable organizations with their 'Model of Outcomes, for wealth and environment from business activity' in Figure 5. They argue that an organization's sustainable practices should be aimed to contribute to moving beyond the threshold of global sustainability, which is a compromise of increasing contribution to shareholders' wealth and intensified global sustainability. The X-axis of the model represents the growth of the shareholder wealth over a period. The Y-axis represents the impact of the business of sustainability over a period. These two objectives, global sustainability, and financial viability are required to be achieved subject to thresholds.

Figure 5: Model of Outcomes, for Production of Green Knowledge & Innovation




A reconciliation between these two objectives provides benefits to the university and the planet. The curve "AB" represents the combinations of growth of shareholders' wealth and the global environmental impacts, given the resources, including technology, knowledge, and

management capabilities. The horizontal line "CD" is the threshold/ceiling of sustainability, i.e., the minimum level required for achieving global sustainability. "E" is the reconciliation between two objectives where both objectives, global sustainability and financial viability, are achieved. The business operation above "E" contributes to higher global sustainability at the cost of the growth of shareholders' wealth. The operation of business below "E" contributes to global unsustainability. The curve, "FG," is a shift of the curve AB by innovation through new technology, knowledge, and management experts. "H" on the curve "FG" reflects higher financial viability while meeting the same threshold for global sustainability because of innovation. "I" on the curve "FG" enables achieving both the higher level of global sustainability and the higher level of financial viability because of innovation.

Even though the model above discussed is designed for profit motive organizations, the model subject to necessary alterations is appropriate for universities. The relevant alterations are the replacement of financial viability by universities' prime objectives that produce the number of employable graduates in place of Shareholders' wealth. Employable graduates are those who possess sustainability skills as well as soft skills, entrepreneurial skills, technology skills, and research skills. Hence, employability includes the capability of producing green knowledge and innovation from them. Consequently, universities are required to produce their graduates at E on the curve AB. Thus, such universities enable contributing to the threshold of global sustainability fairly.

On the other hand, if the university's quality is below E, the university enables producing more graduates who are not green. Therefore, the university is unsustainable. The curve, "FG," is a shift of the curve AB by innovation through new technology, knowledge, and management experts. "H" on the curve "FG" reflects a higher number of graduates produced while meeting the same threshold for global sustainability because of innovation. "I" on the curve "FG" enables achieving both the higher level of global sustainability and the higher level of graduate output because of innovation.

In order to increase the quality of green graduates for green knowledge and innovation, there is a need to reconfigure the conventional structure of the university so that it enables producing green graduates with quality adequate for meeting the threshold at E on the curve AB or H or I on the curve FG. Hence, the research problem here is confined to ascertain how to green a university to produce green graduates who can produce green knowledge and innovation for

sustainable development. They are the graduates produced at E on the curve AB or H, even I on the curve GF.

When considering Botswana's context, it recently mandated to be a Knowledge-Based Economic by its Vision 2036. In contrast, Botswana faces many structural issues. According to the World Bank Knowledge Economic Index in African countries, it did not dominate education and innovation for a single year from 1995 to 2010 (Asongu et al., 2020). Further, the Knowledge Economic Index gradually fell from 5.07 in 1996 and 4.31 in 2012. The Global Knowledge Index (GKI) replaced the Knowledge Economy Index, 2012. It refers to multi-dimensions of knowledge economy/knowledge society. GKI is useful for policymakers to bridge the knowledge gap for economic development. The lowest score is zero for the worst case, and 100 is the highest case. In 2020, Switzerland's score of 73.6 was the highest, and Botswana's score was 41.1. The lowest score was 21.5 from Chad (Knoema, 2021).

These indicators reflect that these structural issues should be addressed, particularly with the education system (universities). After all, universities are institutions that are strongly interconnected for creating knowledge and innovation in KBEs (George, 2006). Each university must be a credible institution that is a precondition because it provides a stable structure for human interaction with less uncertainty for sustainable development in KBEs. In addition, it provides an independent structure for guiding the behavior and the process of knowledge management.

The empirical context of universities in Botswana reveals that the structure of universities is rather conventional than contemporary (Moremi et al., 2015). The causes behind the challenges can be found the conventional departmental structure and their disciplinary boundaries (Cortese. 2003; Filho et al., 2018; Moore 2005; Savelyeva et al, 2012). The traditional structures of universities produce knowledge closer to Mode 01. As a result, they do not create green knowledge and innovation in the mainstream process. This social phenomenon makes universities unsustainable than sustainable even though they have sustainable practices, but their sustainable practices do not fairly contribute to producing green knowledge and innovation for moving beyond the threshold of global sustainability (Cartwright & Craig, 2006). Hence, this study is carried out to design a modern system of social rules guided by Mode 1, Mode 2, and Mode 3 in particular.

Mode 1 refers to the production of knowledge and innovation by way of a linear model of innovation. For example, universities conduct basic research and publish them. After that, the industry accesses them and applies them. Mode 1 has been challenged due to the delay of innovation and production of knowledge within a discipline among other challenges (Gibbons et al., 1994). The Triple Helix Model of Innovation introduced the mode two innovation model's importance, which simultaneously applies knowledge and innovation through collaboration among three systems, university, industry, and the government. Mode 3 model of innovation is superior to Mode 2 because the Quadruple Helix model of innovation and the Quintuple helix model of innovation promote further hybrid thinking in parallel and simultaneously with four systems by Quadruple and five systems by Quintuple Helix Model of Innovation. The fourth helix, culture-based media and public, entails pluralism of knowledge-by-knowledge society and knowledge democracy in the production of knowledge and innovation (Jonsson et al., 2015). Further, the fifth helix, natural environment of society contributes to make knowledge and innovation green.

To sum up, two universal packages mentioned above primarily determine the scope of glocal knowledge and innovation needed for sustainable development. Such knowledge and innovation need to be beyond mere disciplinary knowledge, in other words, interdisciplinary and transdisciplinary knowledge and innovation. Four that reason, Quintuple Helix Model of Innovation is designed to produce green knowledge and innovation in collaboration with five knowledge systems including the university system. However, the challenge is if the conventional structure of universities enables helix system to produce interdisciplinary and transdisciplinary collaborative knowledge and innovation needed for sustainable development.

Asheim et al. (2011) manifest that an organizational innovation system (university innovation system) is a part of the sectoral innovation system, technological innovation system, regional innovation system, national innovation system. In the same line, van Lancker et al. (2015) point out that an organizational innovation system, i.e., micro-level innovation system improves innovation performance not only at the organizational level but also at higher system levels such as sectoral, regional, and national levels (Walshok et al., 2014). Since each helix has its own innovation trajectory influenced by other organizations in the same helix or other helices, the dynamics for a win-win situation depend on each subsystem's internal structure (Ode & Ayavoo, 2020), in this study, the internal structure of the university.

Many green researchers have even introduced various innovative models for greening universities (Faghihi et al., 2015; Geng et al., 2013). These models are of two types. One of them is ad hoc, project-oriented models. For example, Geng et al. (2013) introduced a model called 'an innovative model on greening one university.' They argue that their model addresses all the practical issues and interests of different stakeholders as a one metabolism process of one university. They demonstrate how projects connect with education and research too. Consequently, they demonstrate that their model manages all the sustainability activities/initiatives/projects of resource conservation and efficient use of energy for achieving three pillars of sustainability.

The proposed model of this research focuses on transforming the entire knowledge and innovation production process to be green in the mainstream. However, the model introduced by Geng et al. (2013) focuses on how ad hoc sustainability projects can be aligned with the existing education and research. The knowledge transfer from those projects is supplementary than imperative in the knowledge production process. As a result, the knowledge and innovation process inevitably decide what course contents and activities/initiatives/projects need to produce green knowledge and innovation instead of ad hoc projects to knowledge.

The second type of model introduced by green university researchers relate to the knowledge and innovation production process (Amaral et al., 2015; Tumbas et al., 2015; Velazquez et al., 2006; Zhao & Zou, 2015). Velazquez et al. (2006), who analyzed eighty sustainable higher education institutes, introduced a most comprehensive model of these types of models. Their model focused on briefly many processes needed for sustainable development, such as Governance, Education, Research, Community outreach, Internal Operations, and Accountability. However, their model lacks addressing a few imperative processes such as culture, three pillars of sustainability. Further, the model does not identify the interrelation and interdependence of all processes. Their model also supplements the knowledge and innovation production process because the university-wide sustainability committee as a sub-committee steers necessary goals, policies, funds, and coordination.

Hence, the conventional structure of the university needs reconfiguration at the micro-level. Such reconfiguration facilitates not only for the production of green knowledge and innovation

but also for collaborating, sharing, and diffusion of the dynamics of the university system to other subsystems of the helix models.

## 1.4 Aim & Purpose of the Study

The enlightened/prudential anthropocentrism points out that the infusion of human values is necessitated due to the inability of nature to be resilient to the adverse impact of the developmental activities, which have now changed the fundamental characters of the ecology. In this mission, the current structure/framework of universities in Botswana is, though they have various sustainable practices, cannot infuse human values adequate to produce green knowledge and innovation required for moving beyond the threshold of global sustainability.

A framework that integrates all essential elements of a green university will steer all university stakeholders' human values to bridge the inadequacy of natural values created by universities' conventional framework/structure. ***Hence, this study aims to ascertain a complete set of requisites for greening a university and integrate them pragmatically to be used by universities as a blueprint to be a green university. In order to reach the aim, four objectives have been set as follows:***

***First: examine what a green university is all about.***
***Second: evaluate if the universities' existing structure enables them to produce green knowledge and innovation.***
***Third: to appraise the essential elements of a green university; and***
***Fourth: to design a blueprint integrating essential elements of the green university***.

Hence, the purpose of this research is to design a framework for greening universities. The framework enables universities to produce green knowledge and innovation adequate to equitably contribute to the threshold of global sustainability qualitatively assessed by Cartwright and Craig (2006), the mandate conferred by the 2030 agenda for 17 SDGs (Jednak & Kragulj, 2015), and the Paris Climate Agreement (2015). Further, it should be adequate to protect the nine safe operating environmental processes quantitatively assessed by Rockstrom et al. (2009). The greening university framework is rather methodological than normative because it is not argued for or against any other framework, but various theories and concepts are condensed to develop a conceptual framework for greening a university.

## 1.5 Research Questions

The research questions below were formulated in this exploratory & descriptive research to achieve the objectives set above.

1. What is a green university (working definition through the analysis of metaphors and metaphorical language as a sense of identifying green university)?
2. Does the existing structure of universities in Botswana enable them to produce green knowledge and innovation?
3. What are the essential elements of the green university?
4. What is a possible blueprint that integrates the essential elements of a green university that could enable universities to produce green knowledge and innovation?

## 1.6 Significance of the Study

Botswana Vision 2036 concedes the importance of green knowledge and innovation. The university system is the apex institution that enables green knowledge and innovation to contribute to all the other knowledge systems, such as the economic system, natural environment of society, media-based and culture-based public and civil society, and the political system.

Hence, this study convinces the policymakers that knowledge and innovation play a significant role in Botswana's innovation policy as a KBE. The said knowledge and innovation belong to five knowledge clusters, university, industry, government, civil society and the public, and the natural environment of society. Even though the university is the apex organization producing knowledge and innovation, sustainable development demands the knowledge and innovation merged with other knowledge clusters. Hence, policymakers are convinced in this study that there are at least three innovation models to be aligned with universities, namely, the Triple Helix model of innovation, the Quadruple helix model of innovation, and the Quintuple helix model of innovation.

These three innovation models are used in European Innovation Ecosystems policy implementation, such as Smart Specialization Strategy (Grundel & Dahlstrom, 2016). However, the Quintuple Helix model of innovation is the best for innovation policy because it merges five knowledge clusters, including the environment as a knowledge cluster, to produce

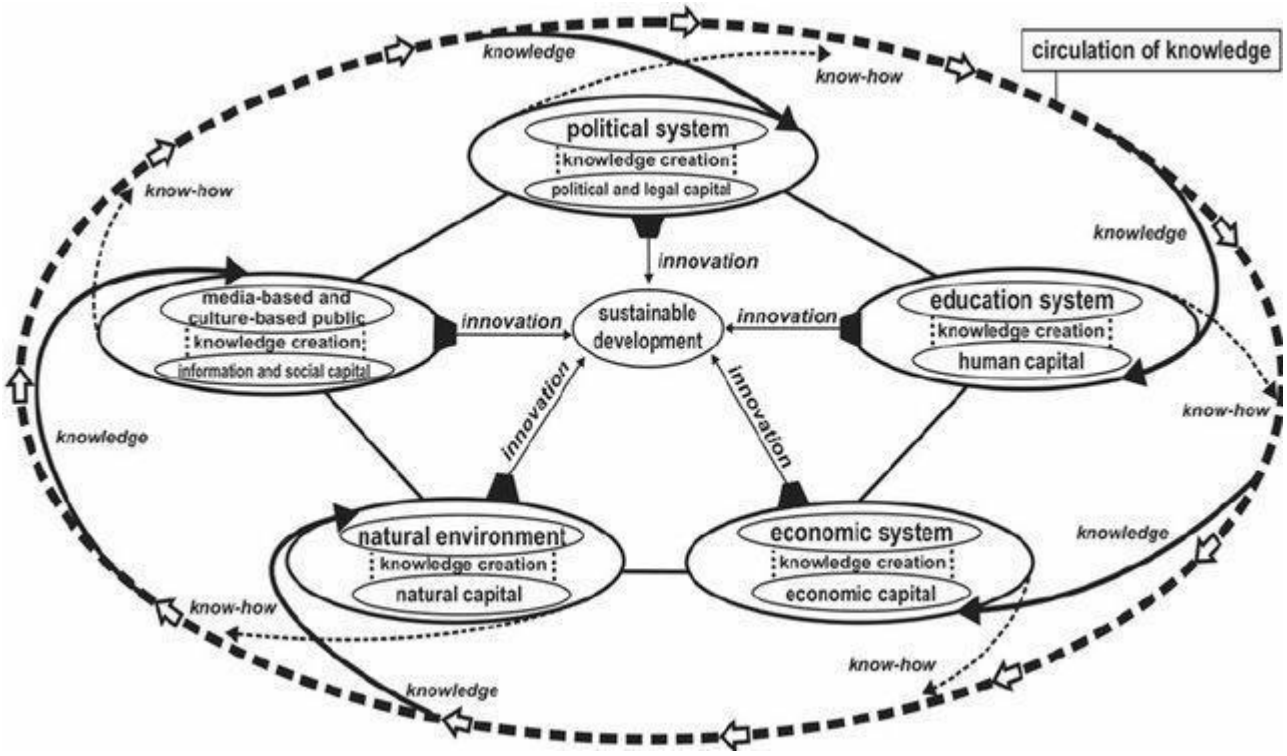
knowledge and innovation with mode 3. Furthermore, Carayannis et al. (2012) point out that society and its socio-ecological transition are considered a significant challenge in the new century. Hence, the ecologically sensitive Quintuple Helix Model of Innovation enables creating synergies among the economy, society, and the environment needed for sustainable development. However, the Quintuple Helix Model of Innovation is alien to the universities with the conventional structure. Hence, the reconfiguration of the conventional structure is demanded to produce green knowledge and innovation.

Consequently, this research enlightens the policymakers to understand the anatomy of the green university system. Accordingly, they enable understanding eight dimensions/processes in a university required to be realigned to produce green knowledge and innovation. In other words, policymakers are convinced that a conventional university cannot be transformed into sustainable universities in the absence of policy, institutional, regulatory, and legal frameworks focused on green knowledge and innovation.

## 1.6(i) Quintuple Helix Model of Innovation

A sustainable university enables producing the ethical human capital, which creates green knowledge and innovation that contributes to all other four types of capital, Economic capital, Natural capital, Information and social capital, and Political and legal capital from four helices of the Quintuple Helix Model of Innovation, Economic system, Natural environment of society, Media-based and Culture-based Public and Civil Society, and Political system more fully depicted in Figure 6.

**Figure 6: Quintuple Helix Model of Innovation**




Source: The Quintuple Helix Model of Innovation and its function (functions). Modified from Etzkowitz and Leydesdorff (2000), on Carayannis and Campbell (2006, 2009, 2010), and on Barth (2011).

Botswana steers its economy to be a KBE bb Botswana Vision 2036 for sustainable development. Sustainable development is integrated with ecology. The development of ecology is a challenge. The Quintuple Helix Model of Innovation depicted in Figure 6 depicts how socio-ecological transition could be made by producing knowledge and innovation. Accordingly, the main circulation flow knowledge is a blend of knowledge created by five systems, Education system, Economic system, Natural environment of society, Media-based and culture-based public and civil society, and Political system. The knowledge created by the natural environment of society is blended with other knowledge systems that become green knowledge and innovation. The blueprint of green universities designed in this study enables reconfiguring universities' conventional structure to produce green knowledge and innovation with Quintuple Helix Model of Innovation for sustainable development strategized by Botswana Vision 2036.

Apart from the macro-level benefits discussed above, the green university provides benefits to all university stakeholders, students, employees, management, shareholders, the university as a corporate citizen, and the planet/socio-ecological environment.

## 1.6(ii) Significance for Students

A green university enables developing their students mainly for two purposes: being employed for others or being self-employed, which means being entrepreneurs or consultants. In this respect, green education makes a business case for both types of students through green-collar employment and green entrepreneurship.

**Green collar employments:** Students who want to be employed can be employed in traditional employment opportunities to which the university's programs traditionally develop them, such as business managers, health information managers, hospitality managers, electrical engineers, and IT managers. With the education for sustainable development, opportunities for a new class of employment have now arisen. These employments are called green-collar employment/employees that can be defined as workers who have interest, expertise, and knowledge in environmental issues and practices within organizations and are employed primarily for this purpose (Harvey et al., 2010).

These green jobs are available in many fields with different skills, from top levels, middle levels to low levels. Cassio (2009) listed the top 20 green job titles representing all levels as follows, Executive Director (Nonprofit), Project Leader/Manager, Sustainability Program Director/Manager, Sales/Business Development Associate or Manager, Marketing Manager/Coordinator, Community Crew Leaders/Supervisors, Conservation Associations, Business/Data Analyst, Research Analyst/Manager, Environmental Educator/Naturalist, Account Executive/Manager, Professor (various academic fields), Sustainability Analyst/Consultant, Operations Manager, Wind Energy Engineer, Administrative Assistant, Trainer (Training Specialist or Training Coordinator), Electrical/Design Engineer, Green Architect, Green Building Project Manager, Solar Process Engineer/Process Integration Engineer, About Green Dream Jobs. The analysis of job descriptions reflects that university graduates will have to engage with the role of green jobs before long.

Apart from green-collar job titles, the university graduates who have knowledge and skills relating to sustainability in their field of discipline receive a comparative advantage over those graduates who do not possess the knowledge and skills of sustainability in their discipline. This comparative advantage is because employers need more and more green-collar employees.

After all, sustainability practices have become part and parcel of corporate social responsibility (CSR) of employers, and students concerned with the environment are ethical students.

**Green Entrepreneurship:** Volery (2002) describes that green entrepreneur are those who transform the conventional business formation into a sustainable formation greening all the aspects of business with a life-long commitment. Anderson (1998) points out that the uniqueness of green entrepreneurship with others is that the green entrepreneur incorporates and consolidates individuals' value perceptions into an eco-friendly business's inner workings. Accordingly, a green entrepreneur is a value-based business to preserve the environment, economy, and community for sustainable development.

Green entrepreneurship initiated in the 1990s is still in its infancy stage, and it creates many new opportunities for the early birds of green entrepreneurs. Harini and Meenakshi (2012) identified a few budding business opportunities for green entrepreneurship, such as renewable energy alternatives and green business incubators, green transportation, retail green product innovation in consumer goods, green information technology, growing local food good for health. Stern (2006) reports that sustainable development actions have created a new market (Greenmarket), which grows to be worth hundreds of billions of dollars each year.

## 1.6 (iii) Significance for Employees of the University

Green collar employees can be described as employees who have the knowledge, expertise, and interest in the environmental issues of the organization and apply them in solving environmental issues of the workplace (Harvey et al., 2010). In the same vein, Amble (2005, as cited in Harvey et al., 2010) narrates green-collar employees acts as an environmentalist in the organization to protect the environment and encourage co-workers to be environment friendly at the workplace. Accordingly, green-collar employees are not necessarily those whose job descriptions specifically require carrying out duties related to sustainability practices within the organization, but they include those concerned with sustainability practices and advocate sustainability practices while employed.

**Job Security:** Green-collar employees are ethical because of their ethical behavior. Harvey et al. (2010) elaborated many characteristics of green-collar employees that recycle house waste and encourage the same at their workplace. They belong to a sustainable organization. They

prefer to cycle to the workplace. They save energy at home and encourage savings of energy at their workplace. They recycle wastepaper in their workplace. They focus on energy efficiency and future energy-efficient technology. They raise funds for community services, abstain from using harmful products to the environment and encourage others to do the same. These characteristics of green-collar employees reflect their ethical behavior not only at home but also at the workplace. Since employers expect their employees to act ethically not only during their engagement, even after the termination of their assignment with the employer, it is undisputed that the employers appreciate and prefer to retain employees with the ethical background than those who have not possessed it. Pinderhughes (2007) points out that green-collar employees receive better salaries and promotions than other jobs in the exact skills range in addition to job security.

**Emerging Green Collar Labour Market:** There are several other benefits uncovered for being green employees. One of the benefits is that there is an emerging labor market for them due to increasing investment in green industries by the public and private sectors (Scully-Russ, 2013). These employment opportunities are related to renewable energy, energy efficiency, eco-tourism, waste management, land management, and clean production. Part of the universities' investment flows create an opportunity for green-collar employment opportunities in their universities. The universities under this study also implemented Biogas projects, a water conservation project (Liyanage & Vishwanathan, 2020), solar power project commissioned by the end of 2019 (Liyanage et al., 2020). These projects provide opportunities for the employees of the university to experience the green-collar jobs within their university.

## 1.6 (iv) Significance for Management and Shareholders

There are many global environmental issues. Among them, ozone depletion, climate disturbance, acid rains, toxic build-up in the ecosystem, soil erosion, water land, air pollution, deforestation, extinction of species, fisheries depletion. These issues reflect how they have already threatened and will threaten the ecosystem on which all beings are dependent.

Universities as corporate citizens are expected to act socially responsible for environmental issues (Institute of Directors Southern Africa, 2016). Plungpongpan et al. (2016) argue that universities, public and private, consider Corporate Social Responsibility (CSR) a duty to perform on behalf of all the stakeholders. Corporate Social Responsibility (CSR) is meant for

sustainability practices to integrate social issues and environmental issues not only in their business activities but also in interaction with the stakeholders. Being socially responsible means fulfilling legal expectations, going beyond compliance, and investing voluntarily in environmental and social issues (Plungpongpan et al., 2016). Accordingly, sustainability and corporate social responsibility are interwoven together, making the management an opportunity to protect the environment and society's equity.

Some universities subject to this study have incorporated sustainability practices for protecting the ecology in their strategies. Accordingly, they have initiated economic sustainability practices by implementing the water conservation project and the solar power project. Concerning economic sustainability projects, Sharp (2002) points out that there are enormous efficiencies and opportunities in campus operations that a systemic commitment can institutionalize, but few universities have exploited them. He further gives an example from the Harvard Green Campus Initiative from 1993 to 1998, which made $ 3.5 million interest-free environmental funds available to the staff who can identify a conservation project with a payback period of not more than five years. During the trial period mentioned above, it had invested $2.4 million in 32 projects, which gave an average return of 34% with an annual savings of over $880,000.

These kinds of projects are within the three pillars of sustainability, in particular, the economic sustainability, and these projects reflect the responsible behavior of a corporate citizen expected by Sustainable Development Goals, in particular, The SDG 06: Clean Water and Sanitation, SDG 07: Affordable and Clean Energy, and SDG 12: Responsible Consumption and Production.

Another specific area that makes the university's ecological environment environmentally conscious by the design of green buildings that refer to buildings that meet the standards set by Green Building Councils. Sharp (2002) points out that the buildings erected in conformity with LEED (Leadership in Energy and Environmental Design) standards enable saving more than 250% of its upfront costs over 40 years of the useable life cycle. Furthermore, green buildings provide many benefits such as efficient use of energy, increased productivity of occupancy, retention of employees, improved market values, and reduced health liability risks because of green indoor air quality. In addition, these green buildings will reward benefits to all stakeholders in the future (von Paumgartten, 2003).

## 1.6 (v) Significance for the University/Campus

Universities also require a brand image and brand equity to attract students, parents, employers, and other stakeholders. Quality education is robust to create a brand image and develop brand equity for a university. The green campus provides financial benefits by energy efficiency or resource conservation and non-financial benefits such as producing sustainability-friendly graduates, increased productivity of both students and staff, increased market value of the property, and even public interest. On the other hand, universities collaborate with other organizations to produce knowledge and innovation for economic and or technical reasons (Talab et al., 2020).

**Students & Parents' Loyalty:** Celikdemir et al. (2017) argue that the public believes that a university enables creating an effective brand based on quality education founded on sustainability. Students and parents are increasingly concerned with their environmentally responsible behavioral consumption. Consumers environmental responsibility is defined as "…a state in which a person expresses an intention to take action directed toward remediation of environmental problems, acting not as an individual consumer with his/her economic interests, but through a citizen consumer concept of societal-environmental wellbeing" (Stone *et al.,* 1995: 601, as cited in Attaran & Celik, 2015).

This phenomenon has induced US universities to adopt seriously sustainable practices in their universities. Green organizations such as the Princeton Review that publishes the Green Colleges List, the US Green Building Council, or the Sierra Club Sustainability Report Card rank sustainable universities. The rankings are vital in attracting students to their universities (Attaran & Celik, 2015). In addition, Princeton Review (2012, as cited in Attaran & Celik, 2015) reported that most students and their parents make acceptance decisions based on a university's environmental commitment. These evidence indicate a new trend loyalty from parents and students for sustainability practices at universities

**Employees' Loyalty:** Students, parents, and employees are also concerned with their employer/university's environmentally responsible behavior. Battacharya et al. (2008) point out that employees are more connected with the employer in their sustainability practices. As a result, employees also enhance their performance. They further point out that there is evidence that organizations with sustainability practices can attract employees and retain

employees. Furthermore, Harvey et al. (2010) argue that employees in an organization with sustainability practices are willing to recommend their organization to others.

Another potential benefit is that even though the employees receive the paycheck, they feel emotionally connected to the organization when they are concerned with the sustainability practices (Battacharya et al., 2008). In particular, young employees are more concerned with sustainability than older employees. Harvey et al. (2010) argue that young workers are ready to sacrifice their payroll compensation for working in a sustainable organization. Grow et al. (2005) argue that demographic factors show that the employers should be cognizant of their needs because their number is growing while the older employees are retiring.

### 1.6 (vi) Significance for the planet

Universities as corporate citizens are expected to create value beyond the shareholders but for stakeholders. The planet is a stakeholder of a university. The planet needs human values beyond its naturalness because the developmental activities that have taken place since the industrial revolution have caused distortions to the naturalness. Consequently, the ecological system of the plant is now unable to provide its fundamental service as usual. Hence, a sustainable university by its sustainable practices relating to the ecological environment, the social environment, and the economic environment, facilitates the planet's protection (Institute of Directors Southern Africa, 2016).

## 1.7 Limitation of the Study

The purpose of the research was to design a green university that can be used as a blueprint by conventional universities to produce green knowledge and innovation needed for sustainable development. All the elements of the green university were deduced empirically. The empirical data was collected from six university stakeholders: professors and Doctors, senior lecturers, academic managers, non-academic managers, and undergraduate and postgraduate students. However, this study did not collect data from other stakeholders of knowledge systems, namely, economic system (economic capital), natural environment of society (natural capital), media-based and culture-based public and civil society (information and social capital), and the political system (political and legal capital). Since green knowledge and innovation are produced to mingle with the other knowledge systems, the empirical data from them is also

relevant, but time and money deter this study's scope. Hence, the findings are constrained by the said empirical data.

## 1.8 Ethics in the Research

A strong relationship between ethical integrity and the quality of the research strongly correlates with each other. Therefore, compliance with ethical standards is imperative. These ethical standards guide the researcher's behavior to protect all stakeholders' rights, such as the researcher, participants, and research users. Saunders et al. (2016) explain the philosophical foundation of the research inquiry. They indicate that there are two dominant philosophical positions of ethics. They are the deontological view and the teleological view. The deontological view is that there are rules to guide the research. The researcher must follow them. The non-compliance of them cannot be justified on any ground. In contrast, the teleological view means that the researcher's act or conduct is decided by the consequences of the researcher's act or conduct but not by the predetermined rules. The teleological view justifies the actions or conduct of the research based on the benefits.

However, this thesis is university research. Therefore, there are ethical guidelines that should be followed in research. The code of ethics provides a list of principles to be followed in conducting research. Adherence to the code of ethics is imperative. Accordingly, the ethics clearance from the North West university was first obtained before collecting data. The ethics committee approved it as a minimal risk study (Appendix 1). Further, a research permit was obtained from the Ministry of Tertiary Education, Research, Science and Education, Botswana (Appendix 2). Additionally, the four principles of Bryman (2012) were observed. They are more fully discussed under the 3.6 Ethical Considerations of the Methodology chapter.

## 1.9 Layout of the Study

This thesis consists of seven chapters, Introduction, Literature Review, Methodology, Data Analysis, Interpretation, Discussion, and Conclusion.

Chapter 1 deals with the university's newer role in producing green knowledge and innovation for sustainable development. Consequently, it discusses the scope of green knowledge and innovation. After that, the study's purpose is to design a green university that enables the production of quality green graduates (human ethical capital). The green knowledge and

innovation produced by the green design become an input for other knowledge systems, economic system (economic capital), natural environment of society (natural capital), media-based and culture-based public and civil society (information and social capital), and the political system (political and legal capital). The chapter further elaborates that the study's significance provides benefits to five knowledge systems and the university's internal and external stakeholders.

Chapter 2 is dealt with the literature review, which theorized the entire study. Accordingly, it is discussed how KBE deals with the inability of neoclassical economics for sustainable development. Further, the chapter discusses the institutional challenges of conventional universities transforming to sustainable/green universities. They are organizations' rationality, bureaucratization, myths and ceremonies, isomorphism, agency, change management, leadership, and stakeholder theory. After that, it deals with a conceptual model already developed whose theoretical framework supports a green university system's design under prudential anthropocentrism of ecological economics.

Chapter 3 describes the methodological choice of research. First, it is argued that the green university concept is a new social phenomenon that should be socially constructed under the philosophy of interpretivism. Hence, qualitative data collected from documents and interviews were qualitatively analyzed. Finally, the theory was inductively developed. The methodological process was subject to validity and reliability, and several strategies were used to ensure the validity of data collection, analysis, and development of theory.

Chapter 4 deals with data analysis under which qualitative data collected from the documents was analyzed by axial coding, enabling the production of priori codes for the axial coding thematic analysis of data collected from interviews. The data analysis enables producing codes, themes, concepts, and relationships among the concepts used to develop the theory by induction.

Chapter 5 is the interpretation under which theory was developed with the codes, themes, and concepts produced by chapter 04, data analysis. Accordingly, nine knowledge clusters were identified by their elements and the rationale of each knowledge cluster. After that, the nine knowledge clusters were integrated under the systems theory.

Chapter 6 is the discussion of the first three research questions. Accordingly, it was settled with a working definition for a green university. After that, it was discussed that the existing structure of the university is not a sustainable university. Finally, it was discussed the eight essential elements derived from the analysis of interview data.

The last chapter is the conclusion. Accordingly, it was concluded how the green university was designed to produce green knowledge and innovation needed for sustainable development. Accordingly, eight essential processers were identified and integrated as Green University System.

# Chapter 2: Literature Review

## 2.1 Introduction

The Cambridge dictionary meaning of Sustainability is 'the quality of being able to continue over a period'. Thesaurus synonyms and related phrases in this respect are 'lasting for a long time,' but the word sustainability is later referred to as a contextual meaning of the Brundtland Commission, sustainable development as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment, 1987). Since then, 'sustainability' is primarily meant for ecology's sustainability, which means the ecosystem's ability to subsist over a long time without significant alterations. Thus, all beings and living things can survive depending on the ecosystem without a threat.

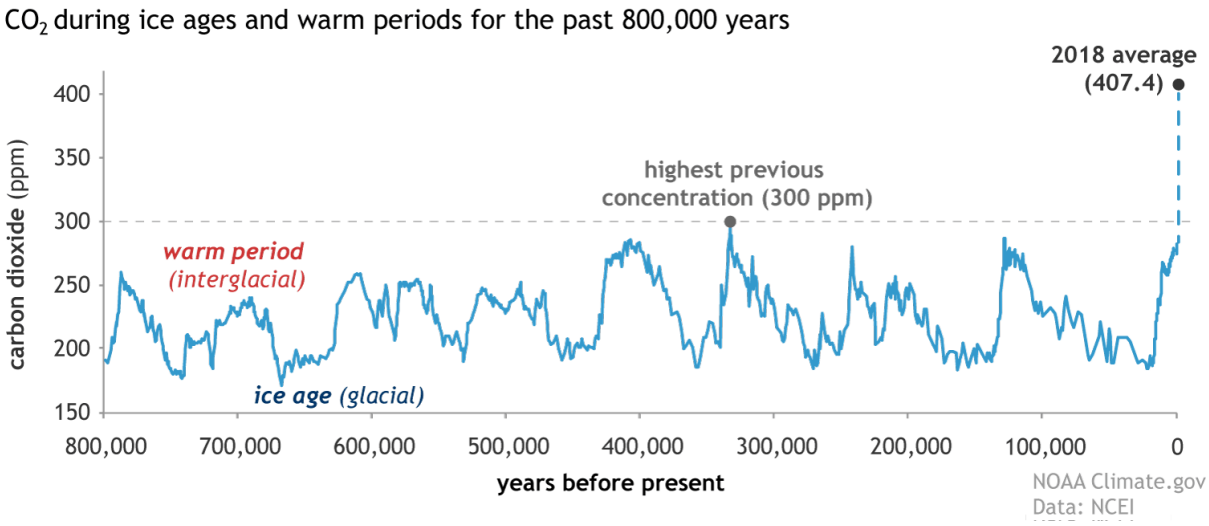
The need for 'Our Common Future' arose because the new geological epoch called Anthropocene began from 1610 to 1964 as the human-dominated world created environmental changes. Thus, for example, undeniable anthropogenic activities caused by the Ozone hole (Steffen et al., 2011) over Antarctica even though the present era is still referred to as within epoch of Holocene latter which began after the glacial epoch called ice age (Lewis & Maslin, 2015).

Since the end of the ice age, the epoch of Holocene has experienced 11700 years during which CO2 was below 310 ppm during the last 800,000 years until 1958. However, humans' unsustainable developmental activities have increased CO2 to 410 ppm (CO2.earth, 2020), causing global warming and other global sustainable issues. This evidence influences scientists to use the term 'Anthropocene' to describe the present epoch (Syvitski et al., 2005; Zalasiewicz et al., 2008). Even though the term is informally used, the term has started receiving the formality by a significant majority decision of Stratigraphy Commission of Geological Society of London. The formality results in joining with the Geological time scale (Zalasiewicz et al., 2008).

Now, the business-as-usual deposits 40 billion of CO2 into the atmosphere by adding two parts per million every year. The deposit of CO2 has now increased up to 410 parts per million in 2020 (CO2.earth, 2020). The increase is unprecedented because CO2 parts per million during

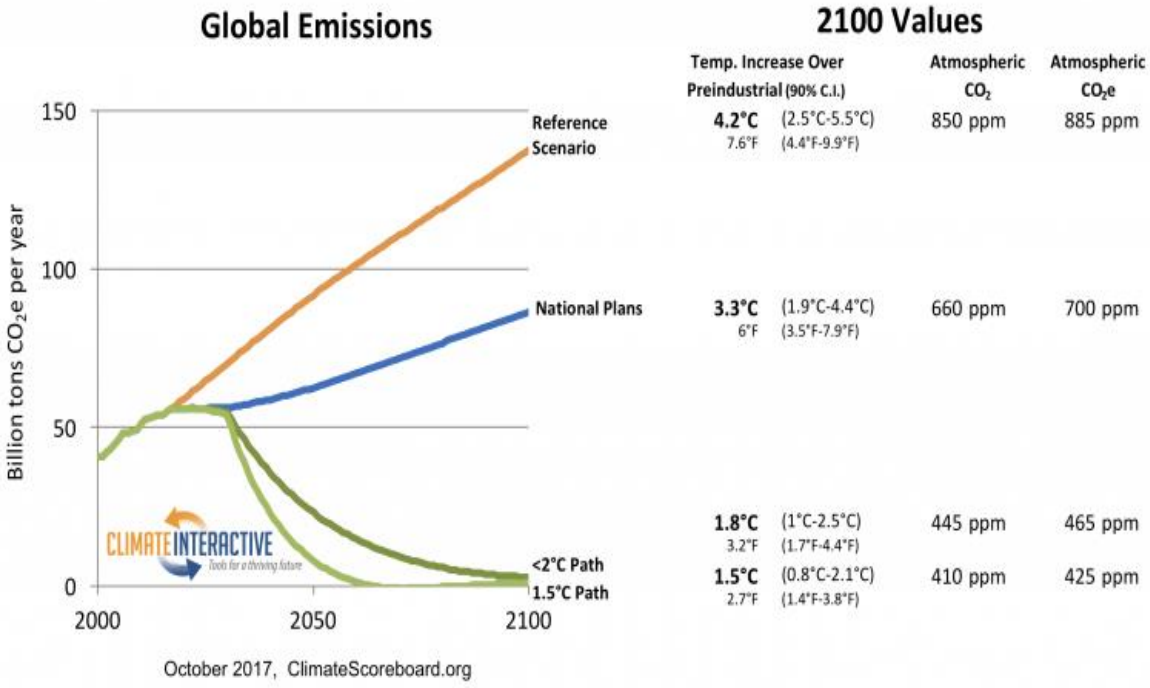
the last 800,000 years before 1950 were always below 310 parts per million (Figure 7). Business as usual by the end of the century, it is estimated that the atmospheric CO2 concentration will be increased between 910 ppm to 1255 ppm, which will result in increasing the average global temperature up to $4.5^0$ C above the pre-industrial level (Figure 8). In contrast, the average global temperature target agreed at the Paris Climate Agreement is $1.5^0$ C to $2^0$ C for which CO2 concentration should be maintained from 450 ppm to 550 ppm, respectively.

**Figure 7: CO2 for the past 800,000 years**




Source: CO2.earth (2020)

**Figure 8:** Net Global Green House Gas Emission




Source: Climate Interactive (2020)

**Sustainable Knowledge System Vs. Conventional Knowledge System**

Sustainable development including the prevention of temperature increase enables creating a world towards no hunger, no poverty, good health, quality education, clean water and sanitation, affordable and clean energy, safer cities, species survival, and increased food security. In brief, a sustainable planet. Hence, two universal programs, the 2030 Agenda for 17 SDGs in 2015 & the Paris Climate Agreement in 2015, have mandated member nations, including Botswana, to engage every economy, society, institution including universities, and individuals for making the planet sustainable.

Botswana, a southern African country, is explicitly mandated to be a KBE by its Vision 2036. These KBEs worldwide are meant to be "economies which are directly based on the production, distribution, and use of knowledge and information" (OECD, 1996). Accordingly, KBEs achieve their economic growth by investing in human capital, innovation, and knowledge to produce skilled, creative, and innovative people and organizations to contribute to economic growth in their knowledge-based economies.

Most of the KBEs worldwide operate in some way or the other way of neoclassical economic models. However, the fundamental neoclassical economics' explanation does not directly support the concept of sustainability. For example, Mulder and van den Bergh (2008) argue that mainstream neoclassical economics does not recognize the importance of natural resources and sustainability beyond the market forces because neoclassical economics emphasizes quantitative changes as a closed system. Therefore, Vivien (2008) argues that even though the natural resources are finite, a decrease in natural resources is offset by the increase of capital produced by the economy in never-ending economic growth. Hence, Mulder and van den Bergh (2008) advocate the evolutionary traditions of environmental economics as an open system that interacts with the environment but emphasizes going beyond the technical changes such as climate change modeling, co-evolution of economy and environment, endogenous preference change, sustainable consumption, and climate change modeling.

Accordingly, the endogenous economic model under neoclassical theory appears to be the best fit with Sustainability in KBEs. The Arrow model for learning by theory, The Lucas model for investment in human capital, The Romer model of technological change are all neoclassical models that explain endogenous factors, technology, human capital, knowledge, and innovations as modern contributory factors of economic growth. KBEs, which rely on endogenous factors, technology, human capital, knowledge, and innovations as modern contributory factors of economic growth, harmonize with sustainability advocated (George, 2006) by bridging the gap between mainstream economics neoclassical economics and ecological economics latter which is founded on sustainability.

In the mission assigned to carry on developmental activities with sustainable practices in KBEs, Universities as organizations who are leaders, models, and catalysts in education and innovations (Clarke & Kouri, 2009; Moore, 2005) are expected to play a vital role in leading by example in promoting sustainable development practices at their Universities (Amaral et al., 2015). In this respect, the power possessed is explained that the universities' catalysts and leaders are in a unique position because of the resources and influence that the universities can use to foster sustainability (Finlay & Massey, 2012). Further, Yuan et al. (2013) bring to the attention of power of higher educational institutes for sustainable development, stating that there were more than 2,198 universities and colleges with 25 million students in China, and their resources and influence can be used to foster sustainable development in China. This strength is the same for all other countries also.

The resources and the influence of universities enable us to produce knowledge and innovation as a closed and or open system. The traditional closed knowledge and innovation system relies solely on internal processes without or little collaboration with external entities (Chesbrough, 2003). As an open system for knowledge and innovation, a university entails a system outside the university. The quintuple Helix innovation model refers to an open system to produce knowledge and innovation. Open knowledge and innovation systems are frequently viewed as an optimistic approach that makes organizations' boundaries transfer knowledge and innovation inward and outward (Jonsson et al., 2015).

Accordingly, universities are institutions that are strongly interconnected with KBEs and Sustainability. Liyanage and Netswera (2021) argue that a credible institution is a precondition for KBEs (and sustainability) because it provides a stable structure for human interaction with less uncertainty. Moreover, it is an autonomous reality that provides an independent structure for guiding the behavior and knowledge creation process (Schiliro, 2012). However, universities' conventional structure/framework does not adequately support sustainable development's green knowledge and innovation. Hence, there is a necessity to reconfigure the conventional framework of a university to a sustainable/green framework to produce green knowledge and innovation.

## 2.2 Ethical Capital

A university's conventional structure/framework transition to a sustainable structure/framework depends on embracing more ethical capital and the natural capital needed for sustainable development. Ethics means a collection of morals that govern an individual, organization, society, or economy for a sense of fairness and a code of conduct about what is right against wrong (Bull et al., 2010).

Ethical capital is one of five types of capital employed for sustainable development (Carayannis & Campbell, 2011). Accordingly, (i) Human resources used to mobilize green knowledge and innovation for sustainable development are called ethical capital. (ii) Economic capital, which mobilizes financial capital for profit, is termed economic capital. (iii) Physical capital, which mobilizes natural resources, is called natural capital. (iv) Political and legal capital is the capital that mobilizes political ideology and legal doctrines. (v) Information and Social capital that mobilizes civil society resources are called information and social capital. Bull et al. (2010)

point out that all these types of capital may be available in an organization, but their mixture may differ from organization to organization.

According to Wagner-Tsukamoto (2007), there are three levels of ethical capital. One of them is the passive unintended moral agency. Business organizations or people who maximize shareholders' wealth complying with a minimum standard of law possess passive unintended moral agency. For example, these organizations or people in business maximize the shareholders' wealth by complying with business rules paying the minimum salary enacted by the law. Stimel and Sekerka (2018) point out that those externally driven controls imposed by the government or industry intend to comply with a moral minimum. In general, such controls are typically reactionary or corrective measures more often after scandals occur. Consequently, passive unintended moral agency results in less effective systemic change.

The second level of ethical capital is the passive intended moral agency. These business organizations or people accept that their business is a part of the community. In other words, they maximize shareholders' wealth while acknowledging other stakeholders of the business. For example, they pay salaries and wages above the legal minimum to maximize shareholders' wealth. Stimel and Sekerka (2018) argue that such internally driven controls build the moral strength for self-regulation, but the behavior is monetized for self-interest and profit. For example, Inverted Moral Market (IMM) provides whistleblowing of unethical behavior of firms by selling sensitive information and short selling.

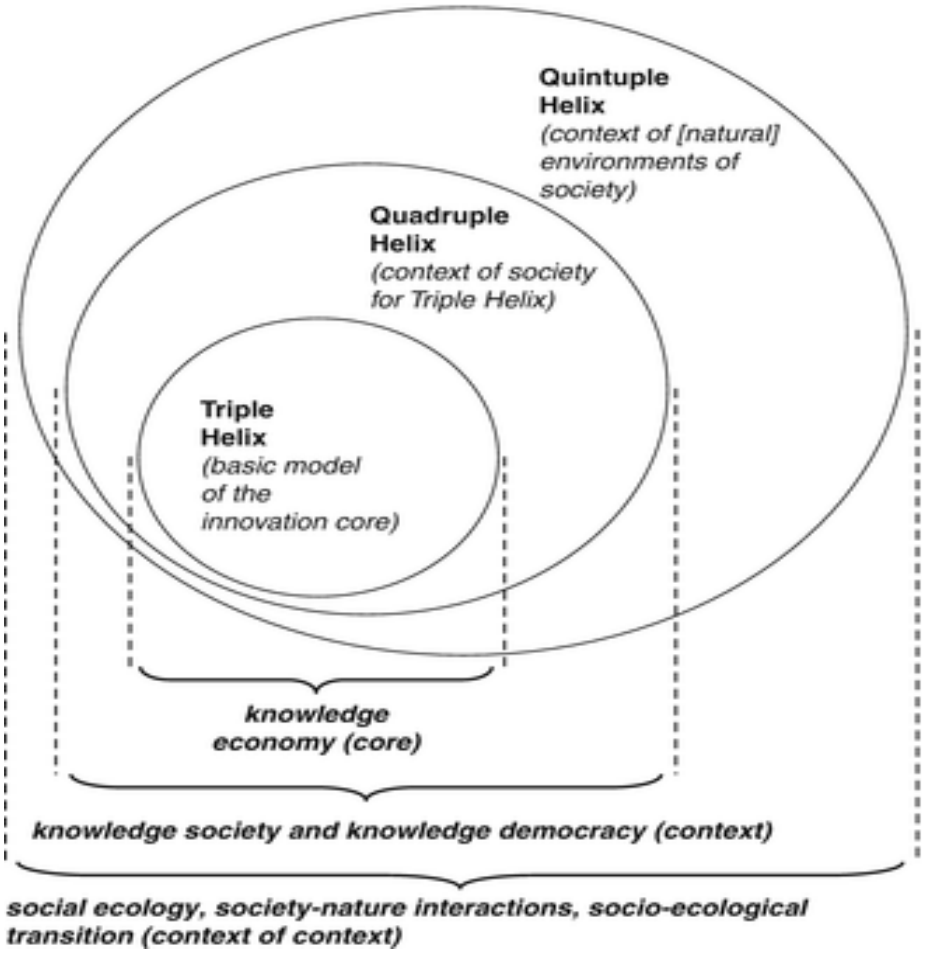
The third level of ethical capital is the intended moral agency of capital. These organizations and people in business carry on their business to maximize stakeholders' value by discharging Corporate Social Responsibility. For example, these organizations and people in business internalize CO2 incorporating the community and the environment as a stakeholder. The recent development of company law espouses the intended moral agency of capital. Section 172 of the Companies Act of the United Kingdom empowers directors to act in the interest of the community and the environment when acting in good faith in the interest of shareholders as a whole. This provision extends stakeholder value creation to enlightened shareholder value creation by empowering directors to support active intended moral agency. In agreement with the intended moral agency, Stimel and Sekerka (2018) manifest that an environment for moral balance can be created by a balance between internally driven controls and external controls.

The challenge for sustainable development is how to create ethical capital needed for sustainable development in a knowledge economy, knowledge society, knowledge democracy, and social ecology. In this respect, the university system is paramount. The Quintuple Helix Model of Innovation explains how the ethical human resource capital produced in the university system contributes to developing ethical values in other knowledge systems for sustainable development (Carayannis & Campbell, 2010).

The Quintuple Helix Model of Innovation in Figure 6 depicts how knowledge and innovation blend among five knowledge systems. However, the sequence of the blending process narrated here is only for understanding, but in practice, the blend could occur in any desired sequence. Accordingly, the education system creates green knowledge and innovation, which results in producing ethical human capital. In this endeavor, universities discharge their functions in three missions. The first and the second missions are teaching and research. The third mission connects with the fourth helix to engage with third-party activities by outreaching initiatives through civic education, innovative projects, and democracy (Carayannis & Campbell, 2021). After that, the know-how of the ethical human capital exists from the education system and enters the main circular flow of knowledge and innovation. After that, the ethical human capital blends with the knowledge and innovation in the main circular flow (Carayannis et al., 2012). Having blended with the knowledge and innovation in the main circular flow, the ethical human capital enters the political system where political discourses produce the knowledge and innovation as political and legal capital. After that, the know-how of political and legal capital exists from the political system and enters the main circular flow of knowledge and innovation. After that, the political and legal capital blends with the knowledge and innovation in the main circular flow.

After blending with the knowledge and innovation in the main circular flow, the political and legal capital enters the economic system where knowledge and innovation are produced, resulting in economic capital. After that, the know-how of economic capital exists from the economic system and enters the main circular flow. In this process, the collaboration of the Triple Helix model (Etzkowitz & Leydesdorff, 2000) is the core/basic model of innovation (Figure 9), thereby creating a knowledge economy that relies on human capital in the helix of the economic system (Carayannis & Campbell, 2021).

Figure 9: The Quadruple and Quintuple Helix innovation systems in relation to society, economy, democracy, and social ecology




Source: Carayannis and Campbell (2021)

Having blended with the knowledge and innovation in the main circular flow, the know-how of economic capital enters the media-based and culture-based public and civil society system where the knowledge and innovation are produced there, resulting in creating information and social capital. After that, the know-how of information and social capital exists from media-based and culture-based public and civil society discourse and enters the main circular flow. In this process, the collaboration of media-based and culture-based public and civil society in a quadruple helix model of innovation extends the basic model of innovation, the Triple Helix Innovation Model, to the next advanced level of knowledge and innovation (Figure 9). According to Carayannis and Campbell (2021), political pluralism, i.e., civil society and national political system, works in harmony to develop knowledge democracy. Such engagement of civil society facilitates to create knowledge society in the innovation process.

In other words, the innovation process is democratized by the intervention of civil society. Consequently, the quadruple helix collaborative process creates an advanced knowledge and innovation system, thereby creating a knowledge society and knowledge democracy.

Having blended with the knowledge and innovation in the main circular flow, the know-how of information and social capital enters the natural environment of society where the knowledge and innovation are produced there, resulting in creating natural capital. After that, the know-how of natural capital exists from the natural environment of society and enters the main circular flow and continues in a never-ending flow until creating Utopia. In this process, the collaboration of all five types of capital/knowledge systems, Quintuple Helix Innovation Model advances further knowledge and innovation system of quadruple helix model of innovation by creating a social ecology. It is the interaction between society and nature for the survival issues of all beings called sustainable development (Carayannis and Campbell, 2021).

In the absence of ethical human capital, namely green knowledge and innovation, the unsustainable economic activities contribute to encroach safe operating environmental processes, in other words, nine ecological boundaries (Rockstrom et al., 2009). Four of them are nearing to encroach. As a result, the planet would be inhabitable for beings because the planet cannot be resilient with distortions caused by the unsustainable developmental activities that have been taking place since the industrial revolution. Consequently, the planet will not provide its fundamental eco-services to all beings, people, and other beings. The compelling evidence that rising sea levels, melting glaciers, are melting, the more extended summer season, hotter summer, and shorter but colder winter, water shortage are not only adverse symptoms but also severe warning signals.

As discussed above, Botswana is the most vulnerable country in Africa. Hence, producing green knowledge and innovation is crucial. It enables maintaining nine safe operating environmental processes, translates domesticated SDGs, and promises by Nationally Determined Contribution of Botswana into theory, non-linear research, and related actions in Botswana. A university-level framework for producing knowledge and innovation is imperative because the national policy framework for sustainable development cannot be made effective without a green university system in Botswana.

Further, a green university system that enables producing green knowledge and innovation can strengthen the supportive policy framework for creating ethical capital at the industry level. Accordingly, the green university produces ethical human capital. In other words, green graduates strengthen the King IV: Code of Corporate Governance of Southern Africa and ESG (Environment, Social, and Governance) policy framework.

The Code of Corporate Governance of Southern Africa explicitly stipulates that the community and the environment are the stakeholders of profit-oriented or non-profit-oriented organizations. The code enables aligning organizations to meet SDGs and the NDC of Botswana. ESG policy framework creates a conducive environment to make sustainable investment decisions needed for sustainable development. Accordingly, six approaches of the ESG policy framework can be used to make sustainable investment decisions by investors. Negative screening is one of the approaches, and it excludes specific industries, such as the gambling industry, alcohol industry, tobacco industry, burning fossil fuel industry. Positive screening is the second approach, and it supports socially and environmentally friendly businesses and industries. This approach espouses investment, such as the least pollution, diversity practices, and product safety measures. Next, the thematic approach embraces the investments directly related to sustainable development, such as climate adaptation projects and climate mitigation projects (Liyanage et al., 2021).

Environmental, Social, and Governance (ESG) integration is the fourth approach. ESG approach focuses on the evaluation of three types of risks and opportunities. One of them is to integrate environmental risk into an organization. It advocates aligning business activities to protect the environment. Accordingly, the investment could be allocated to environmental-related activities such as resource conservation, renewable energy, pollution control, and recycling. Social risk is another aspect of the ESG approach. It encourages investment allocation for social-related activities such as maintaining health and hygiene standards, no forced labor, and no child labor. Governance risk is another aspect of ESG. It accounts for quality governance measures such as proper board constitution including non-executive and independent directors, adequate implementation for zero tolerance corruption policy, audit policy. The fifth approach is the active ownership approach. It focuses on active ownership for sustainable development by the active intervention of shareholders and even other stakeholders. The sixth approach is the impact investment approach. It advocates organizations

to make an economic profit while protecting the environmental (Liyanage et al., 2020) and social pillars.

Accordingly, these two layers of policy frameworks, the national policy framework for producing green knowledge and innovation, and corporate governance codes go hand in hand together. These frameworks enable direct public and private capital to manage Environment, Social, and Governance (ESG) risks. For example, the organization's operations avoid environmental pollution by internalizing CO2 with their renewable energy projects. They satisfy the objectives of the society as a stakeholder of the organization. They demonstrate quality and responsible governance to all organization stakeholders, including the community and the environment.

To sum up, the that corporate-level King IV: Code of Corporate Governance, Southern Africa, ESG framework, Global Reporting Initiatives (GRI), International Integrated Reporting Council (IIRC), or ISO 14001:2015-Environmental Management System cannot alone steer to achieve the goals of domesticated SDGs, NDC of Botswana, or nine safe operating environmental processes without green knowledge and innovation. Universities as the apex organization in the higher education system. Hence, universities are catalysts and leaders to produce green knowledge and innovation needed for sustainable development in Botswana as a KBE. Hence, reconfiguring the university's conventional structures/processes is imperative to have green knowledge and innovation. The green knowledge and innovation so produced are instrumental in working hand in hand together for sustainable development goals. On the other hand, such a micro-level framework is compatible with Botswana Vision 2036 and Botswana's domesticated the 2030 Agenda for 17 SDGs.

## 2.3 Institutional Change for Sustainability in KBEs

Before considering micro-level structural changes for producing green knowledge and innovation by universities, it is essential to know that there are four requisites of KBEs: education and training, innovation, information structure, and the institutional regime. KBEs require necessary changes in the institutions for building KBEs. Universities are also institutions that are also subject to necessary changes. Sustainability, among other issues such as globalization and massification, challenges universities' role legitimately, demanding the required structural changes to accommodate sustainability in their role. Many scholars argue

that universities are complex organizations with distinctive characteristics such as complex governance structure, lack of specific groups responsible for necessary changes. Therefore, the change process is more challenging. Further, some scholars argue that it is rather easier to change the world than to change the university (Arnold, 2004; Baldwin & Bauman, 2005; Blackmore & Kandiko, 2012; Boyce, 2003; Eckel & Kezar, 2002; Merton, Froyd, Clark, & Richardson, 2009; as cited in Higgins & Thomas, 2016).

However, Neo institutionalism theory can be used to understand the behavior of organizations, including universities. First, neo-institutionalism initiated how broader cultural rules and beliefs operate as myths and ceremonies, making organizations homogeneous by isomorphism. Later, neo-institutionalism expanded its scope to describe the transformation and change management, heterogeneity of actors in the fields, and institutional logic.

## 2.3(i) Definition of Organization

In this endeavor, Universities are to be first understood as organizations in society. Hira and Hira (2010) describe an organization as a group of individuals bound by a common purpose, and it is formed within an existing institutional framework. Therefore, the group of individuals, the common purpose, and the universities' existing institutional framework must be understood in the light of neo-institutionalism theories. In this respect, neo-institutionalism theories such as the rationality of organization, bureaucratization, myths & ceremony for the legitimacy of the organization, isomorphism, agency, change management, leadership, stakeholder theory are helpful to realign the structure of universities for the proposed transformation of the universities to be green universities.

