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Teasing the Relationship between Leadership, Water Technology Innovations and Job Creation in Kavango East Region

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Abstract: ***This paper investigated the role relationship between leadership, water technology innovations and job creation in Namibia. The main theoretical framework comes from theories on leadership as a key aspect to socio-economic development.***

A quantitative method was used in a case study design. Data was gathered from grassroots community's experience and understanding towards the relationship between leadership, water technology innovations and job creation.

Informed by this investigation and based on the Kavango East Region case study, there is a relationship between Leadership, water technology innovations and job creation. The challenge seems to be that Regional Leaders rarely pay visits to the rural communities to see what the communities are doing and come up with mechanisms to support them. There is no effective communication between Regional Leaders and the local community; there is no leader-community relation. Because of this, leaders do not allocate resources to be used towards water technology innovation projects by the rural communities. Consequently, the Kavango East Region is the poorest in the country with 53% of its population living in abject poverty.

The relationship between leadership, water technology innovations and job creation should be strengthened. There should be a minimum number of villages to be visited by Regional Leaders every year and performance agreement for Regional Leaders which will be used as a tool to hold them accountable.

Keywords: Leadership; Water Technology Innovation; Leader- Community relation; Job creation..

1. Introduction

Advanced countries that have adequately grasped the role of water technology innovation in their daily operations, have realized enhancement in regional development and better living conditions of their people, [66]. According to [46], the country should develop itself through the use of its natural resources and technology innovation. Namibia has 14 Regions; these Regions are not at the same level when it comes to development or economic growth, delivery and available important infrastructure.

According to [21], Namibia's historic legacy of apartheid colonialism resulted in enormous levels of socioeconomic inequalities, primarily along racial lines, but also according to gender and class. The country's negotiated transition to independence ensured that the economic structure remained largely intact after independence. Despite various attempts by the Namibian Government to provide basic services for all (such as education and health) and despite several policy interventions aimed at redressing the apartheid legacy and extending social protection, Namibia still ranks amongst the most unequal societies in the world. Namibia followed a path of market-oriented economic policies, coupled with moderate social reforms but without a systematic program of redistribution of wealth.

As a result, the country's achievements, in terms of overcoming poverty, unemployment and inequality, were limited. The rural population, vulnerable workers and informal sector workers have experienced only limited material improvements since Independence. Likewise, the achievements of substantive gender equality are still a long way from being realized. Despite the substantial achievements in terms of legal equality, patriarchal cultures and attitudes are still widespread. Women tend to find themselves in the lowest levels of employment and form the majority of operators in the survivalist informal economy. Gender equality can only be achieved if it

addresses the structural impediments that limit the economic independence of self-sufficiency of working women.

Some regions in Namibia are more developed than others. This could be attributed to the colonial leadership of the apartheid South African government which mostly concentrated on regions with mineral resources such as //Karas, Erongo, Khomas, Otjozondjupa and some parts of Oshikoto Region. The calling to use natural resources in order to create jobs and improve the living standards of the community came at the right time, as the world is geared for other economic challenges, which can only be overcome when a given community is self-reliant. Consequently, the role of leadership in water technology innovations in enhancing job creation in the Kavango East Region has become an issue, which needs to be understood. This has inspired this study. By way of making use of a case study of the Kavango East Region, this study probes and benchmarks issues of the role of leadership in water technology innovations to enhance job creation. The aim is to establish a hidden reality in Kavango East Region, as to what extend Regional Leadership play a role in water technology innovations which can be a key to job creation.

1.2.1 Leadership and Development issues

The main cause of lack of development in Namibia in general and the Kavango East Region in particular lies in the leadership and developmental plans created by Namibia's colonial masters. This does not mean that people are poor because of colonial policies of the past, but because they live in areas that were previously neglected by the colonial governments in terms of investing in using natural resources to develop the lives of people, in order for them to be self-reliant. Based on this background, one major purpose proceeding from this study is to take account of historical events regarding leadership and relate that to the impact on job creation and development in Namibia in general and Kavango East Region in particular.

Primordial history presents job opportunities for the people of Namibia and Kavango East Region in particular, as being contract workers in South African mines (Johannesburg) and some central, western and southern parts of Namibia, areas which were promoted by the colonial governments in Namibia. [44] stipulates that while social and economic development in Kavango was largely neglected by the South African administration because it was a black homeland, some of the transport infrastructure was developed for strategic reasons by the South Africans during the Namibian liberation war. That administration also started several agricultural development projects along the Kavango river, and allocated about 60 large farms to foster commercial farming by Kavango residents. Those first farms probably provided the foundation for the current massive effort to privatize large farms.

In contrast, the newly independent Namibia presented its National Vision 2030, which states that, the country should develop itself through the use of its natural resources and technology innovation. Namibia has 14 Regions which are not at the same level when it comes to development or economic growth, service delivery and available important infrastructure. Although this vision is realistic, however, the belief of the inhabitants of Namibia and Kavango East Region in particular is that job opportunities are not available locally, the only way to get a job is to migrate to areas where there are mines, sometimes to other places (Aussenkher and Noordoewer) that are using natural resources (such as water) which are also available in abundance locally (Kavango East Region). However they fail to use them although others use them at other places. Thus, in Namibia and the Kavango East Region in particular, leadership has always regarded existential realities such as poverty, inequality and unemployment as a source of social, political and economic challenges in that region.

One fundamental argument remains that, after Namibia's independence on 21 March 1990, the Kavango East Region has been electing political leaders, but the question that needs to be raised is with regards to what impact this leadership has had on developmental issues such as job creation, poverty eradication and inequality in the area. It is a known fact that development of any given region depends largely on the leadership of that particular region. According to [45], the relationship between leadership and sustainable development is very important, because there is no development without leadership especially in the social, human and cultural dimensions. It is broadly recognized that Africa and Namibia's service delivery in particular is insufficient and will be a major constraint in attaining the Millennium Development Goals (MDGs) and Namibia's well known vision 2030 [46].

Although Namibia is free from colonialism and apartheid, the consequences of the colonial policies still prevail. However the proclaimed Vision 2030 needs to be accompanied by a paradigm shift concerning the issues of how leadership should use the available natural resources in their respective areas of jurisdiction to create jobs and foster development for their regions and Namibia in general.

If leadership is to shift its focus onto using the Kavango River as a key to develop its people and Namibia in general, the Kavango Region could have been a center of wealth a long time ago. [44], agrees and further states that, in a broader context, it is significant that Kavango shares the middle section of the whole river system with Angola, and also occupies a central place between the catchment in Angola and the famous Okavango Delta, downstream in Botswana. As public, political and economic interests in the whole Okavango River Basin grow, the Kavango region is likely to assume an increasingly important and strategic role in the management of the River's health and wealth.

According to [44], a second asset is the location of Kavango and Rundu in particular the major trade routes between Namibia and Angola, Botswana, Zambia and Botswana. The Region already enjoys a variety of benefits from trade along these routes, especially along the Trans-Caprivi Highway. Indeed, Rundu is the only major economic center within a huge expanse that stretches 900 km west to the east from Ondangwa to Katima Mulilo, and about 1,000 km north to south from Menongue in Angola to Grootfontein and Maun in Bostwana. Rundu is thus a major supplier of goods and services to people spread across a very large area.

Finally, the Region and its people are increasingly moving from a traditional, rural economy (based on farming and harvesting natural resources for domestic use) to a cash- and urban-based economy. Rundu is reputedly the fastest growing town in

Namibia, and a rapidly escalating proportion of the Kavango residents now live in Rundu and other emerging towns.

Identifying the strength of economic developmental activities for each region in Namibia have been a key aspect on which apartheid and colonial masters used to develop some parts of Namibia, but that was not done for the interest of every person living in that particular area. It was mainly done to benefit the colonial masters. For example if one considers the reasons as to why Walvis Bay in the Erongo Region was turned into a harbour by the colonial masters, one can realise that it was mainly to assist them logistically into better trade. The same applies to Ludertiz in the //Karas Region. It seems the colonial masters worked hard to fight and allocate resources to be used to develop Walvis Bay and Ludertiz[44]

If the leadership could only understand this and invest their energy and resources in expanding on the strength of regional developmental activities, the Kavango East Region will contribute more to Namibia's Gross Domestic Product (GDP). The challenging dynamics often experienced by regional leaders is on how to support their inhabitants to use natural resources to create jobs and develop themselves. Another important aspect worth mentioning here is that the colonial and apartheid governments, used force in their operations. This made the black communities in Namibia fear them and not engage their leaders to discuss developmental issues. The new independent Namibia adopted the policy of decentralization on which it promotes leader-community interaction concerning development. It promotes open participation in development dialogue between Regional leadership and the communities they serve. [39]maintains that, the Government has established thirteen (13) Regional Councils under the Act of 1992. This was a plan to bring the government closer to the people especially the previous disadvantaged black people. The apartheid government operated on the principles of making the black people's living standard worse as compared to whites and the coloured people. This resulted in widening the gap between the black people who are seen as poor people and the white people as rich people. At present the majority of black people work for white people, but very few white people work for black people. This is a result of the apartheid system which taught people that black and while people are not equal. [39], further observed that, after the establishment of Regional Councils in 1992, they were mandated to make sure that the living standards of the people were upgraded in all areas in order to reduce vulnerability and foster self-reliance among the communities of Namibia. This was with the intention of making the Namibian people equal irrespective of skin color and previous backgrounds.

Because the colonial and apartheid governments were undemocratic, there was no opportunity for black people to ask their leaders to account for lack of development and poverty became entrenched amongst them. It looks like even after independence, many inhabitants of Namibia and Kavango East Region in particular are still afraid of confronting their leaders for lack of developmental activities or the provision of resources for development. As a result they remain poor, unemployed, and live lives characterized by inequality. It seems that there have not been extensive education in the local communities especially in Rural Kavango East Region on their rights and powers as community members over their own elected regional leaders. Because the communities do not confront their regional leaders, the leaders choose to remain unsupportive to them.

The use of natural resources can be a key to unlock developmental challenges in the Kavango East Region. There is need for leaders to pay attention to this and provide the needed assistance to the community. [67], agrees and says the Kavango River flows through south eastern Angola towards Namibia, where there are a number of districts that have a high potential for irrigated and flood-recession agriculture. Initial surveys in this area indicate that the region could provide important agricultural and economic development opportunities in the future. The district administration in the region is in need of assistance, both technical and financial.

1.2.2 Natural resources as a catalyst to development

In recent years Namibia has been developing new ways of using natural resources commercially in communal areas. Communities in these areas obtained rights in tourism and to manage and benefit from wildlife and plant products by registering conservancies and community forests. These rights are meant to enable communities to establish their own tourism enterprises, to sell trophy animals, game meat, live game, timber products and other woodland resources, and to establish joint ventures with tourism companies. Trophy hunting and tourism joint ventures have brought in substantial revenue in some areas. Several additional benefits stem from community forests and conservancies. For example, residents gain greater security over communal land and its resources, the value of their land increases, and incentives are created for natural resources to be managed effectively and sustainably.

In the case of Kavango East, the greatest values to be obtained from natural resources are likely to be through tourism along the Okavango River. [44] agree and states that, despite earlier criticism of existing perspectives and approaches to farming in Kavango, there is scope for agriculture that makes efficient use of the River water. This is economically lucrative to the country and that contributes significantly to improving the wealth of residents (as opposed the mere poverty reduction). Irrigation schemes can be used for high-value crops, and the schemes can be economically viable (rather than being dependent on public subsidies). Products such as fresh fish, beef (from cattle in feedlots) avocados, mangos and paprika should be investigated and developed where possible.

According to [68] Kavango is one of the poorest regions in Namibia. This is clearly reflected in a report by the United Nations Development Programme on trends in human development and human poverty [68] which presents data on the Human Development Index (HDI) and the Human Poverty Index (HPI) for Namibia's 13 regions.

The HDI provides a quantitative representation of three main dimensions of human development namely a long and healthy life, knowledge and a decent standard of living. Each of these dimensions is assigned corresponding quantitative indicators. The HDI is then the simple average of the three indices [68]. Table below indicates that of the 13 regions, Kavango has the second worst life expectancy at birth, third worse literacy rate, sixth worse gross school enrolment ratio and the second lowest annual average per capita income.

Table 1.3. HDI Indicators for Namibia

Life exp. at birth		Lit. rate, + 15 Years (%)		Gross enr. Rat., 6-24 years (%)		Annual ave. adj. perCap.inco.(N$)	
2001	1991	2001	1991	2001	1991	2001	1991
Namibia 49	61	84	76	66	68	10358	5448
Caprivi 41	53	80	66	60	66	6 411	2 413
Erongo 59	65	94	85	58	63	16 819	8 189
Hardap50	60	86	79	60	63	12 092	8 977
Karas 57	60	92	88	58	59	12 706	10 049
Kavango44	57	72	62	63	66	4 427	2 662
Khoma 58	68	96	91	59	57	25 427	17 152
Kunene55	63	59	51	45	50	7 240	3 327
Ohangwena 41	63	80	71	72	74	4 304	1 616
Omaheke 60	59	67	57	56	51	12 232	5 955
Omusati 45	65	84	78	77	84	5 466	2 193
Oshana 46	62	91	86	75	77	9 963	2 902
Oshikoto 46	61	84	78	71	71	5 895	2 537
Otjozondjupa 61	61	75	66	56	52	9 457	5 525

Source: Adapted from [68]

These figures show that Kavango has the second lowest HDI (0.410) for Namibia after Ohangwena (Table 1.3 above).

The Human Poverty Index also concentrates on three essential dimensions of human life; longevity, knowledge, and a decent standard of living. Whereas the HDI provides a measure for the capabilities of individuals, the HPI focuses on deprivation in the same three dimensions [68]. Thus the first deprivation relates to survival or vulnerability to death at a relatively early age; the second relates to knowledge or being excluded from the world of reading and communication and the third relates to a decent standard of living in terms of the overall economic provision or poverty as measured by income. Table 1.3 above shows that of the 13 regions, the Kavango has the fourth highest probability of people dying at birth and not surviving to the age 40. In addition the Kavango has the third highest illiteracy rate and the second highest share of the population in households that spend more than 60% of their total income on food.

These indices results in Kavango, along with Omusati and Oshikoto, having the highest Human Poverty Index (45) of the 13 regions as shown in Table 1.4 below. Table 1.4. HDI Namibia 2001-2004 and 1991-1994

Human Development Index

	2001-2004	1991-1994
Namibia	0.557	0.607
Caprivi	0.421	0.441
Erongo	0.705	0.690
Hardap	0.572	0.637
Karas	0.664	0.666
Kavango	0.410	0.480
Khomas	0.732	0.784
Kunene	0.504	0.509
Ohangwena	0.403	0.524
Omaheke	0.627	0.528
Omusati	0.476	0.595
Oshana	0.548	0.602
Oshikoto	0.490	0.555
Otjozondupa	0.638	0.567

Source: Adapted from [68]

Table 1.5. Indices for Survival, illiteracy, and Income Poverty

Prob. at birth not Sur. age 40 (%)		Adult illi. rate (%)		Pop. in HHs that spend mo more 60% of tot. inco. on Food (%)	
2001	1991	2001	1991	2003/04	1993/94
Namibia 42	18	16	24	32	38
Caprivi 55	28	20	34	40	46
Erongo 25	14	6	15	5	27
Hardap 39	20	14	21	25	19
Karas 28	19	8	12	18	25
Kavango 50	23	28	38	50	71
Khomas 27	10	4	9	3	8
Kunene 33	16	41	49	39	39
Ohangwena 57	16	20	29	27	40
Omaheke 27	22	33	43	40	53
Omusati 52	13	16	22	50	39
Oshana 49	16	9	14	33	47
Oshikoto 49	16	16	22	53	36
Otjozondupa 24	18	25	34	20	43

Source: Adapted from [68]

According to [46] agricultural output alone is not sufficient to sustain most households. Livelihoods therefore are considerably diversified and a major source of income for many families is wages and salaries. Non farming activities, pensions and cash remittances are also important. About 70%

of the whole population lives within a ribbon 10 kilometres wide along the River. This is where people first settled because water, good soils and pastures were available. This place is most suited to farming. Nowadays, people are also attracted by greater economic opportunities, especially in Rundu and the surrounding growing settlements, and the services that are available along the River.

Given these reasons, this paper finds it appropriate to use Kavango East Region as a living proof of existing problems in the role of leadership in water technology innovations to enhance job creation. The findings from Kavango East Region will illustrate the potential severity of a threat, which Namibia may face especially in using water to address the issue of unemployment and inequalities. Some symptoms of unemployment have already manifested themselves by the manner in which the Kavango East Region is rated with 56% poverty according to the NSA-poverty profile, 2013. This has led to the formulation of the problem statement in this study based on the role of leadership in water technology innovations to enhance job creation as presented below.

The problem identified by the [38], is that the communities are not using water technology innovations to create jobs for themselves and to use water effectively, due to a lack of the proper relationship between leadership, water technology innovations and job creation in Kavango East Region. The Report goes on to state that this has resulted in high unemployment and high poverty levels. According to the report developed by [44], they found that while the focus of Botswana's use of the Kavango has been on its tourism, Namibia viewed the river as a passing resource to be exploited before it leaves at Muhembo. Thus, the river is perceived as a source of water for irrigation and provides water for domestic and industrial needs in the Central Regions. A number of lodges and camp sites have been developed by private individuals and companies, and one conservancy, but the leadership has paid little attention to the creation of wealth and jobs through the use of water in the Kavango River. Traditional Leaders (Headmen) should know about water technology innovations and its importance through awareness and training from the experts through their regional leaders. According to [45], the relationship between leadership and sustainable development is very important, because there is no development without leadership especially in the social, human and cultural dimensions.

Although there is leadership in place for the Kavango East Region, they are inactive and ignorant of the use of water technology innovations. According to [45], it is clear that leadership plays an important role in administration and this role is in highlighting the human side than in other aspects. [30], avers that, the role of leadership in the development and growth of such regions is paramount, with of course the understanding that leadership is one of the most creative elements of the regional economic development process.

According to [56], which ranked 144 countries on different performance areas, Namibia has been ranked 93 on water provisioning and 103 on innovation and sophistication factors. Namibia has been falling since 2002 by nine (9) ranks overall. This is worrisome statistics, giving the impression that the Kavango East Region is the poorest in Namibia [46]. The situation proved to be worse for the Region after the National Census of 2011. The Ministry of Agriculture, Water and Forestry and the Kavango East Regional Leadership find it difficult to understand the importance of water technology innovation in enhancing development, which has resulted in water technology innovation not being given the attention which it should have been given as part of its priorities which can be used to develop the Kavango East Region through the creation of better living conditions for all. Hence, the Region remains the poorest a thing that is difficult to understand because it has an abundance of water resources.

In order to examine the role of leadership in water technology innovations in enhancing job creation issues in Namibia the Kavango East Region will be used as a case study. The main objective of this study is to investigate the roles of leadership involvement in water technology innovations to enhance job creation.

The sub-objective of this study will be:

1. To investigate the relationship between leadership, water technology innovations and job creation. Information was obtained by critically reviewing literature on leadership theories and political influence on leadership including colonialism and apartheid leadership impact on development and job creation. The researcher also consulted the grassroots people in the villages of Kavango East Region for focus group interviews to obtain this information.

1.3. Limitation of the study

The study had numerous challenges some of which were beyond the researcher's control. Financial resources were the major problem, since the grant received from National Commission for Research Science and Technology (NCRST) for this research was very small. This limited the researcher's frequency of travel to the Kavango East Region. The initial proposal was designed to cover at least more than one region for it to be a wider case study. However, due to the limited financial resources this could not be possible.

Another major challenge was time. The time to carry out the research was confined to the May/June academic recess, which meant that the focus group interviews were conducted in a short period of time and some appointments were missed. Lack of time also forced the researcher to work beyond normal working hours.

The area of study was also an issue worth to mention. Names such as Mashare, Ndonga Linena, Ndiyona and Mukwe are understood in two ways. Firstly, they are Constituency names, which are a political demarcation, and stretch across two traditional authorities. Secondly, they are traditional wards or villages, which are not explicitly demarcated, some villages stretches across two constituencies. During focus group interviews some respondents attended the interviews which were not in their constituency but because the village covers two constituencies, it was difficult to separate the respondents.

The total number of villages from which the research sample was drawn came from the 2011/12 Population Census, which provided some of the research samples of the villages in the Kavango East Region, which are not ordinary rural villages but were upgraded to village council, and settlements namely Divundu and Ndiyona. The good news is that it was detected early and the two were excluded from the sample. This fact has the potential to undermine both the internal and external validity of this research. Another limitation was a lack of cooperation from some household respondents.

Regional leadership has a role to play in a variety of areas of life in the Kavango East Region, such as health, education, trade, peace and stability. They can also influence the use of natural resources found in the Kavango East Region such as forestry and wildlife which are researchable problems. The scope of this study therefore, was delimited to probe the problem of the role of leadership in water technology innovations in enhancing job creation in the Kavango East Region. This study was narrowed down to focus on the experiences and understanding of the communities at the grassroots level in relation to the role of leadership in water technology innovations to enhance job creation using the Kavango East Region.

2. 2.2 Leadership in general

Literature on rural leadership is full of descriptions of the challenging nature of rural areas. Leadership is necessary to assist rural areas to expand their traditional boundaries and bring meaningful development. As society becomes more complex, rural areas become equally complex, placing a greater demand on the individuals who lead them.

But what is leadership? Do leaders have special personalities and/or physical traits? Is a leader an individual who closely monitors the performance of others? Are leaders individuals who articulate a vision and inspire other members in the organization to believe in that vision? Do leaders tell people what to do, tell them when to do it, and punish them if things are not done as prescribed? Do leaders have a specific behavior that they exhibit in the course of their interaction with others? Or, are leaders individuals who can cultivate a special type of relationship with people, making each individual feel unique? In pursuit of answers to these questions and to establish a clear definition of leadership theorists, researchers and practitioners have spent over a century researching and analyzing various theories on the subject of leadership.

In the majority of the literature accumulated over the past century, it is clear that definitions and meanings of leadership are numerous and at times conflicting. For example in an earlier work, [13] indicates that there are 130 definitions of leadership. Furthermore, [11] postulate that over 350 definitions of leadership have been coined over three decades.

Leadership has also been defined from a behavioural and interpersonal perspective. For example, [4] defines leadership as the quality of the behavior of individuals whereby they guide people or their activities in an organized effort. Despite the multiple definitions of leadership, the following components can be identified as being central to the phenomenon of leadership:

(a) leadership is a process;
(b) leadership involves influence;
(c) leadership occurs within a group context; and
(d) leadership involves the attainment of goals.

2.2.1 Main theories of leadership

Leadership can best be defined as a process whereby an individual influences a group of individuals to achieve a common goal [61]. Defining leadership as a process means that it is not treated as a trait or characteristic residing in the leader alone, but as a transactional event that occurs between the leader and his or her followers. It is a process which implies that a leader affects and is also affected by those whom he or she leads. It emphasises that leadership is not a linear, one-way event, but rather an interactive event. However, it is important to note that it is the leader who often initiates the relationship, creates the communication linkages, and carries the burden for maintaining the relationship.

Defining leadership as a process also emphasises the significance of relationships, which are very important in rural areas. The type of leadership effective in rural areas must value relationships, individual differences and the important characteristics of rural communities [6]. Therefore, to be an effective leader in rural areas, a special type of leadership style should be present. Leadership style may be defined as a pattern of specific behaviours or attitudes that a leader places on different leadership functions [1]. Although leadership is viewed as a process, leadership style is the glue that holds the process together.

Approaches to studying leadership have resulted in a focus on leadership styles prevalent in the 1990s and in the first decade of the 21st century. Literature reveals a number of schools of thought about leadership styles. It suggests that leadership styles have developed through at least four main generations of theories namely:

- trait theories,
- behavioural theories,
- situational theories and
- transformational theories.

The available literature also points out that the four theories are not mutually exclusive or time bound. In other words, although it is true that the progression of thinking tends to follow a sequential path, it is very evident in the literature that elements of the four generations of leadership theories have experienced cross-fertilisation [9] ; [73].

The first of the four generation of theories are the trait theories, where a universal set of effective characteristics is identified. Some of the earliest studies of leadership in the United States are based on the assumption that good leadership is synonymous with the possession of certain traits [63]. Specifically, some of the traits include such widely diverse attributes as social characteristics, intelligence, and even physical appearance. Other traits highlighted are the ability to supervise, initiative, self-assurance, and individualised approaches to work [26].

The first half of the 20th century was dominated by research that examined leadership traits. In the early 1970's, there was a noted shift from defining leadership traits to an approach that related those traits to leader effectiveness, reflecting a shift from trait research to behavioural research that was in progress.

The second are the behavioural theories, where a universal leadership style was identified. Behavioural theories began to have a major influence on leadership studies during the 1950s and 1960s. The Ohio State University Leadership Studies that began in 1945 are considered to be the origin of the behavioural approach. Those studies established two of the most well-known approaches to understanding leadership styles. For example, the studies resulted in leadership behavior being charted on two dimensions namely: initiating structure, wherein the leader acted to further the work objectives of the group, and consideration, in which the action focused on interpersonal relations and the needs of the workers.

Leaders who are high on the initiating structure concentrated on employees' tasks and procedures. They devoted much of their efforts on scheduling work, devising work activities, and communicating information about the work. Leaders high on consideration structure focused much on understanding their employees and building productive working relationships. Behavioural theories implied, at least theoretically, that training and education in leadership could create effective leaders [5] ; [42]; [74] .

At the same time as the Ohio State University's studies, Bales (1950) and his associates concluded from their studies that two categories of leadership behaviour were primary namely: task-oriented and socio-emotional. Leadership studies at the University of Michigan also identified these two dimensions, calling them job-centred and employee-centred [42]. Other terms for these two dimensions include task behaviour and relationships [32] and concern for production and people [17]. Several researchers saw these dimensions as opposite sides of the same coin. A leader that was high on one dimension was not necessarily low on the other. [17], however, feel that a leader could be either high on both dimensions at the same time, low on both dimensions at the same time, or somewhere in between. This combination was the basis of their managerial grid, where the leader's style is determined by the amount of attention given to both dimensions. This grid has nine levels of concern for people and nine levels of concern for production.

The third are the situational theories, where a combination of leader, subordinate, and situational characteristics were considered [34]; [64]. Two well-known researchers on leadership, Douglas McGregor (1960) and Fred Fiedler (1967) were very instrumental in the development of situational theories. McGregor theorised that individuals' potential for leadership is greatly influenced by their assumptions about the nature of human beings. Fiedler believes in the contingency theories which states that leadership is based on situational factors. He sees the leaders' capacity to influence subordinates as largely a matter of the leader's style and personality, the characteristics of the work group, and the needs of the work situation [40]. Similarly, [33] identify four different leadership styles that could be drawn upon to deal with contrasting situations. In their research, they provide an influential discussion of choosing the appropriate style for a particular situation.

The other theory is the transformational theory where the focus of the leader is on the unique connection between the leader and the followers. This form of leadership accounts for performance and accomplishments for the larger group and the organization [8]. Transformational leadership theories evolve from the transactional theory which focuses on the leader awarding or disciplining followers depending on the adequacy of their performance [9].

Transformational leadership goes beyond the attempts of the leader to satisfy the followers through transactions or exchanges based on contingent rewards. In contrast, transformational leaders typically heighten awareness and interest in the group or organization, increase confidence, and move followers gradually from concerns for existence to concerns for achievement and growth. Furthermore, transformational leaders develop followers to the point where they are able to take on leadership roles and perform beyond established standards or goals [5]; [4].

Each of the leadership models discussed above offer suggestions of various aspects that might be appropriate for rural leadership. Taken together, these and literally hundreds of other leadership models identify fundamental aspects of leadership that are appropriate for developing a rural leadership model. In summary, some of these aspects include the significance of the work environment and the importance of tasks and relationships. Other attributes of leadership models include trust, integrity, power, influence and finally cultural competence [48]. The authors propose that of all the leadership models discussed they seem to point to the fact that the transformational leadership is the best model for rural areas. This leadership model is also a good model for this study.