## 2.3(ii) Rationality of Organization: Internalization of Transaction Cost

Neo institutionalism provides two reasons justifying the existence of organizations. One of them is the rationality of the organization. Rationality is the economic reason assigned by neo institutionalism for the existence and the role of the organization. It enables internalizing transaction costs and making rules for actions. These transaction costs include costs such as information cost, risk cost, waiting cost, and the cost of retaliating or using a middleman (Hira & Hira, 2010). However, there is a flaw in the economic reason. Namely, the transaction costs

do not, in general, include a part of social costs such as the cost of pollution, including anthropogenic greenhouse gas emissions produced by the burning of fossil fuels.

The institutionalization of the societies' social costs in the societies is essential to determine the economic growth rate. However, the institutionalization of transaction costs depends on selective incentives and enforcement that ensure compliance with the organization's rules. The incentives for compliance and the enforcement of punishing for violations make organizations handle the transaction costs efficiently. In this respect, the state as an autonomous entity enables making economic rules and their enforcement from which the preferences of organizations and their behavior can be shaped for economic development (Hira & Hira, 2010).

## 2.3(iii) Bureaucratization

The second reason assigned by neo institutionalism for the existence and the organization's role is the bureaucracy. It refers to a complex organization like universities with multi-layered and complex processes. A bureaucratic organization possesses a hierarchical authority structure with rules and regulations. Specialization, division of labor, technical competence guidelines are other characteristics. These characteristics create impersonality and personal differences. Therefore, formal communication is standardized. Martin (2016) points out that many universities are today a more hierarchical and centralized structure, reduced local autonomy for departments, and centralized for a top-down approach.

According to Weber (1968: 974), there are three causes for the growth of bureaucratization, namely, one of them is that the capitalist firms compete among them in the marketplace. The second cause is that there is competition among the states to control their capitalist firms. The third reason is that there is an increasing demand for equal protection for all before the law. He further explains how the competition among capitalists' firms in the marketplace. These causes desperately justify the bureaucratization demanding to discharge official business continuous, precise, unambiguous manner, and speedily.

Accordingly, bureaucratization and rationalization make organizations efficient under neo institutionalism theory. Nonetheless, Weber (1952: 181-82) explained the gravity of bureaucratization and rationalization that rationalization has created an iron cage in which humanity has been imprisoned till the last ton of coal is burnt unless there is a prophetic revival. He further contended that bureaucracy, which is the organizational manifestation of the

rationalist, is a very efficient and powerful way of controlling people in an organization. Therefore, once bureaucracy has been established, it cannot be reversed.

## 2.3(iv) Myths & Ceremony for Legitimacy of the Organization

Neo institutionalism, which was developed by the path-breaking research papers by Meyer and Rowan (1977), Zucker (1977), and later contributions by DiMaggio and Powell (1983) elaborated the nature and extent of the structural elements of rationalized organizations (Scott, 1987). The most crucial point argued by these seminal research papers was that organizational structures and practices are myths and ceremonies adopted by organizations because they need a sheen of legitimacy than the effectiveness and efficiency of the organization (Alvesson & Spicer, 2019). Thus, they argue that formal organizations, say universities, incorporate rationalized institutional rules as structural elements to rationalize institutions. Such rationalized organizations enable them to increase their legitimacy and increase their resources and survival capabilities.

Even though these organizations display more confidence, satisfaction, and good faith internally and externally, conflicts arise and lose legitimacy when the activities are coordinated and controlled because elements of the structure are decoupled from the activities. The decoupling of the activities from the structure results in an inability to implement the program. Consequently, the inspection and evaluation become ceremonial.

All these because formal structures are made of their relational network and are made of social reality by way of views of essential constituents, the knowledge gained from the education, manifestations of powerful institutional rules, social prestige, and the courts' interpretations by-laws. The above argument is the best fit for conventional universities' structures whose structures and practices are myths and ceremonies adopted by them looking for a sheen of legitimacy than their effectiveness and efficiency.

Legitimacy is of two types, internal legitimacy and external legitimacy. Suchman (1995) explains the internal legitimacy as an apparent collective acceptance by the organization members for the ongoing set of individual and social processes desirable, proper, or appropriate at least to some extent. External legitimacy is the legitimacy granted by external stakeholders such as parents, government regulators, and the public. The external legitimacy enables the

organization to access resources in their external environment (Meyer & Rowan, 1977; Meyer & Scott, 1983; Powell & DiMaggio, 1991). In this sense, it appears that the universities worldwide are increasingly accepting sustainability as a sheen of legitimacy now mandated by the 2030 agenda for 17 Sustainable Development Goals and the Paris Climate Agreement.

## 2.3(v) Isomorphism

The rationalization and bureaucratization of organizations are continuously taking place in the organizations. Myths and ceremonies are also constantly observable in organizations. Further, DiMaggio and Powell (1983) argue that the causes of rationalization and bureaucratization but not them have changed since the middle of the last century. They point out that bureaucratization as the common organizational form creates more homogeneous organizations. However, the organizations' structural changes occur not by the necessity of efficiency or market competition but by isomorphism influenced mainly by the state and the profession. Isomorphism is a constraining process that makes one organization resemble the other organizations in the organizational field.

Universities as an organizational field are encouraged to be isomorphic organizations requiring voluntary and statutory compliance with data requirements, research quantity, funding models, and standard quality rankings (Pratt, 2004). As a result, most universities are conventional universities that produce intellectuals and employable graduates in their traditional disciplines, which evolve gradually at a very slow pace because the isomorphism of their universities in their discipline is their general rule. A change is an exception. The rationality behind this is explained as homogenization by DiMaggio and Powell (1983), who develop institutional isomorphism and point out three types of isomorphism: cohesive, mimetic, and normative mechanisms determine the processes or the organizational structure.

Cohesive isomorphism refers to the pressures for uniformity with similar organizations and their society by their cultural expectations. The state's political pressures and force by way of regulatory oversight and control are factors that make it cohesive. Mimetic isomorphism compels to be uniform with similar organizations because the organizations believe it is safer to follow similar organizations' organizational structures or processes to be beneficial. Circumstances of uncertainty are the factor that makes mimetic isomorphism. Normative isomorphism refers to being uniform because of professional standards. Therefore, professional influence and the role of education are the factors that make normative isomorphism. Accordingly, cohesive and normative isomorphism are external mechanisms, whereas mimetic

isomorphism is an internal mechanism for being similar to other organizations. However, isomorphic change among the universities could be achieved by under external pressure to change. The two universal packages, the 2030 Agenda for 17 SDGs and the Paris Climate Agreement, create the external pressure for an isomorphic change towards greening universities. A radical national policy framework enables external pressures for isomorphic changes among universities (Croucher & Woelert, 2016).

## 2.3(vi) Agency

Neo-institutionalism at its early stages was directed on myths and ceremonies, isomorphism, and legitimacy. It has later focused on the agency (Currie & Spyridonidis, 2016) and change management (Muluneh & Gedifew, 2018). Society is conceptualized as an entity that consists of multiple logics in particular from key institutions, namely, Christianity, Bureaucratic state, Democracy, Capitalist market, and Nuclear family. These institutions were later revised as religion, the state, the corporation, the profession, and the family by Thornton et al. (2012). The community was recently added as another key institutional order (Thornton et al., 2012).

These institutional logics are material practices of symbolic constructions. They are “taken for granted social prescriptions" (Battilana & Dorado, 2010: 1420) or "Frames of reference that condition actors' choices for sense-making, the vocabulary they use to motivate actions, and their sense of self and identity" (Thornton et al., 2012:2). These institutional logics influence the decision-making of issues and solutions at the micro-level. For example, conventional universities which operate under capitalist markets do not recognize sustainability beyond the market mechanism.

However, the Institutional logic of Christian theology, Aristotle's teachings, and the United Nations Intergovernmental Panel of Climate Change are compatible with the light ecological economics such as eco-form at micro-levels. An organization has to embrace multiple logic but not a single logic. They are competitive, but they may be cooperative, orthogonal, or blurred (Goodrick & Reay, 2011; Waldorff et al., 2013). Since institutional logics is not fixed among all the actors of society, their application is subject to interpreting the organization's actors (McPherson & Sauder, 2013). When analyzing institutional logic, institutional actors, such as vice-chancellor, deans strategize a balance between complex institutional logics with the people and practices without contradictions (Battilana & Dorrado, 2010).

When interpreting institutional logic, the institutional actors follow the rule of agency of institutions because institutional actors are different from social actors. Institutional actors are tied to the resources, rights, obligations, roles, and social position. Hence, the agency plays a double bind between actors and structure (Seo & Creed, 2002). Universities as an organizational field also must operate within institutional logic. Actors of the university such as Vice-Chancellors, Deans, other academics, and non-academic have to perform the agency of institutional logic explicitly determined by the state and profession but within the university's structure. In the presence of a global state and the profession that professes a sustainable planet, the dilemma is how the current structure fits with institutional logic.

## 2.3(vii) Change Management

Another perspective of neo-institutionalism focused recently is change management. Singh (2009, as cited in Goswami, 2015) defined changed management as how organizations, groups, or individuals retaliate the changes that take place because of dynamic internal and external factors compelling to change from the current condition to the desired state. Accordingly, the sustainability dynamics demand to change the current needs of the universities to the desired shape for sustainable university.

Hence, a change in universities is also inevitable in the fast-paced world. Torraco (2005) argues that there are two distinct theoretical frameworks to change universities under Organization Development. First, organization Development can be described as a planned development by reconfiguring structures, strategies, and processes that make the organization effective and efficient. (Cummings & Worley, 2005, as cited in Torraco, 2005).

The two theoretical frameworks are “O” theory-Organizational capability and “E" theory, economic value. Top management-driven change is entirely different from the participatory nature of the "O" theory. With expert consultants' help, the top management creates new strategies and structures to have a systemic change to increase its economic value. Beer and Noria (2000, as cited in Torraco, 2005) argue that both theories, O theory and E theory, can achieve a planned organization's planned change. They further suggested mixing both systems to reduce the cost and increase the benefits. Hence, traditional universities' transformation to sustainable universities in a Knowledge-Based Economy is an innovative paradigm shift that requires institutional change. It can be achieved by theory O or Theory E.”

There are two approaches to change management. Namely, such change can be carried out proactively or reactively. Proactive change makes necessary changes in understanding the dynamics of the environment in advance. For example, even though not adequate to move beyond the threshold of global sustainability, there are sustainability practices at universities by various projects such as recycling of waste, generation of electricity with renewable energy, conservation of resources, education for sustainability. Reactive change makes necessary changes to respond to the dynamics after they have happened. However, proactive change for global sustainable issues for making nine safe operating environmental processes is more prescriptive than reactive change.

## 2.3(viii) Leadership

However, change is inevitable for optimizing the performance of an organization. Universities are critical players and critical stakeholders for addressing global actions for sustainability challenges (Maruna et al., 2018; Pedersen et al., 2017). They are required to change proactively than reactively. In change management, leaders who have to perform a vital role in motivating and inspiring followers to achieve the organization's goals are not resistors but accommodators of the changes required for dynamics such as sustainability issues arising in the environment. These leaders are of various types, such as transformational, transactional, charismatic, and interactional leaders.

Transformational leaders change the organization by developing a vision for sustainability, transforming a traditional university into a sustainable university. Bass (1990:21, as cited in Trivedi, 2015) delineates those transformational leaders stimulate their employees to voluntarily take ownership beyond their self-interest to achieve the organization's goals and objectives. In this endeavor, transformational leaders enrich and boost the awareness for the acceptance of the mission to achieve the organization's goals and objectives. Hence, transformational leadership is more appropriate for the transformation of a traditional university to a sustainable university.

However, most leaders for change towards sustainability in universities worldwide play as transactional leaders rather than transformational leaders. Bass (1985:27, as cited in Trivedi, 2015) explain transactional leadership describing that that “changes in degree or marginal improvement can be seen as the result of leadership that is an exchange process: a transaction

in which followers' needs are met if their performance measures up to their explicit or implicit contracts with their leader." Hence, transactional leaders manage sustainability by exceptions (positive rule). These leaders make changes to comply with the standards of the industry. These leaders are mere followers of other transactional leaders of the organizational field. They do not have a vision of sustainability practices for sustainability. For example, these leaders introduce sustainability practices in a piecemeal meal by introducing various sustainability projects rather than a holistic manner by transforming the university into a sustainable university.

## 2.3(ix) Stakeholder Theory

An organizational change driven by sustainability from a traditional university to a sustainable university is rational because such a change creates values for all stakeholders, students, faculties, employees, management, government, and the society at large (the planet). Students of the sustainable universities who are ethical students are developed for green-collar employment opportunities and green entrepreneurship. Faculties who are ethical are ensured their job security. They receive opportunities to conduct green research and receive funds. Employees of such universities who are ethical employees have job security with the current employer, and they are developed for the emerging green labor market (Scully-Russ, 2013). Ethical management enables having good governance by discharging corporate social responsibility contributing to the 2030 Agenda for 17 SDGs and (Intended) Nationally Determined Contributions (NDCs) under the Paris Climate Agreement. They operate considering the planet as a stakeholder reporting by the triple bottom line (three pillars of sustainability), economic environment, social environment, and ecological environment.

Since an organizational change for a sustainable university creates values for all stakeholders, such a change follows both types of legitimacy, institutional legitimacy and strategic legitimacy (Suchman, 1995, as cited in Kuruppu et al., 2019). Strategic legitimacy is an approach used for instrumentally managing the operational resources of the organization. An institutional legitimacy is an approach used to manage external factors, both cultural and contextual factors. For example, since the stakeholders are connected not only with the center of the organization but also with each other stakeholders who are physically, economically, socially, culturally, and symbolically close to the organization (Kuruppu et al., 2019). Hence, stakeholders should understand their power, legitimacy, and urgency (Kuruppu et al., 2019).

Accordingly, with the development of open system theories and institutional theories, the traditional view of the organization as a social machine that transforms an input into output has been changed to construe beyond the technical aspect of the organization by including the dynamics of an organization such as cultural norms, symbols, beliefs, and rituals, Hence, neo-institutionalism is the best fit with the proposed structure for sustainable university. In other words, the neo-institutionalism argues that the formal organizational structure is determined not only by the technical demand and the resource dependencies but also by the social and political environments latter which influence the practices of the organization to be responsive to the rules, beliefs, and conventions of the social and political environment created by the state and the profession (Huther & Krucken, 2016; Tiba & Frikha, 2019). Hence, the current social and political discourse desperately demands from all to have sustainability practices voluntarily, not for the sake of mere sustainability. However, such practices should be adequate to contribute to global sustainability, in other words, towards nine safe operating spaces of the ecology fairly.

## 2.4 Ecological Economics: Light Ecology vs. Deep Ecology

Out of nine ecological boundaries, four ecological processes, climate change, land systems, biogeochemical flows, and genetic biodiversity loss are about to cross their boundaries. Furthermore, three more environmental processes, land systems, biogeochemical flows, and genetic biodiversity loss are also about crossing the threshold. These distortions in the environmental processes indicate that nature has been unable to be resilient. As a result, nature has been unable to provide its fundamental services to all beings (Keulartz, 2012). In the meantime, developmental activities are taking place continuously changing the conventional meaning of sustainability.

The conventional meaning of sustainability meant for ecology has changed towards the development need of the society. Hence, it is argued that because of developmental activities, the term ‘sustainability cannot be further referred to as ecology but referred to the society (Reboratti, 1999:207-209, as cited in Jabareen, 2008). The latter ideology means that developmental activities are necessarily required for society despite the fact that developmental activities significantly alter the ecosystem.

These two moral mindsets of the concept of ‘sustainability’ accepting sustainability in two contradictory directions created a paradox. One mindset is called a deep ecology mindset. Deep ecologists believe that ‘sustainability refers to the ecology's sustainability that developmental activities are allowed only to the extent of no significant alterations to the ecological system. This view's ethical stance is that the ecology and its constituents, such as human beings, animals, trees and plantations, rivers, mountains, the earth's surface, have values in their own rights. Values in their own rights are called intrinsic values. Since these intrinsic values exist in their own rights, not only the intrinsic values of human beings but also the intrinsic values of all other constituents of the ecology should also be accepted and respected.

The second type of moral mindset of the paradox is called light ecology. Light ecologists believe that sustainability refers to society, and they argue that sustainability relates to the ecology needed for society despite significant alterations of the ecology caused by developmental activities. This anthropocentric view gives a priority for human beings over all other beings and things of the ecology. In other words, the well-being of human beings is accepted at the expense of all other things. The ethical stance of this view is that human beings prevail over all other ecology constituents because there are no intrinsic values of the constituents of ecology other than human beings, but they have only instrumental values for the betterment of human beings. This view has roots from Immanuel Kant's moral philosophy, Jewish, Christian theology, and even before BC (Before Christ), the teachings of Aristotle that "nature has made all things specifically for the sake of man” (Alawa, 2016).

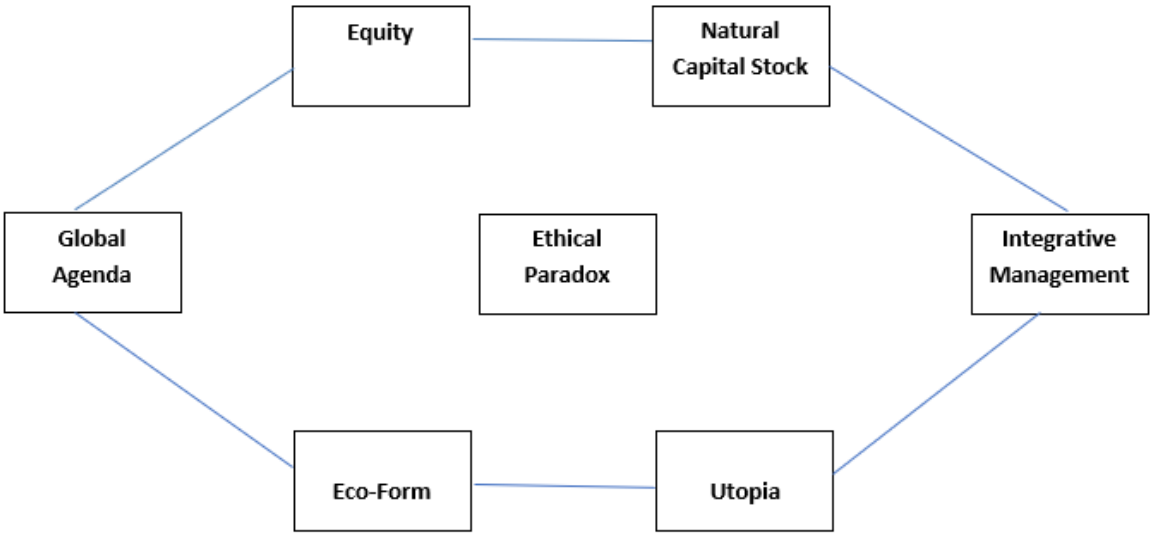
However, the light ecologists’ anthropocentric view is later rationally questioned how human beings' inherent values are only superior to the other constituents of the ecology. As a result, anthropocentrism's traditional view has been refined to a new version called prudential/enlightened anthropocentrism. The ethical stance of this view is that the ecology's alteration is allowed while paying attention to maintaining the ecology's ability to provide essential services to human beings. Accordingly, ecologists who view enlightened anthropocentrism introduced several systems for this purpose: ecological restoration, a novel ecosystem, and ecological design.

In this respect, Keulartz (2012) argues that it can be observed that there is a switch from ecological restoration to ecological design over the last decade and further contends that ecological design is more technocratic, hubris, and mastery rather than humility. If nature is

not perceived as a strong field of agency of its own anymore, its representation in terms of the services it delivers for human wellbeing is to be expected. Because of its servant or slave-like conception of non-human nature, one could describe the worldview behind the technological design as enlightened/prudential anthropocentrism".

Accordingly, the need for ecological design advocated by the enlightened anthropocentrism is theoretically consistent with the conceptual framework for sustainable development introduced by Jabareen (2008), and the principles of ecological economics discussed in his model depicted in Figure 10 are further critical when designing a structure/framework for transforming an unsustainable university to a sustainable university.

Figure 10: A Conceptual Framework for Sustainable Development




Source: Jabareen (2008)

According to the framework, seven concepts out of which 'Ethical paradox' rests at heart, Natural capital, Equity, Eco-form, Global political agenda, and Utopia have been interwoven with the umbrella concept 'sustainability/sustainable development.

## 2.4(i) The Concept of Natural Capital

The concept, natural capital stock advocates that it is necessary to maintain the natural capital for ecological sustainability. In this respect, the natural capital stock is of three aspects, (i) Non-renewable resources such as minerals, (ii) The natural system's finite capacity enables producing renewable resources such as agricultural products and water, and (iii) The natural

system’s capacity, which enables absorbing the externalities such as air pollution, water pollution (Jednak & Kragulj, 2015).

The conspicuous feature of natural capital is that the natural capital is metaphorically defined than the literal meaning. It has not adequately been paid attention to since the first industrial revolution. Coulson et al. (2015) point out that the metaphorical sense of capital is relational and philosophical, but the literal meaning assumes the accepted meaning. When comparing the natural capital with economic capital, it is noticeable that there is adequate ethical and legal framework to protect the economic capital despite the fact that there are debates concerning accumulation, distribution, and consumption of economic capital creating inequalities (Morgan, 2006, as cited in Coulson et al., 2015). However, there is an active debate about preserving economic capital in the presence of an adequate ethical and legal framework developed during the last three and half centuries since the industrial revolution. However, the absence of an adequate ethical and legal framework for preserving natural capital resulted in the deterioration of natural capital, resulting in substantial depreciation of natural capital by consuming natural capital beyond its resilience.

Accordingly, the manifest characteristic of natural capital stock is its depreciation by human pressure is unprecedented and undebated while accepting that they have contributed to depreciation since the industrial revolution. Hence, two questions arise in this respect. The first question is how the depreciation of natural capital stock is calculated. Even though there is no clear answer in the past, there is an acceptable answer to all after the nine planetary boundaries were determined by 28 scientists (Rockstrom et al., 2009), and 18 scientists later further clarified the same, stating that four planetary boundaries are so depreciated that they are now within the zones of uncertainty areas (Steffen et al., 2015).

The second question about depreciation is how the depreciated or depreciating value can be restored. The answer to this question is quantitatively given by Steffen et al. (2015), providing controllable variables and the controllable variables' current value for each of nine planetary boundaries. In this respect to the restoration of natural capital, there are two approaches. First, the deep ecologists argue that natural capital is limited and non-substitutable, but natural capital has a complementary role for all beings. Therefore, society's developmental activities must be scaled down to the extent that the planet would be resilient and provide continuous fundamental services to all beings dependent on ecology.

On the other hand, light ecologists argue that if nature cannot bounce back before the deformity caused by development activities, human values should be infused to bridge the gap of natural values. The latter view of prudential anthropocentrism, which agrees with this study of designing a framework for producing green knowledge and innovation, is supported by the 2030 Agenda for 17 SDGs and the Paris Climate Agreement. More than 190 countries, including Botswana, have agreed to carry on developmental activities in a sustainable manner under these two universal packages.

## 2.4(ii) The Concept of Equity

The concept of equity demands the environmental, social, and economic justice required for distributing equity between the present generation and future generations, namely, intra-generational equity and intergenerational equity. The demand is justified. Otherwise, the inequality increases because sustainability risks, environmental risks, social risks, and economic risks do not distribute evenly among people and other beings due to unequal distribution of adaptive and resilient resources. Therefore, all three equity, recognition, redistribution, and participation concepts should be directed to avoid sustainability risks.

Since the sustainability risk became a broader concept which includes goals not only traditional economic marginalization and poor standard of living but also sustainable, equitable, and stable society, Malone and Yohe (2002) point out that a vision for sustainable, equitable, and stable society could be achieved by a human-centered and knowledge-based partnership. In this respect, they recommend three criteria to be satisfied. The first criterion is that there should be a broad-based programme to be implemented vigorously and urgently. In this regard, it is required to integrate all the knowledge disciplines/clusters and all the sectors of the developed and developing countries. It is worth noting here that what they have envisioned has exactly come true under the United Nations the 2030 agenda for 17 sustainable development goals and the Paris Climate Agreement after 12 years of their vision.

The second criterion mentioned is to create a new model that enables a reciprocal action between the human system and the natural system. In this respect, what appears is that the recent quantification of the human interaction with the natural system by 28 scientists (Rockstrom et al., 2009), and later 18 scientists have further quantified and disclosed controllable variables which could be used to control the human interaction with the natural

system (Steffen et al., 2015). Finally, the third criterion of the strategy meant by them was the necessity for a conceptual framework for knowledge management and its application for social innovations under which this study focuses on designing a green university.

## 2.4(iii) The Concept of Eco-Form/Design

The concept of eco-design is not novel. It has ancient roots and even appears informally in various sectors. One of them is the traditional agricultural sector, in which farmers cultivate diverse crops in seasonal rotations. Another sector is traditional buildings put up with local materials that enable keeping optimal heating and cooling. Another example is the existence of self-sufficient tribe villages. Later, with the increasing attention on sustainability, eco-design has immerged formally. (Aktas, 2013). However, eco-urban planning, Eco-industrial parks, eco-architecture, eco-products, eco-communities, eco/green buildings, and green universities in this study are few labels now familiar with eco-designs. The objective of ecological design is to conserve ecological integrity so that the ecosystem can provide fundamental services such as clean air, clean water, and absorption of carbon by the ecosystem while being resilient from distortions caused by the developmental activities (Shu-Yang et al., 2004).

Accordingly, an innovative ecological design/green design for a university enables providing benefits to all stakeholders, management, students, employees, society at large/planet. Among the benefits, a green university enables resource consumption in its operations without depleting and conserving them. The green university allows protecting ecological integrity without causing distortions beyond the ability of the ecosystem's resilience. Such a green university enables the offset of natural debt, which environmental damages would cause. Further, such a university allows for us to increase environmental literacy. A sustainable university promotes the production of knowledge and innovation diffused among the other four subsystems of the Quintuple Helix Model of Innovation as an open knowledge and innovation system.

## 2.4(iv) Integrative Management

The concept of integrative management points out the integration of the natural environment, social environment, and economic environment for ecological integration required to preserve the natural capital stock. The framework for greening universities integrates all three pillars of sustainability in producing knowledge and innovation. For a few examples, among other things, green university enables the protection of the environment by green internal operation, the

social environment is protected by community outreach. The economic environment is protected by the conservation of resources used and energy efficiency.

## 2.4(v) The Concept of Global Political Agenda

The concept of political agenda denotes the global political discourse about the sustainable development on international issues such as peace, security, trade, heritage, hunger, shelter, and other essential services trading off between Northern and Southern countries for 'no development without sustainability and 'no sustainability without development' respectively.

Even though the debate of the south's developmental rights prevails over north, all nations have agreed on the gravity of sustainable development, and almost all the countries have politically decided on two critical global agendas for sustainable development, the 2030 agenda for 17 SDGs in 2015 and the Paris Climate Agreement in 2015.

The 2030 agenda is a shared vision and mission for eradicating poverty and a commitment to sustainable development with shared responsibility for implementing all Sustainable Development Goals as a whole but not in a fragmented manner in all countries in the world. In this global leadership, there are four sections: the political declaration by the member countries, the 17 Sustainable Development Goals and 169 targets, means of implementation, and the framework for the following up and reviewing the agenda (UNDP, 2020).

Over 190 countries by the Paris Climate Agreement agreed to limit greenhouse gases not to increase the average global temperature level by more than $1.5^0$ C, subject to the maximum increase not more than $2^0$ C based on average global temperature before the beginning of the industrial revolution. Hence, member countries have agreed to reduce carbon emission by their nationally determined contributions (NDCs). The agreement further stipulates that to achieve the said targets, appropriate climate financial flows, a new technology, enhanced capacity building, supporting actions to develop the most vulnerable countries, and enhanced transparency of actions will be put in place (UNDP, 2020).

## 2.4 (vi) The Concept of Utopia envisions a perfect society.

However, even though an ecological design advocated by enlightened anthropocentrism intends to bridge the gap arising from the inability of nature to render essential services for the

people's wellbeing, such a design is still skeptical. For example, Keulartz (2012) points out that even though there are sufficient scientific and technical capabilities for designing an ecological system, there is a doubt that it would be successful in the long run.

In this sense, Kronlid and Ohman (2013) advocate relation-oriented environmental ethics and argue that actions connected with environmental values should be maintained concerning humans, nature, and technology. Hence, ecological design suitable for a sustainable university, a growing branch of sustainable development, is within the discourse advocated by enlightened ecology. Furthermore, such a design will bridge the gap that arises from the prevalent inability of nature to serve the essential services for the people's wellbeing.

## 2.5 Chapter Summary

As a Southern African country, Botswana operates in neoclassical economic models that do not fundamentally support sustainability. For example, while neoclassical economic models admit that natural resources are finite, they argue that a decrease in natural resources is offset by the increase of capital produced by the economy in the never-ending growth. However, the knowledge-based economies of neoclassical economic models which rely on endogenous factors such as technology, human capital, knowledge, and innovations, harmonize the economic growth with sustainability.

A university is an organization that is instrumental in producing knowledge and innovation, particularly green knowledge and innovation advocated in this study. Neo Institutionalism Theory argues that the economic reason for the existence of an organization is rationalism. Rationalism justifies that an organization is required for achieving goals by its structure (Onday, 2016). Bureaucratism is needed to discharge official business continuous, precise, unambiguous manner and speedily. When considering the structure of an organization, neo-institutionalism argues that the organizational structures and practices are myths and ceremonies adopted by organizations not because they are effective but because they give a sheen of legitimacy to those organizations. They are rather isomorphic in their organization field.

Neo institutionalism further argues that agency influenced by organizational logic operates between the actors and the organization in decision making. However, neo-institutionalism

later focused on proactive and reactive change management to change the environment's dynamics and the leadership for change to formulate a vision that enables providing benefits to all stakeholders, students, employees, faculties, management, government, society, and the planet. In change management, universities envision and design a sustainable university incorporating ecological economics principles such as natural capital, equity, global agenda, integrative management, eco-form, and Utopia in the light of prudential anthropocentrism for producing green knowledge and innovation for sustainable development.

# Chapter 3: Methodology

## 3.1 Introduction

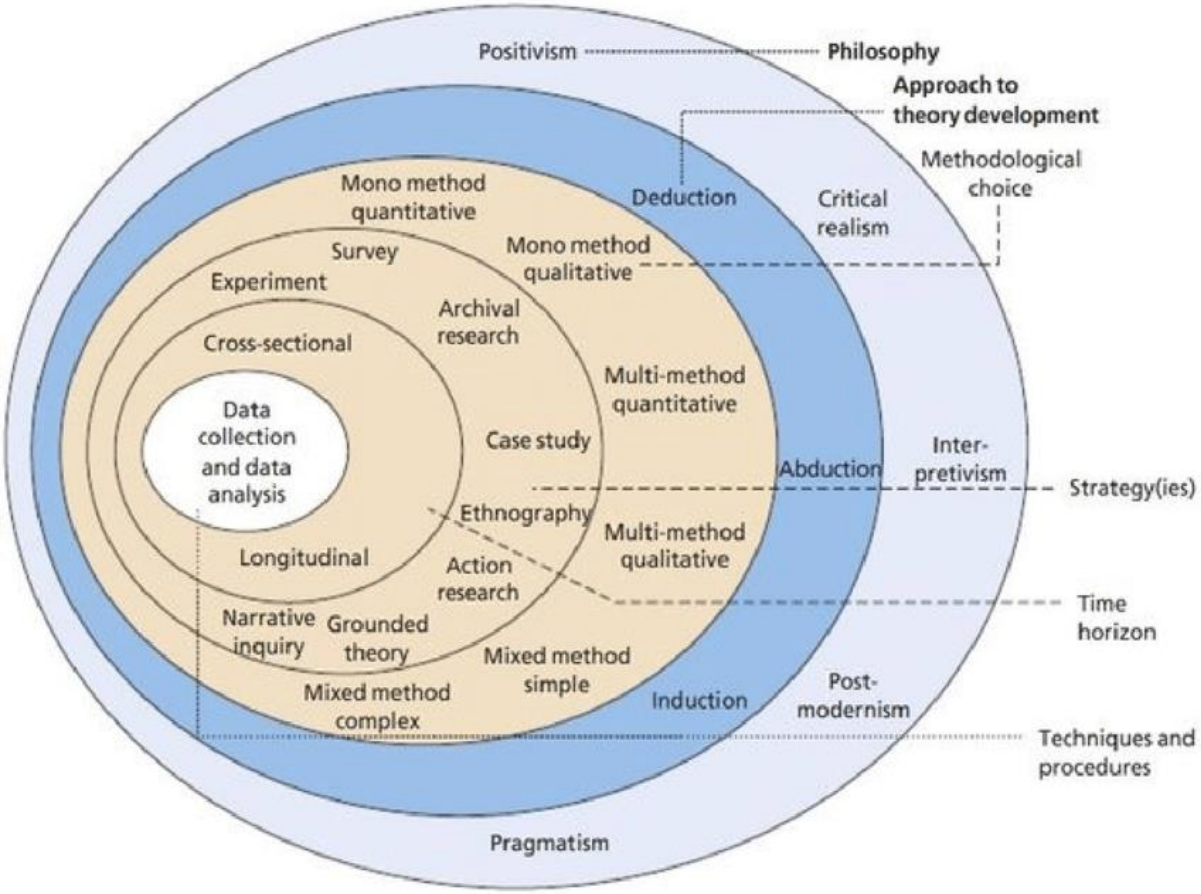
Brown (2006) describes research methodology as a philosophical framework on which the entire research is carried out. Scholarly work usually begins with identifying a problem statement, ends with the publication, and commercializes the research outcomes. There are many sequential stages between these two stages: formulation of objectives, formulation of research questions, literature review, research paradigm, methodological choice, data collection methods, data analysis, ethical conduct, results and discussions, conclusion, and publication. Saunders et al. (2016, citing Crotty, 1998) point out that data collection and analysis are central to the research. Therefore, the researcher must convince readers how the researcher has seriously researched scientifically. They further explain that there are five outer layers of the central point, namely, from the most outer layer to the inner layer are research philosophy of the research, approach to theory development, methodological choice of the research, the strategy of the research, time horizon of the research, and finally the central point, the data collection and analysis of the research as the most inner layer. In simple terms, research methodologies are concerned with the processes and instruments used in executing a research project because these processes and instruments directly affect the results. Hence, the methodology is an integral part of the research project.

This chapter is structured to give the reader a good orientation on how the research methodology was planned and executed. This chapter starts with Research Paradigm and Design, under which it is first discussed the research paradigm then the design. The research paradigm explains the ontological, epistemological, axiological, and methodological assumptions of the research. These assumptions in this study pave the way to choose the world view of the interpretivist paradigm interchangeably with social constructivism (Creswell, 2013:24; Denzin & Lincoln, 2011). This interpretivist research collects what is meaningful to the participants as a phenomenological study (Creswell, 2013:24; Saunders et al., 2016:141). The data collection and analysis are based on grounded theory (Creswell, 2013:25). Finally, the theory is developed by abduction rather than induction.

## 3.2 Research Paradigm and Design

The research paradigm describes a set of beliefs focusing on three questions. i. what should be studied? How should research be conducted? Furthermore, how should findings be interpreted? Burrell and Morgan (1979) identify four distinct and rival paradigms: radical humanist, radical structuralist, functionalist, and interpretive, out of which interpretive paradigm is the applicable perspective in this research. Furthermore, Guba and Lincoln (1989) define a research paradigm as a "Basic set of beliefs that guides the actions." Accordingly, this research's philosophical and theoretical framework is guided as Creswell (2013) asserts four philosophical assumptions: ontology, epistemology, axiology, and methodology.

Figure 11 Research Onion




Source: Research Onion-Saunders et al. (2016)

According to the most outer layer of the research onion (Figure 11) is the research philosophy of the research, a system of beliefs and assumptions used when developing research knowledge.

There are five research philosophies: ***positivism, critical realism, interpretivism, postmodernism, and pragmatism,*** out of which interpretivism is used in this multi-method qualitative research.

Each philosophy is founded on a research paradigm defined as a set of basic assumptions that underwrite the frame of reference, mode of theorizing, and ways of working in which a group operates (Saunders et al., 2016:132). A research paradigm fundamentally consists of three assumptions: Ontology, which refers to the assumptions about reality, and epistemology, which relates to assumptions about the study of knowledge. Finally, axiology relates to the assumptions in respect of the role of values. All these essential assumptions and their relationship to this research are explained in the sections below.

From paradigmatic assumptions follows methodological choices. The methodological choice of this research is multi-method qualitative research (Table 3). In this regard, qualitative research is carried out to ascertain the essential elements of a green university by co-construction of the multiple meanings from the documents such as already published research papers, sustainability practices of universities, and interviews for socially constructing the framework for greening universities.

**Table 3: Methodological Choice**

| Methodological Choice | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mono Method | | | | ~~Multiple Method~~ | | | | |
| ~~Quantitative Study~~ | | Qualitative Study | | ~~Multi-Method~~ | | ~~Mixed-Method~~ | | |
| ~~Multi Method Quantitative~~ | | Multi Method Qualitative | | | ~~Mixed-Method Simple~~ | | ~~Mixed-Method Complex~~ | |

Source: Author

## 3.2(i) Research Paradigm

The research paradigm in this study is under the philosophy of interpretivism. A research paradigm is a set of basic and taken-for-granted assumptions that guide the process of the research. There are four philosophical assumptions, namely ontology, epistemology, axiology, and methodology. Accordingly, in the Ontological position, the nature of reality is that the researcher is not independent or detached from the research participants in finding the reality. The reality by way of shared meanings can be constructed by social constructivism through culture and language. The researcher embraces multiple realities from different participants because of different cultural backgrounds, experiences, times, and circumstances. For example, the university community in this research answered differently to a question about the leadership approach for greening a university. Some participants advocated a top-down approach. Some other participants said bottom-up, and others said mixed method, both top-down and bottom-up approach.

In the Epistemological position, the study of reality is that the facts in this research required for studying the knowledge cannot be observed or measurable but can be studied by way of perceptions and interpretations that result in multiple realities. Bryman (2012) explains the epistemological difference between positivism and interpretivism as explaining human behavior and understanding human behavior. Interpretivism understands human behavior empathetically, but positivism explains human behavior without empathy. In support, Weber's (1947:88) definition of sociology is "Science which attempts the interpretive understanding of social action to arrive at a causal explanation of its course and effects". Bryman (2012) points out that even though Weber's (1947:88) definition addresses both the explanation and the understanding, a causal explanation must be understood concerning interpretive understanding because there is no meaning concerning external forces for those involved in social actions. Further, Bryman (2012) connects interpretative understanding with MaxWeber's (1864-1920) approach called Verstehen means understanding.

This research's axiological assumption is that the investigation is value-bound because the researcher is reflexive in the research. The reflexivity means that the researcher is required to maintain a certain level of consciousness by introspection, i.e., the examination of own mental, emotional, and bias processes and all others involved in the research such as participants, co-researchers, and other stakeholders (Palaganas et al., 2017) because the researchers are a part of the social world (Ackerly & True, 2010). Those who conduct their research in a socio-

economic, political, and cultural context, aspirations of people, characters of people, values and belief systems, experiences, philosophies, political commitments, and social identities shape their research.

In the process of consciousness, the researcher must acknowledge that the reflexivity in research constitutes a part of the findings (Palaganas et al., 2017) and be subjective, and therefore, what is required to be consciously aware that reflexivity is different from subjectivity. However, reflexivity creates a space between subjectivity and objectivity. Further, reflexivity blurs the difference between the research contents and the process of the research (Etherington, 2004). It can be achieved by addressing the qualitative research's rigor and trustworthiness. In this respect, Barusch et al. (2011) point out several strategies: the rationality of sample, triangulation, identification of limitations, careful representation of analysis, theoretical framework, prolonged active engagement, thick description, negative case analysis, and external audit.

## 3.2(ii) Interpretivist Approach

The interpretivism philosophy argues that the social phenomenon, green university, is multiple meanings created by people. Therefore, these multiple meanings cannot be studied in the same way physical objects are studied in natural sciences because social sciences are different from natural sciences. Hence, interpretivism aims to create a new and richer understanding by interpreting the social world in its context together with the researcher and participants of the research.

Accordingly, interpretivism is fit with this study because Hattingh (n.d. as cited in Achterberg, 1994:36) argues that the notions of "Sustainability and sustainable development entails much more than the quantitative notion of something that can last indefinitely, i.e., forever. Along the same line, it also entails pertinent qualitative elements entailing answers to value questions that cannot be deduced from a quantitative concept of sustainability, sustainable development alone". Hence, this research is carried on the qualitative notion of greening university because it aims to develop a framework that can be used as a blueprint for greening a university.

Therefore, the research questions of this research are directed to achieve the purpose of the research. There was no exhaustive list of questions that can be explicitly stated at the beginning of the research. Instead, four research questions to guide the literature survey, research design,

and not going off the tangent have been framed. Subsidiary questions arose while collecting and analyzing data. They are to be determined by the researcher asking questions himself depending on circumstances at the time of data collection. Varied answers are also possible for these research questions. It means that this research inquiry's research questions are value questions that should be explored in-depth to articulate credible meanings of value choices, i.e., qualitative notions of the findings. Hence, interpretivism is the research philosophy used to create a new and richer understanding of the concepts of greening a university in the social world.

## 3.2(iii) Theory Development by Induction & Abduction

The green university is a new social phenomenon. There is no theory previously developed adequately concerning the research aim, objectives, and research questions. Value questions of the green university cannot be understood by a rigid approach of positivism which does not allow alternative explanations of what is happening in the social world. Hence, the reasoning with interpretive frameworks is more appropriate. They involve developing theory beginning with the observation of empirical data followed by detecting categories, patterns and developing theory in this research inquiry.

Saunders et al. (2016) point out that the development of theory by deduction originated in the natural sciences, but social sciences emerged in the twentieth century allowing the researchers to be cautious of deduction. It is because some variables cannot be understood by cause-and-effect links but can understand how humans interpret them in their social world. Creswell (2013) lists five types of interpretive frameworks that social scientists in their qualitative studies use. Namely, Postpositivism, Social Constructivism, Postmodernism, Pragmatism, Critical, Feminist, Queer, and Disability theories.

Lincoln et al. (2011) explain how different philosophical assumptions apply in different interpretative frameworks. Accordingly, under Postpositivism, the ontological assumption is that there is only one reality that exists beyond us, out there. The epistemological assumption is that even though the reality can be constructed through research and statistics, the validity is derived from the peers but not from the participants. The ontological assumption of postmodernism is the emergence of subjective-objective reality. Epistemologically, knowledge is co-created with multiple ways of findings. The ontological assumption of pragmatism is the useful, practical, and working reality. Finally, the ontological position of Critical, Feminist,

Queer, and Disability theories is that reality comes from power and identity, such as race, ethnicity, gender.

Since there is a lack of theory previously generated related to this study's purpose, greening university, this research does not mean to test a theory by hypothesis testing as expected by postpositivism. On the other hand, the researcher does not intend to co-create findings for subjective-objective reality as postmodernism expects. Critical, Feminist, Queer, and Disability theories are also not appropriate in this research because this research does not suffer from the power and identity of social structures such as race, ethnicity, class, gender.

Hence, the interpretative framework appropriate here is social constructivism. It enables the co-construction of multiple realities by the researcher from the participants' lived experiences. In this endeavor, the research can negotiate the participants' experiences by interactions while honoring them. Saunders et al. (2016) point out that there are three slightly different strands of interpretivism/social constructivism. Namely, Phenomenologists, Hermeneutics, and Symbolic interactionists.

Hermeneutics studies cultural artifacts such as stories, texts, images, symbols. Symbolic interactionists focus on pragmatic thinking by interacting with people by way of conversations, meetings, teamwork. Since this research inquiry focuses on the university community's experiences about the various concepts of the green university, the research is a phenomenological study. Creswell (2013) explains that phenomenological research focuses on individuals' lived experiences and co-construct a common meaning of them by induction. Creswell (2013) further points out that phenomenology's fundamental purpose is to reduce the experiences of research participants with the researched phenomenon to describe the universal essence. In this regard, the phenomenon can be explored with "a heterogeneous group …that may vary in size from 3 to 4 individuals also to 10 to 15" (Creswell, 2013**:**78).

Accordingly, the phenomenology study of this research takes into consideration the common experiences of the university community. First, data is collected from the university community about their experiences of green universities. After that, they are analyzed on grounded theory. Creswell (2013) spells out that Glasser and Strauss (1967) introduced the grounded theory and later disagreed as to how coding can be conducted, and they can be verified. Despite the procedural disagreement, they and their students, Juliet Corbin, Adele E. Clarke, and Kathy

Charmaz (Morse et al. 2009) further contributed to develop the grounded theory. As a result, there are now three schools of grounded theory, Glasserian grounded theory (1978), Straussian grounded theory (Strauss & Corbin, 1990), and constructivist grounded theory by Charmaz (2006).

This research relies mainly on the systematic procedure of Strauss and Corbin (1990) and Corbin and Strauss (2008). Hence, the theory is developed by abduction rather than deduction for the purpose. Suddaby (2006) explains the fundamental differences between deduction, induction, and abduction. He points out that deduction develops theory moving from theory to data. Induction develops theory moving from data to theory. Abduction develops theory moving back and forth between data and theory.

In this study, there were two phases of data analysis. The first stage engaged with the document analysis. The second stage analyzed interview data. Document analysis developed theory by abduction based on grounded theory. The interview data was also analyzed by abduction based on grounded theory. For example, the interview data was collected to test the theory developed by document analysis in the first stage. In other words, the theory was developed by moving from theory to data (deduction) at interviews. After that, the interview was again collected to find a new theory. In other words, the theory was developed moving from data to theory (induction).

The positivist approach that theory to data in the development of theory by deduction, which has its origin from natural science, is inappropriate because the positivist approach's rigid methodology does not allow extended or even alternative explanations without limits set in a highly structured positivist research design. In this study, the variables such as green corporate governance, green corporate culture, green education, and green research, among others, can be defined as it appears in a less structured research design based on an interpretivist approach. It enables revealing the alternative explanations without constraints set by the research design. Hence, the world views of interpretivism with inductive merged with abduction reasoning is the most appropriate lens of world view in this research.

## 3.2(iv) Research Population & Sample

The research population is the universe of cases/elements (documents and interviewees in this study) from which the sample is selected. A subset of the population is called a sample. This

research is a qualitative research inquiry. Hence, the population and the sample are different from quantitative research that chooses probability sampling. Even Though probability sampling can be used in qualitative research, it is rarely used with qualitative research (Bryman, 2012). He further argues that probability sampling in qualitative research is not feasible because of difficulties in the fieldwork or even the impossibility of mapping the population. However, he asserts that the qualitative researcher does not rely on probability sampling not because of technical reasons but because of the qualitative nature of questions that need different perspectives. Therefore, the qualitative researcher relies on purposive samples. It is not possible to say in the beginning how many documents or interviewees are necessary for qualitative research.

This study aims to ascertain a complete set of requisites for greening universities and integrate them pragmatically to be used by universities as a blueprint to be a green university that enables the production of green knowledge and innovation to contribute fairly to global sustainability. However, since the social phenomenon, the green university is a new concept not adequately researched. Research questions cannot be understood by a rigid methodology of the deductive approach under positivism. Hence, qualitative data founded on grounded theory is collected from research papers published in the public domain. After that, qualitative data by way of interviews is collected from the community of universities in Botswana.

The research papers already published consist of research papers from four databases of scholarly publishers of academic journals, Emerald Insights, EBSCOhost, and ProQuest, together with the web search engine and the database, Google Scholar. The boundary of the population is determined by the keywords used to search the databases. These keywords are relevant to green/sustainable universities.

There are seven universities in Botswana. Four of them are public universities. They are (i) The University of Botswana, (ii) Botswana International University of Science and Technology, (iii) Botswana Open University, and (iv) the Botswana University of Agriculture and Natural Science. Three of the private universities are (i) Botho University, (ii) Ba Isago University, and (iii) Limkokwing University of Creative Technology. Public universities enroll their students for the certificate, Diploma, Postgraduate Diploma, Bachelor's Degree, Master's Degree, and Doctor of Philosophy. Private Universities enroll students for the same except for Doctor of Philosophy. These qualifications relate to business, education, engineering & technology,

humanities, science, and social sciences. When full-time equivalent student and full-time equivalent staff ratio is considered 20 to 01 (Baily et al., 2011 as cited in HRDC, 2019), the staff's population can be approximated to 1,700.

Students' enrollments for five years are depicted in Table 4. The 'Total in Tertiary Education' is the sum of 'Total in Universities' and 'Other Tertiary Education.' The 'Other Tertiary Education' are Brigades, Colleges of Education, Institute of Health Sciences, Private Institutions, Public Institutions, and technical colleges. The 'Total in Universities' is the sum of 'Public Universities' and 'Private Universities.' The contribution of university education and the overall tertiary education reflect the comparative effectiveness of tertiary education in Botswana. Fisher and Scott (2011) point out that higher education and education levels positively correlate with the country's development. The population figures were taken from a World Bank report available on Google.

**Table 4: University Students Enrollment 2013/2018 in Botswana**

| Students Enrollment 2013/14 to 2017/18 | | | | | |
|---|---|---|---|---|---|
| Academic Year | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 |
| Public Universities | 18,573 | 19,375 | 16,010 | 15,723 | 21,966 |
| Private Universities | 6,120 | 5,928 | 11,511 | 13,615 | 11,299 |
| Total in Universities | 24,693 | 25,303 | 27,521 | 29,338 | 33,265 |
| Other Tertiary Education | 35,746 | 35,280 | 28,926 | 29,753 | 20,185 |
| Total in Tertiary Education | 60,439 | 60,583 | 56,447 | 59,091 | 53,450 |
| Population in Botswana in respective years (2014/15/16/17/18) in million | 2.063 | 2.089 | 2.121 | 2.16 | 2.205 |

Source: Tertiary Education Statistics 2018 (HRDC, 2019).

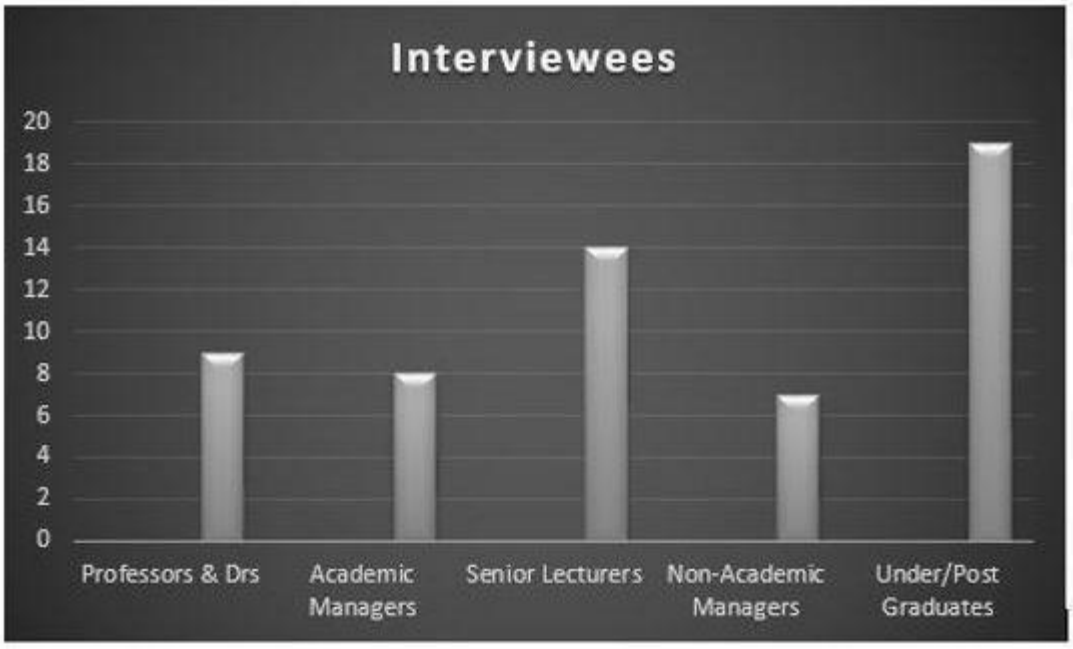
Because the concept of the green university is a new concept, every member of the university community may not be conversant with the concepts. Therefore, data must be collected from those who are aware of the concept of a green university. The participant’s awareness could be detected when explaining the research's purpose initially. Consequently, a purposive sample is the most appropriate non-random sample. The researcher exercises his judgment in selecting cases that enable answering the research questions. Neuman (2011) points out that purposive sampling is appropriate when the researcher works with a small sample and the researcher needs cases that are informative in research questions. There are various purposive samples,

namely, extreme case purposive sample, heterogeneous purposive sample, homogeneous purposive sample, critical case purposive sample, and theoretical purposive sample.

The heterogeneous sample is appropriate for capturing a wide range of perceptions from different university communities. Therefore, the sample for interviews is a heterogeneous purposive sample/maximum variation sample for the research problem and the research purpose. The maximum variation sampling technique is used to collect data with maximum variation. Patton (2002) argues that the maximum variation is a strength and advises identifying participants with diverse characteristics before selecting the sample.

There are 07 universities with over 1,700 academic and non-academic staff and over 33,000 students. Therefore, it is better to collect qualitative data from a diverse sample of the university's community, Professors/Dr., Senior Lecturers, Academic Managers (Dean/Head of Departments), Non-academic Managers, Undergraduate/Postgraduates. Accordingly, the heterogeneous sample is appropriate for capturing a wide range of perceptions from different university community groups such as professors & Drs, Academic managers, Senior lecturers, Non-academic managers, and students (Figure 12). The X axis represents type of participants, and Y axis denotes the number of participants.

Figure 12: Heterogeneous Sample of Interviewees (n = 57)




Source: Author

## 3.2 (v) Theoretical Sampling & Saturation

Grounded theory innovated theoretical sampling (Charmaz, 2006; Corbin & Strauss, 2015; Chun Tie et al., 2019; Glaser, 1978; Glasser & Strauss, 1967). It is a non-random sample. Charmaz (2006:192) defined theoretical sampling as "seeking and collecting pertinent data to elaborate and refine categories in your emerging theory." Therefore, the cases are chosen to contribute to the emerging theory. The process is continually looking for new data/cases subject to constant comparison. In other words, new data/cases are looked for discovering new concepts in the beginning. After that, new cases are looked for differentiation, elaboration, consolidation, and validation (Corbin & Strauss, 2015). The continuous process is discontinued upon the saturation point is satisfied. Namely, the new data/cases collected do not develop the emerging theory further because the theory has been well developed and validated (Strauss and Corbin 1990). Consequently, at this juncture, the sample size ceases to increase further because cases in grounded theory do not necessarily contemplate people but concepts in grounded theory (Corbin & Strauss, 2015).

When considering the sample size of two data collection methods, document analysis and the interview, the rule that determines the number of documents or interviews to be carried out is the concept of saturation (Glasser & Strauss, 1967). Patton (2002) argues that qualitative research's sample size depends on the time allotted, resources available, and study objectives.

Accordingly, it is required to cover the phenomenon of the research study reasonably. Therefore, subject to the underlying principle of theoretical saturation, 97 research articles (Table 6 to 14) that belong to various knowledge clusters are analyzed. Fifty-seven participants who are conversant with sustainability practices at universities were interviewed. 39% of them were female participants, 61% are male participants. These participants belong to various age categories. 32% of the participants belong to the age group 21 years to 29 years. 30 years to 39 years age group and 40 years age group represent 23% each. The participants 50 years or above represent 22%. They were met in Six universities, Botho University, University of Botswana, Baisago University, Open University, Limkokwing University, and the Botswana University of Agriculture. Outside the greater Gaborone area, Botswana International University of Science and Technology could not be reached due to extended Covid-19 movement restrictions. The number of Interviewees consisted of nine Professors & Drs, eight Academic managers, fourteen Senior lecturers, seven Non-academic managers, and 19 Undergraduates & Postgraduate students.

The theoretical sampling is appropriate in this research inquiry because subsequent respondents to be chosen based on evolving storyline and emerging theory revolved around greening universities. The other reason is that the research strategy used here to analyze data is the grounded theory. Creswell (2013) points out that grounded theory research collects data in a Zigzag process. The researcher goes to the field and gathers data, goes back to the office to analyze data, and again goes back to the field to collect more data and so on. Glasser and Strauss (1967:45) delineate theoretical sampling as "the process of data collection for generating theory whereby the analyst jointly collects, codes and analyzes his data and decides what data to collect next and where to find them. In order to develop his theory as it emerges. The process of data collection is controlled by the emerging theory, whether substantive or formal".

The grounded theory in this research began with the research questions, which refer to the development of substantive theory by appraising the essential elements of a green university. The substantive (empirical) theory is the theory, which applies to a specific area of practice, in other words, a specific empirical area. For example, one of the particular aspects of practice concerning a green university is green corporate governance.

In this phenomenological study, the university community's common experiences concerning the various processes are collected. Creswell (2013) asserts that the grounded theory develops theory by unifying theoretical explanation moving more than mere description (Corbin & Strauss, 2008:107). Corbin and Strauss (2008) elaborate that there are phases of coding under the grounded theory while data is collected. Those three phases are open coding, axial coding, and selective coding (Table 6 to 14).