2.3 Regional leadership of Kavango East Region

The Kavango East region is facing a lack of leadership, which is supposed to bring about water technology innovations at the centre stage to enhance job creation for the local inhabitants. Lack of leadership is a ticket to lack of development. According to [44], "…a number of lodges and camp sites have been developed by private individuals and companies, and one conservancy, but the leadership has paid little attention to the creation of wealth and jobs through the use of water in the Kavango River".

[45] suggests that, the relationship between leadership and sustainable development is very important, because there is no development without leadership, especially in the social, human and cultural dimensions. [1], also agrees and further suggests that leadership role is of great importance in motivating people and creating an effective working environment in order for the project team to meet greater challenges in today's global economy.

Advanced Countries that have adequately utilised water technology innovation in their daily operations, have realised enhancement in regional development and better living condition of their people, [66]. According to [46], the country should develop itself through the use of its natural resources and technology innovation. Namibia has 14 regions and these regions are not at the same level when it comes to development or economic growth, service delivery and available important infrastructure. The 14 regions are at different levels, due to the apartheid policies, which turned some regions to be core regions (Khomas, Erongo and Karas Regions) because to their better water technology innovation, while many northern and north eastern Regions (Zambezi, Kavango east, Kavango west , Ohangwena, Oshana, Omusati, Kunene and some parts of Oshikoto Region) were not given enough attention in terms of the use of water technology in enhancing development, and are now regarded as Resource Frontier regions. These Resource Frontier regions are characterised by high poverty levels, lack of public infrastructure and a high migration of its population to other regions.

The Government of the Republic of Namibia (GRN) has established fourteen (14) Regional Councils under the Act of 1992; this law was a plan to bring the government closer to the people especially the previously disadvantaged. According to a Practical Guide of Decentralisation Enabling Act (2008) of Namibia, the main responsibility of regional councils is to draw up regional development plans and administer formal settlements [58]. Additionally, they should also be responsible for delivering basic services, like rural water supply, primary healthcare and primary education, according to the Decentralisation Policy for Regional Councils.

The results of the study can be used to develop a base of knowledge from which regional and local leaders could assess their leadership roles 'strengths and weaknesses, and improve their leadership performance through in-service leadership training in water technology innovations to study other regions in Namibia. Additionally, this study will contribute to the body of knowledge as it will provide a basis for the development of materials for capacity building in leadership and pre-service courses in leadership in the decision making process of water technology innovations to promote job creation.

Many argue that leadership may be the catalyst through which these changes may occur. Communities that are creative, entrepreneurial, and committed to building a shared vision and consensus are found to be better prepared to address community needs [12]. For rural communities to be sustained, there is need for local leadership to take charge and guide the way into the future. A new generation of leaders is needed to build local partnerships for managing change in today's diverse communities [65]. Leadership itself has played a fundamental role in nearly every aspect of society, and is particularly important in developing rural communities.

In 1908, President Theodore Roosevelt initiated the Country Life Commission and charged it to study the major aspects and issues in rural areas in the United States of America. A primary finding of that study was the overriding lack of quality leadership within rural areas. Yet, reflecting on leadership by itself is inappropriate leadership (as defined later within this chapter) is the accomplishment of group purpose, which is furthered not only by effective leaders, but several other factors including innovators and entrepreneurs, available resources, and social capital, or contributing to the common good [25]. Therefore, leadership must be considered within a context, regarding a specific purpose, in this case the role it plays in the use of water technology innovations to enhance job creation in Kavango East Region.

Therefore, one of the context and purpose behind this study is, the rural communities and how leadership relates, interacts, and affects individuals, social capital, and change within the communities of the Kavango East Region.

2.4 Leadership and rural development

Rural communities have unique ideals and values, as well as a culture and life of their own. Unfortunately, many of today's rural areas are in trouble. Issues facing rural communities are vast and numerous; more specifically, rural communities in Namibia. Still, many argue that leadership may be the catalyst through which positive changes can take place. Local leaders are concluding that if economic and community development is to take place, it is their responsibility to make it happen. Fortunately, some of today's rural communities are doing exceptionally well. But what makes these communities different? And what community aspects come into this equation? Finally, could the presence of effective community leadership be the key to leading troubled communities to a brighter tomorrow.

[53], conducted a study in Nigeria. The overall purpose of the study was to ascertain the role of local leaders in community development programmes in Idea to Local Government Area (LGA) of Imo State. The study aimed to:

1. Ascertain the various roles played by local leaders in community development programmes in the study area;
2. Identify the sources of information on community development;
3. Describe the gender issues in local leadership as it relates to community development;
4. Identify the factors that hinder local leaders from achieving results in community development in the area; and
5. Draw implications for extension policy and practice.

They said that, it is generally accepted that self-sustained rural community development is vital to the economic and social progress of any developing nation like Nigeria. Unless the ways and means of massively accelerating development in the rural areas where over 80% of Nigeria's population reside [24] our national goal of self-sufficiency and control over resources may continue to evade us. Interestingly, the resources already exist, but what is missing is the mastery of the practical wisdom and technology to mobilise them for our overall benefit (leadership). The main argument in favour of community-based development is that communities are deemed to have a better knowledge of the prevailing local conditions (such as who is poor and deserve to be helped, or the characteristics of the local micro-environment), and a better ability to enforce rules, monitor behaviour, and verify actions related to interventions [54].

The true success of a comprehensive economic and social development programmes in Nigeria is primarily dependent upon the extent it contributes to the well-being of those living in rural areas. This is because the majority of Nigeria's population that reside in rural areas, depend on agriculture for their livelihoods. The development that is envisaged is not merely a handout of benefits to people in need, but a process of empowerment where rural communities can acquire mastery over their own destiny through the realisation that they, individually and collectively can do something to improve their circumstances. This is a refocusing strategy different from waiting on government, oil companies or other organisations/donors to solve their own problems themselves.

According to [2] community development is a social process thorough which human beings can become more competent to live with and gain some control over local conditions and the changing world. Sustainable community development cannot take place through force or order, but is most likely to happen when all actors participate and share their ideas, visions and responsibilities equally and democratically in steering and implementing their community or village development projects [3].

According to [51], one approach in creating sustainable rural development is through giving the main actors (villagers living in the community) an equal opportunity to think and plan their own future. This underpins the need for effective leadership at the local community level in order to harness the efforts of the rural people towards their own development. Usually, community development programmes aim at creating awareness of rural possibilities; providing information on resources, inputs and infrastructure; deploying technical assistance; skills acquisition and development; increasing literacy levels; improving productivity and productive systems; adapting appropriate technology in agriculture; sensitising potential volunteers and donors among other things.

Ideally, most community development programmes in developing nations focus on peoples' felt needs and basic amenities such as the provision of good roads, electricity, health clinics, markets, school buildings, and farm settlements among others. These goals can only be achieved through the combined and collective efforts of all those who share the conviction that rural community development must be accorded

a high priority in our drive for poverty alleviation and national self-sufficiency.

Furthermore in order to help bring a rural community to action, it is necessary for individuals and groups to provide good leadership. When good leadership is provided, the people participate voluntarily in the accomplishment of stated objectives. The approach to rural community development is always through local leaders who not only act as pioneers of projects but also help in influencing and motivating their people to action.

For any rural community development to be successful, influential local leaders must be involved or else they might undermine the progress of such programmes. Therefore, any agency or organization coming up with a development programme for the community must initially "clear" with these influential local leaders, a process otherwise referred to as legitimisation. It is saddening to recall that rural community development was neglected by successive government since colonial rule in Nigeria. For instance, while the colonial government concentrated their development projects such as roads, schools, hospitals, and pipe-borne water around the major cities and built network of roads to areas where they exploited our natural resources, the rural areas were completely left out. The post-independence governments are not equally left out in the practice of rural neglect as only communities whose sons and daughters were in government benefited from development projects otherwise referred to as "national cake". Even where good development programmes were designed for rural areas, in most cases they failed because there were no scientific and empirical studies of the target rural communities which could guide their implementation. Since the 1980's, Nigeria and many African countries have experienced a rising wave of revolts and restiveness by some rural communities. Governments have not been able to tackle these crises because there were no reliable baseline studies on the problems of such rural people [52].

It is estimated that Nigeria has over 25 million families living on farms who are supposed to be reached by extension workers. Currently, the extension worker farm family ratio is 1:250. This means that 100,000 extension workers have to be at work in the rural communities. Unfortunately, Nigeria cannot boast of one tenth of this number currently. This dearth of extension workers indicate that many farmers are not reached and therefore not exposed to new innovations and technologies in agriculture. Since it will take years to produce the required number of extension workers, and no government can afford to employ the number needed for effective coverage of extension work in the rural communities, the only logical solution will be to utilise the services of local leaders to compliment and accomplish the rural development tasks. It therefore falls on the people in rural areas to free themselves from the shackles of underdevelopment with or without government support. The questions now are what roles do the local leaders play in community development efforts in the place under study? What are the sources of information for community development? What are the gender issues existing in community development in the area? And what are the constraints to effective leadership in community development programmes in the area. These questions form the focus of this research study [52].

The study in Nigeria was carried out in Ideato LGA of Imo State Nigeria in 2006. Ideato LGA is made up of 24 communities. These communities were stratified into five zones based on their geographical location. One community was randomly selected from each zone. These include Dikenafai, Ogboka, Akpulu, Ntueke, and Arondizuogu. The population comprised all the leaders and non-leaders in the selected areas without restriction to any other socio-economic characteristic. A stratified random sampling technique was used in selecting the two categories of respondents in each community.

In order to select the actual leaders and non-leaders in the communities, a pre-test was conducted. In the pre-test, the village heads in each community were asked to identify 30 leaders in their respective communities. Subsequently, the identified leaders were equally asked to identify 20 actual leaders in their respective communities. From the later list which was ranked, 12 leaders were finally selected from each community giving a total of 60 leaders from the five zones. On the other hand, the non-leaders comprised any other member of the communities who were not selected in the first or second instance. Twelve non-leaders were selected from a list of 80 farm families provided by the extension agents in the respective communities. This gave a total of 60 non-leaders from the five zones. However, valid responses that are suitable for analysis were obtained from only 48 leaders and 56 non-leaders giving a grand total of 104 respondents for the study.

A well-structured and validated interview schedule with items based on the objectives of the study was used for primary data collection. The instrument was pre-tested for reliability using the split-halve correlation technique and validated by experts in the agricultural extension and rural development profession (the academia, extension administrators and rural development experts). The pre-test shows a reliability coefficient of 0.82 and was significant at 0.00 probability level. According to [22], a reliability coefficient of 0.8 and above implies a satisfactory and an acceptable level of internal reliability. Focus group discussions (FGD) were conducted in each zone to make the study more interactive and participatory oriented. Items discussed were centred on the specific objectives of the study. Trained extension agents assisted in the collection of data under the supervision of the researchers. The researchers assessed the role played by local leader in community development.

In order to ascertain the various roles played by local leaders in community development programmes, statements bordering on roles of local leaders in community development obtained from extensive literature and interviews with experts was structured and used. A four point likert type scale with values of very important = 4; Important = 3; less important = 2; and not important = 1, was used to identify the most important roles played by local leaders in rural community development. A cut-off mark of 2.5 was used to indicate the level of importance of each statement. Statements with values of ≥ 2.5 indicated an important role as perceived by the respondents while statements with values <2.5 indicated an unimportant statement as perceived by the respondents. In order to identify the sources of information for community development in the area, a list of possible sources of information for community action and development also obtained from literature and interviews with experts was prepared and the respondents were allowed to indicate the most reliable sources of information. To describe the gender issues to local leadership as it relates to community development, relevant questions bordering on gender issues and obtained from literature and case studies were structured and used in a Focus Group Discussion (FGD). This discussion

was organised in each of the five zones that were chosen for the study.

In identifying the constraints that hinder local leaders from achieving results in community development in the area, a four point Likert type scale was used to determine the extent to which some list of issues may pose as a constraint or possible solution to the constraints. These constraints were obtained from practical experiences, case studies and related literature on local leadership and community development issues worldwide. The response options and values assigned were; not at all = l; to some extent = 2; to a great extent = 3; and to a very great extent = 4. Statements with values of ≥2.5 indicated a major constraint to effective leadership in rural community development and vice versa. Percentage scores, mean scores, and standard deviations were utilised in realising the objectives of the study.

Results show that the most important roles played by local leaders in community development in the area constituted about 78% of the perceived roles and they include; making decisions on different issues affecting the community that require an integrated approach (= 3.82); acting as liaison between governmental and non-governmental agencies and the community for financial and technical assistance (= 3.80); monitoring and evaluation of projects for proper implementation (= 3.78); and raising funds through levies, donations, launchings, etc to finance community development projects in the area (= 3.76). Other important roles include statements 5-18. On the other hand, the respondents viewed statements 19-23 as unimportant roles played by local leaders in community development in the area. This constitutes about 22% of the overall perceived roles. In most rural communities, local leaders are normally democratically elected to represent the different sections in the community. This provides the opportunity for the elected leaders to make genuine decisions that will favour the majority of the people.

Decision-making is a difficult task especially when it concerns rural communities. This is because the integrity of the decision-makers is always at stake hence they strive to live up to expectations in taking good decisions for their people. In the Focus Group discussions conducted, the respondents noted that they hold the decisions of their leaders in high esteem and endeavour to comply with the directives they give. Extension workers therefore should make good use of this opportunity by harnessing the efforts of the local leaders into their programmes to ensure sustainability and success. They can achieve this by involving local leaders in programme development and implementation [23]. Given the fact that the local leaders are always vocal, intelligent, cosmopolitan, knowledgeable, and sometimes educated, their role in liaising between agencies of development and their communities stand out clearly. The respondents also observed that in seeking external financial or technical aid, they have always used their best brains in the community to obtain that. This is because such people are well connected to the corridors of power or to influential people/organisations.

They also know the best approaches to bring them into the community for assistance. Such leaders can also promote extension work especially where they have been involved from the outset. The success of any development project depends on whether it has good machinery for monitoring and evaluation. Monitoring and evaluation is necessary in order to make prompt adjustments during the life of the project and to ensure compliance with targeted objectives. Respondents noted that the failure to properly monitor and evaluate projects in the past has led to the collapse of many development projects initiated in their community.

One of the major roles played by local leaders in the area of study was the issue of raising funds for community development. When this is done internally, it was through launchings, donations, levies and fines, as opposed to donor funding that comes from outside the community. The respondents noted that raising funds for projects in the rural community is a very sensitive task because most in most cases, the funds are not properly used due to corruption and a lack of transparency. This has often generated crises in most communities where some interest groups that are not satisfied with the way previous projects were executed, may boycott participating in future launchings or paying levies. This may result in actions that may deteriorate into open chaos. Extension workers should be careful not to involve themselves with community finances and concentrate on their educational responsibilities [53].

The study conducted by [50], indicated that where there are strong and well informed and educated local leaders, their community tend to be empowered more and this contributes to rural development. Observation show that this sort of leadership is lacking in the Kavango East Region. Their study also revealed that, Local leaders are indispensable set in any community. Where such leaders are dedicated, honest, and hardworking, the community tends to develop rapidly whilst living in peace. Respondents noted through the FGD conducted that most of the community development projects in the community were initiated by the local leaders who also educate the people on the consequences and impact of such projects before they are implemented. The leaders were able to play this role because of their high level of intelligence, being cosmopolitan, good level of education and good connections. Extension should always make good use of the local leaders in galvanising mass participation and adoption of innovations in the rural communities because of their strong influence on the people. When Extension workers work hand-in-hand with the local leaders, they can provide more information for rural community development.

Some of the key findings on the role played by local leaders in rural development was that, among the prominent roles played by the local leaders include; making decisions on different issues affecting the community that require an integrated approach, acting as the liaison people between governmental and non-governmental agencies and the community for financial and technical assistance, monitoring and evaluating projects for proper implementation, and raising funds through levies, donations, launchings, etc to finance community development projects in their areas. Further results showed that the main source of information on community development in the area was through the local leaders. This role played by local leaders in Nigeria concerning rural community development is lacking among the leadership of Kavango East Region.

It is worth noting that their study revealed some constraints; the results showed that out of the 23 constraints considered, respondents perceived 19 factors as major constraints and four as not being constraints. The most important of the constraints include; incompatibility of government policies with community programmes (= 3.84), insufficient sources of funds for community development projects (= 3.83), poor implementation of programmes (= 3.80), and gender bias (= 3.77).

Some of these constraints have been detected to be the same in the Kavango East Region, such as lack of funding, and gender bias. The study revealed that, when programmes are poorly executed or implemented, the grassroots get discouraged to participate in other programmes initiated by the leaders. Leaders should therefore ensure that they gain the credibility of their subjects and sponsors and further commit their energy and time in a transparent way towards achieving success in community development programmes. To check this, erring local leaders must be disciplined through appropriate mechanisms. Such mechanisms must involve the possibility of detecting embezzlement and punishing the leaders in the event of a proven fraud [54] by requiring the leader to repay the aid money which he or she has misappropriated, other leaders will desist from the same practice. Gender bias, especially against women was highlighted as one of the limiting factors to local leadership in the area of study.

According to [55], the role of the local leaders in rural and community development is influenced by their gender. [55], maintains that women do not play the same level of leadership role as their male counterparts. The respondents noted that in most cases, women were not involved in decision-making processes because they felt that women had little or nothing to offer. Numerous studies have proven the contrary, that women possess the necessary skills and capacity to deliver good programmes in the community [3]; [55]. Therefore, both men and women should be involved in leadership roles in community development so that they complement each other's efforts where necessary. Mechanisms to make local leaders account for any irregularities and mismanagement added value to the success of the rural development efforts in Nigeria, a thing which is lacking in the Kavango East Region.

2.5 The Role of Leadership in water technology innovations

The study reviews extant literature on what other authors have established on the role of leadership in water technology innovations in enhancing regional development. In the literature available, technological innovation is generally understood as bringing a new product, process, or service successfully to the market, meaning that it can be sold for a profit [31]. Technological innovation thus goes beyond invention, which depicts the elaboration and prototyping of a new technological principle. It is related to diffusion, which refers to the spread of new technology into the wider society.

Accelerating innovation and technology will help address the complex challenges facing America. Technology innovation can be a means to ensure that future actions are more sustainable and be an economic driver, help businesses thrive, create jobs and be a source of U.S. exports [36]. The improvement of water treatment and management systems and technological solutions in recycling and sea water desalination together with other non-technological solutions should be explored. These approaches require the attention and action of governments around the world [59]. This means that leadership involvement is a paramount aspect to any developmental activity. My opinion is that leadership should be involved in order to see development taking a centre stage in the Kavango East Region, in the form of employment creation.

Among the factors listed by the researchers mentioned below, that affect water technology innovation in enhancing development are executive management support [14], willingness to allocate resources [35], clear business plan and vision [74] and effective communication [28]. We will explore these factors briefly below;

1. Executive management support

Top management support is needed throughout the implementation process. The project must receive approval from top management [14]. Managers should legitimise new goals and objectives. A shared vision of the organization and the role of the new water technology innovations should be communicated to employees.

2. Willingness to allocate resource

Top management needs to publicly and explicitly identify the project as a priority [74]. Senior management must be committed with its own involvement and willingness to allocate valuable resources to the implementation effort [35].

2. Clear business plan and vision

A clear business plan and vision to steer the direction of the project is needed throughout the ERP life cycle [16]. A business plan that outlines proposed strategic and tangible benefits, resources, cost, risks and timeline is critical [74]. Hence, the role of water technology innovations in enhancing regional development can be realised.

4. Effective communication

[28] suggests that Effective communication is critical to ERP implementation. [74] adds that Expectations at every level needs to be communicated. The management of communication, education and expectations is critical throughout the organization. On March 27, 2014 Environmental Protection Agency in the U.S, office of water issued a Blue print for Integrating Technology Innovation into the National Water Program, which highlighted EPA's initial ideas and plans for advancing technology innovation across various water programs[36]. This shows that leadership involvement is a key issue if any given country desires to use its water effectively to contribute to development. In order for Namibia and Kavango East Region in particular, to develop, it is important to take into consideration the role of water technology innovations in socio-economic development.

Leaders should encourage rural territories to explore new ways of becoming or to remain competitive, in order to make the most of their assets and to overcome the challenges they may face, such as an ageing population, poor levels of service provision, or a lack of employment opportunities. In this way, Leaders contribute towards improving the quality of life in both farming and the wider rural population. It uses a holistic approach to address rural problems. It recognizes that being competitive in the production of food, having an attractive environment and creating job opportunities for the local population are mutually supportive aspects of rural life, requiring specific skills, appropriate technologies and services that need to be tackled as a coherent package and with tailored policy measures.

2.6 Challenges facing leadership in water technology innovations

One should imagine a holistic and integrated approach to water quality and water quantity management, which maximizes ecosystem restoration. It is difficult to envision sustainable solutions to our water challenges without technological innovations, such as the distinct opportunities identified above. While these water resource challenges and market opportunities are framed as individual pursuits, ideally, many of these can be achieved in an integrated manner. So, for example, in the case of a traditional municipal wastewater

treatment facility, one should imagine a utility that generates energy; captures nutrients for resource recovery; sells their water for reuse; generates half the volume of bio solids; emits substantially less greenhouse gases; uses green and natural infrastructure to manage storm water, mitigate climate impact and provide aesthetic cityscape benefits; and contribute to a comprehensive watershed monitoring program in partnership with a diverse set of partners. Just imagine if we put all of the pieces together.

Extant literature on this issue deal with it at the international level. According to [36], it is stated that, whether it's the ongoing response to California's devastating drought or the latest round of battles over proposed regulations, there's no escaping to the fact that water issues are increasingly in the national spotlight. What is often overlooked in the ongoing discussion over solutions is the fact that the water crisis presents an abundance of opportunities for innovation and economic growth.

[36], further stated that, a new approach to a variety of such challenges facing the world today is to develop public-private partnerships focused on innovation and commercialization. That does not only solve problems, but it also supports regional economic development efforts. These "clusters" are fast becoming an innovative means to foster partnerships in a coordinated manner. A cluster is a geographic concentration of interconnected companies, universities and other organisations with a specific focus on industry. The goal of these dense networks is to leverage a region's assets to create economic opportunities and catalyse innovation. Clusters spur innovation and create an environment where companies and organisations can easily share ideas and solutions.

A successful and active cluster is a great benefit to a region's technology transfer efforts. Clusters accelerate the development of new technologies, and connections within clusters lead to partnerships between businesses and researchers. In addition, clusters streamline the adoption of new technologies by providing companies with easier access to potential partners for pilot studies and encouraging communication between companies and regulators.

The Environmental Protection Agency has recognised the potential of the cluster concept and is actively supporting its development nationwide through Environmental Technology Innovation Clusters Program. The program's initial focus is on creating a strong cluster network with an emphasis on water technology. At present, EPA has identified 14 such water clusters throughout the United States in various stages of engagement and development, with more still at the formative stages.

"The program is solving water problems while creating regional economic opportunities," says Sally Gutierrez (2015), director of the program. "Clusters are in a position to leverage the unique assets of a region—assets that might include academic and research organisations, water utilities, investment networks or other resources."

Each cluster has its own unique focus and goal within the realm of water technology. For example, Pittsburgh's Water Economy Network is focused on how water and energy issues intersect, while the Nevada Center of Excellence in Water is working to bring together water resource management with Big Data. However, all are working to reduce the barriers to quick commercialisation and adoption of innovative water technology. And as the cluster movement grows, so does its track record of success. The EPA water cluster movement is based in Cincinnati, a city with a rich history of water research and a unique concentration of labs and testing facilities. The Confluence, which is a cluster organization covering southwest Ohio, northern Kentucky, and southeast Indiana, has partnered with EPA to use these resources to aid the development of a number of promising water technologies. The EPA began collaboration with Urbanalta in 2012. Urbanalta is a Cincinnati-based small business, that develops novel measurement methods and technology for monitoring combined sewer overflows

Urbanalta is currently adding design engineers to its R&D team and building pre-production prototypes of a Flowing Water Scope. Urbanalta has licensed the technology and is working with a local government utility in the first deployment. This collaboration received the 2014 Federal Laboratory Consortium Midwest Partnership Award.

The EPA and Confluence provided support for local startup CitiLogics, for demonstrating their technology at various Kentucky and Ohio water utilities. As a result CitLogics has signed its first contract with the Greater Cincinnati Water Works, allowing the company to hire its first employee in only two years. CitiLogics is bringing economic growth into the region, generating $300,000 in research grants in 2013, $500,000 in 2014 and an expected $2.5 million in 2015.

Confluence was working to bring down barriers to technology commercialisation and to expedite the regulatory approval process. On January 16, 2013, Confluence brokered the landmark signing of a multi-state agreement with the EPAs of Ohio, Kentucky and Indiana to help streamline and harmonise the approval process of emerging drinking and waste water treatment technologies.

The EPA developed and patented a green-infrastructure detention basin retrofit device (the Kraken) that is being demonstrated in collaboration with the Boone County Conservation District and Sanitation District #1 of Northern Kentucky. A Northern Kentucky company has licensed the Kraken technology from EPA to distribute in Ohio, Indiana, Kentucky and Tennessee with projected sales in excess of $6 million in the next 3 to 5 years. Confluence's work is getting noticed, as it was awarded the 2015 FLC State and Local Economic Development award. But the cluster movement is nationwide, and water clusters all over the U.S are accelerating technology transfer as well.

Boasting an abundance of water technology companies and academic institutions with dedicated water science and water business programs, the Milwaukee and South Wisconsin area is internationally known for its freshwater expertise. The Water Council (Milwaukee's cluster organization) works to coordinate these resources, bringing solutions to the market timeously while positioning the area to be a leader in the burgeoning water industry.

One of the most powerful tools at the disposal of the Water Council is the Global Water Center, a water research and business accelerator center that combines water research facilities, space for established water companies and accelerator space for startup water companies. This collection of water resources and facilities is unique in the world, and a major driver of innovation and commercialisation in the Milwaukee area.

Working with the Wisconsin Economic Development Corporation, the Water Council also created the BREW (Business, Research, Entrepreneurship, In Wisconsin), a

freshwater seed accelerator program. The BREW has demonstrated impressive success – 9 of 11 winners from its first two "batches" has received patents or have patents pending.

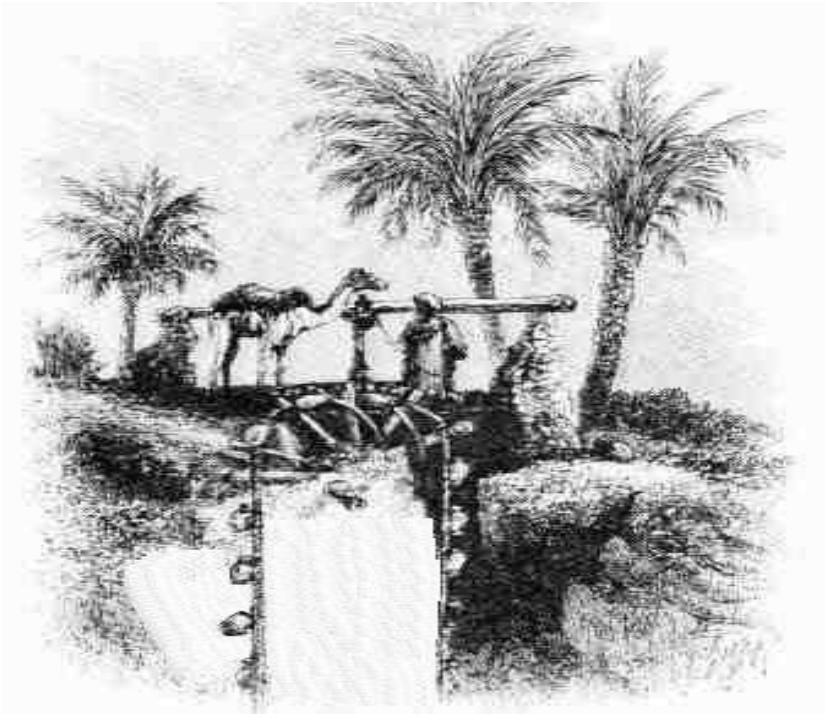
One winner from Batch 1, and a company that has taken advantage of the cluster effort in Milwaukee is Vegetal I.D., a company that provides green roof solutions to help control storm water. Through The Water Council and the BREW, Vegetal I.D. received space in the Global Water Center, a startup grant from WEDC, technical and business assistance from two of Wisconsin's academic institutions (including the University of Wisconsin-White water Institute for Water Business), and funding and testing plots from local utilities, helping to bring its products to the market faster and better positioned for success.