Strauss and Corbin (1990:61) delineate open coding as "the process of breaking down, examining, comparing, conceptualizing and categorizing data." This process enables us to uncover concepts/properties which can be later grouped into categories. Accordingly, open coding was carried out by coding relevant data units by way of tagging or labeling. The applicable vivo codes, in other words, literal coding were tagged at the beginning of document analysis. After that, axial coding was carried out. Strauss and Corbin (1990:96) elaborate axial coding as "a set of procedures whereby data is put back together in new ways after open coding, by making connections between categories."

Axial coding was founded on coding family (Dimension), Dimensions, elements, and properties. The coding family enables theory to emerge from data fostering theoretical sensitivity. Finally, selective coding integrated categories forming into theories such as green corporate governance, green corporate culture, and seven more dimensions.

Axial coding enables the identification of the relationship of properties of the category. For example, green structure, green strategy, and green leadership were the properties of the category called green corporate governance. Finally, selective coding was carried out to test the hypothesis. Strauss and Corbin (1990:116) elaborate selective coding as “the procedure for selecting the core category, systematically relating to other categories, validating those relationships, and filling in categories that need further refinement and development." The constant comparison of data continued until theoretical saturation through theoretical sampling was achieved (Bryman, 2012). In the same manner, open coding, axial coding, and selective coding were carried out to derive all nine categories (Table 6 to 14).

## 3.2(vi) Methods of Data Collection

This research is a multi-method qualitative research inquiry. Data is collected from two sources, documents and interviews. Documents provided the secondary data, whereas the interviews provided primary data. The data collected from more than one source enables overcoming data collection weaknesses from one source (Bryman, 2012). In other words, the multi-method qualitative study allows overcoming weaknesses of the mono-method qualitative study. Hence, this study relied on a multi-method qualitative research inquiry.

Lee (2012) sets out that the secondary data is different from words of mouth because the secondary data obtained as physical or digital evidence is spatial and temporal for using different purposes other than the purpose for secondary data. There are advantages of collecting data from secondary resources in this study. One of them is that the researcher can save resources including money and time (Vartanian, 2011). Another advantage is that since the data is permanently available, such data is open to the public to scrutinize the research findings for a more extended period. However, there are disadvantages also. One of them is that the data quality is not assured for the study because they have been created for a purpose different from the study's purpose, but multiple methods used to collect data in this study improve data quality by triangulation.

### *3.2(vi)(a) Data Collection by Documents*

First, data was collected from documents, already published research papers. After that, data collection was continued with interviews. Then, a critical review of the concept of the green university together with sustainability and sustainable development in the light of multidisciplinary, interdisciplinary, and transdisciplinary research documents was analyzed. In this respect, the four databases of scholarly publishers of academic journals, Emerald Insights, EBSCOhost, ProQuest, and the web search engine and the database, Google Scholar, were accessed systematically to gather relevant research articles already published in academic journals.

The keywords to search the specified databases were determined in this regard. The keywords such as Sustainable/Green university, Green education/curriculum/teaching, Green research, Green campus, Community outreach, Corporate Governance, Organizational culture, Green campus/operations, Three pillars of Sustainability, Sustainability reporting were used.

These keywords were run on several rounds with appropriate similar adjectives and nouns. For example, the adjective 'green' was used to replace the word 'sustainable.' The noun 'education' was replaced by the word 'curriculum,' namely, Sustainable education as green education/curriculum. The broad search terms mentioned above paved the way for identifying relevant research articles. Research articles that were duplicated in two or more databases were identified, and duplication was avoided. They are systematically subject to quality checks by sorting them on a spreadsheet template to reduce the selection bias based on the methodology developed by Gough et al. (2017).

### *3.2(vi)(b) Data Collection by Interviews*

After carrying out the axial coding for data collected from document analysis from already published research papers, A different source could be used to corroborate the theory developed with the axial coding. Therefore, interviews from those conversant with the research objectives and research questions were carried out to confirm, differentiate, or add new theories developed by document analysis.

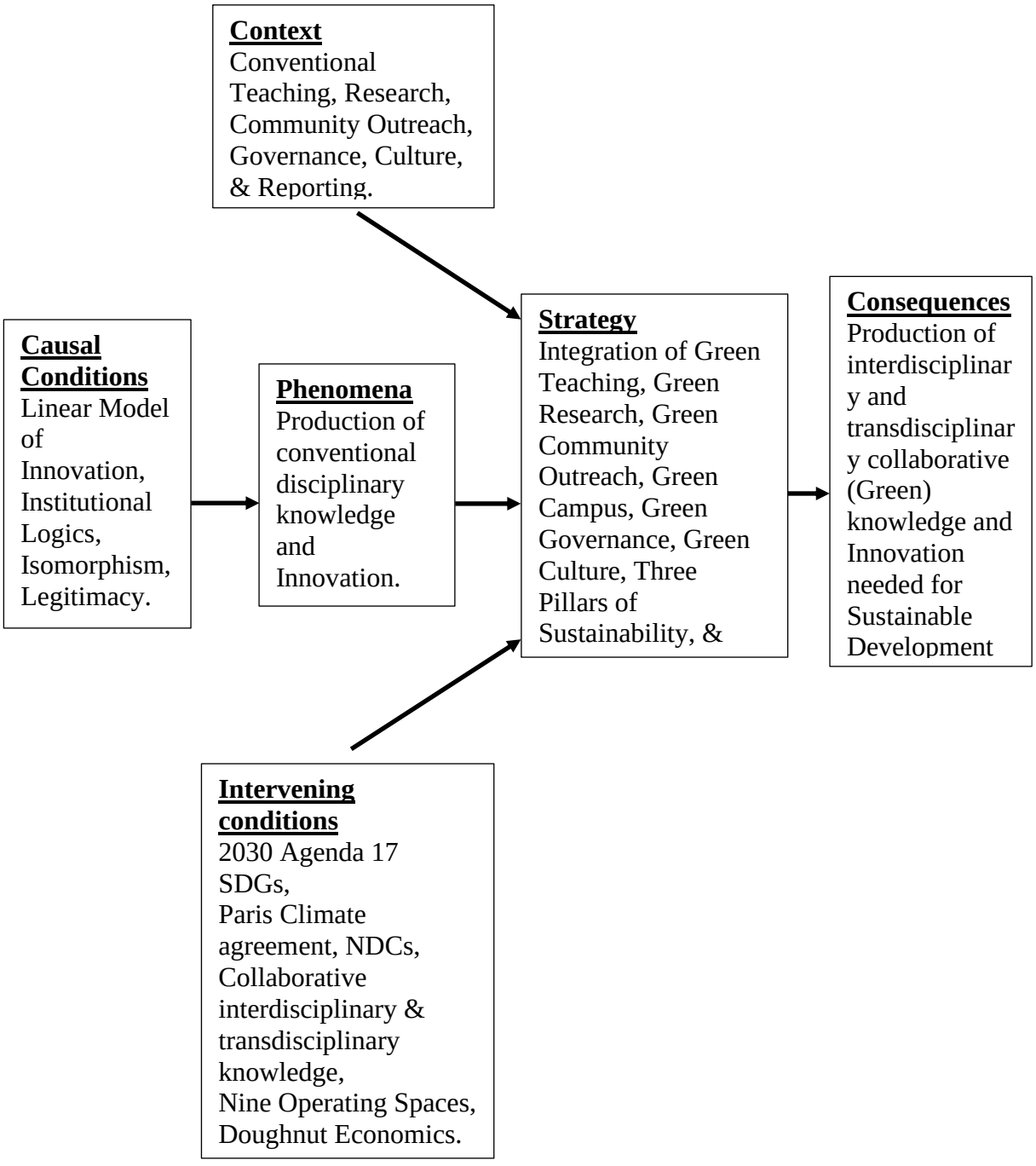
Various types of interviews are available in this respect, such as structured interviews, semi-structured interviews, and unstructured interviews. Semi-structured interviews are more appropriate because the concepts revolve around the social phenomenon, the green university

is new, and multiple meanings are available. Hence, the research objectives and the nature of the study's research questions demand the socially constructed meanings in this exploratory research followed by descriptive research. The purpose of the descriptive research is met by collecting and analysis of interview data. The axial coding of documents analysis exposed various codes, themes, categories, concepts, and theories that would need further analysis through semi-structured interviews. As a result, the researcher enables developing socially constructed meanings under interpretivism's philosophy (Saunders et al., 2016: 394).

## 3.2(vii) Theoretical Sensitivity

Strauss and Corbin (1990) assert that the coding paradigm is imperative to develop theory without missing the density and precision of the theory. Therefore, data and codes were examined on the coding paradigm. Data and codes connect (i) causal conditions, (ii) phenomena, (iii) context, (iv) intervening conditions, (v.) action/interaction strategies, and (vi) consequences. However, these six features of the coding paradigm have been reduced to three later as conditions, actions and interactions, and consequences/outcomes (Corbin & Strauss, 2015). Nevertheless, this research continues with six features because abundant data sources are available in this research. Further, this doctoral study provides more space and time than a research article to be published in a journal. Accordingly, Figure 13 depicts the coding paradigm

Figure 13: Coding Paradigm (Axial Coding)




Source: Author

Causal conditions are the conditions that make the central phenomenon occurred (Corbin & Strauss, 2008). Accordingly, the Linear Model of Innovation (Gibbons et al., 1994), Institutional Logics (Battilana & Dorado, 2010), Isomorphism (DiMaggio and Powell, 1983),

and Legitimacy (Suchman, 1995) enable universities to produce conventional knowledge and Innovation in their discrete disciplines.

Phenomenon is the central idea about which a set of actions/strategies is directed for managing or handling or to which the set of actions is related (Corbin & Strauss, 2008). Accordingly, the inadequacy of conventional knowledge and Innovation that universities are currently producing is the phenomenon in this research

Context is the setting that influences the phenomena of interest (Corbin & Strauss, 2008). Correspondingly, Conventional Teaching, Research, Community Outreach, Governance, Culture, & Reporting create a context among universities to produce conventional knowledge and Innovation in their discrete disciplines.

Intervening conditions are the conditions that facilitate making strategies in a specific context (Corbin & Strauss, 2008). 2030 Agenda 17 SDGs (Barcellos-Paula et al., 2021), Paris Climate agreement (Liyanage v Netswera, 2021), NDCs (Mizan et al., 2020), Collaborative interdisciplinary & transdisciplinary knowledge (Carayannis & Campbell, 2010), Nine Operating Spaces (Rockstrom et al., 2009), and Doughnut Economics (Raworth, 2017) invoke to produce interdisciplinary and transdisciplinary collaborative knowledge and Innovation for sustainable development.

Strategies are the actions and interactions for achieving the desired goals by addressing the phenomena (Corbin & Strauss, 2008). Consequently, the strategy is to Integrate eight processes of universities, namely, Green Teaching (Zhao & Zou, 2015), Green Research (Zhao & Zou, 2015), Green Community Outreach (Lidstone et al., 2015), Green Campus (Zhao & Zou, 2015), Green Governance (Salvioni et al., 2017)), Green Culture (Bauer et al., (2020), Three Pillars of Sustainability (Savelyeva & Douglas, 2017), and Green Reporting (Sassen & Azizi, 2018).

Consequences are the intended or unintended outcomes that can be expected by implementing strategies (Corbin & Strauss, 2008). Hence, once the strategy would be implemented, such universities can produce interdisciplinary and transdisciplinary collaborative (Green) knowledge and Innovation needed for Sustainable Development.

## 3.3 Template Analysis

Hence, the data set collected from interviews will be guided by a template analysis depicted in Table 5. The template analysis is suitable in this study because the researcher has codes, themes, categories, concepts, and theories already developed from the document analysis conducted previously in the first phase of this study. In the template, there is a hierarchical list of priori codes, themes, categories, concepts, and theories in advance, which would be further explored, arranged, rearranged, supplemented, or even removed by vivo codes generated from interviews. Accordingly, the following template is prepared in advance before commencing the interviews.

### Table 5: Template Analysis for Interviews-Categories and Priori Codes

1. Contextual Factors
   1.1 Objectives of the research
   1.2 Relevant research questions for the interview
   1.3 Interview Questions
2. Green Corporate Governance
   2.1 Structure
   2.2 Approach
   2.3 Accountability
3. Green Corporate Culture
   3.1 Values & Beliefs
   3.2 Communication
4. Triple bottom line/Three Pillars of Sustainability
   4.1 Environment
   4.2 Social
   4.3 Economic
5. Green Education
   5.1 Green knowledge & Skills
   5.2 Green Pedagogical Activities
   5.3 Green non-pedagogical Activities
6. Green research
   6.1 By Faculties
   6.2 By Students

7. Green Internal Operations
    7.1 CO2 mitigation
    7.2 Resource Conservation
    7.3 Living environment
8. Green Community Services
    8.1 Outreach by Students
    8.2 Outreach by Faculties
9. Green Reporting
    9.1 Measuring the progress
    9.2 Reporting the progress
10. Integrative Approach
11. Contribution to global sustainability

Interview questions were designed based on the themes and priori codes mentioned in the Template for Template Analysis. The anticipated interviewees are of five categories, namely, (i) professors and Doctors, (ii) Senior Lecturers, (iii) Academic Managers (Deans/Heads of departments), (iv) Non-academic Managers are those who are engaged in general management (v) Undergraduates and postgraduates. However, all those who are subject to the interviews are required to be conversant of sustainability and green/sustainable university since the concept of the green university is relatively new; otherwise, those who are not conversant will not be able to effectively contribute to the objectives of the research because of the knowledge gap.

## 3.4 Research Guideline for Interviews

Human participants in this study, namely, interviewees, are involved ethically. The process of informed consent is a central component of the ethical conduct of the research. The informed consent process discloses to the interviewees all critical aspects of the research and their expected participation. Accordingly, the followings are disclosed, among other things,

Title of the Research: A Framework for greening universities in Knowledge-Based Economy, Botswana

The purpose of the interview is to know the essential elements required for greening a university in a Knowledge-Based Economy in Botswana.

Project: Ph.D. thesis, North West University Business School

Principal Investigator: Shantha Indrajith Hikkaduwa Liyanage, Senior Lecturer, Faculty of Business & Accounting

Supervisors: Prof. Fulu Netswera & Prof. Jan Meyer

- Your participation in this research study is voluntary, and you may withdraw at any time if so desired.
- Your interview will take approximately 30 minutes.
- Your responses will remain confidential.
- Your participation remains anonymous.

The above disclosures make the interviewees make informed decisions if they should participate in the study or not.

After obtaining the informed consent from the interviewees, the semi-structured interview will be conducted. The main interview questions (IQs) and additional interview question AIQs) will be founded on the objectives of this study, Research questions, and the codes, themes, categories, concepts, and the theory found out from the axial coding document analysis. Accordingly, they are as follows.

Theme: Green Corporate Governance

IQ-01: What do you think of the importance of the management/governing council's intervention for greening a university?

AIQ-02: What type of approach, the top to bottom approach or Bottom to Top approach, is appropriate for the intervention?

AIQ-03: How can accountability be made?

Theme: Green Corporate Culture

IQ-01: What type of culture is required for greening a university?

AIQ-01: What values and beliefs necessary for greening universities to be communicated among all those in the university?

Theme: Three Pillars of Sustainability

IQ-01: When greening a university, Should the university focus on environmental, social, and economic sustainability?

AIQ-01: Should the university look at issues of local, regional, global, or all in greening university?

Theme: Green Education/Curriculum

IQ-01: What do you think of teaching knowledge and skills of sustainability for students?

AIQ-01: How about the use of non-pedagogical activities related to sustainability at the university?

Theme: Green Research

IQ-01: What do you think of devoting a part of faculty research to sustainability issues?

AIQ-01: Should the students be focused on the part of their research on sustainability issues?

Theme: Green Internal Operations

IQ-01: What do you think of making the university's internal operations sustainable through renewable energy, energy efficiency, and resource conservation?

AIQ-01: Will a living sustainable internal environment have an impact on stakeholders?

Theme: Green Community Outreach

IQ-01: What do you think of universities' role to interact with the community for teaching them and learning from them for sustainability issues?

AIQ-01: How about the role of students and faculties in this respect?

Theme: Green Reporting

IQ-01: Should the university measure and report the progress of the sustainability practices of the university?

Theme: Integrative approach

IQ-01: Are all 2-9 elements essential for greening a university? Can we leave any of them when greening?

Theme: Contribution for moving beyond the thresholds

IQ-01: Does the contribution by greening a university mean the sustainability practices enough to defeat the global issue of unsustainability?

## 3.5 Validation Process

This research is multi-method qualitative research. Secondary and Primary data was collected from two sources, document analysis, and interviews. The underlying philosophy is interpretivism founded on grounded theory. The study was conducted to produce valid and reliable knowledge. The rigor in conducting the research is imperative for maintaining trustworthiness.

The study's validity and reliability are not as exact as with the quantitative research perspective because the researcher's ontological assumption is that the researcher is not detached from the research context and participants. The epistemological assumption for qualitative research is that there are multiple realities instead of one actual reality. Shared meanings are socially constructed to ascertain the multiple meanings obtained from documents and interviews from different cultures, languages, times, and circumstances, looking for what research participants mean. The axiological assumption for qualitative research is that since the researcher is a part of what is researched, the research is conducted as value-bound research to avoid bias, researcher bias, participant bias by reactivity/reflexivity.

Two validation processes have been followed to maintain this qualitative study's trustworthiness for increasing the quality of the research. The first is to maintain the rigor of the process by compliance with the research and internal coherence steps. The second process is to ensure validity and reliability.

## 3.5(i) The Rigor of the Process

The rigor of the research reflects the transparency of the research. The users of the research build confidence in the research judging at rigor which means rigor “by which we demonstrate integrity and competence, a way of demonstrating the legitimacy of the research process" and "rigor is how we show integrity and competence: it is about ethics and politics, regardless of the paradigm” (Tobin & Begley, 2004:390). They further explain the rigor's literal meaning: the strict precision, uncompromising quality, or inflexibility. What is required for the purpose is to research the schema of qualitative research with internal coherence. The research's coherence reflects the fit between the research's aim, philosophical perspectives of the research, methods of inquiry, analysis of data, and theory development. Hence, six schemas of Bryman (2012) were followed in this research inquiry briefly as follows.

1. General Research Questions

Research questions have been framed based on two elements: the study's aim and the theoretical background of the study. The aim/goal of the research is to design a framework for greening universities in Knowledge-Based Economy, Botswana. The theoretical framework focuses on how organizational theories related to the universities, such as Isomorphism, legitimacy, and institutional logic, are changing to grasp various university processes' reconfiguration to produce ethical human capital with the quintuple helix model of innovation. Hence, the research questions were framed to ascertain various university processes required to reconfigure for producing green knowledge and information by a university as a subsystem of the Quintuple Helix Model of Innovation (Carayannis & Campbell, 2011).

2. Collection of Data

There are no theories previously developed for greening universities. Since the social phenomenon, the green university is relatively a new concept. There are many realities in the social context. These realities are dependent on culture, language, circumstances, and contexts. The responses are, therefore, derived by value questions of qualitative nature depending on experiences and practices. Hence, the relevant cases for data collection could be found from documents (published research papers) and the community of the universities, Professors, Doctors, Senior lecturers, Academic managers, Non-academic managers, Students, graduates, and postgraduates in Botswana.

3. Transformation in data

Qualitative data collected from documents was first analyzed by axial coding documents analysis, which develops units of data & codes, Themes, concepts, patterns, and theories. After that, the interview data collected was analyzed on a template analysis with computer-assisted qualitative data analysis called QDA Miner Lite. Finally, the thematic map was further developed and made ready for interpretation.

4. Interpretation of data.

The theory was developed by abductive reasoning when analyzing data collected from two methods, documents and interview data. The abductive reasoning enables an understanding of how documents and the university community interpret the social world of green university. The meanings of the green university were ultimately socially constructed as multiple meanings from documents and participants of the interviews.

5. Conceptual and theoretical work:

After analyzing qualitative data, conceptual and theoretical work were carried out according to the research aim/purpose and research questions. Accordingly, eight essential elements of a green university were identified. Then, they were integrated to reflect a conceptual model.

6. Writing up finding/conclusions

The purpose of the research is to ascertain a complete set of requisites for greening universities and integrate them pragmatically to be used by universities as a blueprint to be a green university. Accordingly, it was found that there are eight processes required to be reconfigured for greening a university. They are corporate/university governance to incorporate green corporate governance, the culture of the university to include green corporate culture, three pillars of sustainability, education to incorporate green education, research to incorporate green research, community outreach as green community outreach, internal operations to incorporate green internal operations, and reporting to incorporate green reporting. Finally, it was concluded that all these eight essential elements should be integrated to transform a conventional university into a green university that enables creating green knowledge and innovation with mode 1, Mode 2, Mode 3 Quintuple Helix Model of Innovation.

## 3.5(ii) Validity and Reliability

The internal coherence of the methodology discussed above was adhered to maintain the study's rigor to increase the research's quality of trustworthiness. The second validation process for improving the quality of trustworthiness is validity and reliability. Tobin and Begley (2004) argue that validity and reliability can establish the objectivity of the research, and they are complementary with the objectivity of the research. Objectivity means that the research is free from bias. However, the concept of validity and reliability originated with quantitative research. Therefore, a debate has arisen that it is not applicable for qualitative research because of different worldviews founded on different ontological, epistemological, axiological, and methodological assumptions.

Guba and Lincoln (1989, 2005) developed alternative concepts for validity. They substitute dependability, credibility, transferability, and confirmability in place of reliability, internal validity, external validity, and authenticity. Dependability means that it is required to record all the changes to produce a reliable account so that the qualitative research users understand and evaluate the research because qualitative research underlying an interpretivist approach is likely to be changed when the research is in progress. Credibility means that socially constructed realities should be matched with what the research participants have intended. Transferability means requiring a complete description of the research study, research question, research design, research context, interpretations, and findings to decide if the results can be applied in another setting. Finally, authenticity means the criteria used to promote fairness, awareness, and learning so that the constructivist/interpretivist aspect of research is improved (Lincoln et al., 2011).

Reliability, in other words, dependability means reproducibility of the findings. Reproducibility means if the same researcher or another conducts the same research, the same results would be obtained. Reproducibility in qualitative research is different from quantitative research, which focuses on one reality/universal reality. Whereas in qualitative research, what is done, heard, and seen is not the same as the original formation. Therefore, reproducibility in qualitative research is to depict the research process (Crescentini & Mainardi, 2009) clearly and transparently. Accordingly, in this study, among other things, the audit trail below mentioned provides proof of evidence needed for reliability. Furthermore, further population, sample, and context of the research following six schemas of Bryman (2012) were also dealt with clear and transparent research.

The social world under qualitative research is assumed to be in flux. It is highly contextual and multifaceted. There is no researcher-refined instrument and statistical techniques that can be used similar to quantitative research, but different strategies are available for ensuring the validity of qualitative research. Validity in qualitative research means “the extent to which an account accurately represents the social phenomena it refers to” (Hammersley, 1990: 57). The characteristics founded on truth and accuracy of the account of social phenomena investigated in the research (Crescentini & Mainardi, 2009) are essential. The validity of research bridges the gap between the social phenomena investigated and the social world's realities (McMillan & Schumacher, 2006) created by various types of bias, such as researcher bias, respondents' bias, and reflexivity bias.

## 3.5(iii) Strategies for Validity

There are three types of biases to be addressed in this qualitative research. They are respondents' bias, researcher's bias, and reactivity bias. Respondents' bias may arise due to many reasons. For example, the topic may not be familiar with them or may want to make the researcher pleased to answer what the researcher is looking for. The researcher's bias may arise from the researcher's enthusiasm for the topic, researcher's knowledge, research assumptions, and Reactivity because of the researcher's influence by his presence or authority and power.

Several strategies have been applied to increase the quality of the research by mitigating bias. Among them, the following strategies have been applied.

1. Triangulation
2. Peer examination refers to criticisms/weaknesses or objective feedbacks received from conferences and other meetings.
3. Member check by transcript, validation interviews
4. Negative case analysis is the analysis of data that does not match the themes or patterns of the rest of the data.
5. An audit trail keeps all the activities, audio recordings, field notes, coding books required to be transparent.
6. Prolonged involvement
7. Reflexivity

### *3.5(iii)(a) Triangulation*

Triangulation is a corroboration process used to validate research data, analysis, and interpretation. In this process, two or more independent sources are used to collect data within one study to ensure what the data tells is valid. In this multi-methods research, data was collected from documents and interviews. First, data was collected from documents. After that, they were analyzed and interpreted by axial coding document analysis. Finally, a template was developed to collect interview data based on codes, themes, concepts, and theories developed by analyzing documents. Finally, data collected from the interviews was analyzed axial coding thematic analysis.

### *3.5(iii)(b) Peer Examination*

The validity/credibility of this research was further strengthened by peer review/examination. In addition to the built-in process in this dissertation by ethical clearance process, colloquiums, two supervisors, peer reviews of the thesis were carried out by presenting and publication of research articles. Peer review is a process that scrutinizes scholarly works by experts in the same field. The peer review serves two purposes. One of them is that it filters the research's quality by reviewing its validity, significance, and originality. The other purpose is that the peer review comments on various aspects of the research, improving the research quality (Kelly et al., 2014).

This study was scrutinized twice. First, it was presented at an international research conference (Jain et al., 2019). After that, it was published in a journal of Springer Nature (Liyanage & Netswera, 2021). Besides, several related matters of this study were also presented and published in journals. Therefore, they are described under prolonged involvement in this dissertation.

### *3.5(iii)(c) Member Check*

Another strategy used to strengthen the credibility of the research is member validation. It is a process to ensure no misunderstanding or misinterpretation of what participants meant by their responses. After interviews, respondents were given blank transcripts then and there. Then, they wrote what they expressed. After writing, their verbatim was clarified if necessary. The member check enables ruling out the possibility of misinterpretation and avoids the biases of the researcher.

### *3.5(iii)(d) Audit Trail*

An audit trail in research is a systematic record to enable a third party to trace the history and the events sequentially from the initiation of the research with the research proposal to the end-user report. It describes how data was collected, coded, and themes were identified, concepts were derived, and interpreted through the research inquiry. For example, Lincoln and Guba (1985:319-320) point out to maintain the following for an audit trail.

i. Written field notes, unobtrusive documents for all raw data.
ii. Summaries such as quantitative and qualitative data and theoretical notes relevant to data reduction and analysis.
iii. Codes, themes, concepts, and integration of concepts into relationships and their interpretations.
iv. Methodological notes include research design, strategies, rationales, and trustworthiness notes such as notes relating to credibility, dependability, confirmability and audit trail notes, or any other process notes.
v. Materials relating to intentions and dispositions such as inquiry proposal, reflexivity.
vi. Instrument development information such as pilot forms, preliminary schedules, and observation form.

After the approval of the research proposal, three chapters, introduction, literature review, and methodology were drafted before the ethics clearance. After that, data was collected from two sources, documents, and interviews. First, the data collected from documents was analyzed by axial coding document analysis (Tables 06 to 13), which depicts open coding, axial coding, categories, and concepts. The second source of collecting data is from interviews. Before collecting interview data, the interview questionnaire (Appendix 3), informed consent (Appendix 4), and the interview guidelines were scrutinized by the ethical clearance of the university (Appendix 1) and the country (Appendix 2). The interview data collection was guided by a template (Table 5) contained codes, categories, concepts, and theories developed by the axial coding. Just after the interviews, the interviewees were given blank transcripts on which they wrote their verbatims. Interview data was analyzed by axial coding thematic analysis (Figures 12-19) which depicts open coding, axial coding, categories, and concepts. Journal entries for peer review research conferences and journal publications (Jain et al., 2019; Liyanage & Netswera, 2021) were also provided. The remaining audit trails were either

discussed, depicted, or annexed wherever relevant. For example, a reflexivity statement is mentioned under reflexivity below.

### *3.5(iii)(e) Negative Cases Analysis*

In the process of analyzing data before arriving at findings, the evidence for disconfirming the findings was perused. Lincoln and Guba (1985; Creswell, 2013) point out that the researcher should revise the findings considering negative cases. Accordingly, in the first phase of the analysis, document analysis, concepts were derived from the categories while paying adequate attention to negative cases. Since the documents were initially generated to advocate the various aspects of the green/sustainable university, extreme cases appeared as weaknesses, disadvantages, or barriers. These were revised until the finding is fit by eliminating those extreme cases. For example, the three pillars of sustainability were revised with the extreme cases that environmental sustainability as sole sustainability criteria in many documents. These extreme cases were eliminated by the documents related to the other two pillars, economic sustainability and social sustainability, all of which are subject to necessary trading off for the purpose of sustainable development.

After that, extreme cases were further examined from the interview data. For example, one respondent responded that the students should not conduct green research in their community outreach. When dealing with the participant's transcript, it was clarified that the students are supposed to focus on more classroom pedagogies, and the respondent has no previous experiences of such research by the students. However, the negative case was not corroborated by other respondents. In this manner, every negative case was paid adequate attention to analyzing them.

### *3.5(iii)(f) Prolonged involvement*

The interest in sustainability initiated with the part-time marketing job involved while studying in the UK. The author of this study had to visit door to door to register houses eligible for home insulation grants. The interest was further continued with the dissertation submitted as partial fulfillment of MBA(UK) in 2012. The dissertation was entitled “Barriers to the Adoption of Solar Photovoltaic Panels, a Case Study in Birmingham City Council Area.” After initiating this study in 2017, Five research papers related to sustainability were published. The Journal of Knowledge Economic, a sister journal of springer nature, published the research paper based on this study on 4$^{th}$ March 2021. The journal website displayed that more than 750 have

accessed the article within a period of fewer than two months (Appendix 5(a)). The same research article was uploaded for a discussion table on Academia ended with 100 views, 42 attendees (Appendix 5(b)), and 17 comments (Appendix 5(c)). In addition, ten research papers were presented at international conferences. As a result, the prolonged engagement of the study provided many experiences and insights for completing the dissertation. Among them,

Peer Review Research Papers Published

01. Greening Universities with Mode 3 and Quintuple Helix Model of Innovation-Production of Knowledge and Innovation in Knowledge-Based Economy, Botswana. *Journal of Knowledge Economy*. 2021, 12(1) https://doi.org/10.1007/s13132-021-00769-y. Authors- Prof. Fulu Netswera and the researcher.

02. Insights from E.U. Policy Framework in Aligning Sustainable Finance for Sustainable Development in Africa and Asia, *International Journal of Energy Economics and Policy*. 2021, 11(1), 1-12: Authors- Prof. Fulu Netswera, Abel Motsumi, Isaac Nthomola, and the researcher.

03. Creation of Financial and Environmental Values with Solar Photovoltaic Projects While Managing Risks. *International Journal of Sustainable Economies Management*, *IGI Global*. Vol 9(02)- (080520-125726). September 10, 2020: Authors- Prof. Fulu Netswera, Shiv Pal, Isaac Nthomola, and the researcher.

04. Diffusion of Innovative Water Atomization Technology to Conserve Water in Water Stress Countries. *Journal of Applied Material Science & Engineering Research, 4(2), pp.33-40.* doi.org/10.33140/JAMSER.04.02.01. May 2020: Prof. Venkatesh Vishwanathan and the researcher.

05. Water Conservation through Voluntary Responsible Behaviour at Botho University in Botswana. *American Journal of Applied Psychology*. 9(2), pp. 34-41. DOI: 10.11648/j.ajap.20200902.11 March 2020.: Prof. Venkatesh Vishwanathan and the researcher.

The research Conference Papers presented

01. Presented at BUIRC November 26, 2020-Full paper submitted- Networks and Networks of Innovation for Green Knowledge and Innovation with Mode 3 and Quintuple Helix Model of Innovation: Prof. Fulu Netswera, Prof. Jan Meyer, and the researcher.

02. Presented at BUIRC November 26, 2020-Full paper submitted- Green Corporate Governance for Greening Universities: A Non-linear Model of Innovation Analysis: Prof. Marcos Ferasso, Kgosietsile Onthametse, and the researcher.

03. Diffusion of innovative water automation technology to conserve water in water stress countries at the Webinar on Next Generation Fuels & Chemicals organized in Singapore and held on June 02, 2020. Prof. Venkatesh Vishwanathan and the researcher

04. Creation of Financial and Environmental values by managing the risk with levered & diversified investment for Solar P.V. Projects at the Webinar on Renewable & Non-Renewable Energy organized in Singapore and held on April 21, 2020. Prof. Fulu Netswera, Shiv Pal, and Isaac Nthomola and the researcher.

05. Policy Intervention for a National Framework in aligning Sustainable Finance of Financial institutions in Botswana. At BA ISAGO October 03, 2019: Prof. Fulu Netswera, Abel Motsumi, Nipuni Bhagya Pramodi, and the researcher.

06. A Strategic Approach on Water Consumption and Conservation for Economic Sustainability at an African University at LAMIPISA on September 03, 2019: Prof. Venkataraman Vishwanathan and the researcher.

07. The Availability of Sustainable Finance for a Solar Photovoltaic system in Botswana; Benefits and challenges- presented at LAMIPISA 2019 on September 03, 2019.: Prof. Fulu Netswera. Shiv Pal, Isaac Nthomola, and the researcher.

08. A purposeful design for a green university in Knowledge-Based Economies- presented in April at 3rdBiennialDLIS Conference, University of Botswana, on 15-17th April 2019.: Prof. Fulu Netswera and the researcher.

09. Economic Sustainability of Grid Connected Roof Mounted Solar P.V. System, A Case Study in an African University presented at FBA Research Conference, 2018.: Prof. Fulu Netswera, Dr. Olumide Jaiyeba, and the researcher.

10. Sustainable University: A Business Case for Stakeholders – presented at BUIRC, Botho University, Botswana, 2017. Dr. Clever Gumbo, Thabiso Motshome, and the researcher.

### *3.5(iii)(g) Reflexivity*

Another important aspect of validity is to admit the fact that the researcher cannot be value-free. Consequently, the researcher must ensure that the researcher's attitudes, beliefs, and actions would not affect the research process and the outcome. So, the researcher has to exhibit reflexivity because the readers need to know the researcher's interest in the research, to whom it is reported, and the researcher's gains (Creswell, 2013).

The researcher in this study vehemently believes global warming's adverse effect is very conversant with the research aim and objectives. The prolonged involvement above discussed the researcher's engagement with sustainability as an academic researcher for nearly one decade. This study is carried out for the researcher's Ph.D. The researcher first collected interview data from his university's community, where the researcher is attached as a senior lecturer. They were first analyzed and interpreted, but the sample was extended to heterogeneous samples collecting interview data from other five universities. However, when collecting, analyzing, and interpreting data, the researcher was always empathetic. In other words, documents and research participants were understood from their frame of reference. Such reflexivity is vital for ascertaining reality objectively.

## 3.6 Ethical Considerations

Bryman (2012) discusses four areas of ethical principles in social research. They are, avoiding harm to participation, Lack of informed consent, invasion of privacy, and deception.

Ethical practices were carried out to anticipate and avoid harm to participants, such as stress, loss of self-esteem, and even physical injury. In addition, the principle, anonymity and confidentiality were adhered to avoid harm to participants. The participants interviewed were assigned numbers from 1 to 57. Their names were not recorded.

Informed consent (Appendix 3) plays a vital role in research ethics, in particular, when collecting data by interviews. The informed consent process disclosed all the critical aspects of the research that the study's purpose, the voluntary nature of participation, confidentiality of data collected, and the anonymity of their involvement were explained before the interview.

The avoidance of the invasion of privacy was ensured in writing and by word of mouth. Both the informed consent and the research instrument clarified that participation in the interview is voluntary. Further, they were allowed to pull back from the interview at any time if so desired. Additionally, the word-of-mouth explanation took place when initiating every interview.

Bryman (2012) states that the deception occurs when the researcher conducts research representing their work as something different than what it is. This principle was complied with the provision of a complete and accurate explanation of the research in writing and by word of mouth. The complete and precise explanation of the research appeared in writing at the beginning of the research instrument and the informed consent. The word-of-mouth explanation took place when initiating every interview.

Saunders et al. (2016:243-245) elaborate on ten ethical principles. All these ten principles were followed. They are as follows. Integrity and the objectivity of the research were adhered to by following the rigor of the research. The rich and thick description further narrated the truthfulness and the accurate facts and figures of the research. Another principle is respect for others. In this respect, the researcher developed the trust and respect of the participants. Avoidance of harm was ensured by anticipating, guarding, and preventing adverse consequences for research participants. The participants' voluntary nature was secured by informed consent, which includes that their participation is voluntary, and they can withdraw at any time. A few participants, though they have agreed to participate, they withdrew later because of busy schedules. Another principle is the informed consent of those taking part was adhered to by the informed consent.

Ensuring the confidentiality of data is another principle that was adhered to by the anonymity of the participants. The data collected was not shared with anybody else other than for the study. Responsibility in data analysis was ensured by not altering the data, and the results were not falsified. Plagiarism was avoided by paraphrasing and acknowledging others' works with more than 350 references. Another principle is compliance in the management of data. In this

respect, it was adhered to comply with the data protection law protecting personal data. The tenth principle is to ensure the safety of the researcher. The researcher collected data only during working hours and working days. In addition, the researcher visited data collection sites accompanying one or two personal assistants to find the locations and other support services.

The principles of ethics mentioned above were taken into the care of primary and secondary data from the inception of the study to the end of the study to protect all the research stakeholders, the participants, the researcher, the users of the research report. In this endeavor, the researcher always contemplated four qualities of the researcher, namely, honesty, objectivity, integrity, and carefulness. Honesty is the moral character that connotes virtuous attributes such as truthfulness and straightforwardness. Integrity is the practice of honesty throughout the research. The objectivity of the research was ensured by being external to the mind to avoid subjectivity. Finally, carefulness was practiced avoiding the biases of the researcher and avoidance of errors and mistakes.

## 3.7 Chapter Summary

The research's philosophical framework began with identifying the research problem that the universities' conventional structure does not produce green knowledge and innovation. Therefore, the research aims to design a blueprint for transforming conventional universities to produce green knowledge and innovation required for sustainable development.

Since the concept of greening universities is a new social phenomenon that evolves with qualitative aspects rather than the quantitative nature, the research is exploratory. Neuman (2011) elaborates that exploratory research is warranted when the study's scope is new or unclear. The methodological choice in this research is a multimethod qualitative research inquiry. As a result, the ontological worldview is that the researcher and the research participant are not detached. Epistemologically the knowledge is perceived. Axiologically, the research is value bound by reflexivity.

In the same line, the qualitative data, by document analysis, and interviews from a sample of professors, senior lecturers, academic managers, nonacademic managers, and students, are collected. The qualitative data collected from documents was analyzed by axial coding, and

data gathered from interviews were thematically analyzed for triangulation. Finally, having so analyzed, the theory was developed by induction.

The trustworthiness of the multimethod qualitative research was ensured by maintaining the rigor of the process by the coherence of the steps of the research such as framing the research questions, collection of data, the transformation of data into codes, themes, and concepts followed by theory development which was supported with a theoretical framework and finally writing the report. Besides, validity and reliability were ensured.

A clear and transparent process strengthened reproducibility. The validity was ensured by following six strategies such as triangulation, member check.

# Chapter 4: Data Analysis & Findings

## 4.1 Introduction

In this multimethod qualitative research, data was collected from two sources, document analysis and interviews. Data was first collected from documents. After that, data was collected from interviews. Data so collected are analyzed here. Data analysis is a process used to make meanings from what the researcher read from the documents, what the researcher heard from the interviewees. The process consists of consolidating, reducing, and interpreting data in search of meanings. The process began by identifying units of data from the data set, one after one breaking data into data units. Lincoln and Guba (1985) point out that a data unit represents two criteria. The first is that it is heuristic, which means it reveals a specific meaning relevant to the research. Examples of three data units in document analysis are rules and regulations (for green corporate governance), Procedures and process (for green corporate governance) and, Strategic approach (for green corporate governance). The second criterion of the data unit is that it is a small piece of information that can stand alone. After that, units of data related to giving a common meaning for the research question are categorized into themes/categories. In other words, a category incorporates related data units/codes and indicates a particular meaning. For example, the above three data units that go together were converged into one category called (green corporate governance) structure & strategy. Merriam (2009:185) outlines several criteria to be satisfied with categories. They are,

i. Categories should be responsive to the purpose of the research. In the above example, that category called ‘Structure & Strategy’ represents the research's purpose, greening universities in the Knowledge-Based Economy, Botswana. Structure and strategy are one of three categories that created the concept of green corporate governance.

ii. Categories should be exhaustive. It means that there shall be an end of creating categories to which all units of data/codes can be categorized. In this study, there are eight.

iii. Categories should be mutually exclusive. It means that the categories cannot overlap with another category. In other words, one unit of data cannot belong to two categories.

iv. Categories should be sensitive to data units so that the reader can gain the meaning of the category.

v. Categories should be conceptually congruent. It means that the units of data together indicate the level of abstraction denoted by the category.

Having developed a complete set of categories at the same level of abstraction, they can be used to develop concepts for the research. The number of categories required to construct a concept is dependent on the data collected and the purpose of the research. For example, three categories, structure and strategy, leadership approach, and Leadership accountability, build a relationship and create the concept of Green Corporate Governance. The concepts so developed were used to develop a theory by abduction.

## 4.2 Document Analysis-Axial Coding

The secondary data collected from research articles were first analyzed well before interviews under the exploratory research. These research articles, which belong to various knowledge bodies such as sociology, politics, ecology, geography, architecture, education, environmental studies, ethics, and public policy provide facts required for the research.

The process of analyzing documents began with sorting documents for the research questions. For example, the research question that “What are the essential elements of the green university." Then, in the absence of theory previously developed in this study, the research identifies codes, themes, categories, and concepts from the bottom-up process working back and forth between codes, themes, categories, and concepts (Marshall & Rossman, 2010).
Accordingly, research papers were sorted under eight essential elements developed by abduction founded on grounded theory: Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education/Curriculum, Green Research, Green Community Outreach Green Internal Operations, and green Reporting. After that, the research papers under each element, such as Green Corporate Governance, were read, and relevant data were assigned notations by abduction. Those notations were, among other things, policies, procedures, strategic planning, holistic approach, a system of rules and procedures, top-down approach, bottom-up approach, characteristics of green leadership, accountability by the board to shareholders/stakeholders, internal and external accountability, greenwash.

Each document was read carefully, and chunks of data were identified as tentative labels, which gives meanings that emerged from data. These notations, which were frequently repeated, became open coding. The open codes were derived as Socially constructed codes than Vivo codes. Strauss (1987) explains vivo codes as codes derived from people's natural language rather than sociologically constructed codes. After that, axial coding was carried out. Axial coding is used to identify the relationships among open codes. Opens codes that go together representing a meaning were grouped as themes following the rules of Merriam (2009:185) above discussed. For example, policies, procedures, strategic planning, a holistic approach, a system of rules, and procedures created a meaning called Structure & Strategy. The top-down approach, bottom-up approach, characteristics of green leadership were categorized as green leadership. The board's accountability to shareholders/stakeholders, internal and external accountability, greenwash were categorized as accountability.

After constructing themes, the interrelationships among themes were identified. For example, the three themes mentioned above, green structure, green strategy, and green leadership were abstracted as Green Corporate Governance (Table 6), and the same process enables the abstracts of the remaining seven essential elements of the green university (Table 7 to 13).

## 4.2(i) Green Corporate Governance: Axial Coding Document Analysis

The scientific discourse on the concept of corporate governance was derived from categories, namely, Structure & Strategy, Leadership, and Accountability/Disclosure. These categories were derived from the respective abductive open codes (Table 6: Template for Axial Coding document Analysis). Accordingly, the university as a subsystem of the Quintuple Helix Model of Innovation is instrumental in producing ethical human resource capital (green graduates) needed for sustainable development in a KBE. Ethical human resource capital accumulated at universities enables producing green knowledge and innovation blending with the other types of capital, economic capital, natural capital, information and social capital, and political and legal capital required for sustainable development.

The process of producing green graduates can be made effective by institutionalizing sustainability principles in the university's governance element (Franzoni & Gennari, 2013; Lozano, 2006; Salvioni et al., 2017). Such institutionalization with the governance enables embracing sustainability principles with all the university processes, particularly culture,

teaching, research, community outreach, internal operations, and accountability on the premise of three pillars of sustainability (Gandini et al., 2014; Tilbury, 2012). Since governance acts as an integrator of other elements, some argue that governance is the fourth pillar of sustainability (Mischen et al., 2019).

A governance system consists of rules, regulations, procedures, processes, policies, and practices for greening a university enables incorporating it. It communicates the principles of sustainability by vision, mission, goals, objectives (Salvioni et al., 2017) and strategic approach of the university (Paletta & Bonoli, 2019) not only with a process, say, research process in isolation but holistically with all the processes, namely, curriculum, research, community outreach, internal operations, human resource, marketing, finance (Moon et al., 2018). Furthermore, these policies and procedures should be clear in assigning responsibilities to those who lead the government and should incorporate all university stakeholders (Jali & Lekhanya, 2017).

There are two types of environmental governance strategies, formally certified models such as ISO 14001: Environmental management system and non-formal uncertified systems. The fundamental difference between these two types is that formally certified systems focus on managing the direct impact on the environment from the operations. In contrast, non-formal systems focus not only on direct impact but also on indirect environmental interactions with education and research (Clarke & Kouri, 2009). However, this research contemplates green corporate governance for sustainable development beyond environmental management.

Sustainability is a core process of the university engaging senior leadership in making policies, implementing, and monitoring them (Mader et al., 2013). Many approaches are available for leading towards a sustainable university, including the top-down approach (Klettner et al., 2014), bottom-up approach, or both (Purcell et al., 2019). The most suitable approach is dependent on the university's context, but what is essential is to make the university green. In support, Ogg (2010, as cited in Visser & Courtice, 2012) spell out what Paul Polman uttered: sustainability is a responsibility of all of us. Nobody can wait for the best expert in the world to help us. Furthermore, sustainability is a survival issue, nobody has a right to do business unless the environment is protected.

Accountability is a critical issue in leadership governance despite the leadership approach. The strategic management is responsible for transforming sustainable policies into strategies followed by implementing and monitoring the progress for achieving goals and objectives of sustainability in the university. They are accountable not because they are compliant with policies but buy personal convictions (Cartwright & Craig, 2006) for all the stakeholders of the university, both internal and external stakeholders (Salvioni et al., 2017) avoiding greenwash (Bekessy et al., 2007).

**Research Question:** How does the notion of governance of a university contribute to greening a university?

| **Table 6: Template for Axial Coding Document Analysis-Green Corporate Governance (Selective Coding)** | | |
|---|---|---|
| **Green Corporate Governance by Categories, Structure & Strategy, Leadership, Accountability** | | |
| **Source** | **Category** | **Open Coding (Vivo/Literal Codes)** |
| 1. Salvioni et al. (2017) | Structure & Strategy | Policies |

Salvioni et al. (2017) express those policies that address sustainability play a vital part in implementing sustainability in higher education. Their direct quotes used to draw out vivo codes provide that "Appendix 7-Table 6(1)." In keeping with the direct quotes stated above, the open coding, policies, was identified. Policies as an open code relate to the category, structure & Strategy.

| | | |
|---|---|---|
| 2. Moon et al. (2018) | Structure & Strategy | Policies |

Moon et al. (2018) express the importance of integrating policies of sustainability at Higher Educational Institutes. Their direct quotes used to draw out vivo codes provide that " Appendix 7-Table 6(2)." Accordingly, the open coding, policies was identified. Accordingly, the open coding, policies was identified. Policies as an open code relate to the category, structure & Strategy.

| | | |
|---|---|---|
| 3.Paletta and Bonoli (2019) | Structure & Strategy | Strategic Plan |

Paletta and Bonoli (2019) explain how the strategies can integrate SDG at a university. Their direct quotes used to draw out vivo codes provide that " Appendix 7-Table 6(3)." In the light of their direct quotes, which were used to extract vivo codes, open coding, the strategic plan was identified. A strategic plan as an open code relates to the category, Structure & Strategy.

| | | |
|---|---|---|
| 4. Clarke and Kouri (2009) | Structure & Strategy | Environmental Management System |

Clarke and Kouri (2009) point out that Environmental Management is a vital part of the organization's structure. Their direct quotes used to draw out vivo codes provide that " Appendix 7-Table 6(4)." According to the direct quotes used to extract vivo codes, open code, Environmental Management System was detected. Therefore, the environmental Management System as an open code connects with the category, Structure & Strategy.

| | | |
|---|---|---|
| 5. Jali and Lekhanya (2017) | Structure & Strategy | Policies & procedures |

Jali and Lekhanya (2017) demonstrate the importance of policies and procedures in giving clear instructions to sustainability-related responsibilities. Their direct quotes, which were used to pull out vivo codes, contain the following. " Appendix 7-Table 6(5)." As direct quotes stated above, the open coding, policies & procedures were recognized. The open coding, policies & procedures associates with the category, structure & Strategy.

| | | |
|---|---|---|
| 6. Mader et al. (2013) | Structure & Strategy | Policies |

Mader et al. (2013) specify the role of policies for the successful implementation of sustainability at universities. Their direct quotes, which were used to extract vivo codes, are " Appendix 7-Table 6(6)." As direct quotes stated above, the open coding, policies were recognized. The open coding, policies couples with the category, Structure & Strategy.

| | | |
|---|---|---|
| 7. Sar (2014) | Structure & Strategy | Accountability/Disclosure |

Sar (2014) gives voice to, among other things, the importance of disclosure of performance in relation to the three pillars of sustainability. The direct quotes which were used to draw out vivo codes from their article are as follows. " Appendix 7-Table 6(7)." In agreement with the direct quotes stated above, the open coding, accountability/disclosure was detected. The open coding, Accountability/Disclosure connects with the category, Structure & Strategy.

| | | |
|---|---|---|
| 8. Purcell et al. (2019) | Leadership | Top-down & Bottom-up |

Purcell et al. (2019) articulate the essential role of the leadership approach to implementing sustainability successfully. The vivo code from their article is that " Appendix 7-Table 6(8)." The open coding, Top-down & Bottom-up, was identified in keeping with the direct quotes stated above. The open coding, Top-down & Bottom-up, connects with the category, Leadership.

| | | |
|---|---|---|
| 9. Visser and Courtice (2012) | Leadership | Characteristics of Leadership |

Visser and Courtice (2012) expressed their views about leadership characteristics. The direct quotes used to extract vivo codes from their article state that "Ogg (2010) says, " Appendix 7-Table 6(9)." As direct quotes stated above, the open coding, characteristics of Leadership was identified. The open code, Characteristics of Leadership, relates to the category, Leadership.

| | | |
|---|---|---|
| 10. Klettner et al. (2014) | Leadership | Top-down approach |

Klettner et al. (2014) believe that the top-down leadership approach is instrumental in implementing the sustainability strategy. Their direct quotes, which were used to pull out vivo codes, stipulate that " Appendix 7-Table 6(10)." Accordingly, the open coding, Top-down approach was uncovered. The open coding, the Top-down approach, links to the category, Leadership.

| | | |
|---|---|---|
| 11. Cartwright and Craig (2006) | Leadership | Board to Shareholders |

Cartwright and Craig (2006) demonstrate that how the board of directors can guide sustainability. Their direct quotes, which were used to extract vivo codes, state that " Appendix 7-Table 6(11)." In agreement with the direct quotes stated above, the open coding, Board to Shareholders was reckoned. The open coding, Board to Shareholders associates with the category, Leadership.

| | | |
|---|---|---|
| 12. Salvioni et al. (2017) | Accountability/Disclosure | Internal & External stakeholders |

Salvioni et al. (2017) reveal that sustainability should be linked to both internal and external stakeholders by governance policy. Their direct quotes, which were used to draw out vivo codes, state that " Appendix 7-Table 6(12)." The open coding, Internal & External Stakeholders, was identified in accordance with the direct quotes stated above. The open coding, Internal & External Stakeholders, associates with the category, Accountability/disclosure.

| | | |
|---|---|---|
| 13. Bekessy et al. (2007) | Accountability/Disclosure | Green Wash |

Bekessy et al. (2007) uncover that accountability is essential to detect greenwash. The direct quotes which were used to extract vivo codes of their article state, among other things, that " Appendix 7-Table 6(13)." As direct quotes stated above, the open coding, Green Wash, was identified. The open coding, green Wash, relates to the category Accountability/disclosure.

## 4.2(ii) Green Corporate Culture: Axial Coding Document Analysis

The scientific discourse on the concept of Green Corporate Culture is derived from the categories, namely, Culture for Governance, Values & Beliefs, and Communication of Values. These categories were derived from respective open codes (Table 7: Template for Axial Coding Document Analysis). Accordingly, a sustainability culture is created with embedded intrinsic and instrumental values for sustainable development (Soini & Dessein, 2016). These values determine people's behavior with antecedents of sustainable practices (Miska et al., 2018). In other words, values embedded with sustainability guide how development activities should be carried on, but the practices demonstrate how they have been carried out. It means that there is a gap between cultural values and cultural practices. Hence, Caprar and Neville (2012) argue that sustainability values do not always translate into sustainability practices because of the antecedent nature of values before actual behavior (Egri et al., 2012). It means that the antecedent cultural values enable playing a subtle role in sustainability.

Many universities prioritize technical aspects to protect the environment, such as energy efficiency without creating pro sustainability behavior among the community, which enables creating effective sustainability practices (Levy & Marans, 2012). While admitting the interlink, they distinguish culture for sustainability from the culture in sustainability and culture as sustainability. They further elaborate its role for broader application of human life and social life embedded with intrinsic and instrumental values as a whole by a paradigm shift by both a

structural component and an agency needed for sustainable development transformation towards self-governance as a meta governance.

In this respect, it is required to formulate policy across all sectors by developing vision, mission, goals, objectives, and strategies (Adams et al., 2018) which can be used for communication of values and beliefs of sustainability among the internal and external community of the organization (Genç, 2017). These communication vehicles foster cross-functional collaborations for the community's positive involvement rather than compliance by control procedures (Galpin et al., 2015).

Accordingly, culture is part and parcel of sustainability governance at universities (Bauer et al., 2020). The success or failure of being sustainable depends on organizational culture, which influences the university's strategies, objectives, and governance aspects (Mzangwa, 2019). Since culture integrates people to achieve sustainability objectives, some argue that culture is the fourth pillar of sustainability (Nurse, 2006) since the 20$^{th}$ century. However, policies have yet to recognize the role of culture for sustainability (Wroblewski et al., 2019).

**Research Question:** How does the notion of a culture of an organization contribute to greening a university?

**Table 7: Template for Axial Coding Document Analysis-Green Corporate Culture (Selective Coding)**

***Green Corporate Culture by Categories, Values & Beliefs, Policies & Structure, Communication***

| Source | Category | Open Coding (Vivo/Literal Codes) |
|---|---|---|
| 1. Mzangwa (2019) | Culture for Governance | Policies & Strategies |

Mzangwa (2019) expresses the view that there is a correlation between the policies and culture of the organization. The direct quotes which were used to extract vivo codes express that “Appendix 7-Table 7(1).” As explained above, the open coding, Policies & Strategies

was identified. The open coding, Policies & Strategies relates to the category Culture of Governance.

| | | |
|---|---|---|
| 2. Bauer et al. (2020) | Culture for Governance | An Integral Part of Governance |

Bauer et al. (2020) communicate that the organizational culture is part and parcel of sustainability. Their direct quotes used to pull out vivo codes stipulate that "Appendix 7-Table 7(2)." In agreement with the direct quotes stated above. Accordingly, the open coding, An Integral Part of Governance was identified. The open coding, An Integral Part of Governance connects to the category Culture of governance.

| | | |
|---|---|---|
| 3. Wróblewski et al. (2019) | Culture for Governance | Cultural Policy |

Wróblewski et al. (2019) point out that the reframing of cultural policy is vital for sustainability. Their direct quotes, which were used to draw out vivo codes, narrate that "Appendix 7-Table 7(3)." Accordingly, the open coding, Cultural Policy was identified. The open coding, Cultural Policy connects to the category, Culture of Governance.

| | | |
|---|---|---|
| 4. Adams et al. (2018) | Culture for Governance | Vision & Mission |

Adams et al. (2018) indicate that the vision & mission should be developed for sustainability. Their direct quotes, which were used to extract vivo codes, assert that "Appendix 7-Table 7(4)." In the same line, the open coding, Vision & Mission was identified. The open coding, Vision & Mission link to the category, Culture of Governance.

| | | |
|---|---|---|
| 5. Soini and Dessein (2016) | Values & Beliefs | Embedded Values |

Soini and Dessein (2016) demonstrate that both intrinsic and instrumental values linked to sustainability culture are sustainability agents. The direct quotes used to draw out vivo codes mention that "Appendix 7-Table 7(5)." According to their direct quotes, which were used to pull out vivo codes, the open coding, Embedded Values was found. The open coding, Embedded Values associates with the category, Values and Beliefs.

| | | |
|---|---|---|
| 6. Miska et al. (2018) | Values & Beliefs | Practices |

Miska et al. (2018) distinguish the cultural values and cultural practices. Their direct quotes used to pull out vivo codes communicate that "Appendix 7-Table 7(6)." In conformity with their direct quotes, which were used to extract vivo codes, the open coding, Practices was identified. The open coding, Practices links to the category, Values & Beliefs.

| | | |
|---|---|---|
| 7. Levy and Marans (2012) | Values & Beliefs | Behavior |

Levy and Marans (2012) express that people's behavior in the organization has not been adequately aligned for sustainability. Their direct quotes used to draw out vivo codes manifest that "Appendix 7-Table 7(7)." In conformity with their direct quotes, which were used to draw out vivo codes, the open coding, Behavior was identified. The open coding, Behavior connects to the category, Values & Beliefs.

| | | |
|---|---|---|
| 8. Galpin et al. (2015) | Communication of Values | Vision & Mission |

Galpin et al. (2015) show that the vision and mission of an organization are vital for the communication of sustainability values. Their direct quotes used to extract vivo codes state that "Appendix 7-Table 7(8)." As stated in their direct quotes, which were used to pull out vivo codes, the open coding, Vision & Mission was identified. The open coding, Vision & Mission relates to the category, Communications of Values.

| | | |
|---|---|---|
| 9. Genç (2017) | Communication of values | Internal & external communication |

Genç (2017) states that communication plays a significant role in sustainability. The direct quotes used to pull out vivo codes show that "Appendix 7-Table 7(19)." In line with the direct quotes stated above, the open coding, Internal & external communication was identified. The open coding, Internal & External communication relates to the category, Communication of Values.