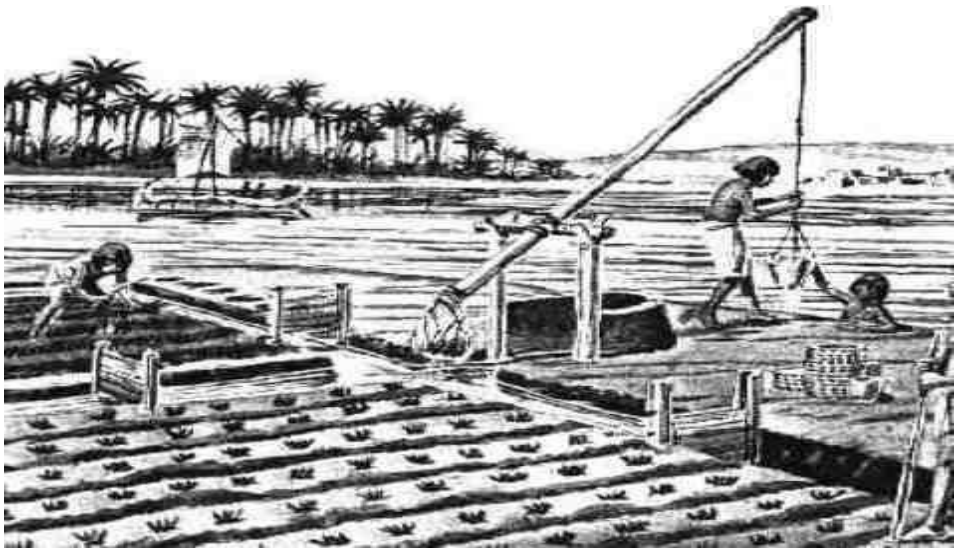
The Water Council and the BREW continue to provide an accelerated path to commercialisation, working both locally nd globally. The BREW's latest batch of startups range from a Toronto-based company with a non-invasive pipe inspection technology to a wastewater company based in Ireland, to a Milwaukee company with a laser scanning technology for water treatment processes.

2.9 The History of Water Technology Innovations

Water technology innovations is not a new thing to be associated with mankind. It has been among mankind since the beginning of time. However, it is worth noting that water technology innovations have been changing and developing from time to time as mankind started to come up with effective and efficient ways of using water to enhance economic development and create jobs. The bulk of recent literature one can find on the history of water technology innovations, is at continental level. This is true especially in the case of Egypt.

According to [32], the Egyptian water technology commenced with the invention of a device called a shaduf. This is a device that has been used in Egypt since early times to get water for irrigation. This is a machine that draws water from a lower place to a higher place. The shaduf is made up of a large pole





Source:[27]

that is balanced on a crossbeam with a rope and bucket on one end and a heavy counter weight at the other side. When the shaduf is placed into the water and gets full it is lifted, and then placed into a canal or field to water the crops. The shadufs are still used in most rural parts of Egypt today. These were and continue to be very helpful to Egyptians especially in rural areas close to the river Nile. Above is a picture showing the shaduf.Figure 2.1: Egyptian water technology Irrigation fact sheet.

According to [32], a striking contrast of the early Indus civilisation and those of Sumer, Akkad, Babylonia, and Assyria in Mesopotamia, the great Egyptian civilisation in the Nile River valley, is that it has sustained itself for some 5,000 years without interruption. It lasted through warfare and the conquest by the Persians, Greeks, Romans, Arabs, and Turks, as well as through pandemics that devastated its population. Yet its agricultural foundation remained intact. Only in more recent times has the sustainability of the Egyptian agriculture come into question. In response to a 20-fold increase in its population over the last two centuries-from 3 million in the early 1800s to 66 million today, Egypt replaced its time-tested agriculture based on the Nile's natural flow rhythms with an intensified irrigation and flood management that require the complete control of the river.

[32], further says, compared with the flash floods of the Tigris and the Euphrates, the historic Nile floods were much more benign, predictable, and timely. As is the case today, most of its flow originated from monsoon-type rains in the Ethiopian highlands. The remainder came from the upper watershed of the White Nile around Lake Victoria. With almost calendrical precision, the river began to rise in southern Egypt in early July, and it reached flood stages in the vicinity of Aswan by mid-August. The floods then surges northward, getting to the northern end of the valley about four to six week later.

At its peak, the floods would cover the entire floodplain to a depth of 1.5 meters. The waters would begin to recede to the South by early October, and by late November most of the valley would be drained and dry. Egyptian farmers then had well-watered fields that had been naturally fertilised by the rich silt carried down from Ethiopia's highlands and deposited on the floodplain as the water spread over it.

They planted wheat and other crops just as the mild winter was beginning, and harvested them in mid-April to early May. By this time, the river's flow had diminished, sustained only by the more constant flow of the White Nile; the floodplain was completely dry. Then, magically to the ancients, the cycle started all over again. Even into modern times, every June 17th Egyptians celebrate the "'Night of the Drop,' when the celestial tear fell and caused the Nile to rise."

The Egyptians practiced a form of water management called basin irrigation, a productive adaptation of the natural rise and fall of the river. They constructed a network of earthen banks, some parallel to the river and some perpendicular to it, that formed basins of various sizes. Regulated sluices would direct floodwater into a basin, where it would sit for a month or so until the soil was saturated. Then the remaining water would be drained off to a basin down-gradient or to a nearby canal, and the farmers of the drained plot would plant their crops.

The earliest evidence of water control in ancient Egypt is the famous historical relief of the mace head of Scorpion King which dates to around 3,100 BC. It depicts one of the last predynastic kings, holding a hoe and ceremoniously cutting a ditch in a grid network. Besides attesting to the importance of these waterworks and the great ceremony attached to them, this picture confirms that Egyptians began practicing some form of water management for agriculture about 5,000 years ago.

According to [32], Egyptian irrigators did not experience many of the vexing problems that plagued (other historic) irrigation societies. The single season of planting did not overly deplete the soil, and fertility was naturally restored each year by the return of the silt-laden floodwaters. In some basins, farmers planted grains and nitrogen-fixing legumes in alternative years, which helped maintain the soil's productivity. Fallowing land every other year, which was essential in (areas like) Mesopotamia, was thus unnecessary in the Nile valley.

Neither was salinisation a problem. The summer water table remained at least 3-4 meters below the surface in most basins, and the month or so of inundation prior to planting pushed whatever salts had accumulated in the upper soil layers down below the root zone. With salt buildup naturally checked and fertility constantly restored, Egyptian agriculturists enjoyed not only a productive system, but a sustainable one.

[32], indicated that, for nearly 1,500 years Egyptian farmers cultivated about 800,000 hectares under this system of basin irrigation. The shaduf, the water-lifting device already in use in Mesopotamia appeared in upper Egypt sometime after 1500 BC (see Illustration bellow). This technology enabled farmers to irrigate crops near the river banks and canals during the dry summer. This would have allowed the cultivated areas to expand by 10-15 percent. A similar increase might have been afforded by the waterwheel, introduced sometime after 325 BC (see illustration below). So by the time Egypt had become a breadbasket for the Roman Empire, some 1 million hectares of land were effectively under cultivation throughout the course of a year.

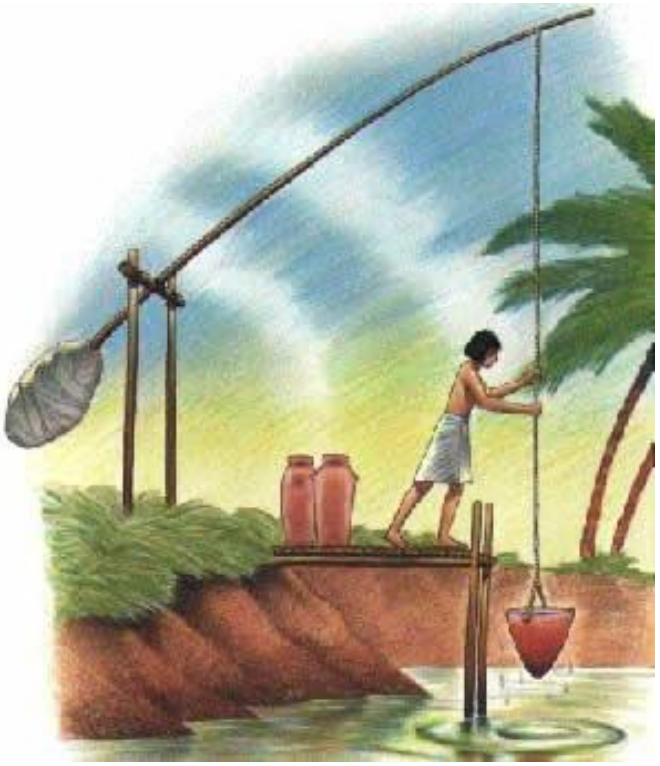


Figure 2.2. A shaduf was used to raise water above the level of the Nile. Source: www.waterhistory.org

Figure 2.3: *A noria, buckets attached to a waterwheel, was another device used to lift water*.[27]

The blessings of the Nile were many, but they did not come without some costs. A low flood

could lead to famine, and too high a flood could destroy dikes and other irrigation works. Even a 2-meter drop in the river's flood level could leave as much as a third of the floodplain unwatered.

The well-known biblical account of Joseph and Pharaoh's dream is a reasonable reflection of the threat of famine that Egyptians periodically faced. Asked to interpret his ruler's dream, Joseph foretells several years of abundant harvests followed by seven years of food shortages, and advises Pharaoh to begin storing massive quantities of grain to avert famine. During a period of disappointing floods between the reigns of Ramses III and Ramses VII in the twelfth century BC, food shortages caused the price of wheat to rise markedly. Prices stabilised at a high level until the reign of Ramses X, and then fell rapidly as shortages eased by the end of the Ramessid Dynasty, about 1070 BC.

According to [32], ancient Egyptians developed a system for measuring the height of the Nile in various parts of the country because of the link between the Nile's flow level and Egyptian well-being. This monitoring allowed them to compare daily river levels with years past and to predict with some accuracy the coming year's high mark. At least 20 "nilometers" were spaced along the river, and the maximum level of each year's flood was recorded in the palace and temple archives (see the photograph below).

Figure 2.4 *: The nilometer on Elephantine Island, Aswan, consists of stairs and staff gauges.* Source: [27]

The reliability of the Nile floods and the unpredictability of its magnitude rooted ancient Egyptians deeply in nature and fostered respect for order and stability. Rulers were viewed as interveners with the gods to help ensure prosperity. The father of all gods was the god of the Nile-Hapi-who although male was portrayed with breasts to show his capacity to nurture. The Egyptians worshipped Hapi not only in temples, but through hymns such as the one below:

"Praise to you, O Nile, that issues from the Earth, and comes to nourish Egypt . . .

> If his flood is low, breath fails, and all people are impoverished; the offerings to the gods are diminished, and millions of people perish. The whole land is in terror . . .

When he rises, the land is in exultation and everybody is in joy . . .

He fills the storehouses, and makes wide the granaries; he gives things to the poor".

In contrast to (other historic) civilisations, early Egyptian society did not centrally manage state irrigation works. Basin irrigation was carried out on a local rather than a national scale. Despite the existence of many civil and criminal codes in ancient Egypt, no evidence exists of written water law. Apparently, water management was neither complex nor contentious, and oral tradition of common law withstood the test of a considerable amount of time.

According to [32], although difficult to prove, the local nature of water management, in which decision making and responsibility lay close to the farmers, was probably a key institutional factor in the overall sustainability of Egyptian irrigation basin. The many political disruptions at the state level, which included numerous conquests, did not greatly affect the system's operation or maintenance. While both slaves and *corvee* labor was used, the system's construction and maintenance did not require the vast numbers of labourers that Mesopotamia's irrigation networks demanded. The waves of plague and warfare that periodically decimated Egypt's population did not result in the irrigation base falling into serious disrepair, as occurred in other historic systems.

Local temples appear to have played an important role in redistributing grain supplies to help cope with the periodic famines. From very early times, boats plied the Nile and were used to transport grain from one district to another. The surplus from several districts might be stored in

a central granary and shared to secure food supplies for the whole region. Fekri Hassan, a professor in the department of Egyptology at the University of London, speculates that the emergence of kingship in Egypt was linked to the need for larger coordination in collecting grain and providing relief supplies to districts experiencing crop failure. The central government imposed a tax on the peasant farmers of about 10-20 percent of their harvest, but the basic administration of the agricultural system remained local. As Hassam observes, "Egypt probably survived for so long because production did not depend on a centralised state. The collapse of government or the turnover of dynasties did little to undermine irrigation and agricultural production on the local level."

[32], stated that, overall, Egypt's system of basin irrigation proved inherently more stable from an ecological, political, social, and institutional perspective than that of any other

irrigation-based society in human history. Fundamentally, the system was an enhancement of the natural hydrological patterns of the Nile River, not a wholesale transformation of them. Although it was not able to guard against large losses of human life from famine when the Nile flood failed, the system sustained an advanced civilisation through numerous political upheavals and other destabilising events over some 5,000 years. No other place on Earth has been in continuous cultivation for so long.

2.9.1 Water Technology Innovations in the Global Context

A recent publication on water technology innovations in the Global Context is the one released by Guardian Sustainable Business (2015) the report states that, the well was a transformative invention, though it is often overlooked. This source of freshwater, vital for the expansion of inland communities, dates back nearly 10,000 years – 3,000 years before the wheel was ever imagined.

The well is but one of a long list of innovations in water technology that has enabled human development to continue apace. Sophisticated pipeline networks and treatment plants today furnish us with this elixir of life and industry. As intense pressure is placed on the planet's limited water supplies, businesses are again turning to technological innovation. New and emerging inventions should see human civilisation through the 21st century and, with any luck, the next 10,000 years. This tells us that, water technology innovation is not a new discussion, on the socio-economic arena. It has been in existence for a long time, and has improved many lives around the globe.

2.10 The origin of water technology innovations in Africa

The most recent document concerning the history of water technology innovations in Africa is a report produced in Israel, entitled *Israeli Irrigation: Fighting hunger and promoting Economic Growth* (2015). The report says that almost 50 years after the success of their first drip irrigation system, Netafim is still a world leader in growing more crops with less water. "We bring their irrigation systems to rural communities, where people are dependent on agriculture for both food and income. Even in times of drought, Netafim technology helps farmers grow the crops which they need to feed their families and to sell in local markets".

This report reveals that water technology innovations started more than 5 decades ago. However, what is important to note is the magnitude to which Israel's economy has been transformed by the use of water technology innovations. Israel is still a leader not only in Africa but in the entire world on using very limited water to grow more crops. Water technology innovations can be an answer to some socio-economic challenges faced by Namibia in general and the Kavango East Region in particular.

According to [49], overcoming the challenges of an arid climate and scarce natural water reserves has always been a vital necessity for the growth of Israel's population and economy since the founding of that state. This has led to continuous improvements in Israel's water sector, through innovations in water technology, practices and long-term plans. [49] further suggests that, currently, Israel annually requires almost a billion cubic metres per year (BCM/year) more water than average natural replenishment provides. Nevertheless, average annual sustainable natural water consumption has been achieved, while providing for all of the country's water needs, via innovations that have involved overcoming extensive engineering, biological and logistic challenges.

These innovations include:

• A visionary, nationwide water conveyance system, constructed from 1955-64, to deliver water throughout the country from the natural reserves in the north;

• Treatment and reuse of almost all of the nation's domestic waste water for irrigation in the agricultural sector;

• Highly advanced irrigation methods such as moisture-sensitive automated drip irrigation direct to the roots of the plant;

• Development of new crop strains that provide 10 times higher yield with the same amount of water;

• Pioneering work in drilling exceptionally deep wells, reaching 1,500 metres and pump settings as high as 500 metres;

• Large-scale desalination of seawater and brackish groundwater;

• Controls of algae blooms in reservoirs for reused water;

• Innovative, multi-tiered water safety methods, early warning systems and other technologies; innovative methods for minimizing non-revenue water loss.

2.11 Innovations in planning, policies and tariffs

Numerous governmental strategies and policies have been created throughout Israel's history to ensure a continuous supply of potable water for all citizens and to promote sustainable national water consumption. These include Israel's National Long-Term Master Plan for the Water Sector, from 2010-15, and innovations in both governmental and the private sector in key areas, particularly demand management, water use efficiency, creating supplementary potable water, and governmental support for innovations, notably in the NewTech Programme.

The Israel NewTech Programme promotes the country as a global water technology leader by investing in human capital, research and development, marketing, and start-up growth and international activity. This programme achieved great success in the local development and global export of Israel's innovative water technologies. Israel's agricultural sector has transformed into one of a world leader in water conservation, as was recognised by the OECD and FAO in 2012. Despite the drastic decline in agricultural water consumption over the past decades, agricultural production has continuously grown, and is sufficient to export approximately 80% of its products with the highest ratio globally in crop-yield/m3 of water.

Israel's successes to date speak for themselves. As of 2015, approximately half of Israel's water supply come from reused treated waste water, brackish water and desalinated water (see graph above), and the agricultural sector is a world leader in water use efficiency and conservation. Israel's successes as such arise from the continuous need for and support of innovative methods, technologies, holistic water resource management and strategies to provide for the nation's water needs sustainably.

2.12 Water technology innovations in Kavango East Region

The use of water technology innovations in the Kavango East Region is an issue that is of great concern. A study conducted by [44], reveal that while the focus of Botswana's use of the Kavango has been on its tourism, Namibia viewed the river as a passing resource only to be exploited before it exits Namibia at Muhembo. Thus, the river is perceived as a source of water for irrigation and provides water for domestic and industrial needs in the Central Regions. A number of lodges and camp sites have been developed by private individuals and companies, and one conservancy. However, leadership has paid little attention to the creation of wealth and jobs through the use of water in the Kavango River. Traditional Leaders (Headmen) should know about water technology innovations and its importance through awareness and training from the Regional leaders. This shows that water technology innovations is not utilised much in the Kavango East Region.

2.13 Opportunities and Challenges of water technology innovations in Kavango East

According to the [38], referred to in chapter 1, the communities in Kavango East Region are not using water effectively neither are they using water technology innovations to create jobs for themselves due to a lack of leadership involvement. This has resulted in high unemployment and high poverty levels in that region. According to [44], while the focus of Botswana's use of the Kavango has been on its tourism, Namibia views the river as a passing resource to be exploited before it exits Namibia at Muhembo. Thus, the river is perceived as a source of water for irrigation, domestic and industrial needs in the Central Regions. A number of lodges and camp sites have been developed by private individuals and companies, and one conservancy, but the leadership has paid little attention to the creation of wealth and jobs through the use of water in the Kavango River. Traditional Leaders (Headmen) should know about water technology innovations and its importance through awareness and training from the Regional leaders.

This means that there is a great opportunity for water technology innovations in the Kavango East Region. This is actually the key aspect which this study is looking into, the use of water technology innovations in order to enhance job creation. In addition, Namibia has established green scheme projects. The aims of these projects are:

- to enhance socio-economic development and uplift rural communities in Namibia. The key towards achievement of such development was based on the facilitation of an efficient economic environment by the Namibian Government.
- creation of an enabling, commercially viable environment through an effective public-private sector partnership
- to stimulate and increase private sector investment in the irrigation subsector.

[44], suggest that, in line with the above mission and guiding principles, the Green Scheme objectives constitute the Promotion of the objectives of the National Development Plan in terms of achievements towards:

- Enhance food security:
- Improvement nutrition at household level;
- Enhance food self-sufficiency;
- Create employment;
- Diversify the agricultural economic base as a drought proofing mechanism with attention paid to the development of agro-industrial ventures;
- Provide livelihood for the growing rural population;
- Reduce poverty levels;
- Encourage the use of cost-efficient irrigation methods that use low volumes of water, coupled with a water pricing policy based on the scarcity of water and the long- term environmental sustainability.
- Support the development of a sustainable and competitive agricultural sector.
- Encourage private sector involvement and stimulate public-private partnerships in terms of the following:
  (a) Infrastructure and physical development;
  (b) Effective, efficient and economic resource utilisation and management;
  (c) Establishment of a free market environment.
  (d) Through the development of an efficient economic environment enable the social upliftment of the rural community by:
    - Increasing the participation of women and the unemployed rural youth in the operations of irrigation schemes;
    - Providing research, training and extension services to irrigation farmers as well as every commercial establishment participating in the Green Scheme.
    - Minimizing adverse health consequences.
    - Enabling the training of planners and irrigation engineers to plan and implement irrigation projects to enhance additional development.
      Maximizing the production of high value horticulture products to local and external markets.
    - Providing small-scale irrigation farmers the opportunity to participate planning, financing, implementing, operating, and maintaining irrigation systems to create in Employment and foster sustainability.
    - Promotion of the small, medium and micro enterprise sector within the country.
    - Promote irrigation development in consideration of National Development, Resources and related Agricultural Policies Strengthening of the national capacity within the public and private sector in terms of planning, implementation and management of small-Scale irrigation farmers' irrigation farming projects.
    - Facilitating the empowerment of small-scale irrigation farmers.

The Green Scheme was initiated by the Ministry of Agriculture, Water and Rural Development. As such, this Ministry will govern and guide the implementation and further development of the Green Scheme Policy on Irrigation Schemes in Namibia. The policy recommends the establishment of a Green Scheme Coordinating Commission sub-contracted by this Ministry to promote the facilitation of

this process. This is called the Green Scheme Coordinating Commission" .

Background of existing projects

A range of individual irrigation projects have been established by the Ministry of Agriculture, Water and Rural Development, of which some are purely administered within the Ministry of Agriculture, Water and Rural Development, while others are combined initiatives between the Ministry of Agriculture, Water and Rural Development and the Namibia Development Corporation ("NDC").

These projects are managed by project managers, who are responsible for the service provision activities and overall co-ordination of the project to ensure the achievement of the set objectives guided by a ministerial "Steering Committee". Extension and support services are provided through the various departments at the Ministry of Agriculture, Water and Rural Development in terms of engineering, planning, water supply and human resource development.

Similar to the objectives of the Green Scheme, the majority of these projects aim at achieving effective agricultural, economic and socio-economic objectives and returns via the introduction of a resettlement program. However, initially small-scale irrigation farmer involvement demands substantial Government support in terms of pre-investment studies and relevant development arrangements, infrastructure set-up and maintenance, capacity building and development, as well as supporting service provisions within the value chain such as production input supply, storage, marketing and distribution.

The reality is that these green scheme projects have not benefited the grassroots communities in the areas in which the projects have been established. The Kavango East Region, has a lot of green scheme projects namely: Vhungu-Vhungu, Ndonga Linena, Shankara, Shitemo and Shadikongoro respectively. However, the Kavango East Region remains the poorest region in Namibia. This is opposite to the aims and objectives upon which it was created.

In terms of the propositions under the Green Scheme and in line with the institutional and management model for state owned irrigation projects, the commercial irrigation farming enterprise will facilitate all the functions of the service provider. It will also support the Ministry of Agriculture, Water and Rural Development's effort in the facilitation of the human resource development functions, by supporting the small-scale irrigation farmers with skills transfer and mentorship programs.

According to [44], the commercial irrigation farming enterprise and small-scale irrigation farmers in a joint enterprise will be the initiators of any irrigation project, rendering a proposition for the set-up and strategic development of the project and applying for the pre-determined Government development incentives in terms of their substantiated development plan. Directly attributable social obligations to the commercial irrigation farming enterprise under the Green Scheme will be the provision of services to the small-scale irrigation farmers at cost, the facilitation of skills transfer and mentorship programs to the small-scale irrigation farmers and the application of affirmative action principles in terms of the employment of human resources within its farming activities. In addition, it is recommended that the commercial irrigation farming enterprise offer an additional and measurable incentive to the local Traditional Authority to facilitate a direct plough-back to them in terms of the project. Small-scale irrigation farmers always work hard to make sure that they produce more for sale.

The small-scale irrigation farmer will preferably be a representative of the local community, low-income household earners and previously disadvantaged group members, who will apply for the registration of an irrigation project under the Green Scheme in a joint initiative with the commercial irrigation farming enterprise under any form of association. They will be able to obtain the same Government funded development incentives as the commercial irrigation farming enterprise and will be subject to the rules and conditions of the irrigation projects as stipulated under the leasehold agreement which will bind them to adhere to the project's code of conduct, and ensure that they do not engage in some undesirable behaviour or farming practices. These obligations under the leasehold agreement will be enforceable by the Land Boards as the second party to the agreement.

Any financial agreement entered into by the irrigation project participants will be administered under the terms and conditions of the selected financial institution. The Green Scheme Coordinating Commission will act as the point of reference and recommending institution to support the loan applicants, but any financial agreement entered into by the irrigation project participants will be considered on an individual basis and according to the discretion and terms and conditions of the financial institution. In my opinion, if community members of Kavango East Region are supported, in the same way Green Scheme is supported, this will enhance job creation.

2.14 Why use water as a tool to enhance socio-economic development

The most recent literature dealing with this aspect deals with the Zambian context. The report of [44], states that Water is the most common substance on earth. It covers more than 70 per cent of the earth's surface. It fills the oceans, rivers, and lakes, and is in the ground and in the air that we breathe. Water is everywhere. Regardless of language or culture, all human beings share this basic need that is essential for survival.

People drink water, cook with it, bathe in it, sprinkle our lawns with it, fill our backyard swimming pools with it - even create theme parks based on it. People, however, take its abundance for granted when much of the world, especially Sub-Saharan Africa, which includes Zambia, where access to clean water is a luxury. More than half of Africa's villages lack access to a clean water supply. In many of these villages, women and children walk up to ten miles every day carrying heavy buckets and containers to fetch a day's supply of water for their households. Those hours could be spent on other more profitable undertakings.

Without water, there can be no life. In fact, every living organism consists mostly of water. Scientists suggest that the human body is made up of about two-thirds water. A chicken is about three-fourths water, and a pineapple is about four-fifths water. Most scientists believe that life itself began in water, in the salty water of the sea.

Animals share the same water sources as human beings, doing neither any good. During the dry seasons, water supplies are inadequate or non-existent in many villages so that both people

and cattle go thirsty while contaminated water is responsible for a myriad of health problems in the country including dysentery and malaria.

Ever since the world began, water has been shaping the earth. Rain hammers on the land and washes soil into rivers. The oceans pound against the shores, chiseling cliffs and carrying away soil. Rivers knife through rock, carve canyons, and build up land where they empty into the sea. Glaciers plow valleys and cut down mountains.

Water helps to keep the earth's climate from getting too hot or too cold. Land absorbs and releases heat from the sun quickly. But the ocean absorbs and releases the sun's heat slowly. So breezes from the ocean brings warmth to the land in winter and coolness in summer. Throughout history, water has been people's slave and master. Great civilisations have risen where water supplies were plentiful. They have fallen when these supplies dried up. People have killed one another for a muddy water hole.

These civilisations have worshiped rain gods and prayed for rain. Often, when rains have failed to come, crops have withered and starvation has spread across regions. Sometimes the rains have fallen too heavily and too suddenly. Then rivers have overflowed their banks, drowning large numbers of people and causing enormous destruction to property.

Today, more than ever, water is both slave and master to people. We use water in our homes for cleaning, cooking, bathing, and carrying away waste. We use water to irrigate dry farmlands so we can grow more food. Our factories use more water than any other materials. We use water in rushing rivers and thundering waterfalls to generate electricity.

Our need for water is constantly increasing. Every year, there are more people in the world. Factories turn out more and more products, and need more and more water. We live in a world of water. But almost all of it, about 97 per cent is in the oceans. This water is too salty to be used for drinking, farming, and manufacturing. Only about 3 per cent of the world's water is fresh (unsalted). Most of this water is not easily available to people because it is locked in icecaps and other glaciers. By the year 2000, the world demand for fresh water may be double what it was in the 1980's. But there will still be enough to meet people's needs.

There is as much water on earth today as there ever was or ever will be. Almost every drop of water we use finds its way to the oceans. There, the sun evaporates it. It then falls back to the earth as rain. Water is used and reused over and over again, but it is not totally depleted.