## 4.2(iii) Three Pillars of Sustainability: Axial Coding Document Analysis

The scientific discourse on the concept of Three Pillars of Sustainability was derived from categories, Education for Sustainability, Reconciliation of three pillars, and local, national, and global issues, which were categorized by the respective abductive open codes depicted in Table 8: Template for Axial Coding Document analysis.

Brundtland Commission (1987) advocated sustainable development focusing on three pillars of sustainability, economic growth, environmental protection, and social equity. White (2020) points out that the campus understudy has focused on sustainability and economic pillars of sustainability while neglecting the social pillar of sustainability not focusing on the students' food security. In the same vein, Murphy (2012) points out that the social pillar's meanings and objectives are vague compared to the other two pillars. Conner et al. (2018) point out that the university under study is more robust in environmental and social pillar while the economic pillar is the weakest. Panatsa and Malandrakis (2018) argue that even though education for sustainable development relates to all three pillars of sustainability, social and economic sustainability are usually ignored. However, three pillars serve as a guiding framework that could fairly contribute to sustainable development in higher education since the 1980s (Savelyeva & Douglas, 2017). Clune and Zehnder (2018) assert the strategic importance of the three pillars framework, which could guide identifying necessary changes and development in an organization in the market.

Until recently, the conventional focus of sustainability was meant for environmental sustainability, issues of ecological degradation, but sustainable development was meant for economic sustainability and social sustainability (Nurse, 2006). The ecological environment includes SDGs 6, 13, 14, and 15. Economic sustainability is the balance between cost and benefits while protecting the ecological environment. It includes SDGs 8, 9, 10, and 12. Social sustainability means the maintenance of political and community values. It includes SDGs 1, 2, 3, 4, 5, 7, 11, and 16. The metaphors of the three pillars are interrelated, and therefore a trade-off among these three pillars (SDG 17) is inherent (Mischen et al., 2019). In other words, a university that does not satisfy all three pillars cannot be described as a sustainable organization (Weisser, 2017).

Gallardo-Vazquez and Folgado-Fernandez (2020) point out that the university's role is to provide quality teaching and research while the quality of life is improved and three pillars of sustainability in the region in which it operates founded on three pillars of sustainability (McFarlane & Ogazon, 2011). Sustainable universities enable sustainable development at the local, regional, national (North, 2005; Vekic et al., 2020) and global sustainability (Cartwright & Craig, 2006).

**Research Question:** How does the notion of three pillars of sustainability of an organization contribute to greening a university?

| **Table 8: Template for Axial Coding-Three Pillars of Sustainability (Selective Coding)** | | |
|---|---|---|
| ***Three Pillars of Sustainability by categories, Education for Sustainable Development, Reconciliation of three pillars' and Local, national, and global issues*** | | |
| **Source** | **Categories by Axial Coding** | **Open coding (Vivo/Literal Codes)** |
| 1. Savelyeva and Douglas (2017) | Three Pillars | A framework for three pillars |

Savelyeva and Douglas (2017) manifest that a framework that guides the three pillars of sustainability in ESD is essential in Higher Education Institute. Their direct quotes, which were used to extract vivo codes, stipulate that " Appendix 7-Table 8(1)." In keeping with the direct quotes used to draw out vivo codes above, the open coding, A framework for three pillars was identified. The open coding, A framework for three pillars, relates to the category three Pillars.

| | | |
|---|---|---|
| 2. Conner et al. (2018) | Three Pillars | Perceptions of Three Pillars |

Conner et al. (2018) reveal that the perceptions on three pillars of sustainability enable the university to understand the ESD. The direct quotes which were used to extract vivo codes of them stipulate that " Appendix 7-Table 8(2).” As stated above, the open coding, Perceptions of Three Pillars, was detected. The open coding, Perceptions of Three Pillars, connects to the category, Three Pillars.

| | | |
|---|---|---|
| 3. Clune and Zehnder (2018) | Three Pillars | Strategy |

Clune and Zehnder (2018) point out that the three pillars approach should be strategized to steer sustainability in an organization. The direct quotes used to pull out vivo codes of them stipulate that " Appendix 7-Table 8(3).” In light of direct quotes used to pull out vivo codes above, the open coding, Strategy was identified. The open coding, Strategy associates with the category Three Pillars.

| | | |
|---|---|---|
| 4. McFarlane and Ogazon (2011) | Three Pillars | Curriculum |

McFarlane and Ogazon (2011) state that it is needed to design the curriculum to espouse three pillars of sustainability. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 8(4)." As direct quotes stated above, the open coding, Curriculum was recognized. The open coding, Curriculum connects to the category, Communication of Values.

| | | |
|---|---|---|
| 5. White (2020) | Reconciliation | Social Pillar |

White (2020) shows that even though the sustainability programs have paid the least attention to the social pillar, they must reconcile all three pillars. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 8(5).” Based on the direct quotes above, the open coding, Social pillar, was identified. The open coding, social pillar links to the category, Reconciliation.

| | | |
|---|---|---|
| 6. Panatsa and Malandrakis (2018) | Reconciliation | Economic Pillar |

Panatsa and Malandrakis (2018) indicate that even though the economic pillar of sustainability is ignored, all three pillars are interdependent. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 8(6)." As direct quotes stated above, the open coding, Economic Pillar, was identified. The open coding, Economic Pillar, relates to the category, Reconciliation.

| | | |
|---|---|---|
| 7. Mischen et al. (2019) | Reconciliation | Environmental Pillar |

Mischen et al. (2019) state that sustainable development means all three pillars including the environmental pillar. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 8(7)." In conformity with the direct quotes above, the open coding, Environmental Pillar, was identified. The open coding, Environmental Pillar links to the category, Reconciliation.

| | | |
|---|---|---|
| 8. Nurse (2006) | Reconciliation | Three Pillars |

Nurse (2006) points out that all three pillars are interconnected in sustainable development. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 8(8)." As the

direct quotes stated above, the open coding, Three Pillars, was uncovered. The open coding, Three Pillars associates with the category, Reconciliation.

| | | |
|---|---|---|
| 9. Weisser (2017) | Reconciliation | Three Pillars |

Weisser (2017) expresses that there is no sustainability without incorporating all three pillars. The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 8(9)." In agreement with the direct quotes stated above, the open coding, Three Pillars, was identified. The open coding, Three Pillars, connects to the category, Reconciliation.

| | | |
|---|---|---|
| 10. Murphy (2012) | Reconciliation | Social Pillar |

Murphy (2012) points out that the social pillar has not been clearly understood. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 8(10)." Conforming to the direct quotes stated above, the open coding, Social Pillar, was identified. The open coding, Social Pillar, relates to the category, Reconciliation.

| | | |
|---|---|---|
| 11. Vekic et al. (2020) | National, regional, and global development | Regional development |

Vekic et al. (2020) demonstrate that. The direct quotes used to extract vivo codes indicate that universities contribute to the regional development " Appendix 7-Table 8(11)." In line with the direct quotes stated above, the open coding, Regional development was identified. The open coding, Regional development relates to the category, Local, national, regional, and global development.

| | | |
|---|---|---|
| 12. Gallardo-Vázquez and Folgado-Fernández (2020) | National, regional, and global development | Three Pillars |

Gallardo-Vázquez and Folgado-Fernández (2020) indicate that universities play a vital role in the national level of sustainability. The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 8(12).” In keeping with the direct quotes stated above, the open coding, Three Pillars, was identified. The open coding, Three Pillars, links to the category, National, regional, and global development.

## 4.2(iv) Green Education: Axial Coding Document Analysis

The scientific discourse on the concept of Green Education was derived from themes/categories, knowledge, skills, and competencies, Governance, and behavior by the respective abductive open codes depicted in Table 9 Template for Axial Coding Document Analysis.

Education for Sustainable Development (ESD) is the most instrumental approach to transfer the knowledge, skills, and competencies for sustainable development founded on sustainability's three pillars. It enables transforming unsustainable values and belief systems into sustainable values and belief systems as creative problem solvers and change agents (Burns, 2013). Some argue that education for sustainability is equally important with other pillars, and therefore it is the fourth pillar of sustainable development (Abu-Alruz et al., 2018; Biasutti & Frate, 2017). ESD is a holistic process that focuses knowledge and innovation by way of teaching, research, community outreach, and internal operations but without containing to theories so that the learners enable detecting correlations among factors that stimulate sustainable development, uncover a coherent picture of a sustainable world, and intervene to operate a sustainable development (Sady et al., 2019).

In other words, the ESD's objective is that the students should be able to critically reflect on their competencies, skills, knowledge, and attitudes what they have learned (Kopnina & Meijers, 2014) for sustainable development. Knowledge is the understanding of sustainability. Skills are the ability to do well in sustainability. Competencies are the ability to do well in sustainability because of a set of skills. Lozano et al. (2017) provide a list of competencies that universities could develop with ESD. They are, Systems thinking, Interdisciplinary work; Anticipatory thinking; Justice, responsibility, and ethics, Critical thinking and analysis, Interpersonal relations and collaboration, Empathy and change of perspective, Communication and use of media, Strategic action, Personal involvement, Assessment and evaluation, and Tolerance for ambiguity and uncertainty. In addition, pedagogies are available for deeper integration of three pillars with the education (Filho et al., 2015) in ESD (Kieu et al., 2016).

Lozano et al. (2017) provide a list of pedagogies for ESD such as case studies, interdisciplinary team teaching, lecturing, mind and concept maps, project and problem-based learning under universal community service learning, jigsaw/interlinked teams, participatory action research

under community and social justice, eco-justice and community, place-based environmental education, supply chain/Life Cycle Analysis, and traditional ecological knowledge under environmental education. Kalinowska and Batorczak (2017) argue that education for sustainable development at universities should be supported with creative projects and activities that enable the translation of the university's operations with the environment. However, there are non-formal or extracurricular activities as well.

Pedagogies for ESD enable developing positive attitudes for sustainable development (Zhao & Zou, 2015). However, studies have shown different attitudes among disciplines. For example, students in the agriculture discipline perceive the importance of the environment than students in psychology (Biasutti & Frate, 2017). Abu-Alruz et al. (2018) point out in the attitudes research, students perceive that the protection of the environment results in adverse consequences for the quality of life. These students perceive those agricultural and industrial goods and services are more important than protecting the environment. Therefore, the researchers recommended teaching environmental courses mandatorily for all students to understand the link between nature and quality of life.

There are two ways of integrating pedagogies for ESD, the top-down approach and the bottom-up approach. Under the top-down approach, courses or programs are entirely developed to teach or practice sustainability concepts. Under the bottom-up approach, sustainability concepts to be taught or practice is integrated into the existing courses or programs (Tziganuk & Gliedt, 2017).

However, there is a gap between ESD and curriculum because of crucial inhibitors such as lack of training for academics, the already crowded curriculum, pedagogical traditions, lack of institutional cultures (Wood et al., 2016), top-down pedagogy, large classes, and inadequate facilities and the complex process which requires policies such as vision, mission, and financial, human, and other resources (Kieu et al., 2016)

**Research Question:** How does the notion of education of a university contribute to greening a university?

| **Table 9: Template for Axial Coding-Green Education (Selective Coding)** | | |
|---|---|---|
| **Green Education by categories, Knowledge & Skills, Values and Beliefs, Attitudes** | | |
| **Source** | **Categories by Axial Coding** | **Open Coding (Vivo/Literal Codes)** |
| 1. Lozano et al. (2017) | Sustainability Knowledge, Skills, and Competences | Pedagogical Approach |

Lozano et al. (2017) elucidate that the pedagogical approach can develop knowledge, skills, and competency related to sustainability. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 9(1)." As direct quotes stated above, the open coding, Pedagogical Approach was identified. The open coding, Pedagogical Approach, coupled with the category, Sustainability Knowledge, Skills, and Competencies.

| | | |
|---|---|---|
| 2. Sady et al. (2019) | Sustainability Knowledge, Skills, and Competences | Holistic Approach |

Sady et al. (2019) elucidate that holistic education is needed to create sustainable knowledge. The direct quotes which were used to draw out vivo codes provide that " Appendix 7-Table 9(2)." As direct quotes stated above, the open coding, Holistic Approach was uncovered. The open coding, Holistic Approach, coupled with the category, Sustainability Knowledge, Skills, and Competencies.

| | | |
|---|---|---|
| 3. Zhao and Zou (2015) | Sustainability Knowledge, Skills, and Competencies | Curriculum |

Zhao and Zou (2015) point out that sustainability should be taught with the curriculum. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 9(3)." In conformity with direct quotes stated above, the open coding, Curriculum was identified. The open coding, Curriculum links with the category Sustainability Knowledge, Skills, and Competencies.

| | | |
|---|---|---|
| 4. Wood et al. (2016) | Sustainability Knowledge, Skills, and Competencies | Curriculum |

Wood et al. (2016) elucidate that sustainability education should be incorporated into the tertiary curriculum. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 9(4)." As stated above, the open coding, Curriculum was detected. The open coding, Curriculum associates with the category, Sustainability Knowledge, Skills, and Competencies.

| | | |
|---|---|---|
| 5. Tziganuk and Gliedt (2017) | Sustainability Knowledge, Skills, and Competences | Pedagogical/Non-pedagogical Approach |

Tziganuk and Gliedt (2017) elaborate that both the pedagogical and non-pedagogical activities can be used to teach sustainability as a bottom-up approach. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 9(5)." Based on directs quotes stated above, the open coding, Pedagogical/Non-pedagogical Approach, was identified. The open coding, Pedagogical/Non-pedagogical Approach, links to the category Sustainability Knowledge, Skills, and Competencies.

| | | |
|---|---|---|
| 6. Kieu et al. (2016) | Governance for ESD | Policy |

Kieu et al. (2016) elucidate that sustainable policy as a part of governance needs to implement ESD. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 9(6)." As direct quotes stated above, the open coding, Policy was identified. The open coding, Policy associates with the category, Governance for ESD.

| | | |
|---|---|---|
| 7. Filho et al. (2015) | Governance for ESD | Strategy |

Filho et al. (2015) indicate that the strategy should incorporate ESD. The direct quotes which were used to draw out vivo codes provide that " Appendix 7-Table 9(7)." In keeping with the stated above, the open coding, Strategy was identified. The open coding, Strategy links with the category, Governance for ESD.

| | | |
|---|---|---|
| 8. Burns (2013) | Behavior | Sustainable values & beliefs |

Burns (2013) elucidates that learners should understand the difference between sustainable and unsustainable values and beliefs. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 9(8)." As stated above, the open coding, Sustainable values & beliefs was detected. The open coding, Sustainable values & beliefs links with the category, Behavior.

| | | |
|---|---|---|
| 9. Abu-Alruz et al. (2018) | Behavior | Sustainability attitudes |

Abu-Alruz et al. (2018) state that students' positive attitudes relating to sustainability should be developed. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 9(9).” In accordance with the stated above, the open coding, Sustainability attitudes was uncovered. The open coding, Sustainability attitudes couples with the category, Behavior.

| | | |
|---|---|---|
| 10. Biasutti and Frate (2017) | Behavior | Sustainability attitudes |

Biasutti and Frate (2017) demonstrate that there can be a difference in attitudes between different disciplines. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 9(10)." As direct quotes stated above, the open coding, Sustainability attitudes was identified. The open coding, Sustainability attitudes, coupled with the category, Behavior.

## 4.2 (v) Green Research: Axial Coding Document Analysis

The scientific discourse on the concept of Green Research was derived from categories, Governance, Sustainability Research, Sustainability Research by faculty, and Sustainability Research by Students by the respective abductive open codes depicted in Table 10: Template for Axial Coding Document Analysis.

One of the core processes of a university is to perform research. Therefore, it must produce world leaders capable of performing research activities for sustainable development benefits to society at large (Alkhayyal et al., 2019; Amaral et al., 2015). Kajikawa (2008) developed inductively ten domains of sustainability research reviewing selected journal articles. The ten domains are climate, biodiversity, agriculture, fishery, forestry, energy and resources, water, economic development, health, and lifestyle.

Two essential stakeholders could be engaged in sustainable research, faculty, and students. Sammalisto et al. (2015) assert that the faculty is a stakeholder of sustainability research at

universities. They enable imparting not only by teaching but also by research, but they were skeptical that the integration of sustainability core competence is complex at university, even though there are opportunities among different academic disciplines. Students are also essential stakeholders for sustainable research. They enable developing their sustainability literacy and are exposed to interdisciplinary collaborations across faculties and improve their hands-on-problem solving experiences (Dallaire et al., 2018). Further, they enable changing the habits and behavior, develop their green lifestyle, and enhance their critical thinking (Gupta & Singhal, 2017).

Collaborative sustainability research between the faculties and students benefits both the faculty and students (Dmochowski et al., 2016). Collaborative/participatory research with multiple stakeholders is rather solution-oriented than real-world products than academic interests such as publications, presentations, and patents (Wiek et al., 2014).

Sustainability research encounters the quality of them. Kronlid and Ohman (2013) argue that sustainability research lacks applying environmental ethical theories and further expressed that mere statement of simplified notion of anthropocentrism and non-anthropocentrism does not provide the full potential benefits of the environmental ethics in sustainability research. Therefore, they recommend addressing the plurality in environmental ethics. Also, there are many sustainability research challenges, such as inadequate financial support, inadequate interdisciplinary cooperation, inadequate publicity, and lack of clarity of the term sustainability (Kastenhofer & Rammel, 2005).

Another aspect of sustainability research is that they demand more interdisciplinary and transdisciplinary research. It is because research problems are, today, so complex that they require interdisciplinary or transdisciplinary research. Therefore, researchers enable embedding various research projects founded on a global framework so that their research helps meeting the demands for interdisciplinary or transdisciplinary research for sustainability research (Tappeiner et al., 2007).

**Research Question:** How does the notion of research of a university contribute to greening a university?

| **Table 10: Template for Open Coding-Green Research (Selective Coding)** | | |
|---|---|---|
| ***Green Research by Categories, Sustainability Research, Research by Faculty, Research by Students*** | | |
| **Source** | **Categories by Axial Coding** | **Open Coding (Vivo/Literal Codes)** |
| 1. Mawonde and Togo (2019) | Sustainability Research | Policies & Strategies |

Mawonde and Togo (2019) point out that policies and strategies can map sustainability research with the SDGs. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 10(1)." As direct quotes stated above, the open coding, policies & Strategies were uncovered. The open coding, Policies & Strategies, couples with the category, Sustainability Research.

| | | |
|---|---|---|
| 2. Menon and Suresh (2020) | Governance | Policies & Strategies |

Menon and Suresh (2020) express that it is required to have the necessary policies and strategies to walk the talk of sustainability research. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 10(2).” In line with the direct quotes stated above, the open coding, Policies & Strategies was found. The open coding, Policies & Strategies, couples with the category, Governance.

| | | |
|---|---|---|
| 3. Kronlid and Ohman (2013) | Sustainability research | Ethics |

Kronlid and Ohman (2013) elucidate that ethical theories should be addressed in sustainability research. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 10(3)." As direct quotes stated above, the open coding, Ethics was identified. The open coding, Ethics, couples with the category, Sustainability Research.

| | | |
|---|---|---|
| 4. Sammalisto et al. (2015) | Sustainability Research by faculty | Change Agent |

Sammalisto et al. (2015) indicate that universities are change agents in sustainability research by faculty and ESD. The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 10(4)." In conformity with the direct quotes stated above, the open coding,

change agent was found. The open coding, Change Agent, couples with the category Sustainability Research by faculty.

| | | |
|---|---|---|
| 5. Alkhayyal et al. (2019) | Sustainability Research by Faculty | Top-down Approach |

Alkhayyal et al. (2019) indicate that many universities apply the top-down approach to sustainability research. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 10(5)." In keeping with the direct quotes stated above, the open coding, Top-down Approach was uncovered. The open coding, Top-down Approach coupled with the category, Sustainability Research by Faculty.

| | | |
|---|---|---|
| 6. Tappeiner et al. (2007) | Sustainability research by faculty | Interdisciplinary & transdisciplinary research |

Tappeiner et al. (2007) elaborate on the importance of both interdisciplinary and transdisciplinary research approaches. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 10(6)." The open coding, Interdisciplinary & transdisciplinary research was identified in agreement with the direct quotes stated above. The open coding, Interdisciplinary & transdisciplinary research, associates with the category, Sustainability research by faculty.

| | | |
|---|---|---|
| 7.Dallaire et al. (2018) | Sustainability Research by Students | Skills of sustainability research |

Dallaire et al. (2018) elucidate that students' sustainability research is vital to developing their sustainability skills. The direct quotes used to draw out vivo codes indicate " Appendix 7-Table 10(7)." In accordance with the direct quotes stated above, the open coding, Skills of sustainability research was identified. The open coding, Skills of sustainability research couples with the category Sustainability Research by Students.

| | | |
|---|---|---|
| 8. Dmochowski et al. (2016) | Green Research by Students | Collaborative research |

Dmochowski et al. (2016) both the faculty and students appreciate their collaboration for sustainability research. The direct quotes used to pull out vivo codes indicate " Appendix 7-Table 10(8)." In accordance with the direct quotes stated above, open coding, Collaborative

research was identified. The open coding, Collaborative research associates with the category Green Research by Students.

| | | |
|---|---|---|
| 9. Gupta and Singhal (2017) | Green Research by Students | Curriculum |

Gupta and Singhal (2017) elaborate that the curriculum should incorporate students' sustainability research that develops their sustainability behavior. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 10(9)." As direct quotes stated above, the open coding, Curriculum was identified. The open coding, Curriculum connects to the category Green Research by Students.

| | | |
|---|---|---|
| 10. Wiek et al. (2014) | Green Research by Students | Collaborative research |

Wiek et al. (2014) point out that participatory sustainability solution-oriented research between faculty and students provides more benefit than conventional research. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 10(10)." Conforming to the direct quotes stated above, open coding, Collaborative research was identified. The open coding, Collaborative research connects with the category, Green Research by Students.

## 4.2(vi) Green Community Outreach: Axial Coding Document Analysis

The scientific discourse on the concept of Green Community Outreach was derived from categories, Governance for Community Outreach, Benefits to students and community, Benefits to campus and community by the respective abductive open codes depicted in Table 11: Template for Axial Coding Document Analysis.

Universities are no more ivory towers of the 20$^{th}$ century. Instead, they are envisioned to take an active part in transferring knowledge within the university community and community outside the university. It is because there is no other institution other than the university having talents and resources for solving problems faced by communities (Taylor, 1997). de Hooge and van Dam (2019) articulate that a university by community outreach enables the provision of research grants and individual assignments and provision of off-campus community, expert knowledge and skills of academics, and access to resources.

The community referred to in policies is of two types, internal community and external community. The internal community is referred to as the campus community, such as academics, non-academics, and students. The external community is referred to as the public, including society at large, governmental organizations, non-governmental organizations, and media. Hence, sustainable development education focuses mainly on four areas, education, research, campus operations, and community outreach (Lidstone et al., 2015). The partnership with the off-campus community for the common interest of research and projects (Zlotnikova & van der Weide, 2015) is essential for sustainability education. These research and projects provide opportunities to collaboratively act for a knowledge bridge between students and community (Allen-Gil et al., 2005; Zlotnikova & van der Weide, 2015) and scholarship engagement of faculties with the community (Steiner, 2017).

Community outreach, in other words, scholarship engagement, is a way of sharing knowledge and innovations among stakeholders among faculty and students with the community of local, national, regional, and global sustainable development. In addition, the stakeholders can be empowered by pedagogical and extra-curricular innovations, such as competition, demonstration, discourse, events, exhibition, fair, featured speakers, film screening, Theme week (Lopez, 2013).

However, most of the initiatives taken by the universities for sustainability focus on on-campus projects. They neglect community outreach. Policies and strategies for community outreach that can be implemented by a mixture of top-down and bottom-up approaches (Shawe et al., 2019; Too & Bajracharya, 2015) are needed for effective community outreach. In contrast, many policies were less frequently included in community outreach (Vaughter et al., 2016).

Hussain et al. (2019) point out that an organizational change in universities is unavoidable in reshaping community outreach dynamics, which provides reciprocal knowledge transfer from the university to the community and vice versa. Hence, to merge community outreach, it is required first to recognize a relevant policy, strategic planning, and innovation management to co-construction knowledge between academics, students, and community (Lynch-Alexander, 2017). Unfortunately, even though many universities have recognized in their vision, mission, and policies for sustainability by teaching, research, internal operations, and community outreach, they have been unable to connect the sustainable policies with strategies for achieving

sustainability goals (Bieler & McKenzie, 2017). Therefore, it means that green corporate governance plays a crucial role in green community outreach.

**Research Question:** How does the notion of community outreach of a university contribute to greening a university?

| **Table 11: Template for Axial Coding-Green Community Outreach (Selective Coding)** | | |
|---|---|---|
| ***Green Community Outreach by Categories, Benefits to stakeholders, Governance Issues*** | | |
| **Source** | **Categories by Axial Coding** | **Open coding (Vivo/Literal Codes)** |
| 1. Lidstone et al. (2015) | Governance for Community Outreach | Policies |

Lidstone et al. (2015) stress the importance of policies to incorporate community outreach into campus sustainability. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 11(1)." In accordance with the direct quotes stated above, the open coding, policies were identified. The open coding, Policies connects with the category, Governance for Community Outreach.

| | | |
|---|---|---|
| 2.Vaughter et al. (2016) | Governance for Community Outreach | Outreach Projects |

Vaughter et al. (2016) elaborate that various projects can be used to reach the community. Such projects channel knowledge and other resources from universities to the community. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 11(2)." Conforming to the direct quotes stated above, the open coding, Outreach Projects, was identified. The open coding, Outreach Projects associates with the category, Governance for Community Outreach.

| | | |
|---|---|---|
| 3. Lynch-Alexander (2017) | Governance for Community Outreach | Strategic Planning |

Lynch-Alexander (2017) stresses, among other things, that the HEI should recognize the relationship between community outreach and strategic planning. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 11(3)." As direct quotes stated above,

the open coding, Strategic Planning, was identified. The open coding, Strategic Planning, connects with the category, Governance for Community Outreach.

| | | |
|---|---|---|
| 4. Hussain et al. (2019) | Governance for Community Outreach | Organizational Change |

Hussain et al. (2019) elaborate on the importance of organizational change to meet the demand of community outreach from the universities. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 11(4)." In accordance with the direct quotes stated above, the open coding, Organizational Change, was identified. The open coding, Organizational Change, connects with the category, Governance for Community Outreach.

| | | |
|---|---|---|
| 5. Shawe et al. (2019) | Governance for Community Outreach | Systemic approach |

Shawe et al. (2019) elaborate that it is required to incorporate a systemic approach in the absence of a standard approach for community outreach. The direct quotes used to pull out vivo codes provide " Appendix 7-Table 11(5)." As direct quotes stated above, the open coding, Systemic approach was identified. The open coding, Systemic approach connects with the category, Governance for Community Outreach.

| | | |
|---|---|---|
| 6. Too and Bajracharya (2015) | Governance for Community Outreach | Leadership by top-down, bottom-up |

Too and Bajracharya (2015) indicate that both top-down leadership and bottom-up leadership approaches can be used for community outreach. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 11(6)." In keeping with the direct quotes stated above, the open coding, Leadership by top-down, bottom-up was identified. The open coding, Leadership by top-down, bottom-up, connects with the category, Governance for Community Outreach.

| | | |
|---|---|---|
| 7. Bieler and McKenzie (2017) | Governance for Community Outreach | Strategic plan |

Bieler and McKenzie (2017) show how universities' strategic plans have provided sustainability policy to community outreach. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 11(7)." As direct quotes stated above, the open coding,

Strategic plan was identified. The open coding, Strategic plan connects with the category, Governance for Community Outreach.

| | | |
|---|---|---|
| 8. Zlotnikova and van der Weide (2015) | Benefits to Students & Community | Knowledge Bridge |

Zlotnikova and van der Weide (2015) point out that community outreach can bridge the knowledge gap between the universities and the community. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 11(8)." In line with the direct quotes stated above, the open coding, Knowledge Bridge, was identified. The open coding, Knowledge Bridge, couples with the category, Benefits to Students & Community.

| | | |
|---|---|---|
| 9. Allen-Gil et al. (2005) | Benefits to Students & Community | Research Projects by Students |

Allen-Gil et al. (2005) elaborate on how students and the community collaborate by student research for mutual benefit. The direct quotes used to pull out vivo codes provide " Appendix 7-Table 11(9)." As direct quotes stated above, the open coding, Research Projects by Students, was identified. The open coding, Research Projects by Students, connects with the category, Benefits to Students & Community.

| | | |
|---|---|---|
| 10. de Hooge and van Dam (2019) | Benefits to Students & Community | Student Training |

de Hooge and van Dam (2019) elaborate on how students and the community benefit from each other through outreach training projects of students. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 11(10)." In agreement with the direct quotes stated above, the open coding, Student Training, was identified. The open coding, Student Training, associates with the category, Benefits to Students & Community.

| | | |
|---|---|---|
| 11. Steiner (2017) | Benefits to University & Community | Scholarship of Engagement |

Steiner (2017) points out that the collaboration between the university and the community provides mutual benefits. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 11(11)." As direct quotes stated above, the open coding, Scholarship of

Engagement was identified. The open coding, Scholarship of Engagement, connects with the category, Benefits to University & Community.

| | | |
|---|---|---|
| 12. Lopez (2013) | Benefits to University & Community | Instructional Practice |

Lopez (2013) recommends having a common dialogue among the university, students, and university for mutual benefits. The direct quotes used to draw out vivo codes provide " Appendix 7-Table 11(12)." In accordance with the direct quotes stated above, the open coding, Instructional Practice was identified. The open coding, Instructional Practice links to the category, Benefits to University & Community.

## 4.2(vii) Green Internal Operations: Axial Coding Document Analysis

The scientific discourse on the concept of Green Internal Operations was derived from categories, Internal Ecology, Conservation and Efficiency, and Governance issues by the respective abductive open codes depicted in Table 12: Template for Open Coding Document Analysis.

The universities' education policies for sustainable development focus on green internal operations and green education, green research, and green community outreach (Lidstone et al., 2015). In the past, the quality of life in a university was referred to like the natural environment's quality by attractive landscaping for open spaces, natural habitats like woods, and vegetation coverage within the university. The same has now been extended to include clean air, resource conservation, and energy efficiency by way of various types of projects such as water conservation, efficient use of energy, waste management, renewable energy for internalizing CO2, green transportation inside the university and outside travel, trees for sequestration of CO2 (de Villiers et al., 2014), green buildings (Richardson & Lynes, 2007).

These initiatives are becoming popular among universities because of the increasing quality of life. Richardson and Lynes (2007) elaborate on how green buildings benefit from a higher quality indoor working environment for employees. They further argue that the employees' absenteeism is reduced, and their productivity is increased. They increase customer satisfaction. Thereby profitability can also be improved.

The green internal environment creates a positive impact on the minds of the community. McFarland et al. (2008) point out that most students who use green spaces are high users of the green spaces and positively perceive the quality of life. de Villiers et al. (2014) argue that a green university enables the use of resources efficiently, reduces waste, and improves university reputation. Filho et al. (2015) point out that stakeholders of a green university, such as academics, students, and employees, could live in a friendly environment. As a result, a green university enables attracting ethical staff and students. Universities take the green initiatives for greening the environment directly relate to some SDGs. For example, Rebelatto et al. (2019) demonstrate that energy efficiency and renewable energy initiatives directly relate to SDG 07: Affordable and Clean Energy. Liyanage and Vishwanathan (2020) demonstrate that the water conservation project directly relates to SDG 06: Clean Water & Sanitation, SDG 12: Responsible consumption and production. Rebelatto et al. (2019) argue that universities that have sustainable initiatives directly or indirectly relate to SDGs through research, greening the curriculum, and internal operations. In general, stakeholders' quality of life in a green university is better than in a non-green university.

However, there are challenges for greening the internal environment such as the unawareness of how to protect the environment, inadequate interest for greening the internal environment, inadequate attention placed by the management, high capital expenditure (Noor et al., 2019), structural and functional challenges by not empowering leadership. The challenges such as unawareness of environmental protection, inadequate interest can be addressed by sustainable development education (Sima et al., 2019). Ngadiman et al. (2017) argue that the university's governance enables the alignment of the culture, strategy, and leadership for transforming a non-sustainable campus into a sustainable campus.

**Research Question:** How does the notion of internal operations of a university contribute to greening a university?

| **Table 12: Template for Axial Coding-Green Internal Operations (Selective Coding)** |
|---|
| ***Green Internal Operations by Categories, Quality of life, Awareness of Internal Ecology, Conservation and Efficiency, Governance Issues*** |

| Source | Categories by Axial Coding | Open coding (Vivo/Literal Codes) |
|---|---|---|
| 1. Noor et al. (2019) | Internal Ecology | Protection of the Internal Environment |

Noor et al. (2019) manifest the positive correlation between unawareness of environmental protection and environmental issues including internal operations of the university. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 12(1)." As direct quotes stated above, the open coding, Protection of the Internal Environment, was identified. The open coding, Protection of the Internal Environment, links to the category, Benefits to University & Community.

| | | |
|---|---|---|
| 2. Sima et al. (2019) | Governance | Leadership |

Sima et al. (2019) demonstrate that leadership and other functional issues are vital in greening the internal environment. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 12(2)." Conforming to the direct quotes stated above, the open coding, Leadership was identified. The open coding, Leadership, connects to the category, Governance.

| | | |
|---|---|---|
| 3. de Villiers et al. (2014) | Internal Ecology | Carbon Sequestration |

de Villiers et al. (2014) argue the importance of trees in the internal environment for carbon sequestration. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 12(3)." As direct quotes stated above, the open coding, Carbon Sequestration, was identified. The open coding, Carbon Sequestration associates with the category Internal Ecology.

| | | |
|---|---|---|
| 4. Richardson and Lynes (2007) | Conservation & Efficiency | Green Building |

Richardson and Lynes (2007) demonstrate how green building is vital for efficient resource use and resource conservation. The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 12(4)." In keeping with the direct quotes stated above, the open coding, Green Building, was identified. The open coding, Green Building, links to the category, Conservation & Efficiency.

| | | |
|---|---|---|
| 5. Rebelatto et al. (2019) | Conservation & Efficiency | SDG 07: Affordable & Clean Energy |

Rebelatto et al. (2019) recommend applying SDG: 07 to make the internal environment of HEIs green. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 12(5)." In accordance with the direct quotes stated above, the open coding, SDG 07: Affordable & Clean Energy was identified. The open coding, SDG 07: Affordable & Clean Energy couples to the category, Conservation & Efficiency.

| | | |
|---|---|---|
| 6. Liyanage and Vishwanathan (2020) | Conservation & Efficiency | SDG 12: Responsible Consumption and Production |

Liyanage and Vishwanathan (2020) elaborate on how SDG 12 makes the internal environment green. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 12(6)." The open coding, SDG 12: Responsible Consumption and Production, was identified in line with the direct quotes stated above. Thus, the open coding, SDG 12: Responsible Consumption and Production, connects to Conservation & Efficiency.

| | | |
|---|---|---|
| 7. Richardson and Lynes (2007) | Quality of Life | Green Building |

Richardson and Lynes (2007) elaborate that sustainable buildings enhance the quality of life. The direct quotes which were used to draw out vivo codes provide that " Appendix 7-Table 12(7)." As direct quotes stated above, the open coding, Green Building, was identified. The open coding, Green Building, links to the category, Quality of Life.

| | | |
|---|---|---|
| 8. Tiyarattanachai and Hollmann (2016) | Quality of Life | Green and Non-green universities |

Tiyarattanachai and Hollmann (2016) point out that stakeholders of green universities perceive a better quality of life than stakeholders at unsustainable universities. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 12(8)." The open coding, Green and Non-green universities, was identified in agreement with the direct quotes stated above. The open coding, Green & Non-green universities associate with the category, Quality of Life.

| | | |
|---|---|---|
| 9. McFarland et al. (2008) | Quality of Life | Green Spaces |

McFarland et al. (2008) elucidate that majority of the students enjoy natural green ecology. The direct quotes which were used to draw out vivo codes provide that " Appendix 7-Table 12(9)." In accordance with the direct quotes stated above, the open coding, Green Spaces, was identified. The open coding, Green Spaces, links to the category, Quality of Life.

| | | |
|---|---|---|
| 10. Ngadiman et al. (2017) | Governance | Leadership |

Ngadiman et al. (2017) advocate leadership and other governance issues to make the internal environment of the campus green. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 12(10)." As direct quotes stated above, the open coding, Leadership, was identified. The open coding, Leadership links to the category, Governance.

| | | |
|---|---|---|
| 11. Lidstone et al. (2015) | Governance | Holistic Approach |

Lidstone et al. (2015) demonstrate that green internal operations are part and parcel of the holistic approach for sustainability. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 12(11)." Conforming to the direct quotes stated above, the open coding, Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance.

## 4.2 (viii) Green Reporting: Axial Coding Document Analysis

The scientific discourse on the concept of Green Reporting was derived from categories. Namely, three Pillars of Sustainability, Measuring Progress, and Governance by the respective abductive open codes depicted in Table 13: Template for Axial Coding.

Sustainability reporting communicates the sustainability practices' performance transparently and meets the demand of information by the internal and external stakeholders to ascertain the progress of sustainable development (Lozano, 2006). Further, information disclosure is essential to evaluate the decision taken in the past, present and will be taken in the future. However, universities' sustainability reporting is still in the early stages because of the voluntary nature of disclosure in all territories (Lopatta & Jaeschke, 2014). Even though corporate governance codes and standards such as King IV: Code of Corporate Governance, international standards for reporting such as Global Reporting Initiative recommend disclosing voluntary sustainability performance relating to environmental, economic, and social practices of an organization. However, there is no international sustainability sector-specific reporting

or worldwide university-specific reporting system (Adams, 2013). Hence, there is slow adoption of sustainability reporting at many universities (Sepasi et al., 2019).

In the meantime, Universities around the world play a significant role in sustainable development. These sustainability practices are related to teaching, research, internal operations, and community outreach in universities. These diverse sustainability practices embrace metaphors of three pillars of sustainability, economic sustainability, social sustainability, and environmental sustainability. However, since assessing sustainability practices remains complex, the sustainability reporting system at universities focuses mainly on environmental sustainability rather than economic sustainability. In contrast, social sustainability is the least focused reporting because of yet infancy level of sustainability reporting (Sassen & Azizi, 2018).

However, many assessment tools are generally accepted as best practices for assessing sustainability practices at universities. Alghamdi et al. (2017) analyzed 12 assessment tools, and they uncovered that the same kind of analysis with different approaches was carried out previously by Shriberg (2002) for eleven tools, by Cole (2003) for twelve tools, by Alshuwaikhat and Abubakar (2008) for three tools, Kamal and Asmuss (2013) for four tools, and by Gomes et al. (2014) for eight tools. Seres et al. (2019) disclose that some of the tools are unidimensional, which measures only one dimension, environmental or social, or economic sustainability. Some are bi-dimensional tools that enable measuring any two dimensions, and tri-dimensional tools measure all three dimensions. These tools have their strengths and weaknesses. Shriberg (2002) listed some of them, but what is important is to measure as well said, "What gets measured, gets managed."

These assessment tools consist of many indicators for assessing the performance of sustainability practices. For example, Sustainability Assessment Questionnaire (SAQ) consists of 53 indicators, Graphical Assessment of Sustainability in Universities (GASU) consists of 59 indicators (Alghamdi et al., 2017). As a result, stakeholders face difficulties in applying them. Hence, materiality criteria were introduced as a central point for reporting as per Global Reporting Initiatives requiring disclosing all material aspects sufficiently crucial for internal and external stakeholders (Lubinger et al., 2019).

Further, the university's governance aspect plays a significant role in its vision, mission, goals, strategies, leadership, and culture for sustainability practices and sustainability reporting (Adams, 2013). Some assessment tools measure the contribution of governance to sustainability practices. However, some assessment tools are weak in assessing the contribution of Governance (Tumbas et al., 2015).

**Research Question:** How does the notion of reporting of a university contribute to greening a university?

**Table 13: Template for Axial Coding-Green Reporting (Selective Coding)**

***Sustainability Reporting by Categories, Measuring the Performance, Three Pillars, Governance***

| Source | Categories by Axial Coding | Open coding (Vivo/Literal Codes) |
|---|---|---|
| 1. Sassen and Azizi (2018) | Three Pillars of Sustainability | Environmental Bias |

Sassen and Azizi (2018) elaborate on the importance of reporting all three pillars, but many reporting systems pay less attention to economic sustainability and social sustainability. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 13(1)." As direct quotes stated above, the open coding, Environmental Bias, was identified. The open coding, Environmental Bias, associates with the category Three Pillars of Sustainability.

| | | |
|---|---|---|
| 2. Alghamdi et al. (2017) | Measuring the Progress | Tailor-made tools |

Alghamdi et al. (2017) point out that tailor-made reporting tools can focus on specific areas of sustainability. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 13(2)." As direct quotes stated above, the open coding, Tailor-made tools were identified. The open coding, Tailor-made tools associates with the category, Measuring Progress.

| | | |
|---|---|---|
| 3. Sepasi et al. (2019) | Measuring the Progress | Slow adoption |

Sepasi et al. (2019) argue that universities do not adequately adopt reporting even though sustainability reporting is vital. The direct quotes which were used to draw out vivo codes provide that " Appendix 7-Table 13(3)." As direct quotes stated above, the open coding, Slow adoption was identified. The open coding, Slow adoption associates with the category, Measuring Progress.

| | | |
|---|---|---|
| 4. Seres et al. (2019) | Three Pillars of Sustainability | Uni/Bi/Tri-dimensional Tools |

Sereš et al. (2019) describe three types of reporting tools and recommend tri-dimensional tools that report three sustainability pillars. The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 13(4)." The open coding, Uni/Bi/Tri-dimensional Tools, was identified in accordance with the direct quotes stated above. The open coding, Uni/Bi/Tri-dimensional tools, is associated with the category Three Pillars of Sustainability.

| | | |
|---|---|---|
| 5. Lubinger et al. (2019) | Measuring the Progress | Materiality |

Lubinger et al. (2019) recommend materiality as a method to avoid confusion of what is required to be reported. The direct quotes which were used to draw out vivo codes provide that " Appendix 7-Table 13(5)." As direct quotes stated above, the open coding, Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance." In keeping with the direct quotes stated above, the open coding, Materiality was identified. The open coding, Materiality associates to the category, Measuring the Progress.

| | | |
|---|---|---|
| 6. Shriberg (2002) | Measuring the Progress | Strengths & Weaknesses |

Shriberg (2002) discloses the strengths and weaknesses of the assessment tool used to measure sustainability progress. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 13(6)." As direct quotes stated above, the open coding, Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance." As direct quotes stated above, the open coding, Strengths & Weaknesses was identified. The open coding, Strengths and Weaknesses associates with the category, Measuring the Progress.

| | | |
|---|---|---|
| 7. Adams (2013) | Governance | Innovative management |

Adams (2013) argues that sustainability reporting needs to evaluate the governance system. The direct quotes which were used to pull out vivo codes provide that "The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 13(7)." As direct quotes stated above, the open coding, Innovative management was identified. The open coding, Innovative management associates with the category, Governance.

| | | |
|---|---|---|
| 8. Krausche and Pilz (2018) | Governance | Policy |

Krausche and Pilz (2018) point out that the sustainability reporting system needs to evaluate the university's environmental policy. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 13(8)." As direct quotes stated above, the open coding, Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance." As direct quotes stated above, the open coding, Policy was identified. The open coding, Policy associates with the category, Governance.

| | | |
|---|---|---|
| 9. Krausche and Pilz (2018) | Governance | Structure & Strategy |

Krausche and Pilz (2018) argue that the sustainability reporting system needs to evaluate the structure and strategy used for sustainability. The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 13(9)." As direct quotes stated above, the open coding, Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance." In line with the direct quotes stated above, the open coding, Structure & Strategy was identified. The open coding, Structure & Strategy associates with the category, Governance.

| | | |
|---|---|---|
| 10. Tumbas et al. (2015) | Governance | A part of the indicator |

Tumbas et al. (2015) indicate that governance is one of the evaluation criteria in sustainability reporting. The direct quotes which were used to draw out vivo codes provide that "The direct quotes which were used to pull out vivo codes provides that " Appendix 7-Table 13(10)." As direct quotes stated above, the open coding, A part of the indicator, was identified. The open coding, A part of the indicator associates with the category, Governance.

## 4.2(ix) Green Integration: Axial Coding Document Analysis

There are scientific discourses on eight essential elements of sustainability. Those eight scientific discourses were analyzed by tables 6 to 13. Green corporate governance, Green

corporate culture, Three pillars of sustainability, Green education, Green research, Green community Outreach, Green internal operations, and Green reporting were focused on these discourses. In addition, some discourses identified several processes and focused on integrating them (Table 14) even though they have not been adequately addressed. However, integration can be derived from those discourses.

Accordingly, Zhao and Zou (2015) point out that green university consists of three dimensions: green education of the university, green research of the university, and green campus/green internal operations of the university. Likewise, Abu-Alruz et al. (2018) disclose that education for sustainability has been recognized as necessary as three pillars of sustainability: economic sustainability, social sustainability, and environmental sustainability. In the same vein, Vann et al. (2006) argue that sustainability education should address all three pillars of sustainability.

Filho et al. (2015) point out that universities must take a crucial part in sustainable development by integrating education, research, internal operations, and community outreach. However, they further express that only a few universities have integrated education for sustainability holistically.

Sabatini (2019) points out that there is an interconnection between sustainable development and culture because it has a value beyond the instrumental value. In agreement, Bauer et al. (2020) argue that the culture for sustainable development is a subsystem with other subsystems of a university such as education, research, community outreach, and internal operations of the campus. Adams et al. (2018) endorse the same point of view, stating that culture is part and parcel of sustainability together with education, research, community outreach, and internal operations.

Littledyke et al. (2013) elaborate that education for sustainability connects theory and practice with curriculum, research, and community outreach but further elaborate that universities enable connecting so by the governance structure, strategy, and leadership. Tumbas et al. (2015) also endorse the importance of integrating governance as an element of sustainable development and education for sustainable development, research, community outreach, and internal operations.

Lozano (2011) elaborates on broader integration aspects, stating that the universities have increasingly incorporated sustainability into their curriculum, research, community outreach, internal operations, and sustainability reporting.

**Research Question:** How does the notion of reporting of a university contribute to greening a university?

From the eight elements above, what elements are essential for greening a university? Can we leave any of them when greening a university?

**Table 14: Template for Axial Coding-Integration (Selective Coding)**

***Integration by categories, Integration of two elements, Integration of multiple elements***

| Source | Categories by Axial Coding | Open coding (Vivo/Literal Codes) |
|---|---|---|
| 1. Abu-Alruz et al. (2018) | Integration of two elements | Education for Sustainability |

Abu-Alruz et al. (2018) point out that education for sustainability is the fourth pillar to be integrated with the three pillars of sustainability. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 14(1)." As direct quotes stated above, the open coding, Education for Sustainability, was identified. The open coding, Education for Sustainability, associates with the category, Integration of two elements.

| | | |
|---|---|---|
| 2. Vann et al. (2006) | Integration of Two elements | Three Pillars and Education for Sustainability |

Vann et al. (2006) argue that education for sustainability should espouse the three pillars of sustainability. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 14(2)" In conformity with the direct quotes stated above, the open coding, Three Pillars and Education for Sustainability, was identified. The open coding, Three Pillars and Education for Sustainability connects to the category, Integration of Two elements.

| | | |
|---|---|---|
| 3. Sabatini (2019) | Integration of two elements | Three Pillars of Sustainability and Culture |

Sabatini (2019) argues that the culture of sustainability is the fourth pillar of sustainability. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 14(3)" Conforming to the direct quotes stated above, the open coding, Three Pillars of Sustainability and Culture. The open coding, Three Pillars of Sustainability and Culture, links to the category, Integration of Two elements.

| | | |
|---|---|---|
| 4. Zhao and Zou (2015) | Integration of Multiple Elements | Green Education, Green Research, and Green Campus |

Zhao and Zou (2015) point out that green university consists of three dimensions, Green education, Green Research, and Green Internal Operations. The direct quotes used to pull out vivo codes provide that " Appendix 7-Table 14(4)" As direct quotes stated above, the open coding, Green Education, Green Research, and Green Campus was identified. The open coding, Green Education, Green Research, and Green Campus links to the category, Integration of Multiple Elements.

| | | |
|---|---|---|
| 5. Bauer et al. (2020) | Integration of Multiple Elements | Governance, Culture, Education, Research, Internal Operations, Community Outreach |

Bauer et al. (2020) argue that six dimensions are integrated for a sustainable university. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 14(5)" In line with the direct quotes stated above, the open coding, Governance, Culture, Education, Research, Internal Operations & Community Outreach was identified. The open coding, A part of the indicator associates with the category, Integration of Multiple Elements.

| | | |
|---|---|---|
| 6. Adams et al. (2018) | Integration of Multiple Elements | Governance, Culture, Education, Research, Internal Operations, & Community Outreach |

Adams et al. (2018) demonstrate that there are six dimensions of a green university. The direct quotes used to extract vivo codes provide that " Appendix 7-Table 14(6)" As direct quotes stated above, the open coding, Governance, Culture, Education, Research, Internal Operations, & Community Outreach, was identified. The open coding, Governance, Culture,

Education, Research, Internal Operations, & Community Outreach associates with the category, Integration of Multiple Elements.

| | | |
|---|---|---|
| 7. Littledyke et al. (2013) | Integration of Multiple Elements | Governance, Culture, Education, Research, & Community Outreach |

Littledyke et al. (2013) elucidate that a green university consists of five dimensions. The direct quotes which were used to pull out vivo codes provide that " Appendix 7-Table 14(7)". In agreement with the direct quotes stated above, open coding, Governance, Culture, Education, Research, & Community Outreach was identified. The open coding, Governance, Culture, Education, Research, & Community Outreach associates with the category, Integration of Multiple Elements.

| | | |
|---|---|---|
| 8. Lozano (2011) | Integration of Multiple Elements | Education, Research, Internal Operations, Community Outreach, & Reporting |

Lozano (2011) demonstrates that a green university is an integration of five dimensions. The direct quotes used to draw out vivo codes provide that " Appendix 7-Table 14(8)" In keeping with the direct quotes stated above, the open coding, Education, Research, Internal Operations, Community Outreach & Reporting, was identified. The open coding, Education, Research, Internal Operations, Community Outreach, Reporting associates to the category, Integration of Multiple Elements.

| | | |
|---|---|---|
| 9. Tumbas et al. (2015) | Integration of Multiple Elements | Governance, Education, Research, Internal Operations, Community Outreach, & Reporting |

Tumbas et al. (2015) point out that there are six dimensions in a sustainable university. The direct quotes which were used to extract vivo codes provide that " Appendix 7-Table 14(9)" As direct quotes stated above, the open coding, Governance, Education, Research, Internal Operations, Community Outreach, Reporting was identified. The open coding, Governance,

Education, Research, Internal Operations, Community Outreach, & Reporting associates with the category, Integration of Multiple Elements.

| | | |
|---|---|---|
| 10. Filho et al. (2015) | Integration of multiple elements | Education, Research, Operations, & Community Outreach |

Filho et al. (2015) demonstrate that there are four dimensions of sustainability. The direct quotes used to pull out vivo codes provide that "Appendix 7-Table 14(10)" In accordance with the direct quotes stated above, the open coding, Education, Research, Operations, & Community Outreach was identified. The open coding, Education, Research, Operations, & Community Outreach couples to the category, Integration of Multiple Elements.

## 4.3 Analysis of Interviews-Thematic Maps

Neuman (2011) elaborates that the purpose of descriptive research is to present a clear picture of a specific social setting in detail. He further expresses that descriptive research is less concerned with why something happens than how something happens. Consequently, this descriptive research aspect describes how green knowledge and innovation can be produced rather than why it is produced. Hence, Data was collected from the interviews for the descriptive research.

The priori codes developed with template analysis were used to collect interview data. Interviewees transcribed data in their handwritings immediately after the interview. Transcripts were used to analyze interview data. The Vivo codes highlighted/identified from the transcriptions were used to triangulate, modify, or remove the priori codes previously developed with the analysis of documents. Accordingly, it included the new codes where there was no existing code, removed an existing code when it is not triangulated, two or more codes were combined in the light of further information, in the same way, the previous scope of codes was changed. Hence, the theory was developed by abduction. Namely, the theory developed by document analysis placed on the template was used to collect data and develop theory by deduction. After that, data was further collected to find new theories by induction. The back-and-forth system was conducted till the saturation point was satisfied.

In the abductive process of developing theory, the researcher systematically found the links between codes for themes, categories from the themes, and the relationship among categories for concepts. In this respect, the thematic analysis was used to describe and developed the theory. Thus, thematic analysis is the foundational method for qualitative analysis (Braun & Clarke, 2006:78). Moreover, this approach can be used for searching themes or patterns of data set (Saunders et al., 2016) obtained from interviews and documents.

Rules of thematic analysis should be critically followed to carry out the thematic analysis as a rigorous analysis of qualitative data collected in the research inquiry. Hence, it is first required to decide where the sources of codes should come from. In this regard, there are three sources of codes. One of them is that sources of codes can be based on the participants' actual terms in their interviews. These are called vivo codes. The second way that the sources of codes come from is that they are labels developed by the researcher during document analysis (Table 6-14). Finally, the third way that the sources of codes come from is that they can be derived from the terms already used in the literature that describes the theory. The latter two source codes are called 'priory codes.

After that, the coding of each unit of data with a data item was initiated. Textual data describes a data item. A data item in the first phase is a transcription of an interview. The data unit is a complete description of the data code. Hence, data code is an abbreviation of the data unit. The process of coding was carried out with QDA Miner Lite, a qualitative data analysis software package. QDA Miner Lite allowed importing transcriptions of interviews in word documents. The facilities such as keyword retrieval, Query by example, cluster extraction, visualization tools by graphical representations for coding frequencies, and reports were used. Besides, though interview data are qualitative data, they can be transformed into quantitative data for drawing conclusions. The transformation involves turning words or images into numbers. The transformation process consists of several stages. First, qualitative data was organized under each group. After that, all data was carefully read and ascertained the existence of themes of categories under which frequencies were counted (Appendix 6).

Each category is internally homogeneous and externally heterogeneous. In other words, a category enables holding data in a particular meaning, but that meaning is adequate to be different from other categories. Such quantification is essential to ascertain more about how

and why, to what extent, and under what circumstances, the researcher concludes. Bryman (2012) argues that a theme can be more clearly identified with the associated frequencies. Bryman (2012: 624) further argues that qualitative researchers' quasi quantification with terms such as 'many,' 'frequency,' 'rarely,' 'often,' and 'some' can be made precise by a limited amount of quantification of qualitative data.

During the coding of interview transcriptions, the same priori codes on the template analysis were triangulated and modified from the Vivo codes from each of the data units from the transcriptions of the interviews. In the meantime, a few new codes, such as a measure of culture, local metaphors of three pillars, integration of elements, and hierarchy of integration, were identified. The number of codes was determined on criterion, research question, research objectives, and research aim.

Once all codes have been settled, the search for themes/categories began. The codes which go together in answering research questions were condensed as a category. Many thoughts guided the process of searching for themes. Among other things, what are the key concepts behind each of the codes? Does it recur and the frequency of them? Does it relate to any other code? Does the code relate to a theme relating to the research question, objective, and aim? Does that theme relate to different themes? For example, themes such as policies and strategies associated with the concept of 'Green Corporate Governance' and other concepts such as Green Corporate Culture, Green Education, and Green Research. These codes recurred many times.

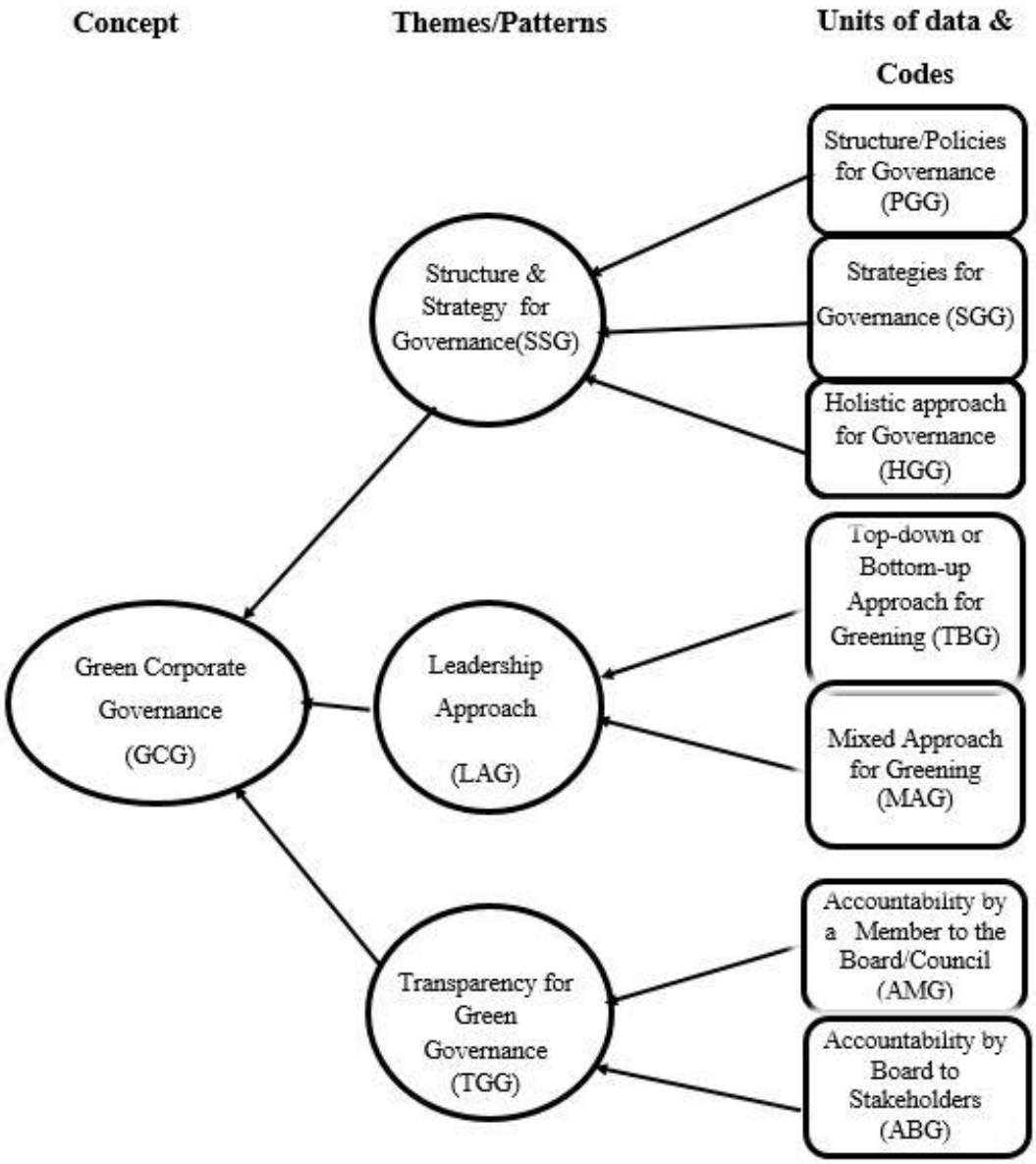
After settling with the codes and their themes/categories, the next step is to agree with the relationship among categories using a thematic map. The thematic map is a graphical representation of codes, themes, categories, and concepts, and it depicts a pattern/s interrelated. The thematic maps so developed (Figure 14 – 21) enable developing theory abductively. Accordingly, the theory developed reflected that a green university has eight essential elements: Green Corporate Governance, Green Corporate Culture, three pillars of Sustainability, Green education, Green Research, Green Community Outreach, Green Internal Operations, and Green Reporting. Thus, systematic integration developed a green university theory, which enables the production of green knowledge and innovation.

## 4.3(i) Green Corporate Governance: **Axial Coding Thematic Analysis**

Green Corporate Governance is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Green Corporate Governance. Figure 14 describes the units of data/codes, themes, and concepts. Three units of data and their codes, ‘Policies for Green Corporate Governance,' 'Structure & Strategies for Green Corporate Governance,' and 'Holistic Approach for Green Corporate Governance,' make a theme called 'Structure & Strategy for Green Corporate Governance.' Two units of data and their codes, 'Top-down or Bottom-up Approach for Greening Leadership' and 'Mixed Approach for Green Leadership,' make a theme called 'Leadership Approach for Green Corporate Governance.' Finally, two units of data and their codes, 'Accountability by a Member to the Board/Council' and 'Accountability by the board to stakeholders' make a theme called transparency for green Corporate Governance. All three themes together create the concept 'Green Corporate Governances.'

**Research Question:** How does the element of Governance of a University contribute to greening a university?

Figure 14: Thematic Analysis-Green Corporate Governance




Source: Author

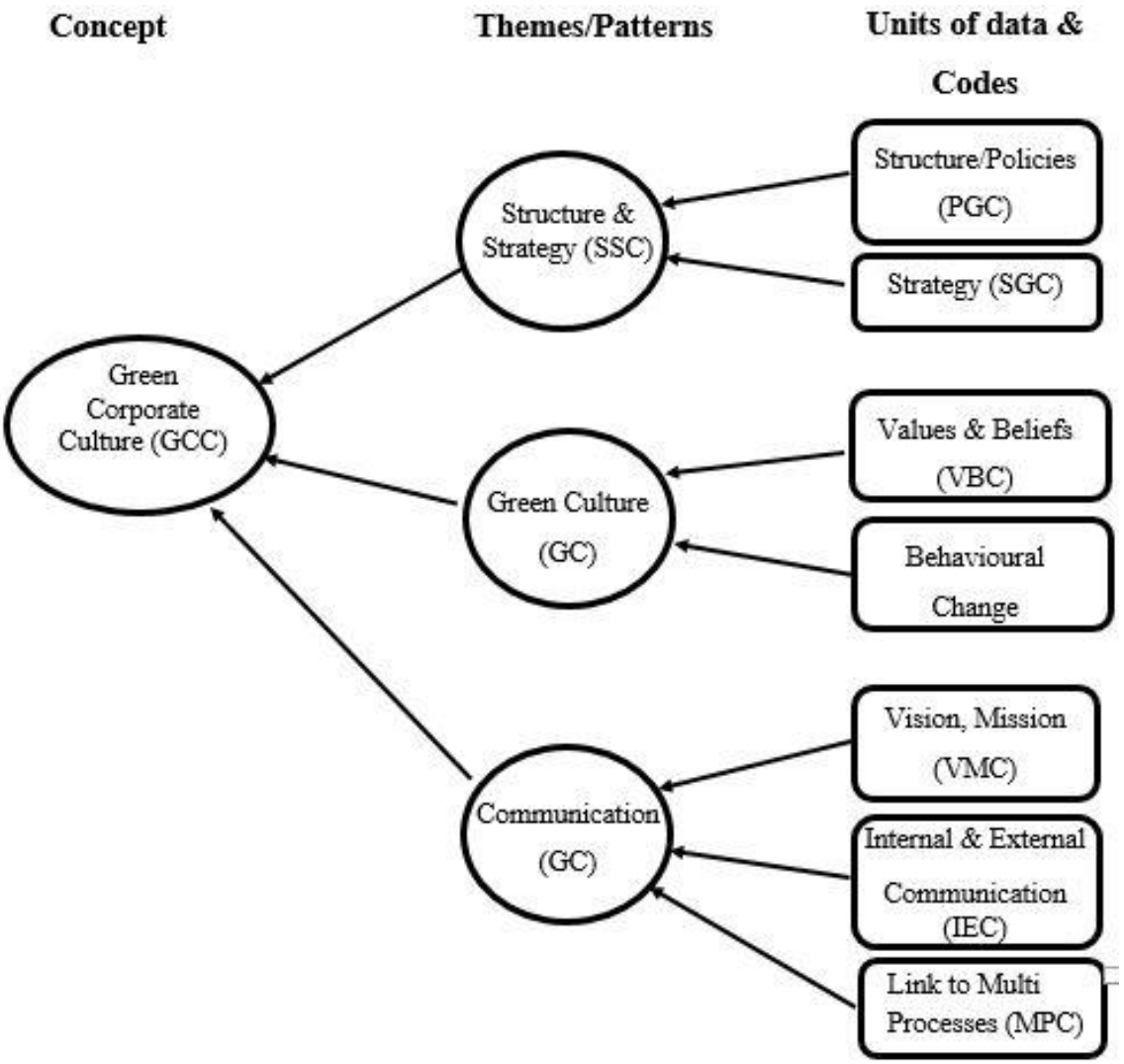
## 4.3(ii) Green Corporate Culture: **Axial Coding Thematic Analysis**

Green Corporate Culture is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Green Corporate Culture. Figure 15 describes the units of data/codes, themes, and concepts. First, two units of data and their codes,

policies for Green Corporate Culture, Structure and Strategy, make a theme called Structure & Strategy. Next, two units of data and their codes, Green Values & Beliefs (GVB) and Behavioral change, make a theme called Green Corporate Culture. Finally, three units of data and their codes, Vision & Mission, Internal & External Communication, Link to multi processes, make Green Communication a theme. All three themes create a concept called Green Corporate Culture.

**Research Question:** How does the element of the culture of an organization contribute to greening a university?

Figure 15: Thematic Analysis-Green Corporate Governance



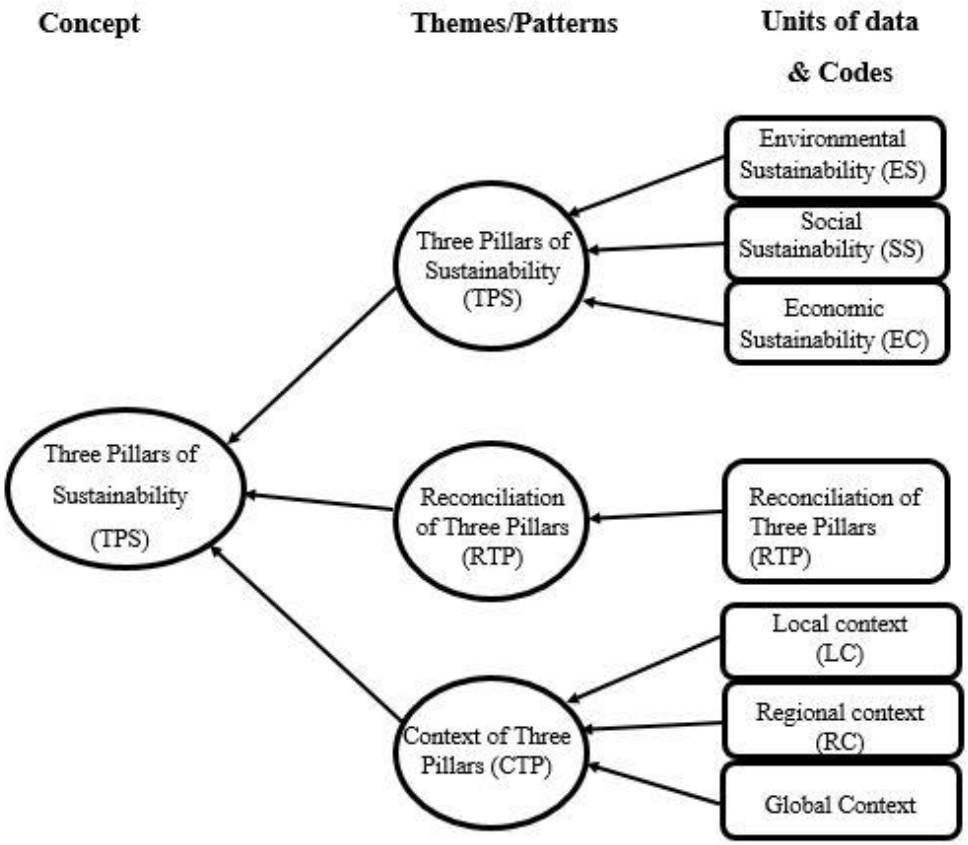

Source: Author

## 4.3(iii) Three Pillars of Sustainability: **Axial Coding Thematic Analysis**

Three Pillars of Sustainability is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Three Pillars of Sustainability. Figure 16 describes the units of data/Codes, themes, and concepts. Three units of data and their codes, 'Environmental Sustainability, 'Social Sustainability, and 'Economic Sustainability,' make a theme called 'Three Pillars of Sustainability. One unit of data and its code, 'Reconciliation of Three Pillars,' makes a theme called 'Reconciliation of Three Pillars.' Three units of data and their codes, 'Local Context,' 'Regional Context,' and 'Global Context,' make a theme called 'Context of Three Pillars.' All three themes make a concept called the Three Pillars of Sustainability.

**Research Question:** How does the element of three pillars of an organization's sustainability contribute to greening a university?

Figure 16: Thematic Analysis-Three Pillars of Sustainability



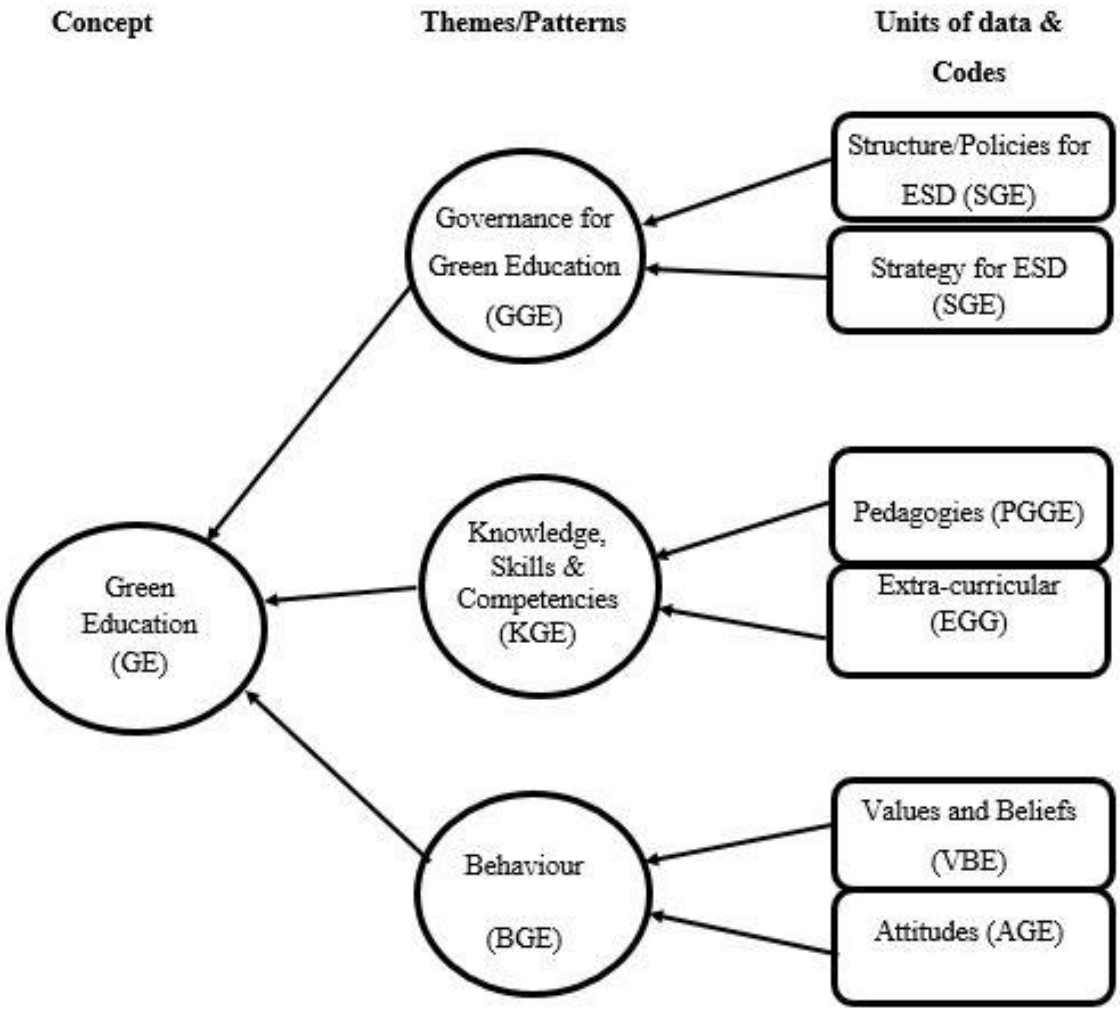

Source: Author

## 4.3(iv) Green Education: **Axial Coding Thematic Analysis**

Green Education is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Green Education. Figure 17 describes the units of data/Codes, themes, and concepts. Two units of data and their codes, 'Policies for ESD for Sustainable Development' and 'Structure & Strategy for ESD create a category called Governance for Green Education. Two units of data and their codes, "Pedagogies' and 'Extra-curricular,' create a category called 'Knowledge, Skills, and Competencies.' Two data units and their codes, 'Values and Beliefs,' 'Attitudes' create a category called behavior. The three categories created a concept called 'Green Education.'

**Research Question:** How does the element of the education of a university contribute to greening a university?

Figure 17: Thematic Analysis-Green Education



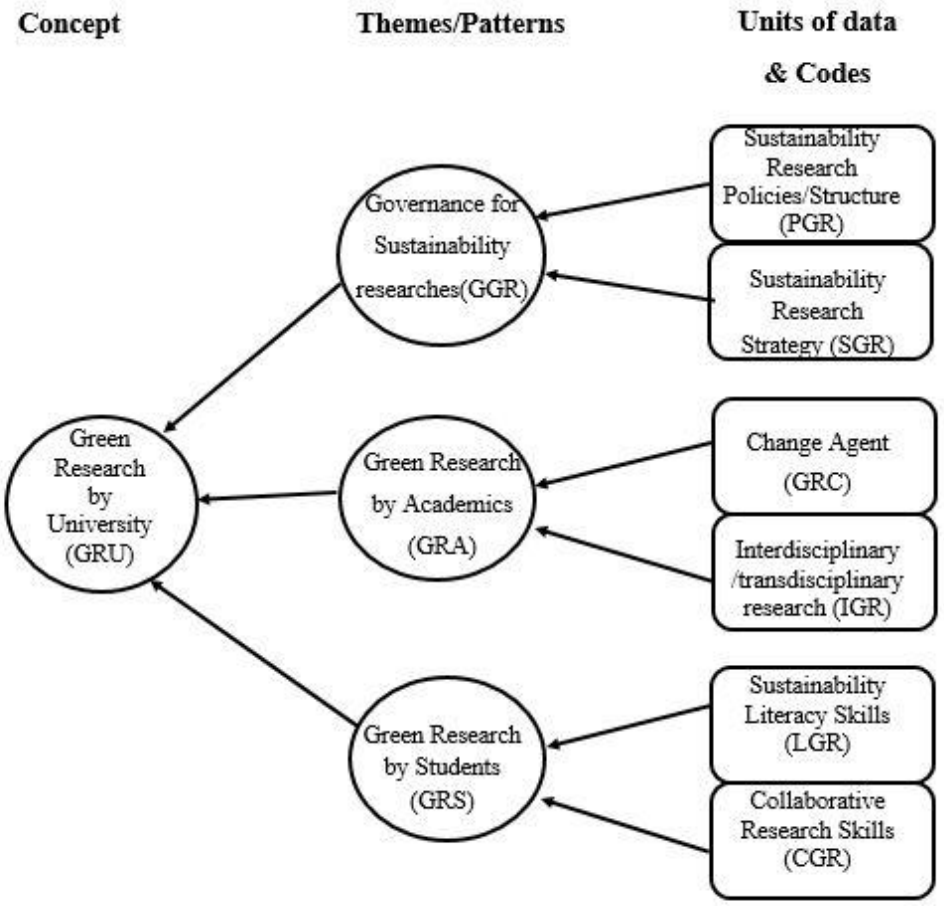

Source: Author

## 4.3(v) Green Research: **Axial Coding Thematic Analysis**

Green Research is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Green Research. Figure 18 describes the units of data, themes, and concepts. Two units of data and their codes, ‘Policies for Sustainability Research,’ ‘Structure, and Strategy for Sustainability Research’ create a category called ‘Governance for Sustainability Research.’ Two units of data and their codes, 'Change Agent,' 'Interdisciplinary and Transdisciplinary Research,' create a category called ‘Green research by Academics.’ Two data units and their codes, 'Sustainability Literacy Skills,' 'Collaborative Research Skills,' create a category called 'Green Research by Students'. The three categories created create a concept called 'Green Research.'

**Research Question:** How does the element of research of a university contribute to greening a university?

Figure 18: Thematic Analysis-Green Research



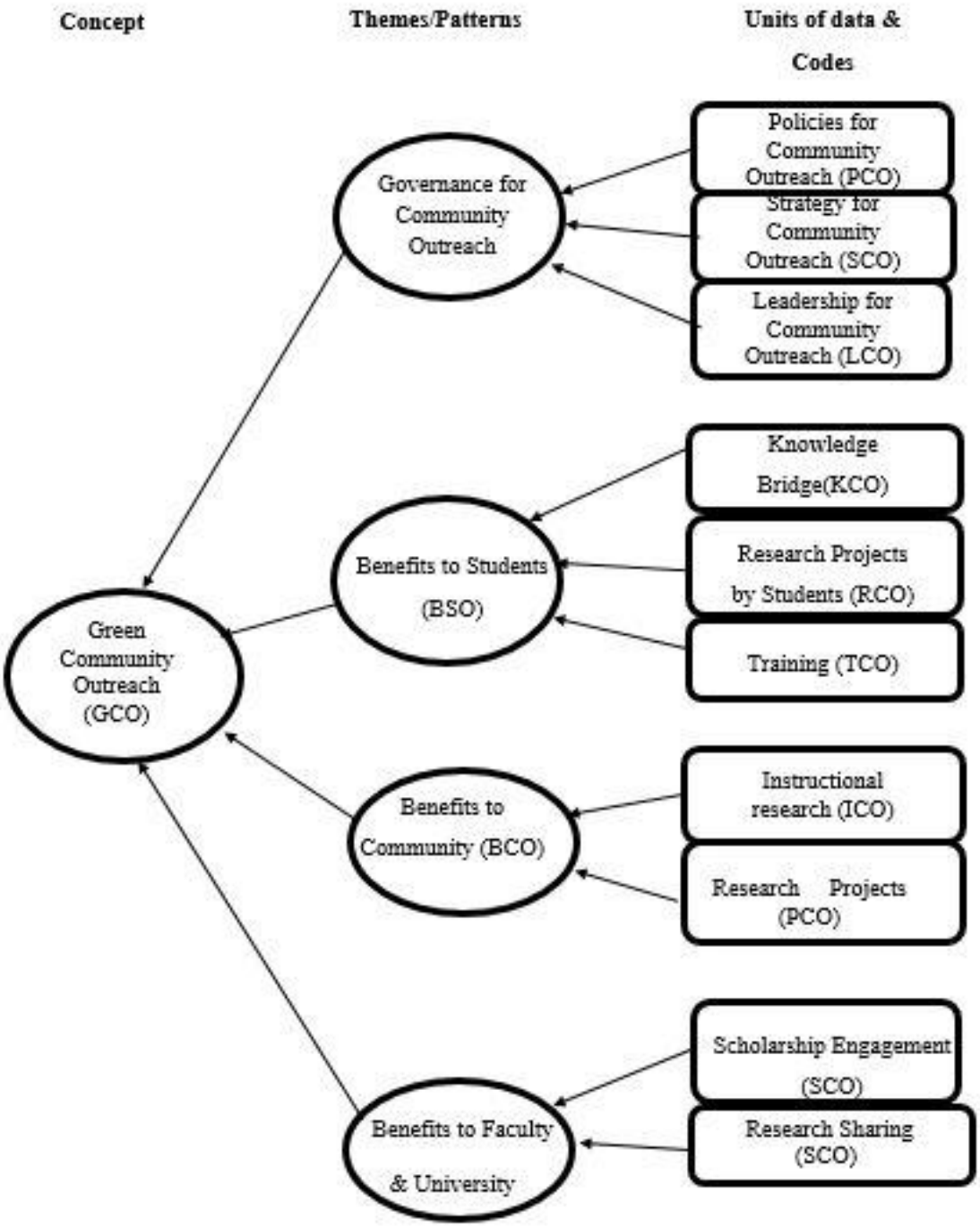

Source: Author

## 4.3(vi) Green Community Outreach: **Axial Coding Thematic Analysis**

Green Community Outreach is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Green Community Outreach. Figure 19 describes the units of data, themes, and concepts. Three units of data and their codes, 'Policies for Green Community Outreach,' 'Structure & Strategy for Green Community Outreach,' and 'Leadership for Community Outreach,' create a category called Governance for Green Community Outreach. Three units of data and their codes, 'Knowledge Bridge,' 'Research Projects by Students', and 'Training,' create a category called 'Benefits to Students by Community Outreach.' Two data units and their codes, 'Instructional research,' 'Research Projects,' create a category called 'Benefits to Community.' Two data units and their codes, 'Scholarship Engagement' and 'Research Sharing,' create a category called 'Benefits to Faculty and University. The four categories mentioned above create a concept called 'Green Community Outreach.'

**Research Question:** How does the element of community outreach of a university contribute to greening a university?

Figure 19: Thematic Analysis-Green Community Outreach




Source: Author

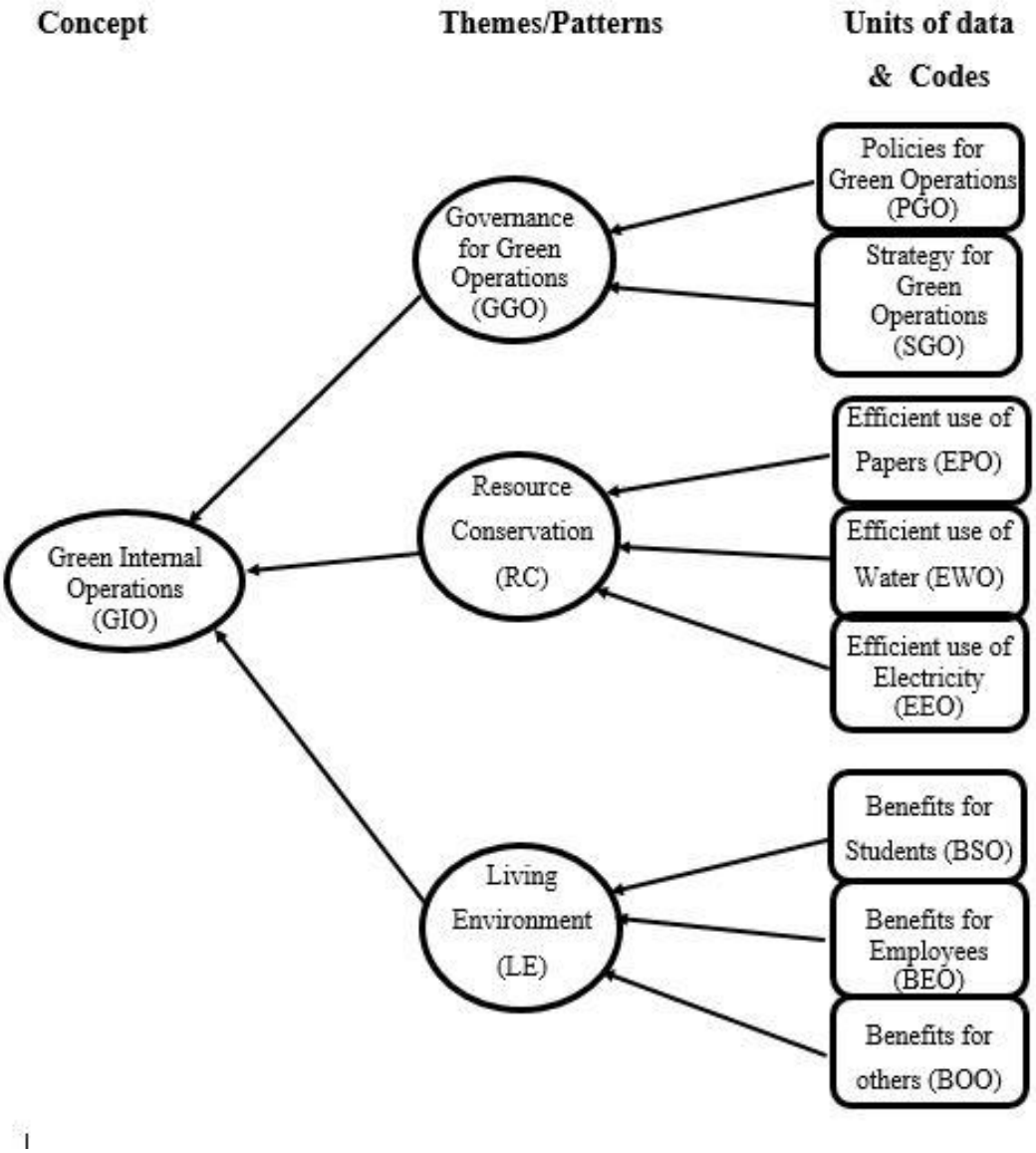
## 4.3(vii) Green Internal Operations: **Axial Coding Thematic Analysis**

Green Internal Operations is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Green Internal Operations. Figure 20 describes the units of data, themes, and concepts. Two units of data and their codes, 'Policies

for Green Internal Operations,' 'Structure & Strategy for Green Internal Operations,' create a theme called governance for Green Internal Operations. Three units of data and their codes, 'Efficient use of Papers,' 'Efficient Use of Water,' 'Efficient Use of Electricity, create a theme called 'Green Resource Conservation.' Three data units and their codes, 'Benefits for Students,' 'Benefits for Employees,' 'Benefits for Others', create a theme called 'Green Living Environment.' The three categories above created a concept called 'Green Internal Operations.'

**Research Question:** How does the element of internal operations of a university contribute to greening a university?

Figure 20: Thematic Analysis-Green Internal Operations



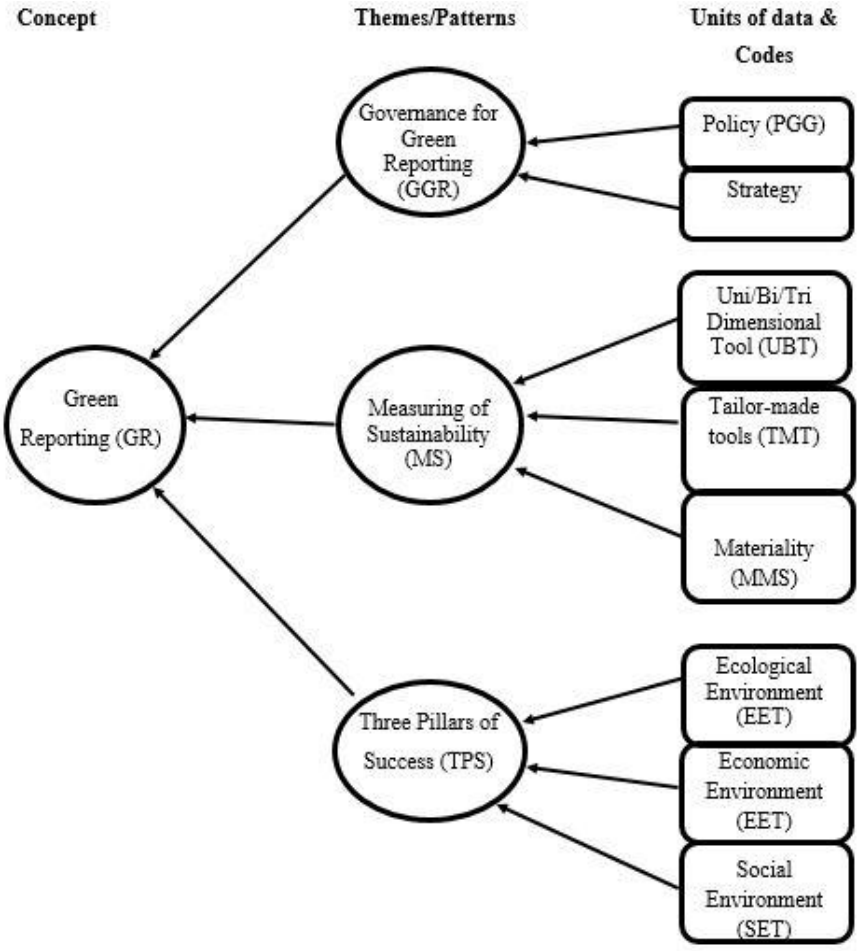

Source: Author

## 4.3(viii) Green Reporting: **Axial Coding Thematic Analysis**

Green Reporting is a knowledge cluster of the green university system. Thematic analysis of interviews transpired the essential elements of Green Reporting. Figure 21 describes the units of data, themes, and concepts. Two units of data and their codes, 'Policies for Green Reporting,' 'Structure & Strategy for Green Reporting,' create a theme called 'Governance for Green Reporting.' Three units of data and their codes, 'Uni/Bi/tri-dimensional tools,' 'Tailor-made tools,' 'Materiality for Green reporting,' create a theme called 'Measuring of Sustainability.' Three data units and their codes, 'Ecological Environment,' 'Economic Environment,' 'Social Environment,' create a category called 'Three Pillars of Sustainability. The three categories mentioned above created a concept called 'Green Reporting.'

**Research Question:** How does the element of Reporting of a university contribute to greening a university?

Figure 21: Thematic Analysis-Green Reporting




Source: Author

To sum up,

After analyzing secondary data by document analysis in the first stage of data analysis, the primary data collected from semi-structured interviews were analyzed to corroborate, contradict, and discover units of data/codes, themes/patterns, and concepts developed with secondary data.

After that, the thematic process above depicted data items developed from interviews. When data items identified by analyzing transcripts provide similar meanings, they were coded with the same code. When a data item gives a new meaning, then a new code was assigned. This process was carried out for triangulation. The process ultimately produces eight concepts: Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education/Curriculum, Green Research, Green Internal Operations, Green Community Outreach, and Green Reporting. These eight concepts create a Green University pattern, enabling the production of knowledge and innovation expected by the Quintuple Helix Model of Innovation for sustainable development as an open knowledge and innovation system.

## 4.4 Chapter Summary

Qualitative data was collected from documents and interviews. Data collected by documents was first analyzed. The process of qualitative data collected from documents began with sorting documents under each research question. After that, data units that give a particular meaning were identified as open coding using Vivo codes. Then, the relationships among the open coding were identified for axial coding. Axial coding enabled generating categories. Finally, the relationships among the categories were used to generate concepts.

Tables 06 to 14 depict open coding, axial coding, and concepts derived from them. For example, Table 6 is the axial coding, which generated the concept called Green Corporate Governance. The table depicts how open codes created three categories, Structure & Strategy, Leadership, and accountability. These three categories created the concept called Green Corporate Governance. Accordingly, nine concepts were derived by axial coding carried out by eight tables. They are Green Corporate Governance, Green Corporate Culture, Three Pillars

of Sustainability, Green Education/Curriculum, Green Research, Green Community Outreach, Green Internal Operations, Green Reporting, and Integration.

After carrying out axial coding with document analysis, data collected from interviews was thematically analyzed. Since axial coding document analysis enabled developing labels during the analysis, they were used as priori codes when preparing transcripts for coding data collected from interviews. A Qualitative Data Analysis package called QDA Miner Lite was used to analyze the interview transcripts.

Besides, though interview data is qualitative, they can be transformed into quantitative data for drawing conclusions. The transformation involves turning words or images into numbers. The transformation process consists of several stages. First, qualitative data was organized under each group. After that, all data was carefully read and ascertained the existence of themes of categories under which frequencies were counted (Appendix 6).

Once codes have been finalized, themes were identified. The related themes were used to create nine concepts. They are Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education/Curriculum, Green Research, Green Community Outreach, Green Internal Operations, Green Reporting, and Integration. Accordingly, Figures 14 to 21 depict the axial coding thematic analysis of interview data. This process became a triangulation of findings of document analysis.

# Chapter 5: Discussion

## 5.1 Introduction

The Brundtland Commission (1987) defined sustainable development as a "Development that meets the needs of the present generation without compromising future generations' ability to meet their needs." The definition is revisited by Visser (2010:48) and refined as "A value-laden umbrella concept about how the interface between the environment and society is managed to ensure that human needs are met without destroying the life-supporting ecosystem on which we depend on."

The phrase 'value-laden umbrella' in the definition invokes the voluntary contribution of each country, society, organization, and every individual to protect the ecological system. They must carry out their activities sustainable to keep the world's further habitable limit of safety (pre-industrial levels mark the limit of safety). The limit of safety for the habitable ecosystem is below $2^0$C of warming by keeping the atmospheric carbon concentration below 450 parts per million (ppm) from the present level of 410 parts per million (ppm) because the current atmospheric carbon concentration level alert that no sooner the critical tipping point would be reached before which an immediate commitment for sustainable development is necessitated.

The necessity of the immediate commitment is evident by the UN's December climate change conference in Bali, Indonesia. The Secretary-General Ban Ki-moon declared a planetary emergency that. "The situation is so desperately serious that any delay could push us to pass the tipping point, beyond which the ecological, financial, and human costs would increase dramatically. We are at a crossroads. One path leads to a comprehensive climate change agreement, the other to oblivion. The choice is clear" (Spiegel, 2007, as cited in Wheeler, 2008).

In this value-laden mission assigned to carry on developmental activities with sustainable practices by every economy, society, organization, and individual, there is a vital role to play by everyone in this global issue. Universities as leaders, models, and catalysts in education and innovations, address global issues by fostering them within current and future generations (Clarke & Kouri, 2009; Moore, 2005). Hence, they should lead by example in promoting sustainable development practices at universities (Amaral et al., 2015).

## 5.2 Working definition for Green University (RQ-01)

The first research question is to define a green university as a working definition. Velazquez et al.'s (2006) widely adopted definition is perused in search of the working definition. They define the sustainable university as ‘‘A higher educational institution, as a whole or as a part, is one that addresses, involves and promotes, on a regional or a global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable lifestyles.’’

This definition reflects that sustainability prevails in a socioeconomic and environmental relationship. It addresses metaphors of three pillars of sustainability, Economic environment, Social environment, and Ecological environment. Economic sustainability refers to carrying on business activities with a long-term vision without compromising the ecological environment and social environment. For example, energy and resource conservation. Social sustainability refers to fair and beneficial business practices, including teaching and research promoting sustainability among students, staff, and the community at large. Finally, environmental sustainability refers to the university's sustainability practices protecting the ecological environment, including the internal environment that is degraded when consuming energy, water, and other resources in their classrooms, library, canteen, offices, auditoriums, playgrounds, and vehicles.

These three pillars are called the triple bottom line (three pillars of sustainability). In other words, three Ps as well, namely, Profit, People, and Planet. Elkington (1997) introduced the term triple bottom line to measure performance by adding three bottom lines. The first bottom line is the measure of the traditional profit and loss account. The second bottom line is the people's account of the corporate citizen, in other words, social equity. Finally, the third bottom line is the planet account of the corporate citizen.

The green university meant in this study goes beyond the above definition in many respects. One of them is the main objective of the green university. The main objective of the green university is settled here as the production of green knowledge and innovations needed for sustainable development mandated by the 2030 Agenda for 17 SDGs, the Paris Climate

Agreement, and Nationally Determined Contribution. Further, Nine Ecological Boundaries, Doughnut Economics, and the Quintuple Helix Model of Innovation. Another aspect is that the above definition does not indicate the mechanism used to produce green knowledge and innovation. In other words, green knowledge and innovation cannot be produced in the absence of green corporate governance and green corporate culture.

The third missing point of the above definition is that it does not define to which extent the university should produce green knowledge and innovation. It is because the mere sustainability practices by teaching, research, the university's ecological environment, and community outreach with an appropriate balance of environmental, economic, and social sustainability are not necessarily adequate. Instead, the university's sustainability practices should be sufficient to contribute fairly to global sustainability, which is depicted by the author's altered model from the model originally developed by Cartwright and Craig (2006) more fully shown in Figure 5.

Hence, the working definition is settled as follows. "Green university is a university which is governed with a green corporate culture for the production of green knowledge and innovation by way of green education/curriculum, green research, green community outreach, and the green internal environment with the necessary balance of three pillars of sustainability to fairly contribute for global sustainable development."

The above working definition refers to green corporate governance by the structure, strategy, and leadership, green corporate culture, three pillars of sustainability, green education/curriculum, green research, green community outreach, green internal operations, green reporting by measuring the fair contribution for global sustainability. Further, the working definition has been empirically satisfied after analyzing qualitative data collected from the documents and the interviews more fully discussed later.

## 5.3 Existing Structure of Universities in Botswana (RQ-02)

The second research question is to evaluate if universities' existing structure in Botswana enables the production of green knowledge and innovation. The respondents replied that the existing structure of universities is "traditional, "not modern," "sustainability is not a regulatory requirement," "green is still a very new idea." These responses reflect that the existing structure,

strategy, and leadership are conventional despite respondents stating that there are various projects such as renewable energy with solar power, cow dung, recycling of waste material, and water conservation.

The proposition was further strengthened when the author attended a three-day research conference and presented a research paper entitled "A purposeful design for a green university in Knowledge-Based Economies." The paper has attracted the conference audience. The researcher was nicknamed Greenman. It created the opportunity to discuss the status quo of structure, strategy, and leadership of universities needed for the transformation. The conference participants believe that it is a need of the hour to produce green knowledge and innovation.

One of the questions was what elements are required to green the existing universities when interviewing stakeholders, professors, senior lecturers, academic managers, non-academic managers, and students. Their responses referred to green corporate governance, green corporate culture, three pillars of sustainability, green education/curriculum, green research, green community outreach, green internal operations, and green reporting. The participants responded that all those eight elements needed to be integrated with the universities' conventional structure.

## 5.4 Essential Elements of a Green University (RQ-03)

The third research question is to assess the essential elements of a green university. Green University is a system that enables green knowledge and innovation. The rationale of the green university is to produce green knowledge and innovation needed for sustainable development. According to the systems theory, every system is made of subsystems. Each subsystem has its rationale congruent with the rationale of the main system. Accordingly, the following discussion based on interviews is dealt with appraising the essential elements of green university.

### 5.4(i) Requisite 01: Green Corporate Governance

King IV: Code of Corporate Governance, Southern Africa (Institute of Directors Southern Africa, 2016) provides that the corporate citizen is an integral part of the society and environment, and it is licensed to operate with an inclusive stakeholder approach (Institute of Directors Southern Africa, 2016). It further provides that the governing body of a corporation must recon all

stakeholders' legitimate and reasonable needs, interests, and expectations when executing its duties. The inclusivity approach meant by the Code of Corporate governance refers to the natural environment and society. Therefore, the integration of sustainability can achieve it into the corporate strategy supported by a conducive governance structure.

Doppelt (2010:96) elaborates that "changes in governance structures and processes can provide much greater overall leverage for transformation to sustainability than the implementation of specific sustainability initiatives." However, the ad-hoc recycling of water or minimization of wastage is also an essential initiative for sustainability but not effective levers to contribute to global sustainability fairly.

Accordingly, a corporation's structure, strategy, and leadership are significant elements for a green corporate governance system. Mintzberg (1987) argues that structure, which could be built, refers to a notion that recognizes an organization's patterns and relationships. If formally or informally defined, the structure has two essential attributes: the line of authority and communication. The structure supports the strategy. Kavale (2012) points out that the strategy is a collection of actions and decisions taken by the strategic management to achieve long-term goals and objectives.

There are many processes of the organization to be aligned for achieving the strategy. Galpin et al. (2015) point out that the organization's multi-process, vision, mission, values, strategies, goals, objectives, and human resource value chain should be aligned for sustainability. Leadership enables the provision of structure, strategy, and processes for a sustainable organization (Klettner et al., 2014). In this regard, transformative change in the organization is required. Purcell et al. (2019) argue that both top-down and bottom-up leadership approaches are effective.

Hence, a university's structure, strategy, and leadership indicate how a university's governing body consisting of rules, regulations, policies, procedures, processes, and practices for greening a university enables creating green knowledge and innovation. Hence, three research questions were framed, embracing the idea of Green Corporate Governance. In responding to them, one of the interviewees responded that "I think it is an effective tool for governance of a green university."

The first question was about the nature and extent of the system of rules, regulations, procedures, processes, and practices for greening a university. Next, the respondents expressed the importance of various policies related to their experiences, such as vision, mission, goals, objectives, strategy, and environmental policies. Many expressed that the structure, strategy, and policies enable playing a significant role in transforming a traditional university into a sustainable university. For example, a participant responded that the “Management Council must champion greening the university by setting up structures and policy to support this initiative.”

The second open-ended research question was directed to ascertain leadership's role in transforming a conventional university into a green university. One of the responses stated that "It is impossible to green a university without the participation of top management." Another responded that "University management is the key enabler in implementing the green university by redesigning organizational structure." Some respondents expressed the accountability of corporate citizens in terms of King Report IV: Code of Corporate governance. Their responses are of the view that strategic management is accountable to the stakeholders for why they are not green before long. For example, in response, one participant said that “(green corporate governance is) very important for the university's survival and society. It is not an option anymore.”

In a nutshell, these responses were meant for the strategic management's accountability in aligning structure, strategy, and leadership for greening a university. Cartwright and Craig (2006) recommended Johnson and Scholes' (2003) ethical stance 4: Multiple Stakeholders and Shaper of Society as the proactive ethical stance by which a corporation enables contributing fairly to global sustainability. They further developed a model with seven pathways for aligning corporate governance with global sustainability that would operate to contribute to global sustainability.

The model depicts that Pathway 1: Compliance alignment process required by the regulations of the government policy is unable to contribute to sustainability beyond the threshold because the compliance alignment is restricted by the ethical stances 1 and 2 by the weaknesses of government and the ability of the organization to internalize the negative externalities by the taxes and prices. Pathway 2: Responsiveness alignment process by the leadership induced by government policy is also rather complimentary but not central in achieving global

sustainability beyond the threshold. Pathway 3: Ethical investors' responsiveness alignment process does not necessarily go beyond the threshold, but with public awareness and concern, they are amenable to change. Pathway 4: Responsiveness alignment process by shareholder awareness and concern is crucial for going beyond the threshold because of mainstream influence, but the process is slow because of reactionary behavior despite ethical investors' influence.

Pathway 5: Responsiveness alignment process by customer views on responsible consumption puts pressure on governance to meet customers' sustainability needs. Path 6: Responsiveness alignment process by NGOs' influence enables communication with the governance about public awareness and concern relating to sustainability. Pathway 7: Leadership alignment process by personal director/manager awareness control is the most crucial pathway to achieving global sustainability beyond the threshold because the commitment to sustainability in governance arises not by compliance or responsiveness but by the conviction for doing the right thing sustainability. In this respect, the Companies Act of the United Kingdom by its section 172 empowers the board of directors to act in the community's interests and the environment as stakeholders under the enlightened stakeholder theory.

The third open-ended research question was focused on the leadership approach for greening a university. The responses transpired three types of responses, top-down approach, bottom-up approach, and both approaches together. The transformation of a conventional university to a sustainable university is a change in the organization. 44% of interviewees responded that the top-down approach is the most appropriate leadership approach for change management towards greening a university. Among the responses, one of the interviewees said, "Management councils must champion greening university by setting up structures and policy to support this initiative." Another response disclosed that "Leadership is important because if they value the concept, they can unlock funds for greening university." Another respondent preferred the top-down approach because "Top-down approach, where decisions can be made quickly and can be implemented fast." Beer's Theory E, Economic –Top-down approach (2001) argues that a change in an organization is a matter to be dealt with changing formal structures and systems, which deliberate actions of management can achieve. Hence, a change from the present state to the desired state can be achieved by implementing strategic management by way of aligning the structures and systems for the desired change.

39% of the respondents preferred a bottom-up approach for greening a university. One of the responses was that the "Bottom to top approach encourages staff buy-in." Another response was that "to start the management can do it as a bottom to top approach for giving ownership to the staff and switch to a top to bottom approach if they are not much responsive." Another interviewee responded that ownership is the key component". Beer's Theory O, Organization capability (2001) argues that a change in an organization naturally arises without pre-planning and programs by the organization's high committed culture by which the bottom is motivated to be involved in change when a change is emergent.

17% of the respondents advocate combining both strategies, the top-down approach and the bottom-up approach. One of the responses in this respect was that a "Mixed approach would be powerful because some of the governance should start from the top to bottom and others are vice versa." It is corroborated by a respondent stating that "Both approaches are required in different situations in a university." Beer (2001) argues that both theories are valid for achieving a necessary change in the organization trading off the benefits and negative consequences of both theories considering the presence of literature and industrial practices. He further elaborates that even though two approaches could be used for trading off between these two theories, he prefers to implement theory E, Economic value, which could be followed by theory O, Organizational capability. Otherwise, both theories' simultaneous implementation is also possible even though it would be more difficult (Kim et al., 2014).

Accordingly, it was empirically found out that the top to bottom approach is the most appropriate leadership approach which could be used to transform a conventional university into a sustainable/green university because the said approach enables introducing a system of governance that consists of rules, regulations, procedures, processes, and practices for greening a university. Such a system must make necessary changes in the university's conventional governance structure and the strategy required for greening a university.

To sum up, empirically, a university's conventional governance aspect must be reconfigured by topping up a green corporate governance structure, green strategy, and green leadership to transform into a green university.

## 5.4(ii) Requisite 02: Green Corporate Culture

Universities are also organizations in society. They operate in a culture created by the people involved there. Schein (2004:17) defines organizational culture as “the patterns of shared basic assumptions learned by the organization as it solves its problems of external adaptations and internal integration that has worked well enough to be considered valid, and therefore to be taught to new members as the correct way to perceive, think, and feel concerning those problems." According to Schein (2004), there are three organizational culture levels, assumptions, values and beliefs, and artifacts.

These shared assumptions that are deeply integrated and embedded in the organization reflect them by people's behavior in the organization. According to Schein (2004), people in the organization resolve the problems and develop values and beliefs when they have resolved problems successfully. If the resolution of problems is not successful and reflected by disputes, the culture's underlying values and beliefs are passive, ineffective, or negative. It results in preventing from achieving its goals and objectives effectively and efficiently. The culture of such an organization is reflected as a weak organizational culture. On the other hand, if the values and beliefs are positive, the organization can efficiently and effectively achieve its goals and objectives. The culture of such an organization is reflected as a strong organizational culture.

Accordingly, Organizational culture is part and parcel of the organization in achieving the goals and objectives of the organization. Unless there is a strong culture in the organization, an organizational change is required for making a strong culture for sustainability. Diverse innovations for making a strong culture for sustainability are also necessary. It is because all organizational changes do not involve innovations, but every innovation involves a change in the organization (King, 1990). In other words, there cannot be innovations in an organization without a change in that organization. The change in the organization means having an influential organizational culture congruent to achieving the organization's goals and objectives by the external adaptation and internal integration for innovations, which is meant in this study as a transformative change for greening a university.

The transformation of a traditional university into a sustainable university is an innovative paradigm shift. Hence, changing the organizational culture from weaker organizational green

corporate culture to influential organizational green corporate culture is also a requisite of a sustainable university.

Hence, the first open-ended research question concerning corporate culture was directed to ascertain what type of culture is required for greening a university. When summarizing the responses, it was uncovered that the respondents advocate that pro sustainability culture is needed. One of the responses states that "The University should implement the culture of environmental responsibility among stakeholders." Another interviewee responded that "The value systems should be instilled among the staff and students." Another response was that "a green corporate culture that teaches and appreciates the benefits of sustainability." In the same vein, another stated that "It is the values and beliefs that can drive the initiatives of greening the university."

The sustainability culture should be developed at the university with pro-sustainability behavior from all university stakeholders. The values and beliefs of all university stakeholders should be conducive to the university's sustainability. Employees and students play a significant role in this respect. The pro-sustainability behavior from employees (Brio et al., 2008; Harris & Crane, 2000; Renwick et al., 2008 as cited in Levy & Marans, 2012) and students are required fostered by a comprehensive plan (Jabbour, 2010). One of the respondents articulates that "An inclusive and positive organizational culture of sustainability is necessary." For example, green education/curriculum, Green research, Green ecological operations, and Community outreach could implement positive values and beliefs for behavior and psychology related to sustainability. Another response was that "Team orientation culture" is necessary. Culture teams enable playing a significant role in fostering positive values and beliefs required for pro-sustainability behavior by focusing on three areas, education and training for university community members, engagement and assessment, and monitoring (Levy & Marans, 2012).

Accordingly, it was found that green corporate culture with the necessary values and belief system enables the creation of pro sustainability behavior required for greening a university. Furthermore, these sustainability values operate at the stakeholders' sub-conscious levels by which the university's stakeholders' behavior would reflect.

The second research question related to the green corporate culture was about how the culture could be communicated. The summarized responses articulated that the values and beliefs for

sustainability culture should be communicated to the stakeholders through policy documents such as vision, mission, and value statements required for greening university. One of the responses stated that "sustainability values and beliefs should be communicated across the university." According to Schein (2004), the assumptions, values and beliefs of (green) culture are deeply embedded in the organization. They become non-negotiable, unconscious, and taken for granted. A sustainability culture can be described as "one in which organizational members hold shared assumptions and beliefs about the importance of balancing economic efficiency, social equity, and environmental accountability" (Soini & Dessein, 2016). A pro-sustainability culture with necessary changes in the organization for internalizing sustainable assumptions, values is imperative for transforming from unsustainable university to sustainability; otherwise, the institution is likely to fail (Mzangwa, 2019).

The third level of culture can communicate the organization's shared meanings, external physical manifestations such as vision, mission, goals, objectives, value statement, policies, procedures and physical buildings, various decorations, and dress codes. Symbols that are a part of artifacts are also used to communicate assumptions, values and beliefs (Dutton & Dukerich, 1991). The organization's people can sense symbols to make meanings for shared assumptions, values and beliefs of the organizational culture. Universities abundantly use the display of vision, mission, value statements, quality policy in this respect. Another tool used to communicate assumptions, values, and beliefs is the rites, rituals, and ceremonies such as graduation ceremony, annual price giving ceremony for creating social consensus (Islam & Zyphur, 2009).

Schein (2004) elaborates that if the culture's assumptions, values, and beliefs become non-negotiable, the organization members find slight variation within the organization. Therefore, they cannot change behavior in any other premise other than the behavior taken for granted. Accordingly, conventional universities whose underlying assumptions are to produce knowledge and innovation for knowledge do not change their behavior to produce green knowledge and innovation without green corporate culture.

The artifacts such as myths and ceremonies are the symbols of organizational culture (Schein, 2004), and they act conventionally, resisting embracing new social phenomena, sustainable universities. Meyer and Rowan (1977; Zucker, 1977) and later contributions by DiMaggio & Powel (1983; Scott, 1987) elaborated the nature and extent of the structural elements of

rationalized organizations that the organizational structures and practices are myths and ceremony adopted by organizations not because of they are effective and efficient, but because they give a sheen of legitimacy to those organizations (Alvesson & Spicer, 2019).

The legitimacy can be expounded as a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs, and definitions (Ginzel et al., 1992; Neilsen & Rao, 1987; Perrow, 1970, as cited in Suchman, 1995). In this sense, universities have just started receiving a sheen of the legitimacy of the institutional logic of the Quintuple Helix Model of Innovation (2010), the 2030 agenda for 17 SDGs (2015), and the Paris Climate Agreement (2015). However, green knowledge and innovation are still somewhat alien to universities in Botswana. These are reflected by cultural symbols of universities such as vision, mission, value statements, rites, rituals, and ceremonies such as annual prize giving, which do not adequately address green knowledge and innovation production. Norms that are mainly constructed informally for common consensus among groups of people for their typical behavior reflect people's desire to belong to the community or group (Yamin et al., 2019). They have not been adequately developed for seeking green knowledge and innovation. Also, the negative cases of interviews further corroborate them. One of the respondents believed that “students are not supposed to conduct green research through community outreach.” Another participant replied that “pedagogy could not accommodate green education, whereas extra-curricular activities are enough for the university's greening aspect.”