Although the world as a whole has plenty of fresh water, some regions have a water shortage. Rain does not fall evenly over the earth. Some regions are always too dry, and others too wet. A region that usually gets enough rain may suddenly have a serious dry spell, and another region may be flooded with too much rain.

Some regions have a water shortage because the people have managed their supply poorly. People settle where water is plentiful, near lakes and rivers. Cities grow, and factories spring up. The cities and factories dump their waste into the lakes and rivers, polluting them. Then the people look for new sources of water.

Shortages also occur because some cities do not make full use of their supply. They have plenty of water but not enough storage tanks, treatment plants, and distribution pipes to meet the people's needs. As our demand for water grows and grows, we will have to make better use of our supply.

Water in our daily lives

Every plant, animal, and human being needs water to stay alive. This is because all living organisms process their food using water, that is from taking in food to getting rid of waste. But people depend on water far more than just to stay alive. We also need it for our way of life. We need water in our homes, to brush our teeth, cook food, and wash dishes. We need water in our factories to manufacture almost everything from automobiles to zippers. We need water for irrigation, to raise crops in regions that do not get enough rain.

Water for irrigation/ agriculture

It is estimated that 70% of world-wide water use is for irrigation. In some parts of the world, irrigation is necessary to grow any crop at all, in other parts it permits more profitable crops to be grown or enhances crop yields. Various irrigation methods involve different trade-offs between crop yield, water consumption and capital cost of equipment and infrastructure.

Irrigation methods such as most furrow and overhead sprinkler irrigation are usually less expensive but also less efficient, because much of the water evaporates or runs off. More efficient irrigation methods include drip or trickle irrigation, surge irrigation, and some types of sprinkler systems where the sprinklers are operated near ground level. These types of systems, while more expensive, can minimize runoff and evaporation. Any system that is improperly managed can be wasteful.

In most countries including Zambia, people have had a rich heritage of managing and living with their environment including water since time immemorial and they have demonstrated to be effective custodians of water for agricultural purposes. Rainfall and water has been central to their lifestyles, and influencing their farming activities.

Most of the plants that people raise need great quantities of water. For example, it takes 115 gallons (435 liters) of water to grow enough wheat. People grow most of their crops in areas that have plenty of rain. But to produce enough food for their needs, people must also irrigate dry areas. The rainfall that crops use to grow is not considered a water use, because the water does not come from a country's supply. Irrigation, on the other hand, is a water use because the water is drawn from a nation's rivers, lakes, or wells.

The water a nation uses for irrigation is important to its water supply because none of the water remains for reuse. Plants take in water through their roots. They then pass it out through their leaves into the air through a scientific process called evaporation. Winds carry away the vapour, and the liquid water is gone. On the other hand, nearly all the water used in our homes is returned to the water supply. Sewer pipes drain the waste to treatment plants and return the water to rivers so that it can be used again.

2.15 Less water- more yield notion

According to a report compiled by the International Water Management Institute in September, 2010, Water governance is the set of processes through which decisions related to water management are made. Achieving good water governance requires knowledge about what actions work best in a particular physical and socio-economic context. In many developing countries, institutional and governance models in operation today were designed from a colonial context. At that time, the authorities favoured growing crops in large-scale monocultures and viewed water as an infinite resource. Accordingly, nations installed large, supply-driven surface

irrigation schemes. Under today's conditions of a swelling global population, farmers producing a greater variety of crops, and increasing competition for water from cities and industry. These enduring systems of governance are out of sync with modernity. Poor water governance has been cited as being one reason behind today's water shortages.

As surface irrigation schemes have slowly stagnated, farmers have taken water management into their own hands. Unable to access water with enough flexibility to nurture the variety of fruits, cereals and vegetables they grow now, they have started pumping up ground water through boreholes. This trend has been wide-ranging, especially in South and East Asia where planned and regulated surface irrigation has now largely given way to 'anarchic' pump-based systems. The inability of governments to regulate water use under such conditions has resulted in some catastrophic environmental problems. For example, in India, there have been cases within North Gujarat, Tamil Nadu, Saurashtra and Southern Rajastan where agriculture has collapsed and drinking water supplies have become contaminated by polluted aquifers [70].

A new form of governance is needed that acknowledges the value of water and ensures it is used efficiently. To date, governments have been reticent to implement reforms because they fear political repercussions. Generating support for reform requires recognition of the value of water. Although access to clean drinking water and sanitation must remain a fundamental right, water used by agriculture, industry and the environment will ultimately need to be priced. To ensure dwindling water resources are shared equitably, governments must introduce allocation policies, based on well-defined water rights, where water allocations can be reduced when supply becomes scarce or demand from different sectors increases.

Farmers will need incentives to encourage these sectors to use less water. A way to achieve this is to link agricultural practices to their impact on society. For example, municipal authorities might pay farmers who use less water, so there is more water available for cities. Models of successful water governance reforms are emerging. In Gujarat, decades of electricity subsidies left the authorities facing bankruptcy, electricity utilities and depleted groundwater stores. Scientists suggested that governments should introduce 'intelligent rationing' of power by separating cables carrying electricity to farmers from those supplying domestic users. They recommended providing farmers with a high-quality power supply for a set number of hours each day at a price they could afford. Gujarat implemented the scheme across its 18,000 villages. This move boosted the well-being of individuals by increasing the quality of power supply to rural households, schools and industries; halved the power subsidy to agriculture; reduced the groundwater overdraft; and encouraged the development of non-farm enterprises . In Australia's Murray-Darling River Basin, a successful system of governance is in operation based around separate land and water rights, water trading and water pricing.

2.16 Leadership as a catalyst to socio-economic development

Rural communities remain strategic in the socio-economic development of any nation. A lot of resources abound in the area to the extent that if they are harnessed, they will not only be a foundation but a springboard for the structural transformation for economic growth and development of the people and the nation at large. However, despite approaches adopted to tap the wealth in these rural communities, especially in the developing economies, it appears that not much has been done to harness the endowed resources of the rural areas.

Community development is reputed to be an indispensable component among the approaches adopted world-wide for the socio-economic transformation of any nation, especially developing nations like Nigeria. The rural communities are acknowledged to be endowed with abundant human and material resources that will accelerate the pace of development of any country. It is argued that in Nigeria for instance, the majority of the population dwell in these communities.

Regional autonomy enables regions to optimise their economic, geographic and socio-cultural potentials. This development paradigm has the potential to decrease the disparities that have developed between regions and which today threaten the state with disintegration. There are two approaches towards dealing with regional autonomy: One is a federalist approach encouraging proactive regional government and the other is a unitarist approach with a proactive central government.

The first approach leaves it to regional government to identify strategies and handle all issues except those that impact on the integrity of the state and the nation. The second puts the onus of government and administration on the central government, except for certain defined issues that are to be handled by the regions.

Regional autonomy in Indonesia is determined by Laws No 22 and No 25 of 1999. These laws are just the same as the GRN established fourteen (14) Regional Councils under the Act of 1992. This law was a plan to bring the government closer to the people especially the previously disadvantaged. According to a practical Guide of Decentralization Enabling Act of Namibia, the main responsibility of regional councils is to draw up regional development plans and administer formal settlements [58]. Additionally, they should also be responsible for delivering basic services, like rural water supply, primary healthcare and primary education, according to the Decentralization Policy for Regional Councils.

In addition to the powers conferred upon a regional council by Article 108 of the Namibian Constitution or any other provision of this Act, a Regional Council shall have the power:

(a) to undertake, with due regard to the powers, duties and functions of the National Planning Commission referred to in Article 129 of the Namibian Constitution and any other law relating to planning, the planning of the development of the region for which it has been established with a view to:

(i) the physical, social and economic characteristics of such region and, in so far as any neighbouring region has or is likely to have any effect on the physical development of that region, the physical, social and economic characteristics of any such neighbouring region;

(ii) The distribution, increase, movement and the urbanisation of the population in such a region;")

(iii) The natural and other resources and the economic development potential of such a region;

(iv)The existing and the planned infrastructure, such as water, electricity, communication networks and transport systems, in such a region;

(v) The general land utilisation pattern;

(vi) The sensitivity of the natural environment;

(b) To exercise in connection with its region such powers, and to perform the duties and functions connected with such powers, as may be delegated by the President to the regional council in terms of section 29;
(c) Subject to the provisions of Part VII, to establish, manage and control settlement areas;
(d) To make recommendations to the Minister in relation to the exercise, in relation to a Local authority situated within its region, of any power conferred upon the Minister under the Local Authorities Act, 1992, or any other law;
(e) To advise the President or any Minister on any matter referred to the regional council by the President or such Minister;
(f) To assist any local authority council in the exercise or performance of its powers, duties and functions;
(g) To make, for purposes of the preparation of the estimate of expenditure to be presented to the National Assembly in terms of Article 126 of the Namibian Constitution, recommendations to the Minister of Finance in so far as it relates to matters concerning its region;
(h) To establish from time to time such committees as it may deem necessary to advise it in the exercise of any of its powers or the performance of any of its duties or functions and may appoint such members or such other persons as it may deem fit to be members of such committees;

(i) To acquire or hire, or hypothecate, let, sell or otherwise dispose of movable property; with the approval in writing of the Minister previously obtained in general or in every particular case and subject to such conditions, if any, as may be determined by him or her, To acquire or hire, or hypothecate, let, sell or otherwise dispose of immovable property or any right in respect of immovable property;

(ii) To borrow money from time to time by way of loans from any source within Namibia

and against the security which the regional council may deem fit or the issue of

debentures, bills of exchange and other negotiable instruments;
(k) To guarantee the due fulfillment of the contracts and obligations of any person, and

enter into surety bonds or deeds of security;
To open banking accounts, including savings accounts with a building society as defined in section I of the Building Societies Act, 1986 (Act 2 of 1986), and the Post Office Savings Bank controlled and managed by the Namibia Post.
It seems as though many Regional Leaders including the Kavango East Regional Leaders have failed these tasks, which are the key aspect in job creation in their respective Regions, which this study is investigating.

Regional Council's Act 22, 1992 shows signs of supporting the federalist approach. This is reflected, for example, in Chapter Seven, Article One which states: "Regional authority covers authority in all governmental fields, except authority in foreign politics, security, defence, justice, monetary and fiscal affairs, religion, and "other areas of authority". However, these last words indicate that regional authority is given with reservations. Article Two from the same chapter defines "other areas of authority" as including policies relating to national planning and macro-level national development, balancing budgets, the state administration system and state economic institutions, empowering human resources, natural resources and strategic high technology, conservation and national standardisation.

The half-hearted dispensation of autonomy can also be seen from the essence of Law No 25/1999, which is not in tune with Law No 22. The provision of relatively wide authority under Law No 22, is not backed up by basic changes to strengthen regional capabilities in respect of finances. It is an absolute precondition of effective regional autonomy that these two laws have a shared direction and support each other. Before they were submitted to parliament, the parties involved in designing the laws should have had discussions to ensure a compatible vision, and put both laws in harmony with each other from their inception to support the common objective of regional empowerment.
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2.17 Why leadership is needed in water technology innovations

Our water resources are limited and face mounting pressures from climate change, pollution, population growth, and ageing water infrastructure. Technology innovation can help address our water challenges and help put us on a more sustainable path while also supporting economic growth. EPA aims to be a catalyst to promote and support technology innovation to restore, protect and ensure the sustainability of our water resources.
There are many barriers to innovation that are often cited e.g, institutional, cultural, financial and regulatory. EPA will consider ways in which its regulatory activities can reduce barriers to, or encourage incentives for, technology innovation.
The following are examples of actions that EPA will take, in cooperation with our EPA region and state partners;

- According to [36], updating the Effluent Limitations Guidelines and Standards Program to consider more explicitly, sustainable and innovative technologies when developing national standards for controlling water discharges, is needed by leadership. Stepping back and asking a broad set of questions about the best available technology might include the consideration of energy use, sludge generation and disposal, process changes or green chemistry alternatives, water conservation and reuse opportunities, and by-product and pollutant recovery prospects.
- The [36], further suggests that, exploring ways in which National Pollutant Discharge Elimination System (NPDES) permits could be tailored to foster technology innovation within existing legal Promoting Technology Innovation for Clean and Safe Water and regulatory authorities is very useful. Examples of permitting innovation might include watershed-based permitting, opportunities to foster process optimisation or use of existing excess treatment capacity, derivation of long-term average limits for nutrients, opportunities to explore alternative technologies and performance testing of those technologies, or implementation of integrated planning. The report goes on to suggest that leadership in this case EPA office should do the followings:

✓ Provide technical support to overcome barriers and allow for the use of innovative technology (e.g., ways to advance "Utility of the Future" concepts). This might include considering energy, carbon sources, greenhouse gas generation, and water and bio solids reuse in a holistic,

approach. Continue to foster and promote consideration and use of green and natural infrastructure to achieve a broad set of environmental, social and economic objectives.

- ✓ Participate and contribute to efforts by external parties such as the Water Environment Federation, American Water Works Association and others to explore regulatory and/or policy strategies to identify and overcome barriers to the acceptance of innovative and new technology.
- ✓ Continue to collaborate with the Department of Commerce under the Environment and Technology Working Group and Environmental Trade and Technology Advisory Committee in promoting technology-based policies internationally, as well as promoting the environmental technologies exporters.
- ✓ The Office of Water will examine ways to address the ongoing challenges expressed by technology developers for bringing new technologies to market. Technology providers face a complex system of state and local requirements that can discourage acceptance, adoption and use of new technologies. For example, by engaging and supporting independent third-party technology evaluation efforts, EPA aims to continue to help bridge the gap between technology development and implementation for water-related technologies. EPA's Office of Water will evaluate the opportunities to support the growing demand for technology assessment and performance demonstration/verification of a spectrum of water related technologies (e.g., independent third party).
- ✓ Participate in development of the Water Environment Federation (WEF) and Water Environment Research Federation (WERF) Leaders Innovation Forum for Technology,(LIFT), WEF's Storm water Testing and Evaluation for Products and Practices(STEPP) workgroup, and other promising technology evaluation efforts.
- ✓ Coordinate with other domestic and international efforts, including: The Interstate Technology and Regulatory Council (ITRC), a state-led coalition working to advance the use of innovative environmental technologies and approaches. Leadership should find a way to accelerate the market uptake of emerging technologies by introducing them to potentially interested water utilities during the pre-commercial stages of development.
- ✓ Continue to support efforts such as the Confmuence Water Technology Innovation Cluster, where state regulators with Ohio, Kentucky and Indiana recently signed a ground breaking cooperative agreement that allows the Confmuence to work with companies to complete testing that can be approved by all three states at once dramatically speeding time to market.
- ✓ The Office of Water (which represents leadership of that given area) will support EPA's ongoing efforts and programs supporting the development and implementation of innovative water-related technologies, such as the Ageing Water Infrastructure Research Program and STAR grants, fellowships and research contracts under the Small Business Innovative Research Program.