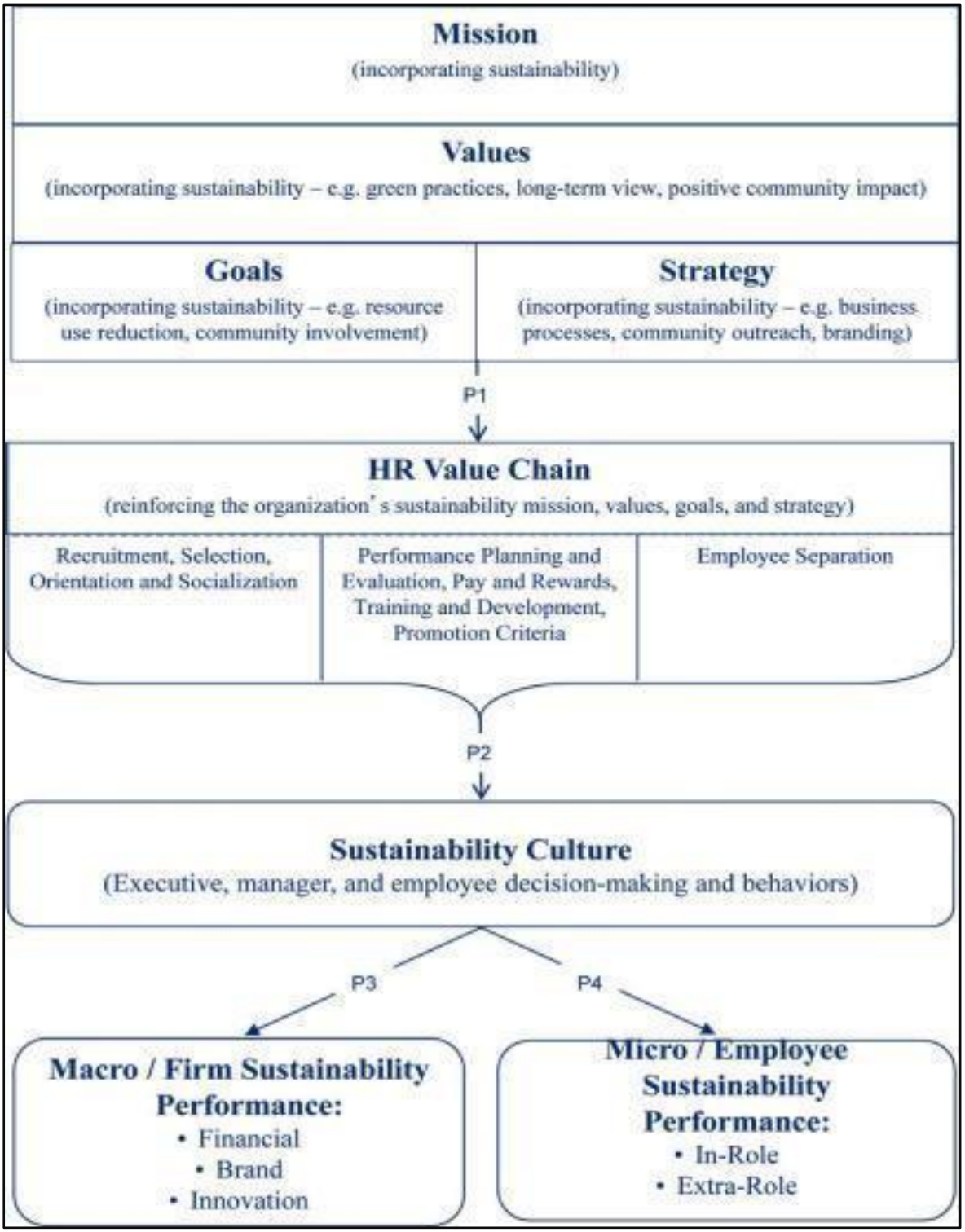
Another finding was that sustainable values and beliefs should be included in the university's various processes, such as Human Resources, Marketing, Finance, and Operations. Respondents expressed their views that sustainability values and beliefs are not adequately strong among the university's diverse communities. In other words, shared assumptions about sustainability among the university community are not explicit for creating green knowledge and innovation even though there are various ad hoc sustainability initiatives such as water conservation, recycling of waste material, energy efficiency projects. The experience is that students, employees, and academics do not push for sustainability. Many sustainability initiatives focus on environmental sustainability projects pulled by higher levels of management.

The values and belief systems are not adequate in all three pillars of sustainability. Therefore, the respondents advocate green corporate culture needs to be part and parcel of the university's governance system. One of the respondents said that the "Culture should be commensurate with the governance" aspect of the university. These respondents' views are commensurate with the increasing recognition of culture as the fourth pillar of sustainability (Sabatini, 2019). Participants were conversant about the need for a sustainability culture. The terminologies such as values and beliefs, assumptions, artifacts were frequently uttered during the interviews. However, they were not conversant with the terminologies such as symbols and rituals of the culture.

These findings that the universities enable producing green knowledge and innovation for future leaders provided that they have to undergo significant changes of the culture for pro-sustainability behavior is imperative (Adams et al., 2018). The necessary changes for creating a pro-sustainability behavior are required in the vision, mission, goals, objectives, rules, regulations, policies, and processes of the university's structure, strategy, and leadership.

These findings agree with the model developed by Galpin et al. (2015) for creating a culture for sustainability depicted in Figure 22 below. They argue that their model is superior to previous studies because it incorporates multiple organizational processes instead of previous studies that contemplated a single-stage, single discipline, and a single level of diverse sustainability perspectives. They further claim that their model is currently in practice and can be used as a blueprint for creating a sustainable culture by practitioners as best practices. This claim is substantiated in this study, and further, the model is developed in narrative synthesis (Rumrill & Fitzgerald, 2001) and empirical literature.

**Figure 22: Culture of Sustainability Model**




Source: Galpin et al. (2015)

The above model developed by Galpin et al. (2015) is summarized below.

**Mission**

The mission statement is instrumental in developing an organizational culture that plays the balancing role of the organization to the market and the society (Castello & Lozano, 2009; Lee et al., 2010; Mark-Ungericht & Weiskopf, 2007; Quinn & Dalton, 2009, as cited in Galpin et al., 2015). It was revealed and further supported by the analysis of documents that some universities already incorporated contents required for the conservation of resource culture, economic sustainability. However, there are two critical aspects needed to be discussed. One of them is that the above experiences reflect that limited application of sustainability practices cannot unlock the full potential of sustainability. What is required is to include necessary guidance in the mission statement to apply three pillars of sustainability. The other aspect is that the necessary incorporation of the culture of sustainability in the mission statement is not necessarily enough. However, substantive sustainability actions are required to avoid the organization being subject to outsiders' accusations as a greenwashing or marketing strategy.

**Values**

The mission should be underpinned by moral principles and beliefs or accepted standards of the university. It should disclose the values such as trust, reciprocity, creativity, restraints, compassion, and independence, which are intrinsic to culture and sustainable development in its country. Thaman (2002) argues that the sustainable development values seem to be higher if the values and goals of development are closer to the nation's community's values for whom sustainable development is meant. In agreement with the said view, Eagan et al. (2002) point out that those firms need to understand the influence of national culture on sustainable development in that country. Therefore, cultural topics and approaches should be included in the university curriculum.

**Goals**

It is required to formulate organizational goals to achieve a sustainable mission underpinned by organizational values. Such goal setting is vital in many aspects. First, it is a tool used to shape employees' performance (Locke & Latham, 2012) and all management levels (Smith & Locke, 1990). Second, it provides criteria for measuring the performance also (Ransom & Lober, 1999).

**Sustainability Strategy**

It is required to integrate an organization's sustainability practices into its strategy, goals, values, and mission to provide long-term value to the organization, society, and the planet. It is important because the link between the strategy and performance for sustainability is founded (Beard & Dess, 1981; Lee et al., 2010). Porter and Kramer (2006) point out that each organization should clearly identify societal issues to be well addressed to enable the organization to get the best competitive advantage. In support, it was observed that the universities are comfortable including renewable energy projects, resource conservation, and recycling projects in their strategies and gained considerable success by executing them. Respondents are also aware of them and responded, among other things, that "A culture of conservation resources and shunning the use of non-degradable products on campus should be adopted."

**Reinforcement of Sustainability**

Having set the direction for the organization's sustainability by mission, values, goals, and strategy, it must integrate sustainability practices into its human resource practices. The human resource processes of the organization by recruitment, selection, and socialization of employees should be aligned with the organization's strategy and core values. The role of Human Resource is to recruit employees who are fitting with the values and belief system of the organization because such employees are committed to the organization (Myatt, 2013). Dessler (1999) argues that integrating employees with the organization's mission and values begins even before hiring the employees. After hiring, there are many human resource practices to integrate the employees with its mission and values. These practices include incentive pay, information sharing, empowerment, and skill development (Pfeffer, 2005) and include separation from the process and even from the organization due to underperformance. However, the separation should be made ethical and just (Dessler, 1999) so that the separation should indicate to the remaining employees that the separation is based on the organization’s values.

**Culture of Sustainability: Employee Outcomes**

The involvement of all employees (and students) in the sustainability goals of the organization is imperative. The employer should design their job descriptions for employees (and curriculum for students) to embrace the organization's sustainability goals as part of their regular job expectations. The performance of sustainability by the employees should be monitored regularly. The employees' behavioral changes for reducing their carbon footprint while averting

the consumption of water, energy, and conservation of material used in their day-to-day life should be detected. Such performance should be evaluated for recognition and reward. The reinforcement of values for sustainability should be made where necessary. A regular manager to coordinate employees' sustainability approach and behavior and the accountability with the strategic management should be appointed.

**Culture of Sustainability: Organizational Outcome**

The organization's sustainability practices could be integrated not only for employees' performance but also for the organization's financial performance and brand image. Such a culture of sustainability provides many benefits to the organization. Among them, sustainability practices could improve the financial performance of the organization. Galpin et al. (2015) report that an organization's sustainability practices could increase profits by 38%. Eccles et al. (2012) point out that organizations with sustainable practices outperform their competitors in the long run regarding stock market prices and financial performance. In addition, sustainability practices improve brand image. The organization enables finding niches and new markets created by sustainability-driven consumers.

Accordingly, it was found that the sustainability values and beliefs should be incorporated into the policy documents such as vision, mission, value statement, goals, objectives, and strategy statement. Further, they should be embedded in the university's core processors, such as human resources, marketing, finance, and operations. Schein (2010) argues that an organization's culture can be incorporated by a top-down approach, namely, by the diligent efforts of strategic management, which should be complemented by down to top.

## 5.4(iii) Requisite 03: Three Pillars of Sustainability

Sustainability as a system, there are two critical views to understand sustainability as a system. Ott (2003) proposed one view that argues three subsystems: economy, human society, and the ecosystem. The ecosystem is the largest system within which the human system resides. The economic system is the smallest subsystem, and it resides inside the human system. Accordingly, these three systems can be illustrated as three concentric circles where the economic system is inside the human system, which is inside the ecosystem. Thus, the expansion of the economic system contracts the area of the human system, and an expansion of the human system contracts the area of the ecosystem.

The second view is popularly known as the three pillars of sustainability expressed by the World Summit United Nations General Assembly (2005). This view is depicted by a Venn diagram consisting of three concentric circles for environmental sustainability, economic sustainability, and social sustainability overlapping with each other towards the center. The overlapping with each other denotes that these three pillars are not mutually exclusive.

The common feature of both views is that sustainability is a systemic condition (Weisser, 2017) referred to as the Three Pillars of Sustainability. These systemic interactions cause global warming, which is the product of systemic interactions (Smith, 2011), and sustainable development issues are articulated as the 2030 Agenda for 17 SDGs. However, the most acceptable view of sustainability is the three pillars of sustainability.

The three pillars of sustainability demand reconciliation among environmental, economic, and social demands (World Summit United Nations General Assembly, 2005). In agreement with the three pillars of sustainability, Larson et al. (2013) point out that these three pillars' interdisciplinary nature must have sustainability practices with a tradeoff among the three pillars: environment, economy, and society (Mischen et al., 2019).

Gallardo-Vazquez and Folgado-Fernandez (2020) point out that the university's role is integrated not only with education but also with the societal demand for creating pro sustainability values based on three pillars of sustainability. The production of green knowledge and innovation connected with the three pillars of sustainability is already in place among some universities (Conner et al., 2018).

Hence, the first research question administered was about the importance of the three pillars of sustainability. The respondents were aware of three pillars, but their answers were short and sweet among many interviewees. Some respondents are conversant with the theme. In general, respondents of the view that all three pillars are essential when greening a university. One of the responses was that "All these aspects have to be considered. We cannot focus on one aspect in isolation." Another responded that "it is obvious to always focus on the environmental, social, and economic sustainability." Accordingly, it was found that all three sustainability pillars are to be considered when greening a university.

The second research question was directed at interviewees about how these three pillars could be managed. The respondents believe that sustainable practices should fall into ecological/environmental sustainability, economic sustainability, and social sustainability with a necessary tradeoff. Many responses clearly articulated the importance of trading off among the three pillars. One of the responses was stated that "All three aspects towards a better and effective workable environment are needed to operate holistically as one aspect neglected affects the other." Sustainable practices by way of green education/curriculum, green research, green campus, and community outreach should include all three pillars with necessary trading off among them in the university context.

However, many sustainable practices, in this research 12%, focus only on environmental or eco-efficiency (Fonseca et al., 2011; Lozano, 2006) while neglecting the social (Murphy, 2012; White, 2020) and the cultural aspect of sustainability (Wright, 2010). An example from Tsinghua university offers 235 green courses, out of which the engineering-related departments offer 185 courses and the non-engineering departments offer only 50 courses. Zhao and Zou (2015) point out that there can be a bias towards environmental sustainability. They further argue that a holistic sustainability practice among the environment, economy, and society is required in a green university.

The social pillar of sustainability relates to the concept of equity, which means all citizens should have equal opportunity for clean water, education, clean energy, employment, shelter, clean air, and no hunger despite their diversity (Murphy, 2012). The participants in this research also provide evidence for the same. However, only 3% of the participants believe that only the social pillar, and 7% believe that it is only the economic pillar that should be focused on sustainability practices at universities.

On the other hand, 82% of the participants believe that universities should focus on all three pillars. Some participants gave examples from their universities. For example, one of the universities under the study had sustainability practices concerning social, economic, and environmental sustainability. Social sustainability relates to the donation of books to libraries of schools. The projects such as the production of renewable energy and water conservation projects are economic sustainability projects. However, renewable energy projects are related to environmental sustainability as well. The environmental sustainability projects relate to the

awareness campaign to stop using single-use plastic such as plastic bags, plastic straws, plastic bottles/beverage containers, cups for beverages, plates, food containers, packets, and wrappers.

Another critical aspect that was transpired from the responses was that a green university must consider local, regional, and global sustainability issues (Vekic et al., 2020). 20% of the respondents believe that the universities should focus only on local and regional issues of sustainability. 21% of the participants thought that the universities should focus only on global issues of sustainability. On the other hand, 59% believe that the universities should engage with all local, regional, and global sustainability issues. In support, one of the respondents elaborated that "greening a university is a fragile process unless local, regional and global issues are taken into consideration because they have a direct impact on a green university." Hence, it was found that when reconciliation among economic, social, and natural environments, it is required to consider local, regional, and global sustainability issues.

In discussing three pillars of sustainability and necessary trading off among them, a conducive governance structure is an element of the three pillars subsystem. Hence, some scholars argue that governance is the fourth pillar of sustainability (Ali-Toudert & Ji, 2017; Huang et al., 2015; Mischen et al., 2019). It is the element that enables sharing the resources for achieving the objectives of the three pillars (Mischen et al., 2019). Hence, public policy and institutional policy are required to embed sustainability objectives related to the three pillars of sustainability (Clune & Zehnder, 2018).

Another aspect of the three pillars of sustainability is the culture with the necessary values and beliefs for pro sustainability behavior. Therefore, some scholars argue that the culture of sustainability is the fourth pillar of sustainability (Ribeiro et al., 2016; Sabatini, 2019). For example, Conner et al. (2018) argue that university sustainability culture enables students to create green knowledge and innovation, which results in sharing their green knowledge and tools with society after their university lifetime. They further elaborate on how their university has created a sustainability culture by introducing various sustainability projects such as composting, banning the sale of plastic water bottles, and offering sustainability education for all undergraduates to develop their knowledge and skills in the three pillars of sustainability.

### 5.4(iv) Requisite 04: Green Education

There is a stream of international appeals from the higher education and universities to green education during the last five decades, such as The UNESCO's MAB (Man and the Biosphere) program in 1962; Club of Rome Report in 1971; Belgrade Charter in 1975; Tbilisi Intergovernmental conferences in 1977; International Meeting of Experts in Environmental Education of Paris in 1982; Moscow Conference in 1987; The World Conference on Environment and Development in Rio De Janeiro first time proposed Education for Sustainable Development (ESD) in 1992. Another landmark is the declaration of 2005 to 2014, the UN Decade of Education for Sustainable Development (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2005). The recent endorsement in 2012 by the UN Conference on Sustainable Development confirmed the leadership role of higher education in ESD. In strengthening the ESD, one of the 2030 Agenda for 17 SDGs of 2015 has been dedicated to SDG 04: Quality Education.

Green education refers to Education for Sustainable Development (ESD), which is referred to as educational programs designed to internalize knowledge, skills, and values needed to shape a sustainable future (UNESCO, 1992). Higgins and Thomas (2016) point out that the essential aspect of the pedagogy related to ESD is that they enable experiencing the material and values. Lozano et al. (2017) list sustainability competencies such as systems thinking, interdisciplinary work, anticipatory thinking, justice, responsibility, critical thinking, analytical work, interpersonal relationships and collaboration, empathy and change of perspectives, communication and use of media, strategic thinking, personal engagement, assessment and evaluations, tolerance for ambiguity, uncertainty, and ethics.

ESD develops environmental and ethical awareness among people and internalizes values and attitudes relating to sustainable development (Biasutti & Frate, 2017). In the same vein, Abu-Alruz et al. (2018) point out that education as the fourth pillar of sustainability enables creating knowledge, skills, and attitudes. Tziganuk and Gliedt (2017) point out that education for sustainable development can be made successful at universities by governance structure through vision, mission, and other policies and strategies (Velazquez et al., 2006). Green education/curriculum and extracurricular activities can be used to integrate green education into undergraduate and graduate education, and green education should include social, economic, and environmental sustainability (Zhao & Zou, 2015).

Sady et al. (2019) point out that curriculum and extra curriculum can develop sustainability competencies. Savelyeva and McKenna (2011) point out that university-wide sustainability culture enables the influence of education for sustainable development. University leadership is another vital element of education for sustainable development (Corcoran et al., 2004; Cortese, 2003). Filho et al. (2015) point out that universities are change agents for promoting sustainability through green education. However, Wood et al. (2016) argue that there is less progress for greening the ivory towers even though there is progress in greening tertiary curricular and pedagogy. Hence, they point out that it is required to reorient teaching, learning, research, and community outreach, making sustainability an emergent property.

In strengthening the request, Universities started playing a vital role in education. Zhao and Zou (2015) cited several case studies conducted by many researchers regarding universities worldwide, such as Brown University, University of Florida, Harvard University, University of Lunenburg, University of Waterloo, Mexican universities, Massey University, and Kenyan Public University, which have already implemented ESD. Another encouraging step for education for sustainability is the Talloires declaration. It was made by University Leaders for Sustainable Future (ULSF) in 1990 between twenty-two universities to foster sustainability has been able to get 432 universities in over 40 countries representing five continents, low, middle-income countries, high middle-income countries including large, small, public, private colleges, and universities (ULSF, 2015).

Green education is the most conversant research question among all the respondents. The first research question was focused on the necessity of teaching green knowledge and skills. The summarized responses transpired that the curriculum should be green so that green knowledge and skills can be internalized. These responses transpired much justification for green education. One of the justifications is that the students who are taught green education are ethical. One respondent said that "green education would make the students better citizens in the future global arena."

Another response was that "The university should focus its efforts on improving a green environment with society and improving the economy." Another aspect that transpired from the responses was that green knowledge and skills are essential for their present and future employment. For example. Tilbury (2012) pointed out the importance of greening the curriculum for architects, engineers, and other graduates. Sustainability values should be taught

in their disciplines to carry out their professional activities, fostering sustainability. This aspect is supported here by a response that "Green education is very critical. Students need lifelong knowledge and skills required for now and future employment." However, in this mission, the factors such as complex structure, conventional disciplinary boundaries, ineffective governance, and the absence of shared vision at the universities face difficulties in achieving sustainability goals (Pollock et al., 2009).

The third aspect that transpired is about the timing of teaching knowledge and skills. One of the responses is that "green education should be a part of the curriculum as early as the first year." Another respondent said that "green knowledge should be taught everywhere in the curriculum." Accordingly, it was found that a green education/curriculum can be used to internalize the green knowledge and skills among students. Green knowledge and skills can be taught as early as their first year and wherever possible in the curriculum. Such green knowledge is essential for their current and future employment opportunities.

The following research question relating to green education is about non-pedagogical activities for teaching green knowledge and skills. All the respondents answered positively though some could not further elaborate. Some respondents were very conversant with non-pedagogical activities, which can be used for teaching green knowledge and skills to students. For example, one of the respondents gave a list of non-pedagogical activities such as guest lecturers, social and environmental activities from the local community, and Non-Governmental Organizations (NGOs). Another responded that "Non-credit basis courses can also contribute to creating green knowledge and skills." Another response stated that "non-pedagogical activities are informal, and both the students and staff can learn mutually." Hence, it is found that non-pedagogical activities can also be used for transferring green knowledge and skills among students.

The finding is that the pedagogical and non-pedagogical activities are instrumental in transferring green knowledge and skills are illustrated by Zhao and Zou (2015). They point out that there are three essential areas of green education at a university: a green education/curriculum, a green student internship, and a green educational environment. They further elaborate that the green education/curriculum is the major component of education for sustainability, which can internalize their environmental protection awareness.

At the inception, the fundamental scientific understanding and sustainable development can be taught mandatorily for all undergraduate students until diverse, sustainable-related curriculum is gradually designed depending on the importance of such education over time (Zhao & Zou, 2015). In this regard, few compulsory modules and few optional modules can be introduced by a pedagogical innovation to disseminate common knowledge to cultivate a typical intellectual conversation across all the academic departments to foster sustainable issues.

Almost all faculties can introduce various types of special sustainable development programs for in-depth knowledge. Faculties like Engineering could take leadership to offer specialized programs for education for sustainability. Apart from pedagogical innovations for education for sustainable development, the policy documents should demand non-pedagogical activities such as guest lecturers, activities, and projects involving students, faculties, communities, and other university stakeholders.

### 5.4(v) Requisite 05: Green Research

University is a critical component of the knowledge society, and research is one of the university's primary tools to enhance the country’s prosperity (Dill, 1997; Henkel, 2007; Mendivil, 2002). Sustainability research, which is a branch of academic research, is another dimension of a sustainable university. Having given two examples that by 2050, there is a possibility to displace 150 to 200 million people and 30% of all species may be extinct, Kronlid and Ohman (2013) point out that the environmental, ethical issues on the continuum of anthropocentrism and bio/ecocentrism are significantly crucial for sustainability research which facilitate to understand complex moral dilemmas faced by new generations of both north and south.

Publishing of sustainability research is essential not only for ascertaining the progress and challenges of the role of the university for educating the present and future generations for sustainability, but also such publications drive sustainability practices to be carried out with action research in the university (Bessant et al., 2015) and the intrinsic value discourse under anthropocentrism and non-anthropocentrism (Stenmark, 2002).

The first research question relating to green research was directed to ascertain the importance of green research by the faculties. The respondents are of the view that a part of faculty research should be dealt with green research. One of the responses articulates that "Research promotes

a knowledge-driven economy, they improve a green economy. Therefore, it is necessary to invest in green research by faculties for achieving a green economy". Another response was that "green research is a vital aspect of growth in any university." Another respondent suggested that "green research is necessary for faculty to have a green research department for various green developmental issues."

Sustainability is an integrative science that integrates across all disciplines (van Kerkhoff, 2014). Today's research problems are so complex that they increasingly demand interdisciplinary and transdisciplinary research, three pillars of sustainability, focusing on regional and global effects (Tappeiner et al., 2007). However, a few universities have holistically integrated the three pillars of sustainability with the necessary tradeoff (Menon & Suresh, 2020). Since sustainability embraces the characteristics of multidisciplinary, interdisciplinary, and transdisciplinary (Draggan 2007; Kates & Dasgupta, 2007; Komiyama & Takeuchi 2006; Loorbach 2007; Martens 2006; National Research Council 1999; Palmer et al. 2007; Perrings 2007; Rapport 2007, as cited in Kajikawa, 2008), several domains are available for the sustainable researchers.

Kajikawa (2008), who carried out contents analysis of 35 research papers published in three core journals of sustainability during 2006 and 2007, developed inductively "ten domains of sustainability-related research: climate, biodiversity, agriculture, fishery, forestry, energy and resources, water, economic development, health, and lifestyles." What is required is to overtly mention the terms of sustainability research domains in the relevant policy documents. For example, it was evident in a university strategic plan that identifies water (Liyanage & Vishwanathan, 2020) and energy as two strategically essential domains for the country and university. Otherwise, faculties and students from various backgrounds may research more conventional and rewarded research in their home disciplines rather than contributing to sustainability research. Hence, it was found that a part of the research of the faculties should be dealt with green research, and the domains of sustainability research could be provided by policy documents where necessary.

The second research question focused on green research to be carried out by students. The respondents believe that green research conducted by students is essential not only to improve their knowledge and skills but also to contribute to community sustainability. In support,

another response was that if students are aware of green knowledge or they are educated for green research, their knowledge and skills will be developed. Gupta and Singhal (2017) support the view mentioned above, stating that incorporating sustainability into the curriculum creates green knowledge through research, which will make students' pro-sustainability behavior towards green lifestyle, such as cycling, resource conservation, and use of public transport. Further, Dmochowski et al. (2016) point out that both the students and the faculty appreciate each other for engaging research between them.

The integration of green education and green research into the curriculum of universities is important because the motive of universities by their current policy documents and their action plan is to prepare their students for the business world rather than contributing to creating a sustainable society (Clugston & Calder, 1999; Savage et al., 2015). They further pointed out that environmental education and research enable students to develop their academic skills to contribute to a sustainable society.

In the meantime, students' green research emerges as an essential area of developing their knowledge and skills. For example, students' sustainability research at a university is also a criterion considered by many sustainability assessments tools (Fonseca et al., 2011; Lozano, 2011; Vallaeys, 2006, as cited in Jorge et al., 2016). Further, Dallaire et al. (2018) believe that students receive the first-time opportunity for interdisciplinary collaboration across faculties, which results in hands-on problem-solving experiences. However, universities face many challenges. One of them is a financial commitment, and the other challenge is to get the students involved. Leadership from top to bottom to integrate sustainability research at different university levels is also essential (Sammalisto et al., 2015). Accordingly, it was found that the students' green research is also vital to improve their knowledge and skills and contribute positively to the community's sustainability issues.

The collaborative research integrating university and the natural environment with the economic system, media-based, and culture-based public and political system enables producing green knowledge and innovation necessary for the Knowledge-Based Economy (Carayannis & Campbell, 2010). However, there are challenges such as inadequate infrastructure, limited funding, and delay in delivering support services in Africa.

On the other hand, the basic research carried out by universities represents a linear innovation model of research in line with mode 01. However, it means that there is a delay in applying basic research and their R & D with the technology life cycle. Hence, what is required for KBE is a non-linear innovation model that goes with Mode 2 and Mode 3. Mode 2 is characterized by applying basic research and their R&D without delay, transdisciplinary, heterogeneity, organizational diversity, social accountability, and quality control (Gibbons et al., 1994, pp 3-4). In addition, mode 2 operates with the Triple Helix Model of Innovation as trilateral networks, university, industry, government relations (Etzkowitz & Leydesdorff 2000, pp 118, 111-112).

Mode 3 is a multilateral network by adding media-based and culture-based public and civil society (Carayannis & Campbell, 2009). With the engagement of society, Mode 3 becomes high-quality democratic knowledge. Mode 3 was further strengthened later by the Quintuple Helix Model of Innovation by adding the natural environment as the fifth helix (Carayannis & Campbell, 2010). The Mode 3 with Quintuple Helix Model of Innovation is an alternative way of escaping Schumpeter's creative destruction (Carayannis et al., 2007).

Hence, it is recommended to create knowledge with research in terms of Mode 3 and the Quintuple Helix Model of Innovation. The green knowledge produced by research, together with other modes of knowledge, knowledge created by the university, by the industry, by the state/government, and media-based, and the culture-based public enjoy the democracy of knowledge-driven by the pluralism of knowledge. These knowledge modes co-exist, co-evolve, and co-specialize with cross integration (Carayannis & Campbell, 2009). Another critical aspect of the knowledge is the levels of knowledge that can be categorized from least to the highest aggregation of knowledge as local, subnational, national, supranational, transnational, and global knowledge. Since sustainability is a global issue that should be addressed locally, green knowledge is termed Glocal (Global local) knowledge (Carayannis et al., 2012).

Hence, a university's research system must be designed according to the Quintuple Helix Model of Innovation for creating green knowledge and innovation in line with at least mode 02 or mode 03. Mode 3 green research system contains linear green research of Mode 1, Non-linear green research of mode 2, non-linear research of mode 3, Quintuple Helix Model of Innovation, Basic Research, Applied Research, Research & Development, and Technology Life Cycle.

### 5.4(vi) Requisite 06: Community Outreach

The university and the students cannot be further treated as mere members of the global society. They should play the role of active contributors to the broader social, economic, and ecological environment on which all beings are dependent. The timely need for community engagement by the universities is now becoming a necessity more than ever. Hogner and Kenworthy (2010) pointed out that the universities can no longer exist as ivory towers of higher education, which dominated the 20$^{th}$-century university educational environment because of the present age. A need has arisen to engage with the community at multiple levels. It is because both the university and the community could learn reciprocally (Levac et al., 2018).

Hence, the first research question administered was intended to ascertain the importance of universities' interaction with the community. The interviewees are of the view that community outreach is another important aspect of a green university. They recognized the role of the university in many ways. One of the responses was that "The University should play a key role." Another responded that "It is a part of the university mandate." Another response was that "The community is a vital stakeholder." Further, respondents elaborated that community outreach is important because it "Share ideas and ownership"; "The interaction will help universities to solve community problems"; "It empowers the community to attain a sustainable world." Hence, it was found that green community outreach is also another essential aspect of greening a university.

The need of the Community Outreach, in other words, the partnership between the community and university, is well described by Boyer (1996:32) that "The scholarship of engagement which means connecting the rich resources of the university to our most pressing social, civic, and ethical problems, to our children, to our schools, to our teachers, and our cities." In ratifying the view mentioned above, Kisker (2007:289) points out that "Collaboration has become pivotal in ensuring quality post-secondary education." Along the same vein, Florence et al. (2007) pointed out that universities, students, and communities significantly value and positively embrace university-community collaboration. Further, Gomez (2014) points out that community outreach is a way of discharging University Social Responsibility.

The second research question was expected to ascertain the role of students and faculties in community outreach. They responded that both students and the faculties should engage with the community for sustainable development projects and research. A respondent expressed that

"Both students and the faculty need to contribute to sustainability issues in the community." Other respondents said that "University can play an important role in educating the community about sustainability." Further, another response was that "Universities with the help of both students and staff can outreach the community for mutual benefits. The community can also have solutions to the issues and more minds and more hands." Another response was that "Students and faculties should consider it as they give back to the community." Steiner (2017) argues that faculty enables using curricula as a research model that complements the community outreach for sustainability issues. In the same vein, Lopez (2013) argues that pedagogical innovations could be designed to strengthen the students' participation across the university community and the extended community so that the scientific knowledge of the university could be connected to the local issues to global sustainable development (Allen-Gil et al., 2005).

However, the collaborative partnerships between the universities and communities have a long history with aesthetic, economic, and infrastructural developments Service-learning, robust to the collaboration, is the rationality for both the students and the university. It has been included in universities' curriculum for more than 100 years (Hogner & Kenworthy, 2010). They further asserted that service-learning is now applied across many disciplines, from Accounting to Zoology in countries worldwide.

On the other hand, such collaboration is vital to address social problems (Zlotnikova & van der Weide, 2015). de Hooge and van Dam (2019) point out that students' community engagement can provide benefits to both parties. Students receive training, and the community gets access to resources, experiences, and the expert knowledge of the faculty, but universities are alleged that they are unaware, dated, or disorganized to address those social problems (Kellogg Commission, 1999) constructively. In agreement with the allegation, Bringle and Hatcher (2002: 503-504) commented that some universities' outreach programs think of "communities as pockets of needs, laboratories for experimentations, or passive recipients of expertise." However, creating an effective university-community partnership is challenging, even though it is an integral part of community-based service-learning. Laninga et al. (2011) propose a better community and university collaboration model as a balanced dialogue that places the project within the context of ethics, economics, and political realities. Jacoby (2003) argues that both parties of the collaboration, university, and community should work for common interests, responsibilities, privileges, and power to achieve synergies.

To effectively contribute to sustainable development, Vaughter et al. (2016), who studied 50 universities, point out that the university's governance for necessary policy, strategy, and leadership play an instrumental role in sustainable community outreach. They further found that most of the policies, strategies, and leadership of those universities focus on the Brundtland Commission's sustainable development policies and the three pillars of sustainability. Lynch-Alexander (2017) indicates that the universities must recognize the relationship between policy and strategic planning for a new scholarship through community outreach (Bieler & McKenzie, 2017). Hussain et al. (2019) express that the organizational changes in governance are essential to reshape the organizational dynamics for community outreach. However, in the absence of a systematic/standard approach, many universities use bottom-up leadership strategies rather than both top-down and bottom-up leadership approaches for community outreach to sustainability (Shawe et al., 2019; Too & Bajracharya, 2015). Conner et al. (2018) express that universities' sustainability efforts are of marketing nature or greenwash rather than creating a sustainability culture that focuses on a holistic and nuanced understanding of sustainability issues.

Accordingly, it is found that both the faculties and the students should reach the community and engage with the community for sustainability research and projects for mutual benefits. In this respect, organizational change is required in the areas of structure, strategy, and leadership.

### 5.4(vii) Requisite 07: Green Internal Operations/Green Campus

Universities operate in an internal ecological environment. Its operations in the internal environment have a direct impact on the ecology. The campus's internal ecology for operations contains lands, buildings, vehicles, office equipment, furniture and fittings, Tools, and other resources that are consumed during the operations, such as water, electricity, air, and stationery. These resources have a significant impact on the ecology. For example, Sharp (2002) citing Green Building Design Workshop at University of Michigan stated buildings globally consume twenty-five percent of the global wood harvest, forty percent of the material entering the global economy, thirty-five percent of the total energy consumption, twenty-five percent of the landfill space, three billion tons of raw materials, generation of fifty percent of the global greenhouse gases, and agents of acid rains. In the same vein, Richardson and Lynes (2007) point out that green buildings that reduce cost by energy efficiency, water conservation, downsizing mechanical equipment, provide a better indoor working environment increase the quality of life.

Accordingly, universities also make greenhouse gas emissions by their operations, and therefore they are also contributors to global environmental issues. On the other hand, it is best practice to have sustainable practices to reduce greenhouse gas emissions in their internal environment for setting an example for their students and other stakeholders. Zhao and Zou (2015) point out that a green campus creates a natural environment to make them aware of sustainable development in their day-to-day lifestyle. In support, Lidstone et al. (2015) argue that campus sustainability is supposed to focus not only on classroom learning but also on all the aspects of university life, including internal operations.

Tiyarattanachai and Hollmann (2016) point out that stakeholders of a green campus perceive a better quality of life than the stakeholders of a non-green campus. Campus sustainability/ green internal environment is more familiar with universities' stakeholders because of the availability of various types of projects. Most of them are environmental and economic sustainability projects such as renewable energy (Liyanage et al., 2020), water conservation projects (Liyanage & Vishwanathan, 2020) and recycling projects.

One of the strategies used in this regard is eco-efficiency by conservation of resources shrinking their carbon emissions. The efficiency of carbon emission mitigation in their operations could be assessed in several ways. Ecological auditing, environmental impact reports, and ecological footprint are the assessment tool out of which ecological footprint is a good measure of the university's carbon emission. The ecological footprint is explained as an aggregate measure representing the amount of biologically productive land and water area required to provide resources consumed and assimilate waste produced by a given entity (Wackernagel & Rees, 1996 as cited in Conway et al., 2008).

The ecological footprint can be measured by the energy consumption concerning buildings, land area, food and water consumption, waste production, the total number of students or staff. Several universities have already completed their ecological footprint. Conway et al. (2008) provided a list of such universities with citation as follows, Holme Lacy College, UK (Dawe et al., 2004), University of Wales (Griffiths, 2002), University of Newcastle, AU (Flint, 2001), the University of Redlands, USA (Venetoulis, 2001), East Anglia, UK (Griffiths, 2002), and Oxford Brookes, UK (Chambers et al., 2000).

Hence, the first research question administered was about making the internal operation of the university green. The respondents believed that there is a direct impact from the operations of the university on the environment. Therefore, it is required to make the university's internal environment green. One of the responses stated, "Making the university green's internal environment is a brilliant way to reduce pollution, excess use of scarce resources." Another respondent said that "I believe all aspects that directly contribute to the development of a sustainable university should be considered." According to these responses, it was found that a green internal ecological environment by way of renewable energy, energy efficiency, resource conservation, and green building is also an essential aspect of greening a university. In support, Rebelatto et al. (2019) point out that energy efficiency and renewable energy, which are used in greening the internal operations of the university, directly relate the SDG 07: Affordable and Clean Energy.

The second research question was about the impact of living in a sustainable environment for stakeholders, such as students, faculty, and employees. The respondents believed that a green internal environment positively impacts all stakeholders, including students, faculty, and employees. Among the responses, one of the responses was that "A living sustainable internal environment will have a greater impact." Another replied that "It will impact various stakeholders to varying levels depending on their relationship with the internal environment." Another said, "There is a direct correlation between how the internal environment works and its effect on the stakeholders looking at behavior, performance, and delivery." In support, McFarland et al. (2008) elaborate that students who use campus green areas perceive that there is a positive impact on their quality of life. In addition, de Villiers et al. (2014) point out that the trees on the campus, which sequestrate CO2, enable the offset of the CO2 emission, which would arise by the university's operation.

However, some of the participants did not assertively endorse the importance of the sustainable internal operation. In this respect, Noor et al. (2019) argue that unawareness of environmental education is a barrier to implement a green campus. In the same vein, Sima et al. (2019) express that greening the campus can be encouraged by increasing the awareness of sustainable development education. They further argue that leadership and necessary structural changes enable encouraging greening universities. Ngadiman et al. (2017) indicate that the university's governance by formulating necessary policies, structure, and leadership has to play a significant role in greening a university. Rwelamila and Purushottam (2015) argue that

university strategy should incorporate strategies for greening universities to achieve the university's green goals and objectives.

### 5.4(viii) Requisite 08: Sustainability Reporting

A university that sets goals and objectives for a sustainable university performs sustainable practices relating to diverse, sustainable principles. Measuring and reporting sustainable practices is vital to ascertain the progress of the goals and objectives set in the sustainable university's strategic plan and comparison with benchmarking universities. Without measuring sustainable practices, the university cannot comprehend if it proceeds towards the direction guided by its strategic plan and generally accepted sustainability standards.

Hence, the first research question was posed to ascertain measuring and reporting the progress of the university's sustainability practices. All respondents responded that sustainability reporting is essential. Their assertive responses were that "it should be monitored to know the progress"; "it should be compulsory"; "If you cannot measure, you cannot control it"; "To see the progress being realized that needs to be measured and the report generated." The respondents further expressed the way of reporting as triple bottom line reporting. They further expressed the challenges of measuring and reporting sustainability practices. Accordingly, it was found that the measurement and reporting of sustainable practices are another requisite of a sustainable university even though the measurement is a complex and challenging process for a university and especially for the early stages of a sustainable university (Gomez, 2014).

There are many tools available for a sustainable university for the measurement of the progress of sustainability. For examples, Alghamdi et al. (2017), who reviewed 12 indicators, listed many reviews of indicators carried out by many other scholars, namely, review of 11 tools by Shriberg (2002), review of 12 tools by Cole (2003), review of 3 tools by Alshuwaikhat and Abubakar (2008), review of 4 tools by Kamal and Asmuss (2013), and review of 8 tools by Gomez (2014). These reviews provide various pros and cons of those indicators, allowing them to identify the most relevant measurement for the university and even tailor-made them, as necessary.

However, almost all the respondents were unaware of specific tools that can be used for the purpose. Therefore, in choosing a tool for measuring and reporting sustainable practices, the tool's approach is essential for a university, depending on its strategic direction. The approaches

used by the tools fall into one of three types, namely, account assessments, narrative assessments, and indicator-based assessments.

Account assessments quantify the university's sustainable practices into monetary values such as saving energy as a percentage and the Payback period of investment in sustainable initiatives. Even though these assessments valid for financial strategy, these assessments do not represent the sustainable university's main perspectives (Dalal-Clayton & Bass, 2002:133). Narrative assessments use texts, maps, graphics, and data specific to the university's sustainable practices. These assessments may use indicators also but not dependent specifically on indicators. The major criticism against the narrative assessment is that these assessments lack transparency and consistency, and therefore less helpful in decision making and strategy making (Alghamdi et al., 2017).

Seres et al. (2019) elaborate that the indicator-based assessment tools are three types: unidimensional, bidimensional, and tridimensional indicators latter, which enable measuring all three pillars of sustainability. The most widely used sustainability assessment is indicator-based assessment tools because of their comprehensive nature and representative nature of measuring sustainability despite the diversity of indicators of the tool and various tools used for measuring sustainability (Dalal-Clayton & Bass, 2002).

There are many reasons for the popularity of an indicator-based assessment approach. Among them, the criteria of the indicators are measurable, and the results are comparable with the performance of other universities and benchmark universities (Lozano, 2006). In addition, the results measured by the indicators are helpful and straightforward for various internal and external stakeholders, including decision-makers and the public (Ramos & Pires, 2013:82). Dalal-Clayton and Bass (2002) argue that the potential for transparency, the potential for consistency, and the usefulness of decision-making from indicator-based tools are higher than the other two approaches. Their analysis is mentioned in table 15.

**Table 15: The three main approaches to measuring and analyzing sustainability.**

| Approaches | Account assessments | Narrative assessments | Indicator-based assessments |
|---|---|---|---|
| Potential for transparency | Low | Medium | High |
| Potential for consistency | High | Low | High |
| Potential for participation | Low | High | Medium |
| Usefulness for decision-making | Medium | Medium | High |

Source: Dalal-Clayton and Bass (2002:134)

Because of high transparency, high consistency, and high usefulness for decision-making attributes of indicator-based tools compared to others, indicator-based tools are widely used in universities. After considering five criteria, such as (i) Quite often mentioned tools in the literature, (ii) Specially designed for universities and widely used in universities, (iii) Easy access for information about indicators, (iv) Coverage of basic sustainability dimensions and (v) Easily measurable and comparable indicators of the tool, Alghamdi et al. (2017) listed chronologically 12 indicator-based tools used by universities below mentioned in Table 15.

**Table 16: A Summary of the 12 Selected Benchmarking Tools**

| No. | Tool | Abbreviation | Year |
|---|---|---|---|
| 1 | Sustainability Assessment Questionnaire 2001 | SAQ | 2001 |
| 2 | Graphical Assessment of Sustainability in University 2006 | GASU | 2006 |
| 3 | Sustainable University Model 2006 | SUM | 2006 |
| 4 | University Environmental Management System 2008 | UEMS | 2008 |
| 5 | Assessment Instrument for Sustainability in Higher Education 2009 | AISHE | 2009 |
| 6 | Benchmarking Indicators Questions – Alternative University Appraisal 2009 | BIQ-AUA | 2009 |
| 7 | Unit-based Sustainability Assessment Tool 2009 | USAT | 2009 |
| 8 | The Green Plan 2012 | Green Plan | 2012 |
| 9 | Sustainable Campus Assessment System 2014 | SCAS | 2014 |
| 10 | Adaptable Model for Assessing Sustainability in Higher Education 2014 | AMAS | 2014 |
| 11 | Sustainability Tracking, Assessment, and Rating System 2014 | STARS | 2014 |
| 12 | Green Matric – UI's Green Metric University Sustainability Ranking 2014 | GM | 2014 |

Source: Alghamdi et al. (2017)

The second research question was prompted to ascertain the measuring and reporting of the green corporate culture of the green university. Though the respondents expressed their views that green corporate culture should be monitored, they were skeptical of how it can be measured. Respondents said that "Monitoring the behavior is important"; "Values and beliefs are not easily measurable but noticeable." However, a common weakness of many tools used to measure sustainability performance does not measure the sustainability culture.

The values such as trustworthiness, equality, respect, and justice are emerging as the fourth pillar of sustainability (Burford et al., 2013; Clugston & Calder, 1999; Nurse, 2006; Ribeiro et al., 2016). These values and beliefs of the culture of sustainability could make necessary behavioral changes of the university community by integrating them to achieve the goals and objectives of the sustainable university. Therefore, assessing the university community's behavioral changes by pro-sustainability value-based indicators at universities that help understand their integrity with the university's sustainable practices is relevant (Ribeiro et al., 2016).

However, Levy and Marans (2012) point out that even though universities have published several sustainability reports with selected indicators, none of them had given due attention to cultural issues. Finally, Sassen and Azizi (2018) elaborate on the reason behind the issue, stating that sustainability reporting assesses environmental sustainability and does not adequately measure social and economic sustainability because sustainability reporting is still at its early stages (Fonseca et al., 2011). Nevertheless, the respondents in this study believed that measuring green corporate culture is vital in green universities.

Accordingly, there is complexity and challenges in measuring and reporting the sustainability practices of the university. In the presence of many tools for measuring sustainability practices, Lubinger et al. (2019) argue that universities encounter what should be disclosed or not. They further argue that the concept of stakeholder materiality introduced by Global Reporting Initiatives (GRI) could guide the relevant reporting aspect that it is required to report what the stakeholders regard as material in their decision making (Diouf & Boiral, 2017). Furthermore, Puroila et al. (2016) express that the concept of stakeholder materiality enables the guide to report relevant and credible disclosures of sustainability practices. Accordingly, materiality and stakeholder engagement are closely related to each other.

In other words, stakeholder engagement is a process that is used to align all the stakeholders to a clear purpose for achieving the agreed goals and objectives of the organization (AccountAbility, 2015), which is a fundamental premise in sustainability reporting. Therefore, it is required to identify stakeholders' interests and set the organization's goals to be implemented and assessed.

Cavicchi and Vagnoni (2018) point out that university governance by its vision, goals, and objectives is critical for sustainability practices and reporting. Kräusche and Pilz (2018) indicate that sustainability goals should be set as a prerequisite of sustainability reporting so that the reporting structure could be self-explanatory. The university's strategic planning for sustainability can be focused on assessment tools (Shriberg, 2002). Leadership is another critical aspect of sustainability reporting. Cartwright and Craig (2006) argue that a board of directors/governing council is required for accountability of greening the university to the rest of the board or governing council of the university, followed by the board of directors/governing body's accountability to stakeholders.

However, universities face internal and external challenges for reporting aspects of sustainability. Universities, which are isomorphic institutions, are not coercive to report in the absence of legitimacy (DiMaggio & Powel, 1983:150) unless other universities have a sustainability reporting culture (Klubmann et al., 2019). It refers to the general acceptance of activities within a given social entity's values and beliefs.

Conventional universities that act to create knowledge conventionally are skeptical of sustainability as a legitimate function. Universities that understood that the traditional creation of knowledge and innovation at risk in the absence of sustainability have reformulated their legitimacy and strategized to align with sustainability and its reporting (Ntim et al., 2017).

### 5.4(ix) Requisite 09: Integration

Figures 14-21 uncover that there are eight essential elements of a green university. They are green corporate governance, green corporate culture, three pillars of sustainability, green education/curriculum, green research, green internal operations, green community outreach, and green reporting. These eight essential elements of the green university are required to be integrated for the very purpose of the green university, production of green knowledge, and innovation to contribute fairly to global sustainability. Consequently, the administered research question queried if all those eight elements are essential for greening a university or leaving any of them when greening a university.

89% of respondents replied that all those eight essential elements are required to be integrated. Many said "yes" or "all are very important." Some elaborated why the integration of all eight essential elements is essential. Those replies are as follows. "All elements on or the other way

contribute to green universities," “All elements are interlinked, leaving some out may compromise the approach for greening a university," "All are critical sets, they are needed." "All are very important. Cannot be left out." When negative cases are analyzed. 11% responded that they either "do not know" or "No." Those who said "No" were not willing to explain why it is "No." One of the respondents replied as "No" stated that "a lot more is needed than just greening university to address the global issues."

## 5.5 Chapter Summary

The responses to the interview questions were mainly discussed. The Interview questions were focused on nine elements of the study. These nine elements are knowledge clusters that define the boundaries of the meta-analysis of the green university system. The first set of research questions were about green corporate governance. The summarized responses indicated that structure, strategy, and leadership are the determinants of green corporate governance. In this regard, vision, mission, goals, objectives, values, processes, procedures, strategy, and leadership must be aligned for greening universities.

The second set of research questions were about green corporate culture. Again, the responses indicated that green values, beliefs, assumptions, norms, artifacts, rituals, and symbols must be aligned for greening university.

The third set of research questions was posed to ascertain the three pillars of sustainability. The responses reflected that all three pillars, economic, social, and environmental pillars of sustainability, must be addressed with necessary trade-offs depending on the local, regional, and global sustainability contexts.

The fourth set of research questions were about Green Education. The responses reflected that sustainability knowledge, skills, and competencies could be internalized by incorporating them into the curriculum by pedagogies and non-pedagogies (extracurricular activities).

The fifth set of research questions were about green research. Again, the responses reflected that green research by faculty and students, which are linear and non-linear, should be aligned for greening universities.

The sixth set of research questions were about green internal operations/green campus. The responses revealed that resource conservation, efficient use of energy, renewable energy, and green areas create a quality of life for stakeholders.

The seventh set of research questions were about community outreach. The respondents express that community outreach is a part of university education, and community outreach by the faculty and students provides reciprocal benefits to the university and the community.

The eighth set of research questions were about green reporting. The respondents believe that green reporting is essential to measure the progress of the sustainability practices and set structure, strategy, and leadership for achieving goals and objectives of sustainable development.

The ninth set of research questions were about the integration of those eight elements administered earlier. Again, the respondents believed that all those eight elements are required to be integrated for greening a university.

# Chapter 6: Designing the Green University

## 6.1 Introduction

The discussion chapter stipulates a working definition for a green university and appraises the nine essential elements of a green university. Hence, the fourth research question, “Design a blueprint integrating the essential elements of a green university so that green university enables the production of green knowledge and innovation to contribute fairly to global sustainability,” is discussed with the systems theory.

Simon (1988), a Nobel Laureate, elaborates system design as a design by the designer who devises a series of actions to change the existing situation to a preferred situation. Accordingly, the green university system is designed here to transform unsustainable universities into sustainable universities. It is designed based on the inputs of prospective end-users of the green university, namely, stakeholders, professors, senior lecturers, academic managers, non-academic managers, undergraduates, and postgraduates. Their inputs were socially constructed into an output called a green university system. Steg et al. (2017) point out that the end-users’ inputs reflect their individual factors, social factors, and physical factors. Steg and Groot (2018) argue that those three factors provide end-users' insights for their sustainable behavior.

There are many strategies such as natural capital, Biomimicry, Cradle to Cradle, which can be used when designing a sustainable system. They enable designing goods or services. In this study, the producer is a service organization called 'Green university, which allows green knowledge and innovation. The main strategy used in this design is natural capital. Hawken et al. (1999) indicate that the term natural capital means the economic system's biosphere's value when producing goods and services. They further elaborate that a strategy to protect the biosphere while creating profit and competitiveness enables solving many environmental problems.

Lovins (2001) explains the strategic importance of natural capital, stating that there will be abundant people with scarce natural resources but not the other way around in the next industrial revolution already initiated. Daly (2005) points out that the economic system is a subsystem of the finite biosphere, which supports the economic system, and human-dominated activities have already contributed to uneconomic growth. In the same vein, Cairns (2006)

elaborates that the present human consumption is so rapid and will be further increased by the increase of population by 3 billion by 2050. Consequently, the natural system cannot replace them by which the life-supporting system of the biosphere is under stress creating a disequilibrium. It is disastrous for all beings as well as the ecosystems.

The reason behind this is because the economic system is anthropocentric, whereas the ecosystem is eco-centric. The ecosystem's ability to provide fundamental services is substantially threatened by the innovation of technology invented and knowledge developed in the latter part of the Holocene and now continuing with Anthropocene. However, sustainability ethics is eco-centric and anthropocentric in prudential anthropocentrism (Cairns, 2003a; 2003b). Hence, an ecologically based economic system can be designed to replace the current unsustainable system with a sustainable system like the green university system.

## 6.2 Systems Theory for Greening University

A university is a system. A system can be defined as "units of analysis," action, decision, or function (Easton, 1965a:15-16). Easton further argues that each subsystem can be used as a unit of analysis when the system is extensive. In this sense and for this study's aim, there are many units of analysis in a university. In other words, some subsystems can be identified as units of analysis, namely, governance, culture, education, research, internal operations, community outreach, reporting/disclosure, and integration.

There are two essential principles of a system or subsystem. One of them is the elements of the system/subsystem. For example, green corporate governance as a unit of analysis/subsystem consists of elements, such as structure, strategy, and leadership. The other principle is that there is a self-rationale for each system/subsystem. Self-rationale means the mode of operation by way of self-logic. For example, when green corporate governance is taken as a unit of analysis/cluster/subsystem, the self-rationale is the 'Responsibility for overall governance to create green knowledge and innovation.' The rationale represents the logic of the cluster. It enables holding the cluster elements for creating dynamics by self-organization and functional relationship among the cluster elements. Further, the rationale defines the border of the cluster. Furthermore, it establishes relationships with other clusters and or the environment of the system.

For example, Green Corporate Governance, designed as a knowledge cluster, is a social system. The political life of the social system determines the behavior of the system. Consequently, Easton (1965b:23-25) elaborates on how the social system can be analyzed meaningfully in four aspects: (i) There is a system (elements and self-rationale) with political life, (ii) There is an environment in which the system is embedded (iii) The system responds to internal variations of the structures and processes created by the environment and internal sources (iv) The feedback process which influences the decision-making of actors.

Accordingly, Green Corporate Governance is a system with a political life by the leadership. It is embedded with the conventional corporate governance environment. Thus, the Green Corporate Governance responds to internal variations of the structures and processes created by the environment and the internal sources. They provide the feedback process, which influences the decision-making behavior of actors for making the system dynamic. It is the same for all subsystems of the green university. In contrast, Luhmann (1988:229) argues that the fundamental elements of a system are communication but not behavior manifested by actions (Willke, 1989:24-25).

Paying attention to the theoretical differences in respect of systems discussed above, Carayannis et al. (2016) assert that a system designer could enjoy the freedom of designing if there is no self-contradiction. Hence, the university system that enables the production of green knowledge and innovation required for sustainable development is designed here without self-contradiction.

The current environment in which the conventional universities operate in KBE in Botswana is sought to produce green knowledge and innovation on a resource-based approach warranted by Botswana Vision 2036. In contrast, the market-based approach is still preferred to conventional universities in Botswana by positioning their product as distinguished and differentiated in the market. Accordingly, greening a university is a competitive advantage strategy. A competitive strategy develops attributes of the firm for setting and defending a strategic position in the market. Competitive strategy is essential for making superior value to customers and the firm.

There are two types of competitive strategies that can be used when positioning in the market. One of them is the market-based view, which focuses on being a distinctive and defensible

market position. The strategy for greening a university is instead a resource-based strategy than a market-based strategy. The resource-based strategy makes the university's resources and capabilities are distinctive when producing knowledge and innovation for its stakeholders. In the presence of institutional logic endorsed by the 2030 Agenda for 17 SDGs and the Paris Climate Agreement, the market is in a state of flux demanding a change for sustainable development. Consequently, as Makhija (2003) expresses, firms' resources are the determinants of creating value when the market condition is in flux. In other words, the strategy for greening a university is a resource-based approach when the market condition is in a state of flux created by the new institutional logic.

Wang (2014) argues that the resource-based view drives for the knowledge-based view and the capability-based view. Tiwana (2002) asserts that knowledge is the most important and valuable resource endowed with characteristics for creating a competitive advantage. Capabilities are the firm's capacity to deploy its resources, including knowledge, to achieve the firm (Amit & Shoemaker, 1993). Knowledge-based economies that rely on knowledge and innovation advocate resource-based views, thereby knowledge-based view and capability-based view.

As Davis and Meyer (1998) elaborated, the knowledge economy is a new reality because of the fast rate of change. It has blurred the demarcation between the seller and the buyer, the service and the product, and the employer and the employee. This results in knowledge and imagination are more important than physical capital (Wood, 2003). It is considered the critical factor of economic growth, which enables placing the country's economy in a competitive advantage. In this respect, universities are the key players in producing knowledge and innovations for a sustainable economy (Salem, 2014). It means that the knowledge and innovation are required to produce together with nature in collaboration with individual levels, intra-organizational level, and inter-organizational level by Quintuple Helix Model of Innovation.

On the other hand, bureaucratization, rationalism, myths and ceremonies, isomorphism, and legitimacy contribute to being a conventional university. In contrast, the agency of social actors and institutional logic created by the Paris Climate Agreement and 17 Sustainable Development Goals (SDGs) complement green universities in KBE in Botswana.

The opportunity created by the institutional logic can be exploited by the Quintuple Helix Model of Innovation because green knowledge and innovation produced by green universities enable blending with other knowledge systems, economic systems, political systems, media-based and culture-based public and civil society, and the natural environment. Even though these five helices together enable more innovations than the four helices model, Leydesdorff (2012) advises being cautious when moving beyond three environments, stating that such a model would require substantive specifications and operationalization. However, the green university system is designed to be a flexible two-plus system, which means two helices are imperative: education/ university system and natural system, but other helices that could be added for more innovation.

Such flexibility is vital to meet three criteria to be satisfied when designing a social system.

i. The system's concept should be able to convince members or actors of the society as observers to an acceptable extent.
ii. The system is useful, and its application is potential.
iii. The concept of a system is open for learning, adaptation, and further improvement. (Carayannis et al., 2016).

Such a flexible system enables the production and transfer of green knowledge and innovation, namely, conferences, publications, basic research, collaborative research, academic engagements, contract research, consulting assignments, patents, licenses, startups, and co-supervising Industrial PhDs.

## 6.3 Designing the green university.

The working definition is settled for this study. Namely, “Green university is a university which is governed with green corporate culture for production of green knowledge and innovation by way of green education/curriculum, green research, green community outreach and the green internal environment with the necessary balance of three pillars of sustainability to fairly contribute for global sustainable development." Further, the above working definition has been empirically constructed, taking into the inputs from the interviews of end-users of the university, professors, senior lecturers, academic managers, non-academic managers, and undergraduates and postgraduates.

The above working definition refers to the green university's objective to produce green knowledge and innovation to contribute fairly to global sustainability. In this respect, the definition identifies metaphorically nine essential elements of the green university, namely, green corporate governance by the structure, strategy, and leadership, green corporate culture, three pillars of sustainability, green education/curriculum, green research, green community outreach, green internal operations, green reporting by measuring the fair contribution for global sustainability and finally the integration.

Accordingly, the green university's design is founded on the working definition and thematic analysis by Figures 14 to 21, which uncovered eight imperatives as interrelated and interdependent concepts as socially constructed subsystems as a social system. Thus, it enables the production of green knowledge and innovation for sustainable development in their mainstream knowledge production process. In support, Umpleby (1997: 635) elaborates the role of the social system comparing with the natural system that the theories of natural sciences change the perceptions and interpretations of us but not the actual behavior of the natural world, whereas the theories of social sciences enable changing the actual behavior of society provided that the new theory, green university enable convincing social actors.

Based on the thematic analysis under descriptive research, Green University is designed as a system for creating and applying green knowledge and innovation under the systems theory. In this respect, the constructivist approach is used to socially construct the green university as a social system that is not naturally predetermined by being independent of the researcher. Accordingly, nine knowledge clusters, their self-rationales, and innovation networks were socially constructed, as depicted in Figures 23 to 31. They are further summarized as depicted in Table 16.

## 6.4 Knowledge Clusters of Green University

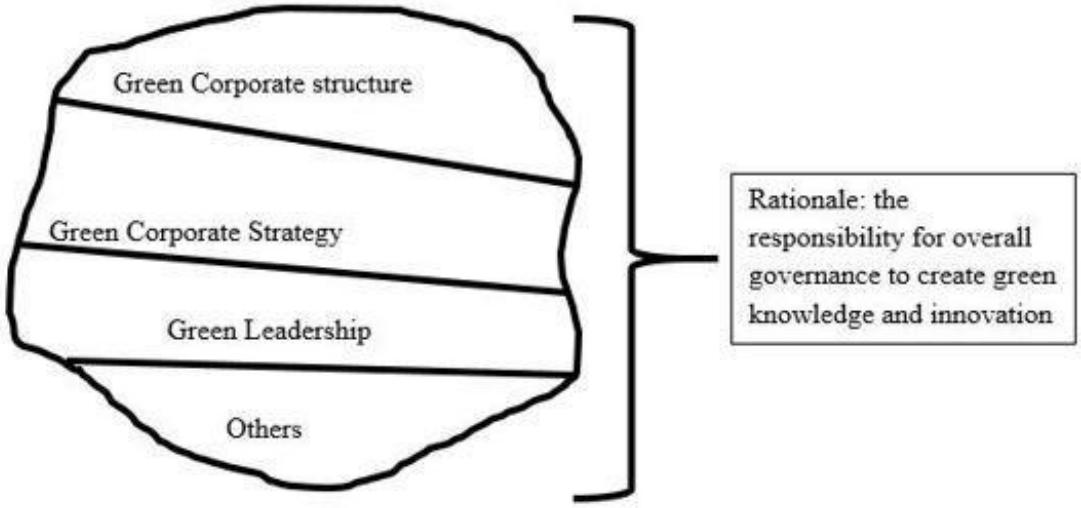
As stated earlier, a knowledge cluster is a collection of related elements held together by its rationale. The rationale is the underlying principle/reason, which enables holding the elements of the knowledge cluster. Each knowledge cluster is a subsystem of the green university system. These are called knowledge clusters because each cluster is vested with knowledge for its rationale. For example, Green Corporate Governance is vested with knowledge belonging

to Green Corporate Governance for achieving its rationale. Hence, each of the knowledge clusters is discussed below.

## 6.4(i) Knowledge Cluster: Green Corporate Governance

Green Corporate Governance consists of Green Corporate structure, Green Corporate Strategy, and Green Leadership. The rationale of the knowledge cluster, 'Green Corporate Governance,' is the overall governance responsibility to create green knowledge and innovation. The rationale represents the cluster's logic for admission and holding of the elements within the cluster by self-organization (The schematic diagram depicted as Figure 23). It defines the cluster's boundary; it networks with other clusters and the green university system's environment. For example, Green Corporate Governance creates dynamics by networking with other subsystems, green corporate culture, green education, green research. It further networks with other systems in the environment, such as the conventional university system at the micro-level, further, with the economic system, political system, natural system, media-based, and the culture-based public at the macro level. For example, if the green corporate governance is designed to produce green knowledge and innovation, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 23-Knowledge Cluster: Green Corporate Governance, its Elements and Rationale

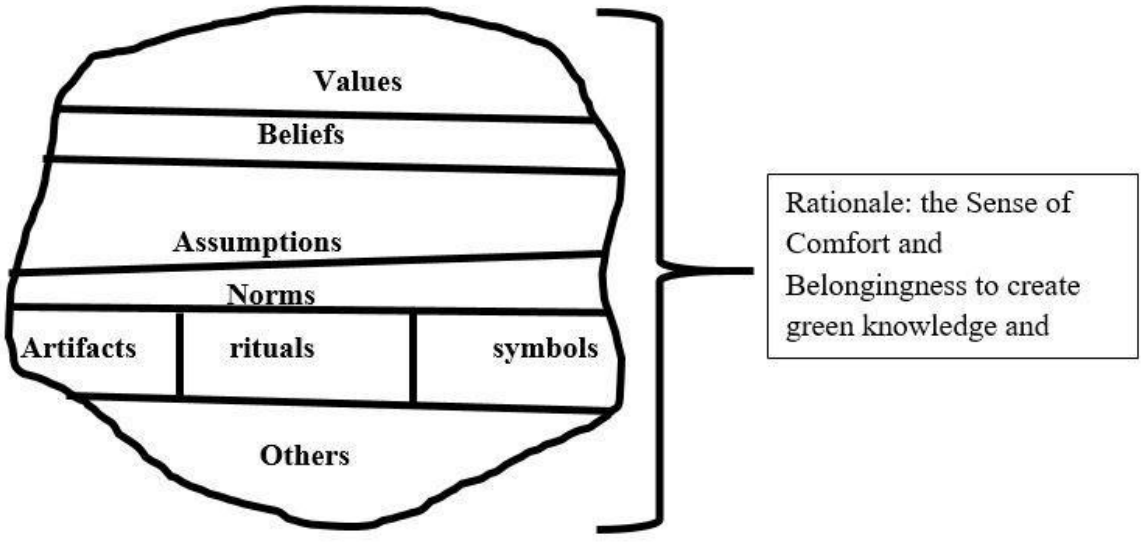



Source: Author

## 6.4(ii) Knowledge Cluster: Green Corporate Culture

The Green Corporate Culture consists of values, beliefs, assumptions, norms, artifacts, rituals, symbols. The rationale of the knowledge cluster, 'Green Corporate Culture,' is the Sense of Comfort and Belongingness to create green knowledge and innovation. It represents the cluster's logic for admission and holding of the elements within the cluster by self-organization (The schematic diagram depicted as Figure 24). At the same time, defining the cluster's boundary, the rationale networks with other clusters and the green university system's environment. For example, green corporate culture creates dynamics by networking with other subsystems, such as green corporate governance, green education, green research. It further networks with other systems in the environment, such as conventional university systems at the micro-level, economic system, political system, natural system, and media-based and culture-based public and civil society at the macro level. For example, green corporate culture implants green shared assumptions, green values, and beliefs among the university's internal stakeholders and external stakeholders. For example, suppose the green corporate culture is designed to produce green knowledge and innovation. In that case, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 24-Knowledge Cluster: Green Corporate Culture, its Elements and Rationale

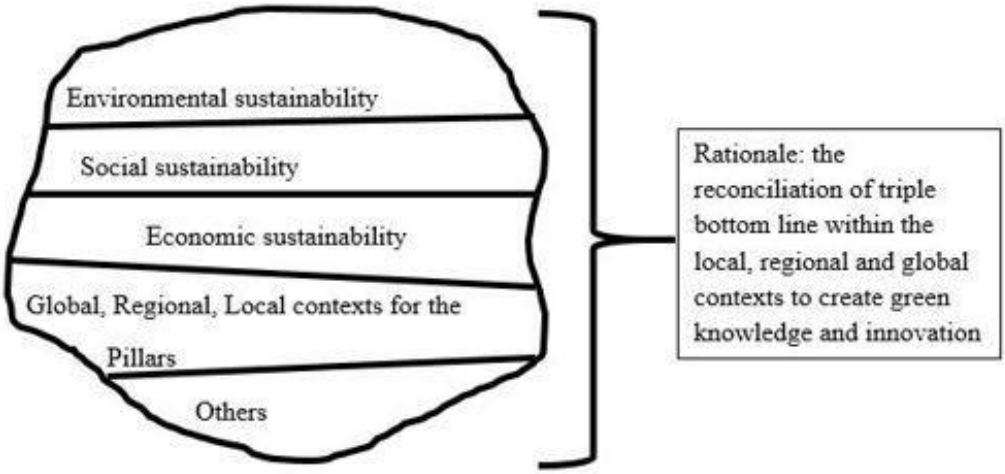



Source: Author

## 6.4(iii) Knowledge Cluster: Three Pillars of Sustainability

The Three Pillars of Sustainability include Global, Regional, Local environmental sustainability, social sustainability, and economic sustainability. The rationale of the knowledge cluster, 'Three Pillars of Sustainability' is the reconciliation of three pillars of sustainability within the local, regional, and global contexts to create green knowledge and innovation, which represents the logic of the cluster for admission and holding of the elements within the cluster by self-organization (The schematic diagram depicted as Figure 25). While defining the cluster's boundary, it networks with other clusters and the green university system's environment. For example, the three pillars of sustainability dynamics are networking with other subsystems, green corporate governance, green corporate culture, green education, and green research. It further networks with other systems in the environment, such as the conventional university system at the micro-level, Further, economic system, the political system, the natural system, the media-based and the culture-based public at the macro level. For example, suppose the three pillars of sustainability are designed to produce green knowledge and innovation. In that case, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 25-Knowledge Cluster: Three Pillars of Sustainability, its Elements and R3ationale

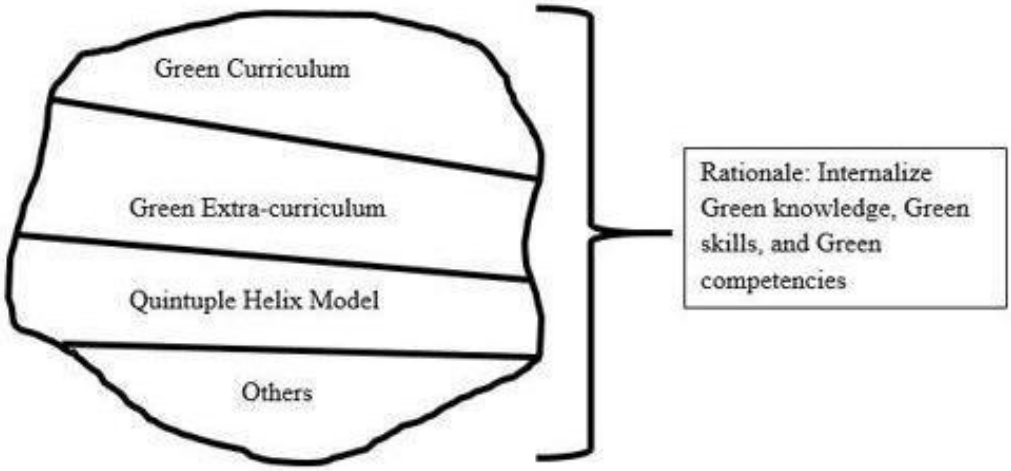



Source: Author

## 6.4(iv) Knowledge Cluster: Green Education

Green Education consists of three elements, the Green Education/Curriculum, Green Extra-curriculum, and Quintuple Helix Model of Innovation latter, which enable the production of green knowledge and innovation as an open system. The rationale of the knowledge cluster, 'Green Education,' is to internalize Green knowledge, Green skills, and Green competencies that represent the cluster's logic for admission and holding of the cluster's elements by self-organization (The schematic diagram depicted in Figure 26). While defining the cluster's boundary, the rationale networks with other clusters and the green university system's environment. For example, green education creates dynamics by networking with other subsystems, green corporate governance, green corporate culture, green research, green community outreach. It further networks with other systems in the environment, such as conventional university systems at the micro-level, and economic system, political system, natural system, media-based and the culture-based public at the macro level. For example, suppose green education is designed to produce green knowledge and innovation. In that case, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 26-Knowledge Cluster: Green Education, its Elements and Rationale



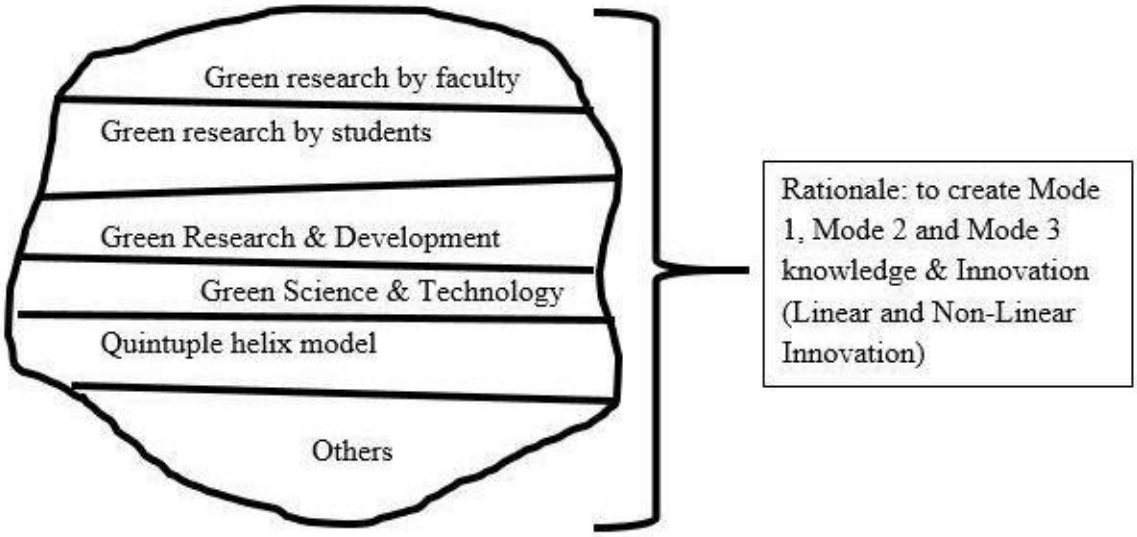

Source: Author

## 6.4(v) Knowledge Cluster: Green Research

Green Research consists of five elements, Green Research by Faculty, Green Research by Students, Green Research & Development, Green Science & Technology, Quintuple Helix

Model of Innovation latter which open boundaries of systems for producing green knowledge and innovation as an open system. The rationale of the knowledge cluster, 'Green Research,' is to create Mode 3 knowledge & Innovation. It represents the cluster's logic for admission and holding of the cluster elements by self-organization (The schematic diagram depicted as Figure 27). While defining the cluster's boundary, the rationale networks with other clusters and the green university system's environment. For example, green research creates dynamics by networking with other subsystems, green corporate governance, green corporate culture, green education, green community outreach. It further networks with other systems in the environment, such as the conventional university system at the micro-level, further, economic system, the political system, the natural system, the media-based and the culture-based public at the macro level. For example, suppose green research is designed to produce green knowledge and innovation. In that case, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 27-Knowledge Cluster: Green Research, its Elements and Rationale



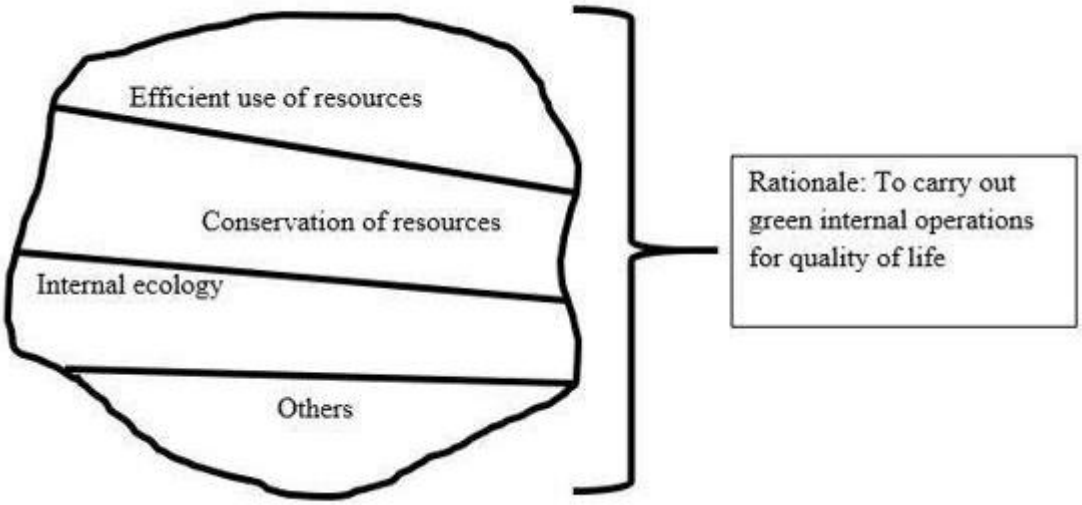

Source: Author

## 6.4(vi) Knowledge Cluster: Green Internal Operations

The Green Internal Operations includes three elements, Efficient use of resources (Green building, Renewable energy), Conservation of resources (Water/Stationery conservation), Internal ecology (Green spaces, Tree planting). The rationale of the knowledge cluster, 'Green

Internal Operations', is to carry out green internal operations for quality of life, representing the cluster's logic for admission and holding of the cluster's elements by self-organization (The schematic diagram depicted in Figure 28). While defining the cluster's boundary, it networks with other clusters and the green university system's environment. For example, green internal operations create dynamics by networking with other subsystems, green corporate governance, green corporate culture, green education, and green research. It further networks with other systems in the environment, such as conventional universities stem at the micro-level further, economic system, political system, natural system, media-based, and the culture-based public at the macro level. Suppose the green internal operations are designed to produce green knowledge and innovation. In that case, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 28-Knowledge Cluster: Green Internal Operations, its Elements and Rationale



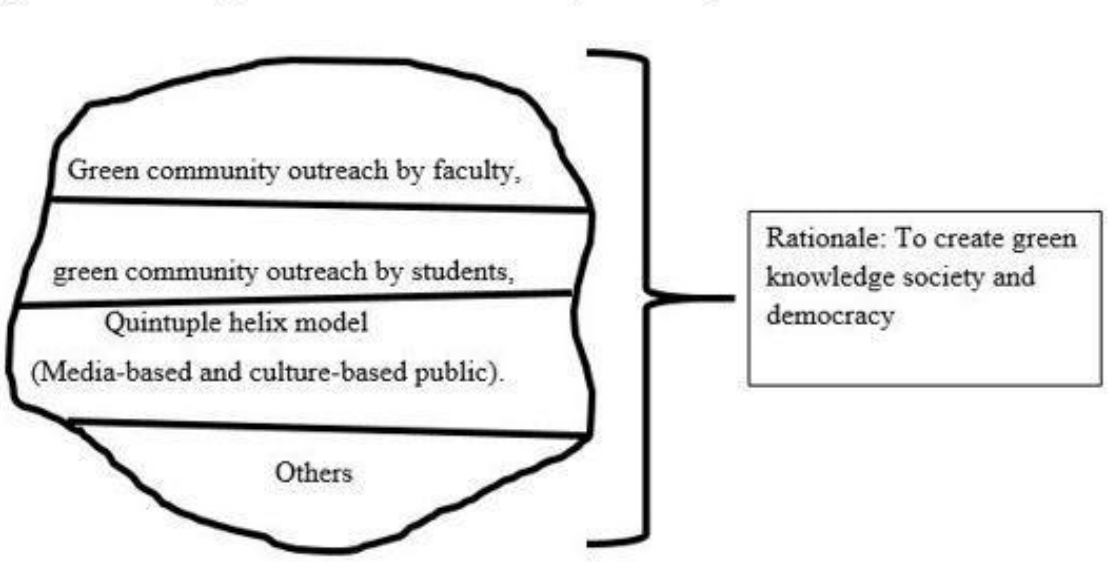

Source: Author

## 6.4(vii) Knowledge Cluster: Green Community Outreach

The Green Community Outreach includes three elements, green community outreach by faculty, green community outreach by students, Quintuple Helix Model of Innovation (media-based and culture-based public and civil society discourse) latter, which entails inter-organizational production of green knowledge and innovation as an open system. The rationale

of the knowledge cluster, 'Green Community Outreach,' is to create a green knowledge society and democracy, representing the cluster's logic for admission and holding the cluster elements by self-organization. The schematic diagram is depicted in Figure 29). While defining the cluster's boundary, it networks with other clusters and the green university system's environment. For example, green community outreach creates dynamics by networking with other subsystems, green corporate governance, green corporate culture, green education, green research. It further networks with other systems in the environment, such as the conventional university system at the micro-level, further, economic system, political system, natural system, media-based and the culture-based public at the macro level, if the green community outreach is designed to produce green knowledge and innovation, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 29-Knowledge Cluster: Green Community Outreach, its Elements and Rationale



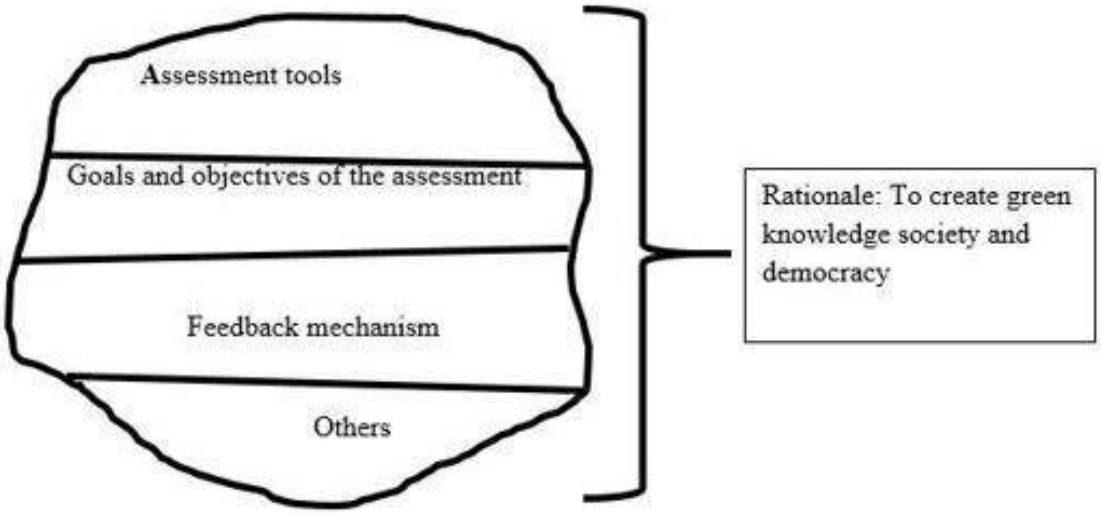

Source: Author

## 6.4(viii) Knowledge Cluster: Green Reporting

The Green reporting includes elements, assessment tools, Goals and objectives of the assessment, feedback mechanism. The rationale of the knowledge cluster, 'Green Reporting' is to ensure the Quality Assurance of the system & feedback mechanism for developing the green university system which represents the logic of the cluster for admission and holding of the elements within the cluster by self-organization (The schematic diagram depicted as Figure 30). While defining the cluster's boundary, it networks with other clusters and the green

university system's environment. For example, green reporting creates dynamics by networking with other subsystems, green corporate governance, green corporate culture, green education, green research. It further networks with other systems in the environment, such as conventional university systems at the micro-level, economic system, political system, natural system, and media-based and culture-based public and civil society at the macro level. Suppose the green reporting is designed to produce green knowledge and innovation. In that case, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 30-Knowledge Cluster: Green Reporting, its Elements and Rationale



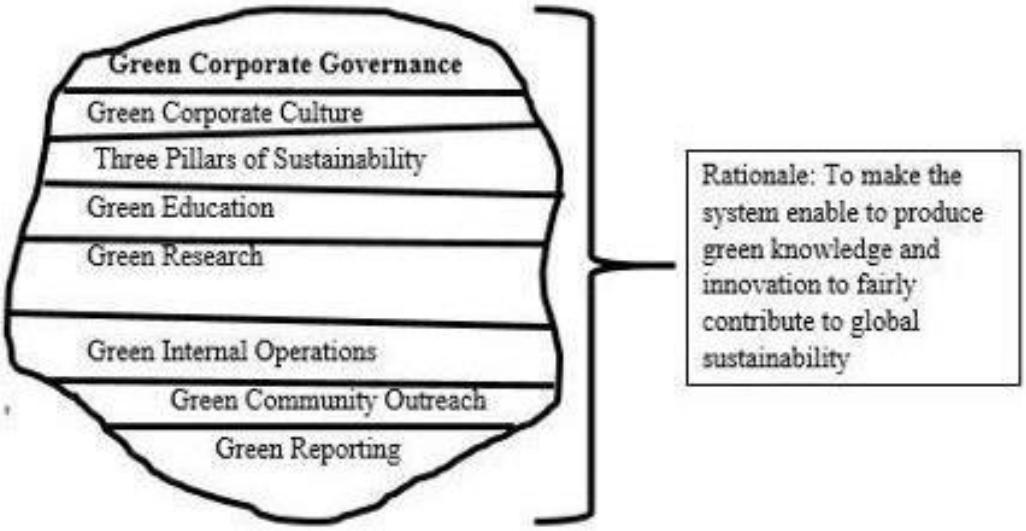

Source: Author

## 6.4 (ix) Knowledge Cluster: Integration

The integration merges subsystems, Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education, Green Research, Green Internal Operations, Green Community Outreach, Green Reporting. The rationale of the knowledge cluster, 'Integration' is to make the system enable producing green knowledge and innovation to fairly contribute to global sustainability which represents the logic of the cluster for admission and holding of the elements within the cluster by self-organization (The schematic diagram depicted as Figure 31). While defining the cluster's boundary, it networks with other clusters and the green university system's environment. For example, the integration creates dynamics by networking with other subsystems, green corporate governance, green corporate culture,

green education, green research. It further networks with other systems in the environment, such as the conventional university system at the micro-level, further, economic system, political system, natural system, media-based and the culture-based public at the macro level. Suppose the integration is designed to produce green knowledge and innovation. In that case, the green university system enables the production of green knowledge and innovation with mode 3 and the Quintuple Helix Model of Innovation.

Figure 31-Knowledge Cluster: Integration, its Elements and Rationale




Source: Author

Accordingly, there are nine knowledge clusters/ subsystems in a green university system. They are called the knowledge clusters because they accumulate knowledge guided by their rationale. Each cluster's elements interact with other elements of the same cluster and the elements of other clusters or clusters, creating a network or networks. The networking within the cluster and outside clusters creates dynamics for innovations.

## 6.5 Network/Networks of Innovation

The role of the proposed green university system is to produce collaboratively interdisciplinary and transdisciplinary knowledge and innovation for sustainable development. They have to collaborate with four exogenous knowledge clusters, Government, Industry, Media-based and Culture-based Public and Civil society, and the Natural System. Such collaboration enables

universities to produce green knowledge and innovation with Mode 1, Mode 2, Triple Helix Model of Innovation, and Quadruple Helix Model of Innovation, preferably the highest quality with Mode 3 and Quintuple Helix Model of Innovation.

Hence, eight subsystems were designed for the purpose, namely. Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education, Green Research, Green Internal Operations, Green Community Outreach, and Green Reporting. The rationale for the whole system was determined. After that, the rationale and the elements of each subsystem were identified (Table 18). Accordingly, all elements of a subsystem interact and network with each other elements for achieving the subsystem's rationale subject to the rationale of the whole system.

**Table 17: Knowledge Clusters of Green University**

| Knowledge Cluster | Elements of Knowledge Cluster | Self-Rationale & Innovation Networks |
|---|---|---|
| Green Corporate Governance | Green Governance Structure (Green rules, green regulations, green policies, green procedures, green processes), green strategy, green leadership. | Responsibility for Overall governance to create green knowledge and innovation |
| Green corporate culture | values, beliefs, assumptions, norms, artifacts, rituals, symbols. | Sense of Comfort and Belongingness to create green knowledge and innovation |
| Three Pillars of Sustainability | Global, Regional, Local ecological environmental issues, social environmental issues, and economic environmental issues. | Reconciliation of triple bottom line within the local, regional and global contexts |
| Green Education | Green education/curriculum,<br>Green extra curriculum.<br>Quintuple Helix Model of Innovation | Internalizing of Green knowledge, Green skills, and Green competencies. |

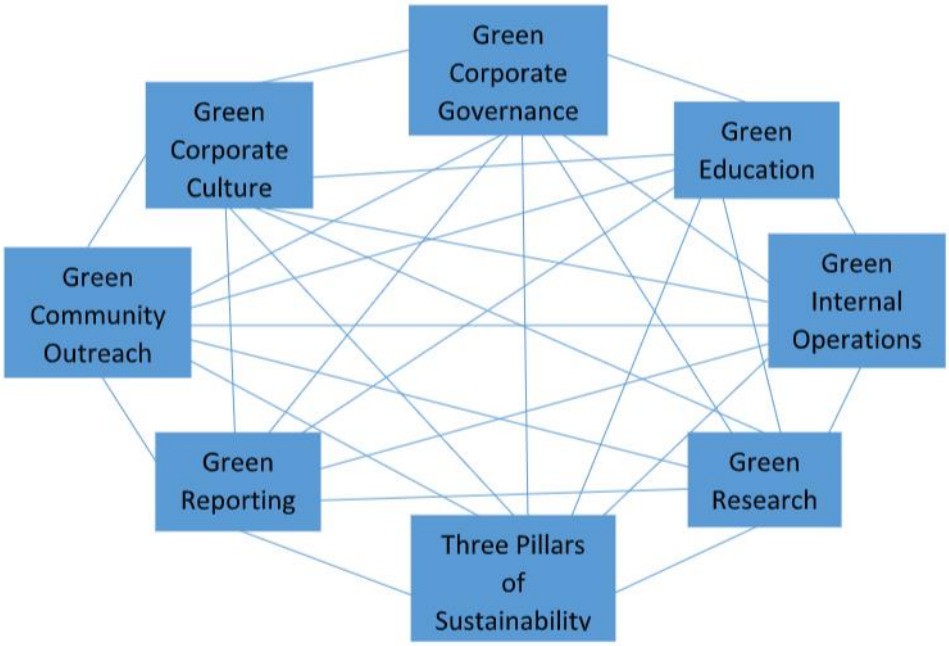
| | | |
|---|---|---|
| Green Research | Green research by faculty, green research by students Research & Development, Science & Technology, Quintuple Helix Model of Innovation | Mode 1, Mode 2, and Mode 3 knowledge & Innovation (Linear and Non-linear Innovation) |
| Green Internal Operations | Efficient use of resources (green building, renewable energy, Conservation of resources (Water/Stationery conservation), Internal ecology (green Spaces, tree planting). | Green internal operations for quality of life |
| Green Community Outreach | Green community outreach by faculty, green community outreach by students, Quintuple Helix Model of Innovation (media-based and culture-based public and civil society) | Green Knowledge Society and Democracy |
| Green Reporting | Assessment tools, Goals, and objectives of the assessment, feedback mechanism. | Quality Assurance of the system & feedback mechanism for developing the green university system. |
| Integration | Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education, Green Research, Green Internal Operations, Green Community Outreach, Green Reporting. | Production of green knowledge and innovation to fairly contribute to global sustainability. |

Source: Author

The interaction of the subsystem with the other subsystem is an innovation network (Figure 32). For example, corporate governance policy incorporated green projects into the Business & Accounting curriculum and Electrical engineering curriculum. The students and faculty are passionate about green culture and implemented a renewable energy project to produce green electricity with solar power in a remote village that the national grid cannot access. The bank

and the private sector investment in the project and the parastatal organizations, including power corporations facilitated the project. The people in the village and the civil societies also contributed to the project voluntarily. Students learned that the payback period, internal rate of return, Debt service ratio, optimization of the energy generation. Faculty conducted research simultaneously. Consequently, the university produces collaboratively interdisciplinary and transdisciplinary knowledge and innovation needed for sustainable development.

Figure 32-Networks and Networks of Innovation



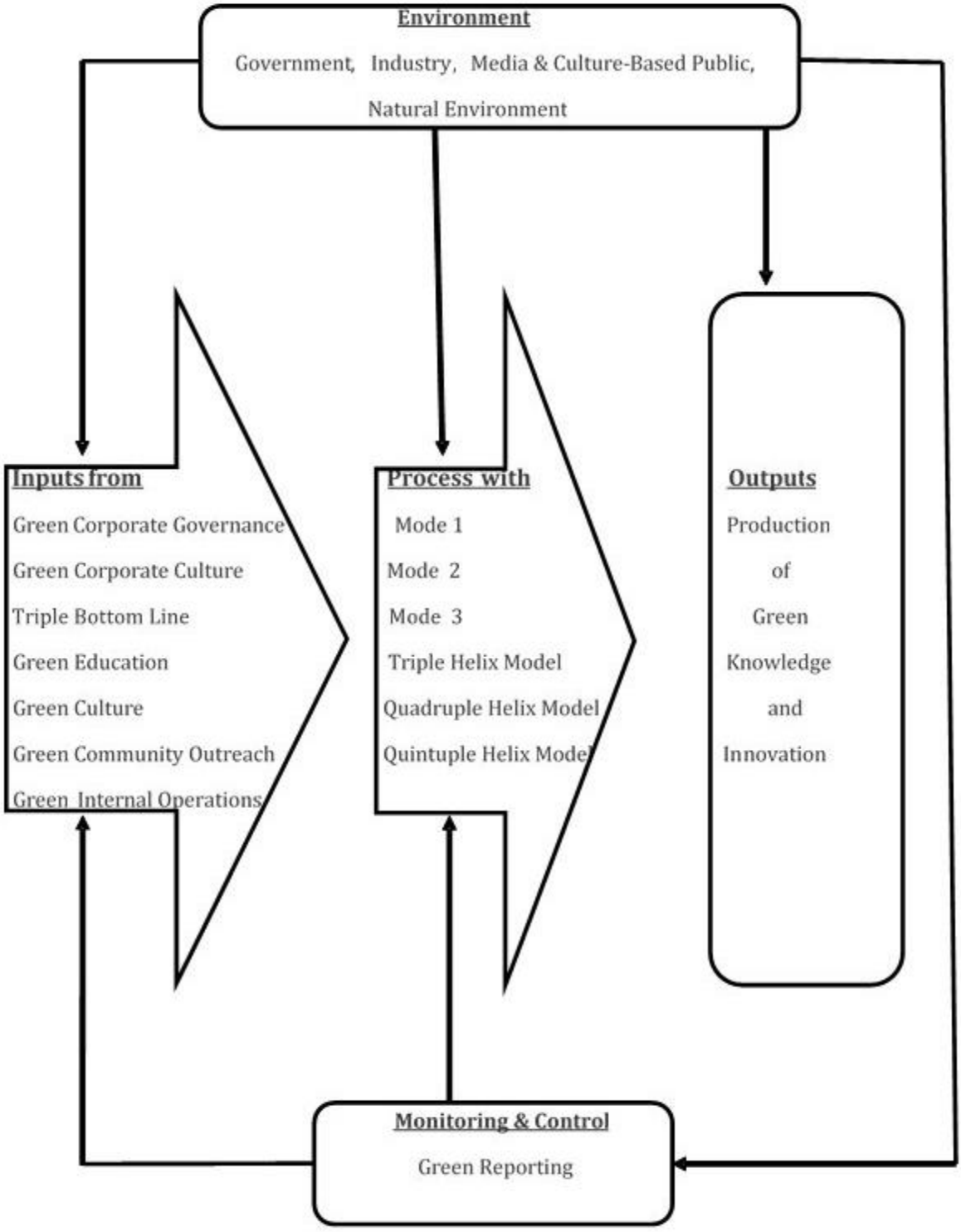

Source: Author

These nine knowledge clusters enable co-existing, co-evolve, co-specialize, and co-opetition among them and other helices as an advanced knowledge-based system (Carayannis et al., 2018) providing opportunities for green innovations. The innovation networks interact within the elements of the same knowledge cluster and with other knowledge clusters too. For example, the Innovation Network, Responsibility for Overall performance, enables networking with the same Knowledge Cluster elements and the other Knowledge Clusters such as Green Corporate Governance, Green Corporate Culture. Moreover, with other helices of Quintuple Helix Model of Innovation without inconsistencies and self-contradiction.

## 6.6 Monitoring and Control

The function of the green university system is to produce collaboratively interdisciplinary and transdisciplinary green knowledge and innovation. The circular process consists of Inputs, Processes, Outputs, and Monitoring and Control (Figure 33). The circular causality is spiral to move forward and causes changes in the system by the Feedback (Weiner, 1948). The inputs are seven subsystems, Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education, Green Research, Green Community Outreach, and Green Internal Operations. These inputs' nature and quality are determined by interaction and networking among the subsystems and interaction with the environment, including knowledge systems, Government, Industry, Media-based and Culture-based Public and civil society, and the Natural Environment. The transformation process enables processing the inputs with the six knowledge systems, Mode 1, 2, 3, Triple Helix Model, Quadruple Helix Model, and Quintuple Helix Model. The monitoring process by reporting/accountability/audit system receives feedback from the environment, Outputs, transformation processes, and Inputs. Then, it takes actions for corrective measures with the transformation processes and the inputs so that the desired outputs are generated by the circular loop of the cybernetics, inputs, throughput, output, and Feedback (Luhmann, 1988).

Figure 33: Monitoring and Control




Source: Authour

## 6.7 Chapter Summary

The green university was designed under systems theory. Accordingly, the green university's rationale was set as the production of green knowledge and innovation for sustainable development to contribute fairly to global sustainability. Every large system consists of several subsystems with its own rationale, congruent with the main system's rationale, the green university system. Nine subsystems were identified as knowledge clusters/subsystems: green corporate governance, green corporate culture, three pillars of sustainability, green education/curriculum, green research, green community outreach, green internal operations, green reporting, and integration. Each subsystem consists of elements within the boundary and interacts with each other and other systems.

# Chapter 7: Conclusion

The developmental practices that took place in the past and taking place in the present are unsustainable. It is in a state of crisis, threatening the survival of all beings in the ecosystem. In this global issue, Universities who are leaders, models, catalysts, and innovators are supposed to lead by example in fostering sustainability by producing green knowledge and innovation to achieve sustainable development.

However, mere sustainability practices by various types of projects such as recycling of wastewater, conservation of water and other resources, renewable energy projects are not sufficient to transform unsustainable universities into a sustainable university unless the sustainable practices of green universities fairly contribute to global sustainability by producing green knowledge and innovation.

Hence, a green university is defined as a working definition that "Green university is a university which is governed with a green corporate culture for the production of green knowledge and innovation by way of green education/curriculum, green research, green community outreach and the green internal environment with the necessary balance of three pillars of sustainability to fairly contribute for global sustainable development."

A green university is expected to produce green graduates at E on the curve AB or H even I on the curve GF depicted in Figure 5. In other words, the quality of green graduates before point E is considered as unsustainable. However, it means that the quality of green graduates can be improved from E to I after which the quality of green graduates can be improved at the cost of other primary objectives of the university.

The quality of green graduates is vital because universities as the apex organization of the education system, provide their output into the main circular flow of knowledge, which would blend with the other four systems, economic system, natural environment of society, media-based and culture-based public and civil society, and political system in the Quintuple Helix Model of Innovation depicted in Figure 6.

Nevertheless, many universities are conventional. They produce conventional knowledge and innovation in their disciplines. Their structure, strategy, and leadership are isomorphic with

other universities. They adopt the conventional structure, strategy, and leadership not because of effectiveness and efficiency but because of the sheen of legitimacy by myths and ceremonies. Hence, this study aims to ascertain a complete set of requisites for greening universities and integrate them pragmatically to be used by universities as a blueprint to be a green university.

For being a green university, the two universal packages for sustainable development, the 2030 Agenda for 17 SDGs, the Paris Climate Agreement, have mandated universities to institutionalize green knowledge and innovation. The change of conventional institutional logic legitimizes producing green graduates. In this regard, the scope of quality of green graduates can be determined by nine ecological boundaries, Doughnut Economics, the 2030 Agenda for 17 SDGs, the Paris Climate Agreement, and Nationally Determined Contribution. Hence, change management in universities is warranted for producing green knowledge and innovation. The conventional structure is required to be reconfigured. The institutional change can be achieved by a top-down, bottom-up approach, or mixed approach.

The exploratory research first identified the eight essential elements of a green university: Green Corporate Governance, Green Corporate Culture, Three Pillars of Sustainability, Green Education/Curriculum, Green Research, Green Community Outreach, Green Internal Operations, and Green Reporting. Then, the descriptive research described how each of them operates in a green university and further integrates for a green university system.

Green Corporate Governance enables setting a strategy and leadership for producing green knowledge and innovation. The university's conventional structure can be reconfigured by vision, mission, goals, objectives, values, rules, regulations, procedures, and processes relating to green knowledge and innovation. Green Corporate Culture enables creating shared assumptions for green knowledge and innovation. In this respect, it is required to plant green values, beliefs, assumptions, norms, artifacts, rituals, and symbols by implementing Green Corporate Governance.

There are four tools where green knowledge and innovation can be developed among students. They are the Green Education/Curriculum, Green Research, Green Community Outreach, and Green Internal Operations. The conventional structure of these four tools cannot produce green knowledge and innovation unless they are reconfigured. Green Corporate Governance and

Green Corporate Culture are instrumental in reconfiguring them. Pedagogies and non-pedagogies can be reconfigured. A part of linear and non-linear academic and student research can be focused on green research. Green Community Outreach between the university (students and academia) and the community can be focused on sustainability. The university's internal operations can be reconfigured with green buildings, sustainable lands, conservation of resources, efficient water and energy use, renewable energy, and recycling of wastewater and garbage. However, it is required to trade off three pillars of sustainability in these practices and activities, considering local, regional, and global contexts. The eighth element to be reconfigured is Sustainability Reporting. It is essential to measure the progress of the production of green knowledge and innovation.

The application of one or a few or most of those dimensions does not effectively contribute to moving beyond the threshold of global sustainability. Hence, what is required is to organize all those eight dimensions to be a sustainable university to perform at its fullest potential for moving beyond the threshold of global sustainability.

Accordingly, these eight essential elements of a green university can be integrated systematically to devise a blueprint for a green university. The foundation is Green Corporate Governance because it enables mandating all other elements by reconfiguring structure, strategy, and leadership. The second step is to design and develop Green Corporate Culture, which is harmonious and cohesive to produce green knowledge and innovation. The third step is to decide the necessary application of green practices and activities by trading off the three pillars of sustainability. The fourth step is the Green Reporting, which paves the way for determining what will be measured in advance. The final step is to design the Green Education/Curriculum, Green Research, Green Community Outreach, and Green Internal Operations. These steps are depicted in the following framework for greening universities called Green University Onion depicted in Figure 34.

However, this study is subject to certain limitations in methodological contents and substantive contents. The sample used to collect data is purposive. A purposive sample is a non-probability sample. Purposive sampling is subject to its limitations even though a heterogeneous sample was used in this research inquiry. One of them is that the data items, a document, or an interview participant, are chosen based on the researcher's judgment. Thus, there is a possibility

to make errors in judgment. Another aspect is that a purposive sample is prone to a bias of the researcher and the participant.

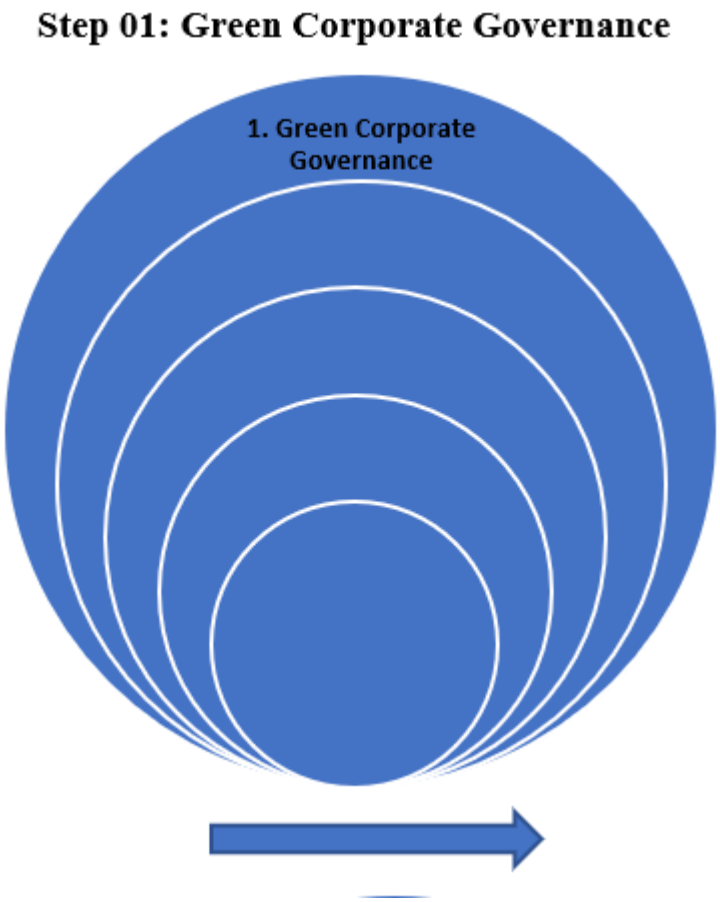
Another limitation is the heterogeneity of the sample of interview participants. Even though participants include Professors/Drs, Senior lecturers, Academic managers, Non-academic managers, and Undergraduates/postgraduates. However, the sample did not include some other university stakeholders, namely, parents of students, sponsors of students, industry, government, and public.

Another limitation of this multi-method research arises from the databases used to collect the sample documents. Sample documents were selected from the following four databases: Emerald Insights, EBSCOhost, ProQuest, and Google Scholar, but other databases could not be accessed.

Another aspect of limitations of the study may provide opportunities for further research. For example, the perceptions of other stakeholders who were not considered in this research, such as parents of students, sponsors of students, industry, government, and the public can be researched.

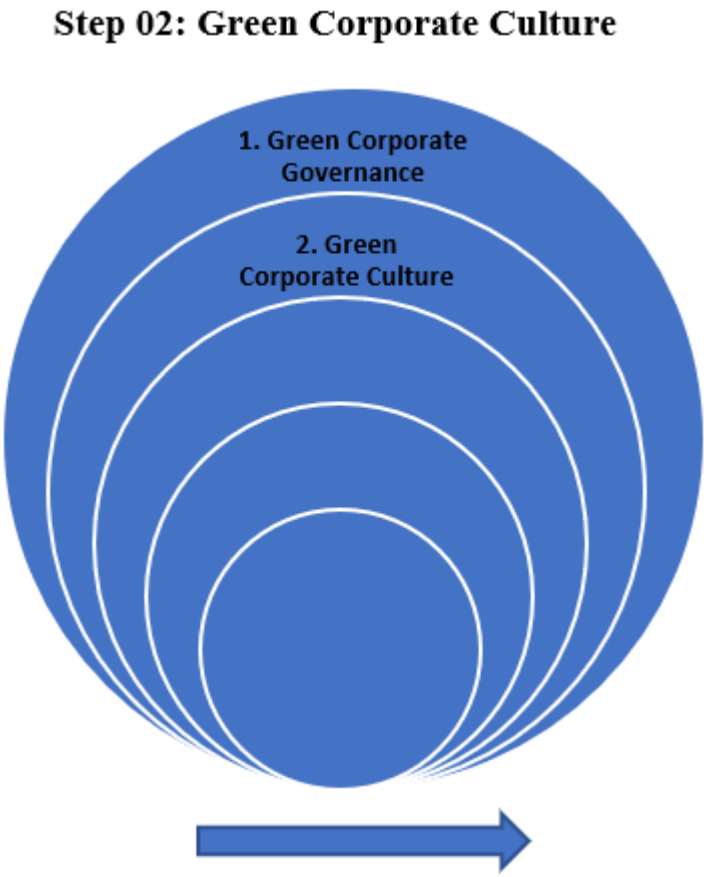
This research was conducted as multi-method qualitative research founded on grounded theory with an interpretivist/constructivist approach. The major criticism against qualitative research is that the findings cannot be generalized. Hence, future research is another opportunity to conduct quantitative research under a positivist approach for greening a university or even for each dimension of a green university such as Green Corporate Governance, Green Corporate Culture.

**Figure 34: Green University Onion**




**Source: Author**

**Figure 34: Green University Onion**




**Source: Author**

**Figure 34: Green University Onion**

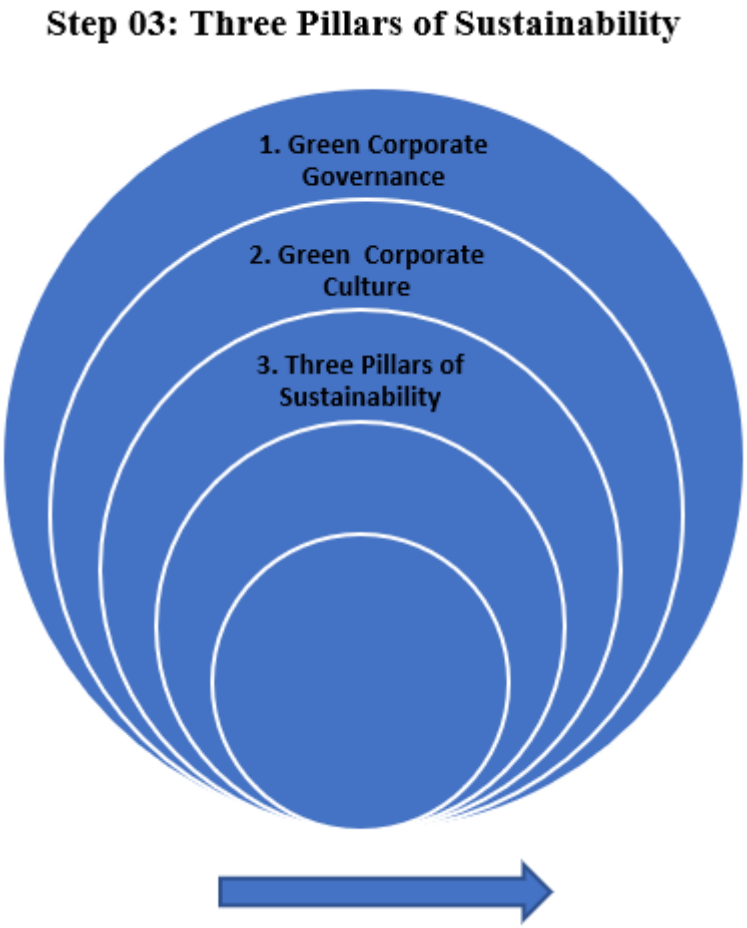



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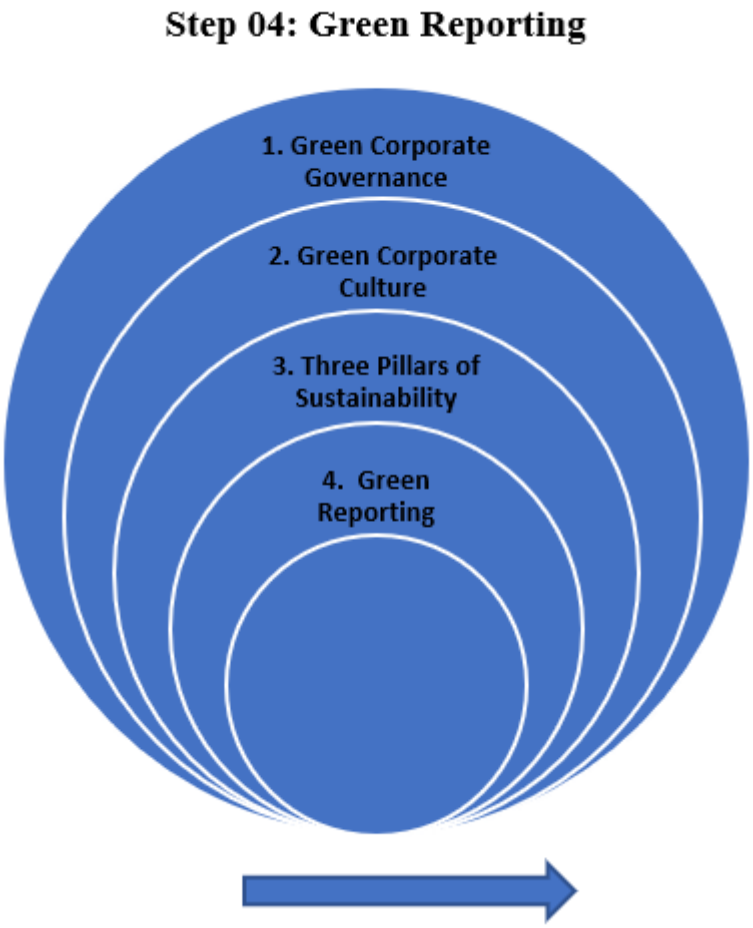
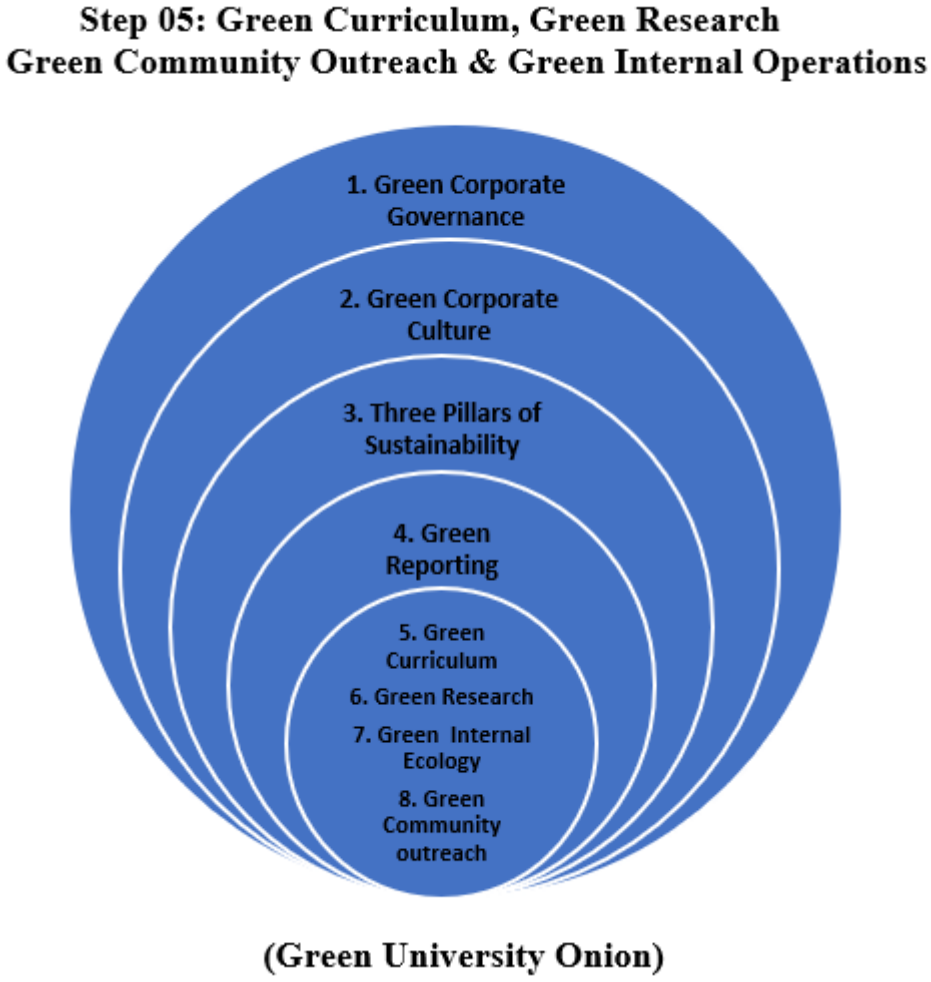
**Figure 34: Green University Onion**




**Source: Author**

**Figure 34: Green University Onion**




**Source: Author**

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# Appendix 1: Ethics Clearance Letter from NWU

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

Economic and Management Sciences Research
Ethics Committee (EMS-REC)

28 February 2020

Prof F Netswera
*Per e-mail*
Dear Prof Netswera,

**EMS-REC FEEDBACK: 28022020**
**Student: Liyanage, IY (35467940)(NWU-00573-20-A4)**
**Applicant: Prof F Netswera – PhD in Business Administration**

Your ethics application on, *A framework for greening universities in knowledge based economy, Botswana,* which served on the EMS-REC meeting of 28 February 2020, refers.

**Outcome:**

Approved as a minimal risk study. A number NWU-00573-20-A4 is given for three years of ethics clearance.

Kind regards,

Mark Rathbone

Digitally signed by Mark Rathbone
DN: cn=Mark Rathbone, o=North-West University, ou=Business management, email=mark.rathbone@nwu.ac.za, c=ZA
Date: 2020.03.05 10:40:23 +02'00'

Prof Mark Rathbone
Chairperson: Economic and Management Sciences Research Ethics Committee (EMS-REC)

# Appendix 2: Ethics Clearance Letter from Ministry of Tertiary Education, Botswana

Telephone : 3655400 / 3655483
Fax : 3914271
E-mail: botsamote@gov.bw

REPUBLIC OF BOTSWANA

Block 6, Government Enclave, Headquarters
Private Bag 00517 Gaborone

**MINISTRY OF TERTIARY EDUCATION, RESEARCH, SCIENCE AND TECHNOLOGY**

**REF: MOTE 1/18/6 VIII (38)**

25th June 2020

Shanta Indrajith Hikkaduwa Liyanage
Both Education Park, Kgale
P.O. Box 501564
**GABORONE**

Dear Sir

**A Framework for greening universities in Knowledge Based Economy Botswana**

Reference is made to your application on the above captioned matter.

Your application for Research Permit for the proposed research titled: ***'A Framework for greening universities in Knowledge Based Economy, Botswana'*** has been granted. The permit is valid for one (1) year. You are kindly advised to peruse section 4.4 to 5.0 of the 'Guidelines for Application for Research Permit' in Botswana.

Any changes in the proposed research should be communicated, without fail, to the Permanent Secretary, Ministry of Tertiary Education Research Science and Technology citing above reference. You are advised to submit final research report to the Department of Research, Science and Technology.

By copy of this letter, the Director of Research Science and Technology (DRST) is advised to take note of this development and ensure that deliverables to government are timely met. Furthermore, you are requested to deposit completed research report to DRST.

Yours faithfully

Dr Kekgonne E. Baipoledi
**For/Permanent Secretary**

**cc: Director of Research Science and Technology**

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## Appendix 3: Research Questionnaire

# Interview Questions For Professors, Drs, Lecturers, Academics, Academic managers, Non-academic Managers, undergraduates/postgraduates of Universities in Botswana

The purpose of the interview is to know the essential elements required for greening a university in a Knowledge-Based Economy in Botswana

Title of the Research: A Framework for greening universities in Knowledge-Based Economy, Botswana

Project: Ph.D. thesis, North West University Business School

Principal Investigator: Shantha Indrajith Hikkaduwa Liyanage, Senior Lecturer, Faculty of Business & Accounting

Supervisors: Prof. Fulu Netswera & Prof. Jan Meyer

- Your participation in this research study is voluntary and you may withdraw at any time if so desired
- Your interview will take approximately 30 minutes
- Your responses will remain confidential
- Your participation remain anonymous
- You may receive the research findings & conclusion after graduation if you wish

Having obtained the interviewees' informed consent, the semi-structured interview will be conducted after obtaining demographic factors.

### Section A: Demographic Factors

**Age**

☐ 21-29

☐ 30-39

☐ 40-49

☐

50 and above

## Gender

☐ Female

☐ Male

Professional Status

☐ Professor/Dr.

☐ Senior Lecturer

☐ Academic Manager (Dean/ HOD etc.)

☐ Non-Academic Manager

☐ Undergraduate/Postgraduate

The main interview questions (IQs) and additional/support interview questions AIQs) will be based on this research's objectives, research questions, the themes, and categories found out from the template analysis will be based on the objectives of this research. Accordingly, they are as follows

**Theme: Corporate Governance**

IQ-01: What do you think of the importance of the management/governing council's intervention for greening a university?

AIQ-01: What type of approach, Top to bottom approach or Bottom to Top approach, is appropriate for the intervention?

**Theme: green corporate culture**

IQ-01: What type of culture is required for greening a university?

AIQ-01: Should values and beliefs necessary for greening university be communicated among all those in the university?

**Theme: Triple Bottom Line/Three Pillars of Sustainability**

IQ-01: When greening a university, Should the university focus on environmental, social, and economic sustainability?

AIQ-01: Should the university look at issues local, regional, global, or all in greening university?

**Theme: Green Education/Curriculum**

IQ-01: What do you think of teaching knowledge and skills of sustainability for students?

AIQ-01: How about the use of non-pedagogical activities related to sustainability at the university?

**Theme: Green Research**

IQ-01: What do you think of devoting a part of faculty researches to sustainability issues?

AIQ-01: Should the students be focused on the part of their research for sustainability issues?

**Theme: Green Internal Operations**

IQ-01: What do you think of making the internal operations of the university sustainable by way of renewable energy, energy efficiency, resource conservation etc.?

AIQ-01: Will a living sustainable internal environment have an impact on stakeholders?

**Theme: Green Community Outreach**

IQ-01: What do you think of the university's role to interact with the community for teaching them and learning from them for sustainability issues?

AIQ-01: How about the role of students and faculties in this respect?

**Theme: Green Reporting**

IQ-01: Should the university measure and report the progress of sustainability practices of the university?

**Theme: Integrative approach**

IQ-01: Are all 2-9 elements important for greening a university? Can we leave any of them when greening?

**Theme: Contribution for moving beyond the thresholds**

IQ-01: Does the contribution by greening a university mean the sustainability practices enough to defeat the global issue of unsustainability?

## Thank you for Your Participation!

# Appendix 4: Informed Consent

## Informed Consent Form

### Ph.D. Research Thesis, North West University, Republic of South Africa

**Researcher:** Shantha Indrajith Hikkaduwa Liyanage

Senior Lecturer, Faculty of Business & Accounting

Gaborone Campus, Botho University, Botswana

**Supervisors:** Prof. Fulu Netswera & Prof. Jan Meyer

North West University, Republic of South Africa

**Type of Participants:** Professors, Drs, Lecturers, Academics, Academic managers, Non-academic Managers, undergraduates/postgraduates of Universities in Botswana

**The purpose:** of the interview is to know the essential elements required for greening a university in a Knowledge-Based Economy in Botswana

**Title of the Research:** A Framework for greening universities in Knowledge-Based Economy, Botswana

**Project:** Ph.D. thesis, North West University Business School

**Participants/Interviewees Role**

- Your participation in this research study is voluntary and you may withdraw at any time if so desired
- Your interview will take approximately 30 minutes
- Your responses will remain confidential
- Your participation remain anonymous
- You may receive the research findings & conclusion after graduation, if you wish

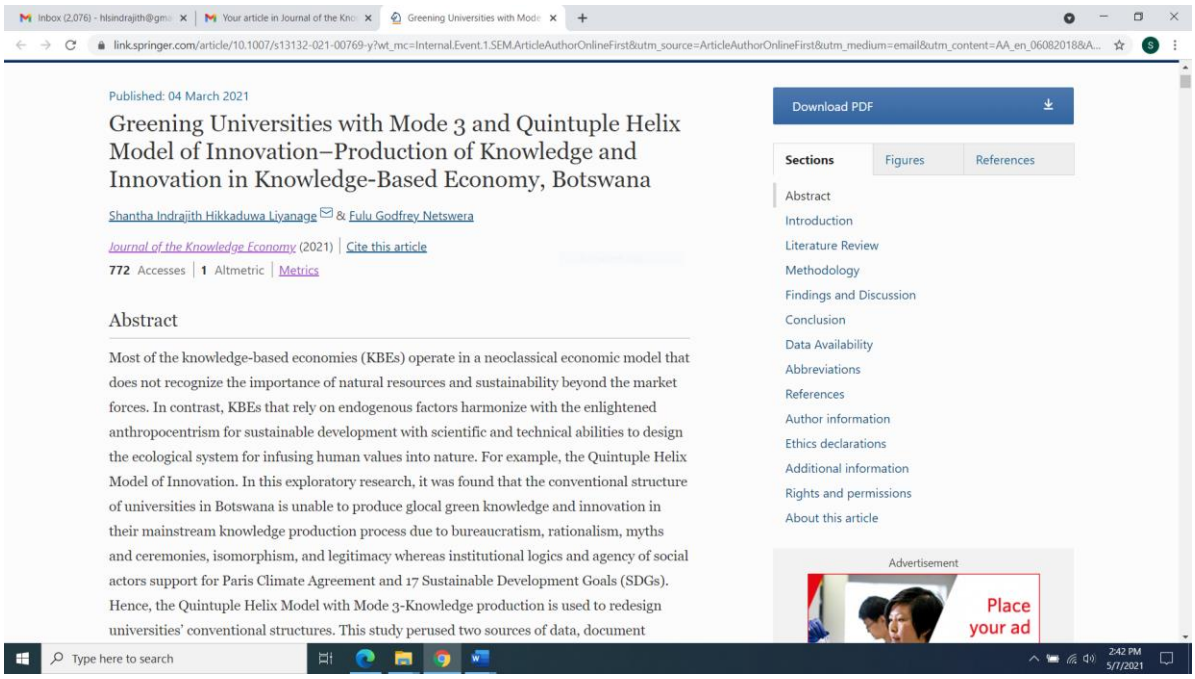
Signature of the Participant/Interviewee Email/telephone (Optional)

Signature of the Researcher

# Appendix 5: Published Research Paper-Greening Universities

The article is available as 'Online First': http://link.springer.com/article/10.1007/s13132-021-00769-y

## Appendix 5(a) – Journal of the Knowledge Economy Website



Published: 04 March 2021

Greening Universities with Mode 3 and Quintuple Helix Model of Innovation–Production of Knowledge and Innovation in Knowledge-Based Economy, Botswana

Shantha Indrajith Hikkaduwa Liyanage & Fulu Godfrey Netswera

*Journal of the Knowledge Economy* (2021) | Cite this article

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Abstract

Most of the knowledge-based economies (KBEs) operate in a neoclassical economic model that does not recognize the importance of natural resources and sustainability beyond the market forces. In contrast, KBEs that rely on endogenous factors harmonize with the enlightened anthropocentrism for sustainable development with scientific and technical abilities to design the ecological system for infusing human values into nature. For example, the Quintuple Helix Model of Innovation. In this exploratory research, it was found that the conventional structure of universities in Botswana is unable to produce glocal green knowledge and innovation in their mainstream knowledge production process due to bureaucratism, rationalism, myths and ceremonies, isomorphism, and legitimacy whereas institutional logics and agency of social actors support for Paris Climate Agreement and 17 Sustainable Development Goals (SDGs). Hence, the Quintuple Helix Model with Mode 3-Knowledge production is used to redesign universities' conventional structures. This study perused two sources of data, document

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Abstract
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Literature Review
Methodology
Findings and Discussion
Conclusion
Data Availability
Abbreviations
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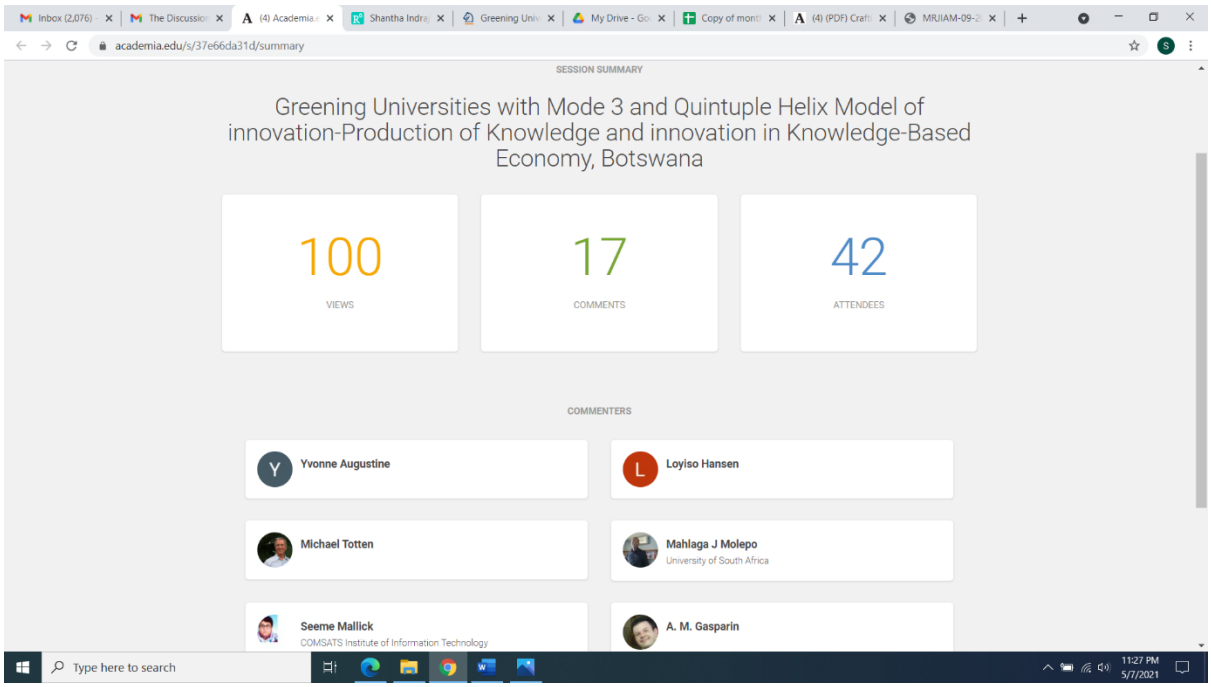
## Appendix 5(b)-Academia Discussion Statistics



SESSION SUMMARY

Greening Universities with Mode 3 and Quintuple Helix Model of innovation-Production of Knowledge and innovation in Knowledge-Based Economy, Botswana

100 VIEWS

17 COMMENTS

42 ATTENDEES

COMMENTERS

Yvonne Augustine

Loyiso Hansen

Michael Totten

Mahlaga J Molepo
University of South Africa

Seeme Mallick
COMSATS Institute of Information Technology

A. M. Gasparin

# Appendix 5(c)-Academia Discussion's Participants Comments

42 participants- Discussion ended on May 6, 2021

**Yvonne Augustine**

1 mo ago

to support the PAris Agreement, and 2030 SDGs Agenda , this paper is excellent. I just know there is Quituple. I used Baldrige to evaluate University, but is rather different. since baldrige is not discuss of Sustainability in detail. Continue in doing research with this measurement. maybe you can separate between Public University and Private University Then continue with the senior high school and junior high school. Is there any difference opinion or objectives. In the longrun it will cover all the education area.

Like Annotation: Page 1

**Shantha Indrajith**

1 mo ago

Thank you, Yvonne very much. This research focuses on the management strategy that can be used by all types of universities, Universities for not making profits and universities for making a profit. I appreciate very much your idea. I was thinking but narrowed it down to a common structure, strategy, and leadership. I hope for future research as you contemplated. Yes, Yvonne, we can see the production of green knowledge at levels below universities up to primary education too but they are doing within the existing structure "In this regard, it is to be noted that many sustainable practices focus on environmental or eco-efficiency (Fonseca et al., 2011; Lozano, 2006) while neglecting the social and cultural aspects of sustainability (Wright, 2010)." Cartwright and Craig (2006) point out that the mere contribution to global sustainability is not adequate to save the world. They argue that the contribution should be fair. Hence, I hope different models will come for both issues you raised in your comment

Like

**Shantha Indrajith**

1 mo ago

Thank you Loyiso Hansen very much for your valuable contribution. He commented on the paper with 23 pages write-up. He emailed it to me but I think others also may have an interest in reading. I post only the summary of the contribution below More comments from you all are

warmly welcome Summary This is thorough research, and couldn't have come at a better time for Botswana and the continent. Bologna application is ineffectual without upgrades as education is no longer a public good. Knowledge acquisition succumbed to profit maximization. The void between concepts and applications explains why we have chronic underdevelopment around for so long. Contextualizing a knowledge-based economy (KBE) in a straight jacket is detrimental to communities. Producing knowledge that does not improve the capacity to solve real-life challenges will not fly. The unique nature of research application is dissected in the link between rationale and objective. That explains the mechanics that is missing here. The mechanical application of the fusion of process innovation, pedagogy, and product innovation broadens the scope and deepens the depth of this exploratory research. Limitation of education is, educational tools have no substance on its own unless it is expressed through other disciplines. The global community of universities doesn't have the resources to design and implement green applications for universities, industries have to pay for it with governments because universities produce knowledge for industries to use. In terms of procedure, you are explicit on the mission, groundwork that has been done, tools to use, parameters of a social dimension to cover, the targets, and desired output. Don't make it boring. What is unique besides upgrading teaching and learning instruments? Are we gunning for the same old conventional research or there are good surprises up your sleeves? Furthermore, interdisciplinary juxtaposing intradisciplinary and interdisciplinary in clusters of networks says nothing about the nature of industries that are of priority considering Botswana is a green startup. Devoted to the notion of the knowledge economy and its significance in education. It is now fashionable to claim that economic progress depends upon knowledge and the utilization of knowledge – the so-called 'knowledge economy'. Yet economic progress and expansion have always depended on new ideas and innovation. Indeed, it was Francis Bacon who first suggested, 'knowledge is power. What has changed, perhaps, is that knowledge is now recognized as being at least as important as capital (physical and financial) and natural resources as a source of economic growth. Knowledge is now regarded as a national economic asset and the basis of national competitive advantage. Accordingly, education at all levels, and especially higher education, with its potential to enhance productivity through research, is seen as the global panacea to economic policy. As one of the major areas of public policy investment, governments around the world, in both advanced and developing economies are restructuring education systems, often in transparent terms that reflect the new policy template of the 'knowledge economy'(Michael Andrian Peters and Walter Humes, 2003). Investments in human capital and labor market skills affect personal income and the structure of wages (Adam Smith). Fuse together industries solution-based practices with complementary theoretical concepts, and other unobserved relevant variants to produce the good. Improved helix functionality with digital technology innovation intertwined with pedagogy. However, depth of discussions determines an academic exercise or pragmatic policy and systems application directives. Carayannis et al. (2016) assert the importance of creative and innovative organizational context for Mode 3 so that it enables combining and integrate different principles of knowledge production and their application by motivating diversity and heterogeneity for research and innovation (2016). Stop playing by the rules when reviewing the role of the State. Be very critical in a nice way to get them to create new responsibilities and new rules that move them

forward otherwise nothing will change. For them to stick to formulation and regulation of policy is hopelessly inadequate. Technology applications have shifted from suburban technology parks to entrepreneurial activities in cities (Victor Mulas et al., 2015). Advancing research discourse on sustainability as a condition that manifests green growth, does the application of ICT have a role to play in these processes? ICT is creating new sources of employment and new businesses. New sources of growth that translate into employment that impact competitiveness, reduce poverty, and increase shared prosperity. Use it to grow human capital and talent to create innovation centers that generate growth, entrepreneurship, and employability. Half of the world's population lives in cities, and the figure approaches 80 percent in Latin America. The fusion of concept and application enables all companies to be involved in the knowledge production economy particularly for young people who are said to be in the third industrial revolution. For example, coding and hardware skills that previously take years to learn can now be taught in weeks (Victor Mulas et al., 2015).

Like

**Loyiso Hansen**

2 mos ago

Your exploratory research paper is very good, extensive, and has depth. It can be better under the circumstance. I suggest an additional angle within the ambit of education. I need to email my comments to you. Send me an email address so I can send it on attachment. Best regards

Unlike 1

**Shantha Indrajith**

2 mos ago

Thank you very much. Hansen. I appreciate very much your suggestions with different angles. Such suggestions will definitely develop our knowledge. Michel suggested about open Source I started reading. Please communicate my email is below
shantha.indrajith@bothouniversity.ac.bw

Like

**Mahlaga J Molepo**

2 mos ago

What a wonderful paper, presentation and discussion. The knowledge systems approach is often neglected in many studies by scholars in mostly developing countries. For instance, the concept of Triple-Helix has not found its rightful place in the South African national discourse as yet because of a narrow approach to understanding how our society is structured at a broader level. This despite the fact that the Triple Helix Association hosted a conference in Cape Town, South Africa in 2019. Kindly invite me for future presentations.

Like

**Shantha Indrajith**

2 mos ago

Thank you very much Mahlaga J Molepo South Africa and Botswana are neighboring countries. South Africa is the best in Africa in discourses of sustainability. We will try our best to contribute to breaking the existing " narrow approach of our society structured at a broader level". We will continue this discourse with you

Like 1

**Michael Totten**

2 mos ago

Hello Shantha, this is a very informative article, emphasizing a direction that really needs adoption in every locality. One thing I would suggest, is thinking about adding in the concept of project/problem-based open-source learning platform, where campus-scale, city-scale, national-scale, and regional-scale inventories of assets are performed. Assets understood in a broad sense of encompassing all forms of capital - natural, human, social, civic, intelligence, financial, and physical infrastructure. For example, there are many large data sets now available for inventorying all solar-capable rooftops and ground spots, and apps that calculate economic & financial assessments, as well as job generation and pollution prevention outcomes. For more detail on this collective intelligence/collaborative innovation network (COIN) see my paper, Campus & City Climate Collorative (https://michaelptotten.medium.com/campus-and-city-climate-collaboration-4c-fc14b74f6cbe ). all the best, Michael

Unlike 1

**Shantha Indrajith**
2 mos ago
Dear Michael Totten Thank you very for the sugession It is a very interesting idea as you said "One thing I would suggest is thinking about adding in the concept of project/problem-based open-source learning platform, where campus-scale, city-scale, national-scale, and regional-scale inventories of assets are performed." I will start reading and hope to collaborate with you on the conceptual idea related to the Project problem-based open-source learning platform. I understand the power of open source and start looking for data

Like

**Seeme Mallick**
2 mos ago
Excellent effort and innovation in the study of the Knowledge-Based Economy: Sustainability in Knowledge-Based Economy: Three Pillars of Sustainability - environmental sustainability, economic sustainability, and social sustainability Green knowledge system & green universities producing green research. Green education = education for sustainable development or education for sustainability Need for Institutional Change for Sustainability in Universities Innovations in Green Corporate Culture and green corporate governance for providing momentum and applying the new green research.

Unlike 2

**Shantha Indrajith**
2 mos ago
Thank you, very much, Seeme Mallick I first presented this paper at a research conference in 2017. After a prolonged involvement, this paper was published. As you said there is a "Need for Institutional Change for Sustainability in Universities". However, Institutional logic, Isomorphism, legitimacy are the challenges of transformation despite 17 SDGs, the Paris Climate Agreement, Nationally determined Contribution, Doughnut economics, Nine Ecological Boundaries have been able to make changes/alterations to the conventional Institutional logic, Isomorphism, and legitimacy of an organization towards sustainable development.

Like 1

**Piero Formica**
2 mos ago
The voice of nature calls students to practice the intellectual gymnasium in which the different branches of knowledge interact until they merge. By building transdisciplinary bridges, students will design their tailor-made study clothes, merging scientific and humanistic subjects. Among the “tools” of the gym, narratives give a glimpse of the paths to take. Think of the German Jesuit Athanasius Kircher (1602-1680), a scientific star of the Baroque age and a traveller in many worlds of knowledge. Kircher moved between the study of volcanoes and fossils, the observation of microbes under the microscope, mechanical inventions such as automata, the magnetic clock and megaphone, Egyptology, music theory, and comparative religion.

Unlike 1

**Shantha Indrajith**
2 mos ago
Thank you, Formica very much that "By building transdisciplinary bridges, students will design their tailor-made study clothes, merging scientific and humanistic subjects." All students have to merge scientific and humanistic subjects to be Green Collar employees moving away from white collar employees.

Like 1

**Shantha Indrajith**
2 mos ago
The article is available as 'Online First': http://link.springer.com/article/10.1007/s13132-021-00769-y Your thoughts are very much appreciative and warmly welcome Universities that are leaders and catalysts, need to reconfigure the conventional structure, strategy, and leadership so that they enable the production of green knowledge and innovation. In this mission, new structures such as green governance, green culture, green education, green research, green internal operations, green community outreach, and green reporting are required. The quintuple helix model provides a strategy to be adopted. This research endeavors an integrative approach in this respect. All your comments are warmly welcome

Like 1

**Loyiso Hansen**
2 mos ago
Okay Shantha, I will scrutinize and send my honest view. Best of Luck!

Unlike 1

**Shantha Indrajith**
2 mos ago
Thank you, Hansen, very much In search of true knowledge, there is no alternative other than the the feedback review.

Like

**A. M. Gasparin**
2 mos ago
Saudações, Shanta! Seu trabalho é muito esclarecedor, colaborando de modo eficaz para o senso crítico. Muito obrigado por convidar à discussão. Em tempo, há que observar a repetição dos termos a seguir: "Artigos de pesquisa que estavam duplicados em duas ou mais bases de dados foram identificados e a duplicação foi evitada. Eles foram destilados sistematicamente e sujeitos a verificação de qualidade por meio de sua classificação em uma planilha para reduzir o viés de seleção com base no modelo da metodologia desenvolvida por ..." Atenciosamente, AMG.

Unlike 2

# Appendix 6: Interview Data Coding Sheet-Coding Sheet-Interviews

| Types of Interviewee | Trans cript No | Corporate Governance | | | | green corporate culture | | Three Pillars of Sustainability | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 -A | Q2 -B | Q2 -C | Q1 | Q2 | Q1 -A | Q1 -B | Q1 -C | Q1- D | Q2-A | Q2-B | Q2-C |
| Professors and Dr | 06 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 2 | 07 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 3 | 13 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 4 | 17 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 5 | 21 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 6 | 22 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 7 | 43 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 8 | 54 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 9 | 56 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Total | | 9/9 | 3/9 | 1/9 | 5/9 | 9/9 | 9/9 | 0/9 | 0/9 | 0/9 | 9/9 | 0/9 | 0/9 | 9/9 |
| % | | 100 % | 33 % | 11 % | 56 % | 100 % | 100 % | 0% | 0% | 0% | 100 % | 0% | 0% | 100% |
| Senior Lecturers | 01 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 11 | 02 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 12 | 05 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 13 | 09 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 14 | 10 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 15 | 11 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 16 | 12 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 17 | 14 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 18 | 15 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 16 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 20 | 27 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 21 | 28 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 22 | 29 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 23 | 35 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Total | | 14/14 | 04/14 | 07/14 | 03/14 | 14/14 | 14/14 | 00/14 | 00/14 | 00/14 | 14/14 | 10/14 | 00/14 | 13/14 |
| % | | 100% | 29% | 50% | 21% | 100% | 100% | 0% | 0% | 0% | 100% | 7% | 0% | 93% |
| Academic Managers | 19 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 25 | 20 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 26 | 30 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| 27 | 44 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 28 | 47 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 29 | 48 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 30 | 53 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 31 | 55 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Total | | 8/8 | 3/8 | 3/8 | 2/8 | 8/8 | 8/8 | 2/8 | 1/8 | 1/8 | 6/8 | 0/8 | 2/8 | 6/8 |
| % | | 100% | 37.5% | 37.5% | 25% | 100% | 100% | 25% | 12.5% | 12.5% | 75% | 0% | 25% | 75% |
| Non-Academic Managers | 08 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 33 | 38 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 34 | 45 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 35 | 50 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 36 | 51 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 37 | 52 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 38 | 57 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Total | | 4/7 | 3/7 | 4/7 | 0/7 | 6/7 | 6/7 | 0/7 | 1/7 | 3/7 | 3/7 | 1/6 | 3/6 | 2/6 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % | | 57% | 43 % | 57 % | 0% | 86 % | 86 % | 0% | 14 % | 43 % | 43 % | 17% | 50% | 33% |
| Under/Post graduates | 03 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 40 | 04 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 41 | 18 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 42 | 23 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 43 | 24 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 44 | 25 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 45 | 26 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 46 | 31 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 47 | 32 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 48 | 33 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 49 | 34 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 50 | 36 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 51 | 37 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 52 | 39 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 53 | 40 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 54 | 41 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 55 | 42 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 56 | 46 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 57 | 49 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| Total | | 19/19 | 12/19 | 07/19 | 00/19 | 18/19 | 19/19 | 02/20 | 00/20 | 03/20 | 15/20 | 09/19 | 07/19 | 03/19 |
| % | | 100 % | 63 % | 37 % | 0% | 95 % | 100 % | 20 % | 0% | 30 % | 75 % | 47% | 37% | 16% |
| Professors and Dr | | 09/09 | 03/09 | 01/09 | 05/09 | 09/09 | 09/09 | 00/09 | 00/09 | 00/09 | 09/09 | 00/09 | 00/09 | 09/09 |
| Senior Lecturers | | 14/14 | 04/14 | 07/14 | 03/14 | 14/14 | 14/14 | 00/14 | 00/14 | 00/14 | 14/14 | 10/14 | 00/14 | 13/14 |
| Academic Managers | | 8/8 | 3/8 | 3/8 | 2/8 | 8/8 | 8/8 | 2/8 | 1/8 | 1/8 | 6/8 | 0/8 | 2/8 | 6/8 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-Academic Managers | | 04/07 | 03/07 | 04/07 | 00/07 | 06/07 | 06/07 | 00/07 | 01/07 | 03/07 | 03/07 | 01/06 | 03/06 | 02/06 |
| Under/Post graduates | | 19/19 | 12/19 | 07/19 | 00/19 | 18/19 | 19/19 | 02/20 | 00/20 | 03/20 | 15/20 | 09/19 | 07/19 | 03/19 |
| Total | | 54/57 | 25/57 | 22/57 | 10/57 | 55/57 | 56/57 | 04/60 | 02/60 | 07/60 | 47/60 | 11/56 | 12/56 | 33/56 |
| % | | 95 | 44 | 39 | 17 | 96 | 98 | 07 | 3 | 12 | 82 | 20 | 21 | 59 |

Notes

The answers given by the interviewees to the question no 02 under the Corporate Governance are multiple answers. They are codes into three, namely, Top to bottom approach, Bottom to top approach, and Mixed approach. These answers were mutually exclusive. The multiplicity of the answers given to question 1 under three pillars of sustainability is of four types, namely, economic sustainability, social sustainability, environmental sustainability, or all three. These answers were not mutually exclusive. In this regard, the interviewees enable responding any combination of them too. The multiplicity of answers to the question 2 under three pillars of sustainability is of three types, namely, local/regional issues of sustainability, Global issues of sustainability, and both local and global issues of sustainability. These answers were also mutually exclusive. No of responses are not equal with the number of respondents, when a respondent/s did not answer or answered two or more alternatives that are not mutually exclusive.

# Appendix 7: Direct Quotes used to Extract Vivo/Literal Codes

| **Table 6: Template for Axial Coding Document Analysis- Green Corporate Governance** ***by Categories, Structure & Strategy, Leadership, Accountability*** |
|---|
| 1. "Governance policy relates to the vision, mission, purpose, and main objectives of a university. Transforming the policy into actual results entails disseminating all the behaviors of a sustainability culture and implementing appropriate systems of direct accountability to both internal and external stakeholders." |
| 2. "In total, 425 higher education stakeholders from 101 countries responded and reported about their achievements and challenges. The study… was presented in September 2014 at the International Conference on Higher Education for Sustainable Development in Nagoya, Japan. Globally, 45 percent of respondents say that they are inspired by policies to integrate sustainability into their institution." |
| 3. "The commitment to the University of Bologna's sustainability was made clear through the last Strategic Plan approach explicitly aimed at the consideration of the UN Sustainable Development Goals (SDGs). Parallel to integrating the SDGs in strategic planning, the university has an additional tool for reporting on the extended performance, presented during the G7 environment held in Bologna in June 2017. Accordingly, the open coding, policies was identified." |
| 4. "An Environmental Management System (EMS) is a part of an organization's overall management system. It includes the organization structure, planning activities, responsibilities, practices, processes, and resources to implement and maintain the EMS. Accordingly, the open coding, policies was identified." |
| 5. "The policies and procedures give clear direction to those who are assigned to perform specific responsibilities. Therefore, the study recommends that leadership governance should be transparent and incorporate stakeholders in the process of reviewing and the improvement of policies and procedures." |
| 6. "Policy formation and change implementation and effectiveness in this area include identifying management and governance systems in higher education which have successfully given sustainability a more central role in universities and colleges; effective ways to engage senior leadership with giving sustainability a more central focus in the |

| |
|---|
| university's core activities and operations; how best to engage key policymakers and government officials." |
| 7. "The relationship between corporate governance and sustainability. Specifically, the relationship between board structure, disclosure, board procedure, and sustainability performance have a significant influence on environmental performance, economic performance, and social equity performance." |
| 8. "The collegiate nature of the higher education sector, with its shared governance models and different constituencies and performance drivers, means that sustainability at a strategic level must be led with leaders at all levels acting with purpose. The "living lab" model can become a part of transformative institutional change that draws on top-down and bottom-up strategies to pursue sustainable development." |
| 9. "This is what Paul Polman has been very, very clear about. It is not an aspirational dream to help us to try to recruit the best people in the world. At the end of the day, this is a survival issue. We will not get the right to grow and even worse, will not have the right to be in business if we create a big environmental disaster…" |
| 10. "There is evidence of leadership structures being put in place to ensure that the board and senior management are involved in sustainability strategy development and are incentivized to monitor and ensure implementation of that strategy through financial rewards and a willingness to engage and communicate the results of these strategies to interested stakeholders." |
| 11. "The viewpoints of directors and managers change in the direction of sustainability, but not because they are compliant or responsive. Instead, the changes arise from a personal conviction that a change of stance is the "right thing to do. " |
| 12. "Governance policy relates to the vision, mission, purpose, and main objectives of a university. Transforming the policy into actual results entails disseminating all the behaviors of a sustainability culture and implementing appropriate systems of direct accountability to both internal and external stakeholders." |
| 13. "New implications for successfully achieving sustainability arise from these findings. Accountability is a crucial issue, as RMIT appears to reap benefits from being a signatory to declarations without achieving genuine progress. To ensure that declarations are more than |

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|---|
| greenwash, universities must open themselves up to the scrutiny of progress to determine whether commitments have been honored." |
| **Table 7: Template for Axial Coding Document Analysis-Green Corporate Culture *by Categories, Values & Beliefs, Policies & Structure, Communication*** |
| 1. “The strategies and objectives of an organization are influenced by its organizational culture leading either to development [transformation] or stasis [failure and setback]. Thus, there are either challenges or motivating successes attained through adherence to a particular organizational culture. These challenges emanate from the management and its community when they disregard diverse societal groups and slow the rate of transformation.” |
| 2. “Organizational culture, in general, can be considered an integral part of sustainability governance since each HEI has a specific mode of engagement with SD depending on its prior experiences, its code of communication, its resources in terms of expertise and time, its recognition of SD as an opportunity for profiling, its perception of public pressure on the HEI.” |
| 3. “The connections between culture and sustainability have been on the public agenda since the 20th century. However, while global sustainability programs at international institutional levels are yet to recognize the role of culture in its sustainability policies, the bid (albeit failed) in the early 2000s to formally add ‘culture’ to the trilogy of sustainability pillars (economic, social, and environmental) mobilized a new discourse for the reframing of cultural policy narrative, which in turn urged a reassessment of methods of cultural management reflecting the same concerns among the sector’s grassroots.” |
| 4. “Change models for sustainability comprise a four-phase process that moves from strategic to operational activity, i. developing a sustainability vision for the university, ii. the mission, the who, what, and why for future actions, iii. enact a sustainability committee to create policies, targets, and objectives, iv. sustainability strategies in four domains of activity, including education, research, outreach and partnership, and campus sustainability.” |
| “Culture for sustainability, the intrinsic and instrumental values of culture become embedded in, and constitutive of, the cultural change…that may transform society. Thus, culture can be considered a structural component. However, as a necessary agency in the transformation |

| |
|---|
| towards a more sustainable society… nature is a constituent of culture, in parallel with the economy and the social, and is (re)shaped by different meanings and symbols." |
| 6. "Cultural values may be considered antecedents of cultural practices since they precede behavior (Egri et al., 2012). Consequently, there appears to be an essential discrepancy between values and practices that need to be considered when delineating culture's influence on corporate sustainability practices, where cultural practices may be a better indicator of sustainability practices." |
| 7. "Many colleges and universities have undertaken serious efforts to reduce their negative environmental impact while also reducing their energy costs. At many institutions, the efforts to influence individuals' behavior have often not been prioritized as highly as technical adjustments… UM developed a unique culture team for developing – and monitoring progress towards developing – a culture of environmental sustainability among UM students, faculty, and staff." |
| 8. "High-performing firms used several communications vehicles to foster greater employee involvement, communication, and cross-functional collaboration relating to their sustainability efforts. They also found that low-performing companies focused mainly on compliance via control approaches. Other research suggests that a focus on sustainability in human reource practices can help in recruiting and retaining top talent, as well as fostering innovative efforts among employees." |
| 10. "In any sustainable plan or strategy communication plays a vital role. People must express themselves internally and externally by using appropriate mode(s) of communications to plan and develop sustainability and sustainable strategies. Thus, to establish effective communication, the managers in an organization have to channel the receiver what they mean to communicate in a simple, direct, and precise manner, whether it be on the oral or written modality." |

**Table 8: Template for Axial Coding-Three Pillars of Sustainability *by categories, Education for Sustainable Development, Reconciliation of three pillars' and Local, national, and global issues***

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| 1. "Three pillars – economic growth, social inclusion, and environmental balance – have been serving as a guiding, grounding, and unifying framework for the sustainability movement in higher education (HE) since the late 1980s." |
| 2. "The University of Vermont measured the perceived performance of the three pillars of sustainability (environmental, social, and economic) and the range of activities (academics, outreach, operations). Respondents rated performance on the environmental dimension highest, with social still being above the overall score. The economic pillar rated by far the lowest performance." |
| 3. "The three pillars framework is strategic because it often reveals specific and feasible changes to drive sustainability solutions within markets and institutional settings." |
| 4. "The authors describe the design and implementation of sustainability education through "sustainability across the curriculum" construct and the alternative of colleges and universities developing full-fledged degrees and other curriculum-related programs in sustainable business and sustainable practices…to become truly sustainable communities by using the three guiding pillars of sustainability." |
| 5. "Campus sustainability efforts have focused more on sustainability's environmental and economic aspects, with less attention to its social aspects. This paper aims to draw on a study of student food insecurity to consider how sustainability's three pillars might be more holistically engaged." |
| 6. "ESD is mainly related to the pillar of the environment but ignores the pillars of society and economy. Further, it is ignored the interdependent relationship between these three pillars." |
| 7. "The UN SDGs can be seen as the culmination of a process that began with the Brundtland Commission, which popularized the term "sustainable development." Since 1987, achieving a global sustainable development and its three main components—economic growth, environmental protection, and social equity—have focused on the United Nations." |
| 8. "Until recently, sustainable development was viewed solely through the lens of the environmentalist, but as the concept has matured, increasing emphasis has been placed on its interconnection to social and economic dimensions of development." |

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| 9. "The metaphors of "three pillars of sustainability" or the "triple bottom line" are often used to emphasize this systemic interconnection. From this perspective, activity or enterprise can be described as sustainable only when all three pillars are incorporated. This interrelationship is often associated with the alternative phrase "people, planet, profit," which serves as a mnemonic device for some public texts intended for general audiences." |
| 10. "While the concept of sustainable development (SD) generally refers to achieving a balance among the environmental, economic, and social pillars of sustainability, the meaning and associated objectives of the social pillar remain vague." |
| 11. "The sustainable university contributes to the regional, national social and economic development (North, 2005), and the contributions of the university are also reflected in regional aspects, such as the increase in immigration, university-industry cooperation, regional income, labor force mobility, also in improving quality of life, sustainability." |
| 12. "Universities must become an integral part of the processes that educate people who are critical, responsible, committed, and consistent, but they must also respond to their society's demands for a set of responsible values that foster sustainability. The latter is based on three fundamental pillars: economic growth, environmental protection, and social development." |
| **Table 9: Template for Axial Coding-Green Education by categories, Knowledge & Skills, Values and Beliefs, Attitudes** |
| 1. "The discussions resulted in a synthesis of twelve competencies, Systems thinking; Interdisciplinary work; Anticipatory thinking; Justice, responsibility, and ethics; Critical thinking and analysis; Interpersonal relations and collaboration; Empathy and change of perspective; Communication and use of media; Strategic action; Personal involvement; Assessment and evaluation; and Tolerance for ambiguity and uncertainty." |
| 2. "Education for sustainable development is a process that goes beyond acquiring knowledge and learning about theories related to sustainable development. It should be a holistic education process concentrated on searching for correlations, presenting a coherent picture of the world, and preparing to operate within it." |
| 3. "Green education is always the central mission of universities, as universities significantly impact their students' attitudes and knowledge development. Tsinghua University's green university principle focuses first on the system of "green education," which means applying |

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| the concept of sustainability to education. Through formal and informal green education efforts. Tsinghua has committed itself to inspire students to become responsible citizens." |
| 4. "This paper explores the experiences of academic staff committed to embedding sustainability within tertiary curricula and pedagogy." |
| 5. "This study examined how faculty perceptions of sustainability pedagogy, key competencies, and interdisciplinary class design differed between bottom-up and top-down approaches. Top-down approaches include creating missions, programs, and courses based solely on sustainability concepts, theory, or practice. Bottom-up approaches focus on integrating sustainability concepts, theory, or practice into existing degrees and coursework in established disciplines." |
| 6. "Sustainable development (SD) is a broad and evolving concept based on the three pillars of environment, economy, and society. Accordingly, ESD is an ambitious, wide-ranging approach. ESD involves a long process of learning and educating, and its objectives require further critical reflection by the learner …A lengthy process is required to proceed from popularizing the term "sustainability" to implementing real actions to achieve it. This process requires vision, policy, and sustained funding, which is not easy to attain." |
| 7. "Strategic Plan refers explicitly to 'a holistic approach to SD', the need to 'ensure that graduates develop a global perspective and understand the need for sustainable development by seeking to embed sustainable development across the curriculum (p. 19) and the need to 'ensure BU operates an affordable, sustainable and secure estate." |
| 8. "As we move into an era of increasing ecological and sociocultural demise, it is more important than ever to encourage learners to engage in these complex issues and tensions, to provide opportunities for the transformation of unsustainable values and belief systems, to foster an understanding of interconnectedness, and to support learners in becoming creative problem solvers and change agents." |
| 9. "Students had negative attitudes toward the environment as a sustainable development practice. They perceived that people's interference with the environment might produce catastrophic consequences impacting people's quality of life. Moreover, students perceived that industrial growth, agricultural production, and building developments were more |

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| important than environmental protection. These results are disturbing and deserve further attention.” |
| 10. "Agriculture students performed better on the environment factors than psychology students, thus demonstrating stronger attitudes toward environmental care, whereas psychology students performed better on society, thus demonstrating more sensibility toward social issues." |
| **Table 10: Template for Open Coding-Green Research *by Categories, Sustainability Research, Research by Faculty, Research by Students*** |
| 1. "As elite institutions, they can map their policies and strategies to make campus operations instrumental in SDGs implementation. They can establish a sustainability division/office to spearhead initiatives such as recycling, retrofitting, renewable energy, gardens, estates section, green procurement, open green spaces, sustainability awareness, and carbon offset projects… SDGs 7, 8, 9, 11, 12, and 13 are shown to fit in a university's operations management." |
| 2. "Universities can and should play a key role in turning society sustainable through their power to teach and generate world leaders and their capability to perform research activities to enable a sustainable future. Broadly speaking, a sustainable university should "walk the talk" regarding its sustainability agenda, i.e., it should teach the concept and philosophy of SD to its students, but it should also be able to embrace the concept within day-to-day organizational management.” |
| 3. "It is based on a critique that existing educational research does not reflect the variety of environmental, ethical theories… When combining educational perspectives, objectives, and questions with ethical reasoning and clarifications, the quality of such research is dependent on the degree to which the characteristics and differences between different environmental ethical positions are considered. Hence, it is significant that the research reflects both the diversity and development within the environmental ethical field." |
| 4. "A university is an ideal meeting ground for teachers capable of imparting their knowledge and well equipped to develop it by research and innovation and for students, entitled, able, and willing to enrich their minds with that knowledge, all of which could serve as a basis for discussion of the need for SD in the world and ESD in universities." |

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| 5. "What students should learn will aim to teach specific knowledge on sustainability that leads to enhancing social and practical skills for students that are beneficial to society at large. Finally, several universities have adapted the top-down sustainability approach, where the upper administration took the initiative to create a sustainable university through education, research, and campus operations." |
| 6. "The complexity of today's research problems increasingly demands that scientists move beyond the confines of their discipline… early-stage researchers enable working across disciplinary boundaries and showing that important discoveries are being made at the intersection of disciplines. Embedding various research projects in a more global framework can meet the demands of an interdisciplinary or transdisciplinary approach for sustainable research." |
| 7. "Student-led interdisciplinary initiatives, such as the SRS, are essential in developing sustainability literacy skills within the student body at both undergraduate and graduate levels. For participants, these initiatives provide essential and often first-time exposure to interdisciplinary collaboration, they connect researchers across faculties, and they provide not only educational but hands-on problem-solving opportunities." |
| 8. "Students/Research assistants expressed appreciation for working directly with faculty to research exciting and often unfamiliar areas of environmental sustainability. Faculty reiterated this enthusiasm for the student-faculty relationship as "educational and valuable," citing the "unique student perspective" as a critical element for developing new and existing courses." |
| 9. "Incorporating sustainability into the curriculum creates awareness through SD programs, events, research, and implementation through operations. They will develop an awareness shift in students' behavior, incorporating green lifestyle (such as the use of bicycles, optimal use of resources, use of public transport, and energy-efficient appliances) into their exhibit and change in habits (such as turning off lights in empty rooms and practice the 3 'R's' Reduce, Reuse, Recycle)." |
| 10. "The most apparent effect of solution-oriented participatory sustainability research projects is a usable product. Unlike traditional research, however, solution-oriented sustainability research aspires to products beyond academic publications, presentations, patents, which are generally accounted for in the academic administration (e.g., quantified in |

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| bibliometric measures). The solution orientation requires accounting for usable 'real-world' products that result from sustainability research, including technologies, goods, or services. These are critical elements of the solution options and sustainability research promises to develop in response to complex problems" |
| **Table 11: Template for Axial Coding-Green Community Outreach *by Categories, Benefits to stakeholders, Governance Issues*** |
| 1. "This paper finds that most policies conceptualized sustainable development using the Brundtland definition regarding environment, society, and economy. In addition, policies conceptualized campus sustainability as including teaching, research, operations, and community outreach." |
| 2. "Sustainability is engaged in the policies concerning overall governance, education, operations, research, and community outreach. Community outreach projects as a sustainable way of introducing information technology in developing countries." |
| 3. "What is essential for those in outreach and engagement at Institutions of Higher Education (IHEs) is to recognize the relationship between policy, economic trends, strategic planning, and innovation management. Therefore, the focus of Outreach and Engagement programs should be to address these "new" scholarships through merging teaching, service, and research." |
| 4. "Reciprocal engagement between universities and the community demands a dynamic, proactive, and leading role from universities to extend their intellectual efforts in ways that raise social, cultural, and economic standards of communities...The organizational changes in HEIs are deemed unavoidable as such issues as outreach, community services, governance, and internationalization have defining roles that are reshaping universities' organizational dynamics." |
| 5. "The integration of sustainable development into Higher Education Institutes follows no standard approach, with the number of initiatives for sustainability outweighing the number of strategies and policies, presenting a general bottom-up process. Overall, Higher Education Institutes lack a systemic approach. The majority of initiatives focus on campus actions, with outreach neglected." |

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| 6. "In practice, the framework can become a guide for developing a community engagement strategy. The factors identified to serve as a checklist during the formulation of a sustainability program. Additionally, the 6-P framework also demonstrates the need for both top-down commitment and bottom-up initiatives for sustainability. Community engagement in sustainability requires a paradigm shift in nurturing a sustainability culture among diverse groups of people within university campuses." |
| 7. "The strategic plans of 50 HEIs were undertaken to determine how sustainability is a significant policy priority in the plans, including across the five domains of governance, education, campus operations, research, and community outreach." |
| 8. "Community outreach projects as a sustainable way of introducing information technology in developing countries provide benefits to Students and the Community." |
| 9. "Students were also required to develop a research project in concert with members of forming a community partnership with the Eco-Village community, designed to meet a community need, Eco Village's energy use, transportation issues, and botanical inventory." |
| 10. "Student training projects can provide benefits for both universities and communities. It appears that student training projects do not depend on individual engagement, individual university staff members, or research grants, and they provide community members with access to resources, expertise, and experiences of academics." |
| 11. "Pre-study findings indicate that curricular content may influence the evolution and community impact of collaborative relationships between the university and the community." |
| 12. "Pedagogical innovation is designed to cultivate a common intellectual conversation across the campus, enhance students' participation (all stakeholders) in the campus's intellectual life, and foster a sense of community across the campus and extended community." |
| **Table 12: Template for Axial Coding-Green Internal Operations *by Categories, Quality of life, Awareness of Internal Ecology, Conservation and Efficiency, Governance Issues*** |
| 1. "A primary barrier to implementing Green Campus is the lack of conscious environmental education and awareness that has hampered the local, sustainable initiatives. In addition, the lack of environmental awareness contributed to the lack of caring about our environment's |

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| problems, such as loss of biodiversity, pollution, global warming, and others. Dahle and Eric (2001) supported that one of the categories classified as a barrier is awareness, where people simply do not know how to be sustainable in their actions." |
| 2. "Many of them suggested that raising awareness and sustainable development education are among the essential means campus community could be encouraged to carry on campus greening. Others recognize structural and functional issues such as empowering and involving staff with leadership positions (e.g., deans, department managers), including collaboration with students." |
| 3. "The authors estimate that of the 4,139 trees, the authors' count contains 5,809 tons of CO2. The authors further estimate the additional CO2 sequestration over the next ten years to be 253 tons per year. The university's annual CO2 emissions were 4,086 tons in 2011. More than 70 percent of this amount relates to overseas travel. Therefore, CO2 sequestration in trees promises to mitigate only about 6 percent of total emissions over the next ten years." |
| 4. "Environmental benefits typically comprise the primary reason for the design and construction of green buildings…better indoor working environments in green buildings can increase profitability by increasing customer satisfaction, increasing worker productivity by up to 16 percent, and reducing employee absenteeism by as much as 45 percent." |
| 5. "Although many studies are focusing on energy issues at universities, less is discussed about the connection among actions from HEIs, energy efficiency, and the SDGs; therefore, this paper aims to present a case study of a university in the South of Brazil and use it to explore how energy-efficiency actions implemented by HEIs are contributing to SDG 7." |
| 6. "The international policy framework relevant to water management is contained in the 2030 Agenda for 17 Sustainable Development Goals. On the agenda, there are 17 SDGs and 169 integrated and indivisible targets together with 230+ indicators. Among the SDGs, SDG 06: Clean Water and Sanitation & 12th Sustainable Development Goals: Responsible Consumption and Production are meant for voluntary water conservation." |
| 7. "Green buildings can reduce costs to the owner/occupier over the building's operational life cycle because of energy efficiency savings, water efficiency savings, mechanical equipment downsizing, reduced insurance and liability costs, building value and demolition, and site clearing costs. Similarly, better indoor working environments in green buildings can |

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| increase profitability by increasing customer satisfaction, increasing workers, and reducing employee absenteeism." |
| 8. "This study compared the stakeholders' perceptions in Green Campus and Non-Green Campus universities' stakeholders' satisfaction on sustainability practices and perceived quality of life at their campuses. The results showed that stakeholders at the studied Green Campus University were more satisfied and had a significantly better-perceived quality of life than stakeholders from the studied Non-Green Campus university." |
| 9. "Frequency statistics determined that, on average, more than half the students were ranked as "high-users" of the campus green spaces, and very few students were considered "low-users." Frequency statistics also determined that most students rated their overall quality of life and quality of life of university students positively. Additionally, this study found that undergraduate students' use of campus green spaces and perceptions of quality of life were related to each other." |
| 10. "The governance of universities must be dynamic and responsive to changes and needs. Administrative and leadership support needs to establish a sustainable campus's policies and objectives, have a vision and planning for the future, sustainable leadership practices, and allocate funds for campus sustainability. Top management plays a significant role, especially in the implementation and success of the sustainable campus policy." |
| 11. "A system, i.e., holistic or whole institution, approach to implementing campus sustainability that encompasses more than just classroom learning and includes all facets of university life: education (curricular and co-curricular education), research (student and faculty research for sustainability), operations (transforming building, procurement, maintenance practices, human resources, and student administration), and community outreach (including the broader community in these efforts)." |
| **Table 13: Template for Axial Coding-Green Reporting *by Categories, Measuring the Performance, Three Pillars, Governance*** |
| 1. "Sustainability reporting by universities focuses on the environmental dimension, whereas the university and the economic dimensions see lower reporting levels. The social dimension is rarely addressed." As direct quotes stated above, the open coding, Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance." |

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| 2. "Assessment tools can help a university reorient itself towards a sustainable future and assist the university in explicitly acknowledging areas to be recognized, addressed, and improved." In accordance with the direct quotes stated above, the open coding, Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance." |
| 3. "Notwithstanding growing concerns over sustainability issues, higher education institutions have been slow to adopt sustainability reporting practices, including publishing consistent and periodic reports, receiving third-party assurance, and integrating sustainability reporting into the university's sustainability management systems." |
| 4. "The direct quotes which were used to extract vivo codes provides that "There are unidimensional indicators, bi-dimensional indicators latter which to measure indicators of eco-efficiency, socio-environmental indicators, socio-economic indicators, and tri-dimensional indicators emerge through the interaction of all three aspects of system sustainability, which are the accurate sustainability indicators" |
| 5. "The direct quotes which were used to draw out vivo codes provides that "As a remedy to make sustainability reports (SRs) more relevant for stakeholders, materiality has emerged as a reasonably new content principle for SRs (Diouf & Boiral, 2017; Eccles et al., 2012). SRs should focus on those aspects which stakeholders regard as material for their decision-making (Calabrese et al., 2016). Materiality aims at terminating the practice that stakeholders are confronted with a wide variety of irrelevant indicators." |
| 6. "The 11 campus sustainability assessment tools reviewed in this article vary significantly in purpose, scope, function, and development state. However, these tools share essential strengths and weaknesses. Many assessments excel in capturing baseline data on environmental and sustainability performance and process-oriented information on how campuses are beginning to manage sustainability." |
| 7. "Critical to developing a report that addresses sustainability issues is a sound governance and management structure for sustainability. Universities have not been innovative in this regard, sticking to tried and tested senior management structures that will not work for transformative and sustained change on an issue that requires collaboration and crosses functional working." In agreement with the direct quotes stated above, the open coding, |

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| Holistic Approach was identified. The open coding, Holistic Approach associates to the category, Governance." |
| 8. "The direct quotes which were used to draw out vivo codes provides that "Apart from the regular validation by an external environmental auditor, it also comprises the publication of an EMAS Environmental Clarification that specifically describes the organization's environmental policy, environmental program, and significant ecological impact using core indicators such as energy efficiency, water, and wastewater, waste, material efficiency, and emissions." |
| 9. "The direct quotes which were used to extract vivo codes provide that "Strategy, structures, and investments were set to identify the degree of formalization of strategic planning inside the university and economic commitment to sustainability initiatives, … The sustainability committee believed that trends on the detected strategic areas could increase awareness of past performance, detect criticalities related to the initiatives developed in the past and plan adjustments to the adopted sustainability strategy." |
| 10. "*Campus Sustainability Assessment Framework (CSAF) Approach* (2003) contains ten sections, including water, materials, air, energy, land, health and wellbeing, community, knowledge, governance, economy, and wealth….*Penn State Indicators Report Approach* (2000) - covers ten different issues including, Energy, Water, Material, Food, Land, Transportation, Built Environment, Community, Research, and Decision-making…while the indicators for Community and Governance are weak." |
| **Table 14: Template for Axial Coding-Integration *by categories, Integration of two elements, Integration of multiple elements*** |
| 1. "However, the fourth pillar named education for sustainable development was emphasized by Biasutti and Frate (2017) as an equally important pillar of sustainable development." |
| 2. "Ball State University's Clustered Minors in Environmentally Sustainable Practices utilizes three courses to address the social, environmental, and economic aspects of sustainability: environmental ethics, ecology, and environmental economics. The intention is to compose a course comprising elements from all three dimensions." |

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| 3. "The proposed approach suggests the interconnection of economic, societal, and artistic dimensions of evaluation, thus going beyond the instrumental view of culture, common in the sustainability discourse. Culture-driven sustainable development is presented." |
| 4. "Tsinghua's strategy is to promote its green university initiative, including one principle (green university) and three dimensions (green education, green research, and green campus)." |
| 5. "Organizational culture, in general, can be considered an integral part of sustainability governance...SD should be implemented. Viewing the HEI as a single system whose subsystems such as teaching, research, operations, and outreach are given equal footing as fields of activity for SD (whole-institution approach) is deemed crucial" |
| 6. "This article is to propose a conceptual framework for designing interventions, measuring and monitoring progress in building, and embedding a university sustainability culture.... several universities have publicly declared their intent by committing to initiatives like the Talloires Declaration (UNESCO, 1990), in which university leaders mobilize internal and external resources toward the objective of incorporating sustainability and environmental literacy in operations/strategy and outreach as well as in teaching and research." |
| 7. "Three broad categories and associated sub-categories emerged from the data as a suitable framework to show how each university transacts EfS through governance structures, processes decision-making), learning about and experiencing sustainability (curriculum), and sustainable practice (infrastructure management)...Effective EfS "connects theory and practice through research-informed investigation, active learning, and community linked action for EfS, moving from the sage on the stage to the guide on the side." |
| 8. "Sustainability reporting offers universities a way to assess their current state regarding economic, environmental, social, and educational dimensions. It also helps to communicate such efforts to their stakeholders...During the last decade, an increasing number of higher education institutions (HEIs) have been engaged in incorporating and institutionalizing sustainability into their curricula, research, operations, outreach, and assessment and reporting." |

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| 9. "The goal of overall research is to develop a theoretical model for assessing sustainable development of higher education institutions, which should enable standardized measurement of sustainability and...the framework modeling sustainable higher education as a fully integrated system, presented in Fig.1, identifies the following areas of integration: education, research, university operations, external Community and Governance." |
| 10. "Universities have a crucial role to play as agents of change (Cortese 2003), particularly in adopting an integrative approach to sustainable development that embraces curriculum, campus, community, and research. However, despite the obvious necessity of developing more holistic approaches to sustainability, comparatively few universities have to date successfully embedded education for sustainable development across the entire curriculum." |