2.18.1 Current trend of job creation in agriculture sector

According to the Agricultural Business Development (AGRIBUSDEV) annual report of 2015, the agricultural sector in Namibia employs a large number of people compared to other sectors. The majority of workers in this sector are rural based and unskilled. From Green Scheme perspective, the two Kavango regions are the top in terms of employment at Green Scheme Farms. See the table below;

Project Name	Permanent Employment –Male	Permanent Employment – Female	Temporal Employment – Male	Temporal Employment – Female
Etunda	35	33	52	152
Hardap	4	2	25	8
Kalimbeza	6	2	22	64
Mashare	5	0	27	61
Musese	28	3	28	57
Shadikongoro	37	3	12	10
Shitemo	49	73	15	2
Sikondo	24	4	480	960
Ndonga-linena	37	13	8	25
ORIP	58	11	48	123
Uvhungu-Vhungu	21	11	60	160

Table 2.1: Level of employment created by Green Scheme 2014/2015 in Namibia. Sources: AGRIBUSDEV

Although the AGRIBUSDEV Annual report says that the agricultural sector in Namibia employs a large number of people compared to other sectors. It is very sad to know that the above table shows the opposite. Table 2.1 above shows that the total permanent employment created for the Green Schemes located within the boundaries of the Kavango East Region, only adds up to 90 persons during the year 2015. While the temporary employment created only adds up to 729, for the same year in the Kavango East Region.

This makes one wonder especially when one considers that out of a population of just over 105,000 in the Kavango East Region, only a handful of people are able to be absorbed by the Green Scheme as employees. It means that the Green Scheme projects are not the solution to job creation as it is stipulated in the Act. Therefore there is need for leadership to look into a mechanism to empower the rural community of Kavango East Region to produce food and expand their already existing small gardens which are currently being irrigated manually. In this way it will assist them to produce more for themselves as well as for sale.

This will enhance job creation and reduce poverty at the end of the day, and encourage self-reliance. Green scheme projects are not a solution to address poverty and inequalities faced by the rural community of the Kavango East Region in particular and Namibia in general. New policies are needed in order to come up with mechanisms aimed at filling the gap left by the Green Scheme projects. Leadership, through the Ministry of Agriculture, water and forestry needs to look into this matter as soon as possible to address this situation.

The community of Kavango East Region has demonstrated a willingness to produce food. One would think that it is the right time that policies are developed to support this region.

Therefore leadership has a role in supporting the rural community of Kavango East Region to use water in an efficient and effective way to enhance job creation, and reduce poverty and inequalities that currently prevail in the lives of the rural communities of the Kavango East Region and Namibia in general.

Name of the Farm	Size (Ha)	Total Number of Farmers-SSF	Total Number of Farmers-MSF	Region
Etunda Green Irrigation farm	1200	64	10	Omusa
Hardap Green Scheme Irrigation Farm	965	0	14	Hardap
Kalimbeza Green Scheme Irrigation Farm	229	5	0	Zambezi
Mashare Green Scheme Irrigation Farm	130	0	0	Kavango East
Musese Green Scheme Irrigation Farm	1000	0	0	Kavango West
Ndonga Linena Green Scheme Irrigation Farm	1000	27	0	Kavango East
Orange River Green Scheme Irrigation Farm	600	9	0	//Kharas
Shadikongoro Green Scheme Irrigation Farm	590	13	0	Kavango East
Shitemo Green Scheme Irrigation Farm	1000	0	0	Kavango East
Sikondo Green Scheme Irrigation Farm	850	0	0	Kavango West
Uvhungu-Vhungu Irrigation Farm	825	10	0	Kavango West
Totals	7 521	128	33	

Table 2.2: List of Green Scheme Irrigation farms in Namibia. Source: AGRIBUSDEV

Green Schemes are also established to assist the government in facilitating training and skills transfer to Small Scale and Medium Scale farmers. Looking at table 2.2 above, which was obtained from the AGRIBUSDEV annual report of 2015, it is disappointing to note that only 40 Small Scale Farmers were trained in the year ending 2015, and no Medium Scale Farmers were trained. This means that in the next ten (10) years only 400 small scale farmers will be trained if policies and approaches do not change to address this situation. The Government, through the Green Scheme project is not doing much to change this situation. If this situation continues poverty will continue to prevail in the Kavango East Region.

The most recent literature on this subject is the study officiated by the International Fund for Agricultural Development (IFAD) in November 2012, in El Tambo, Ecuador. It's said that providing water effectively for a range of agricultural needs has been proven to reduce poverty. At an individual farm scale, access to a reliable water store can make the difference between a crop failing or thriving during dry spells, which in turn will determine whether or not a poor farmer has enough food to feed his or her family. At a global scale, achieving food security through effective water management can prevent the deaths of millions from starvation and malnourishment. While past efforts to develop irrigation infrastructure have had success in reducing poverty, the benefits have not been equitably shared and there are many regions where pockets of poverty still remain. With the increasing conditions that climate change brings there is now an even greater need to find the most appropriate solutions to address poverty and vulnerability, specifically in regions that have not yet been reached.

Women's varying roles in agriculture have also been overlooked when decisions about water use have been made. There is a perception that rural women are solely responsible for fetching and carrying water, and that men undertake the farming, but this is not necessarily the case. Often, women have different roles as compared to men. For example female villagers might manage fruit trees, while men manage crops in the fields. If a government or development organization comes to install an irrigation system and is guided by village men to cut down trees, they may inadvertently dispossess women of their livelihoods. Increasingly, poor families are seeking to escape poverty by sending men to cities to find alternative employment. This trend has been observed in many places where women are increasingly taking on full responsibility for running farms. Despite assuming chief decision-making roles in many farming systems, they often remain underrepresented in water users' groups because of community attitudes and neglect on the part of policymakers to improve the rights and access of women.

Many of today's smallholder farmers grow a range of crops, often on unproductive marginal lands such as uplands. They would benefit from access to a combination of small-scale water storage facilities, along with soil improvement technologies. These would help them to overcome issues of rainfall variability, which is likely to be exacerbated in the future due to climate change.
They may also provide them with opportunities to diversify, for example, by farming fish as well as crops. Providing a large number of smallholder farmers with access to artificial ponds or tanks, small reservoirs, wetlands, and groundwater or soil moisture, has the potential to lift individual families from poverty and underpin global food security. In southern Sri Lanka, the construction and linking of a large storage reservoir to five small existing reservoirs resulted in a 400% increase in productivity [75].

Decision-makers need to take into account the role of women much more if they are to effectively address poverty as well as food security issues. A project that included women in decision-making on irrigation in Jambar, South Gujarat, India, resulted in a higher social status for the women along with greater productivity from their crops [75]. The project involved researchers educating the community's men as to why the women should be involved in making decisions. IWMI and the International Food Policy Research Institute (IFPRI) are presently developing a gender map of smallholder farming in Africa. This will be used to develop recommendations on how to target the main decision-makers of the farms with water management technologies.

Action 1: Empower the poor and women in water management
Women all over the world play an active role in agriculture, thus contributing to food security. In many countries, women are involved in rain fed agriculture as well as backyard or irrigated home gardening, while men are often responsible for rain fed commodities and land management aspects of irrigation. Depending on the traditions of the societies they live in, the prevailing norms and the migration patterns of men, women may play different roles in the production cycle. In some countries, for example, in sub-Saharan Africa, women are the main producers of staple food crops; in others, they work on their family farms or as paid labourers. Yet in other countries, particularly countries in the Middle East, women are mostly involved in post-harvest activities and work as unpaid family labourers only during periods of shortages of labour.

They and often their children suffer the most from water shortages in crop and livestock production, as well as for domestic use. It is estimated that women in many developing countries walk for an average of about 6 kilometers each day to collect water [68]. Water collection for domestic purposes is generally the responsibility of women and girls in almost all developing countries. Thus, if water supplies become scarce or contaminated, women and girls are the ones who must look for alternative sources of water. In addition, they must also provide care if family members suffer from waterborne diseases. The availability of clean water close to home reduces women's workloads, and the time saved in fetching water may be spent on other activities to strengthen livelihood resilience, including productive activities such as crop production.

Therefore, women are often interested in using rainfall run-off or irrigation water for purposes other than irrigating field crops. Most of the water supply projects in the past were developed with a single dimension; they either focused on domestic water supply or provided water only for irrigation. Communities, on the other hand, have diverse uses of water such as for agriculture, fishing, livestock watering, small businesses, kitchen gardening and domestic tasks. In the past, agricultural water management projects have not generally been designed or retrofitted to take into account these multiple uses for water within water management schemes. This trend is changing, and water projects are becoming more multi-purpose, multi-use and multiuser. The involvement of communities, both men and women, in the selection of and planning for such interventions is key to successful gender mainstreaming. Not addressing the multiple uses of water has been recognised as one of the causes of the lower participation of women in WUAs. In some irrigation systems, the use of irrigation water supplies for domestic purposes is considered illegal. Some irrigation projects even have a negative impact on domestic water availability.
A study in Bangladesh has shown that the use of river water for irrigation caused many hand pumps used for drinking water, to run Impact of water-related projects, on women, dry [72]. Similar observations have been made about some of the schemes in the Provincially Administered Tribal Areas such as the Integrated Agricultural Development Project in Pakistan. The installation of tube wells for irrigation has caused a significant decline in groundwater levels and thus reduced the availability of water in the wells dug by nearby households.
In cases where irrigation projects have tried to incorporate other uses of water, they have often ignored women's concerns. In a smallholder irrigation scheme in the Kano Plains in Kenya, men wanted to have watering places for cattle, while women wanted communal areas for washing clothes and dishes. Because women were underrepresented in the WUAs, the project did not take into account the different perspectives of women [29].
Women, like men, may also have clear opinions about how an irrigation system should be operated. Because of their workload at home and their relatively lower flexibility in terms of time, women may have different preferences for irrigation operations and the scheduling of water deliveries.
Although unavoidable in certain circumstances because of the rotation of water deliveries, women tend to avoid night irrigation because of their fear of gender based violence, sexual harassment and other hazards, as well as the difficulties associated with combining work at night with childcare [78].

Irrigation projects in many instances have also brought advantages to women. While they have provided the much-needed water for irrigation in drier areas, resulting in an improvement in the livelihoods of families in general, they have also reduced women's workload in terms of the number of hours women spend fetching water for domestic use. Irrigation has made it easier for women's animals to be watered in convenient places [29]. In particular, providing water for multiple uses reduce drudgery and provides women with more time to do other productive activities.

Action 2 : Access to irrigated land:
Understanding the links between land and water governance as well as natural resources is one of the foundations in the effort to overcome poverty among poor people in rural areas. Thus improvements in the management of these resources is the focus of many development initiatives and projects that seek poverty reduction by empowering poor people to improve their livelihoods.
Experience shows that many challenges remain in achieving these goals in an equitable and sustainable manner. One of the main obstacles to improving the livelihoods of the poor rural people is the lack of attention given to gender issues and women's access to natural resources, in particular land and water. Although research offers evidence on women's multiple roles in agricultural production, their access to productive resources such as land, water, fertilizer, credit and other inputs remains limited.

In most developing countries, access to water for productive use in general and for irrigation in particular is intrinsically linked to access to land. In most parts of the world, relatively few women own land. However, women may still obtain access to land through their families or husbands, a practice that makes them vulnerable to any change in family dynamics. In some societies in sub Saharan Africa, a woman acquires land tenure rights for life; however, this right is transferred to the male members of the family after she dies. In some cases, a woman may lose access to land after the death of her husband or father. Without secure land tenure, women cannot obtain access to credit and membership in agricultural and WUAs.
According to one estimation, only 1 per cent of the total credit directed to agriculture goes to women in Kenya, Malawi, Sierra Leone, Zambia and Zimbabwe because financial institutions do not generally consider women creditworthy [29]. The Grameen Bank in Bangladesh and other micro credit institutions are an

exception because they give small loans to poor men and women. Access to these resources helps the women or men use their labour more effectively by enabling them to make decisions and adjustments in allocating resources under changing economic and climatic conditions.

Many irrigation and land reallocation projects have failed to incorporate appropriate gender strategies in design and implementation, which, in many cases, has exacerbated inequities in resource allocation. In many cases, women's access to land and water has declined as a result of the introduction of irrigation schemes [75];[78]. The project improved family income and indirectly benefited women, but women lost their control over resources (land and money) and became dependent on their husbands. Gender-based farming systems where men and women cultivate separate fields is common in many parts of sub-Saharan Africa.

This reality has often been ignored in irrigation development projects and led to gender inequity with regards to access to productive resources. It has also resulted in the partial or total failure of irrigation schemes. Moreover, key decisions regarding site selection, beneficiaries, land (re)allocation and water rights are made during the planning phases of water-related investment projects and thus form the basis of gender inclusion or exclusion in the projects. The approach of agencies and projects towards as well as the local class and gender hierarchies, are some of the causes of gender-related inequities in connection with access to water resources in sub-Saharan Africa [75].

2.18.2 Reasons for job creation in water sector

Many countries in the developing world are now using water to empower their rural poor people. Most extant literature dealing with this issue is pitched at the international level. In this regard the story of Kenya is helpful. The Coastal Rural Support Programme (CRSP) in Kenya has been working in semi-arid, marginalised rural areas of the Coast Province since 1997. Over the last decade, the programme has grown from working with four village organisations comprising less than 300 community members to working with 195 village organisations comprising more than 30,000 members. The introduction of small farm reservoirs, which has provided the target population of 130,000 with critical access to water for both domestic and productive uses, has helped the majority of households to increase agricultural production and income, in spite of the increasing poverty in the Coast Province.

Many districts in the Coast Province of Kenya are amongst the poorest in the country, where up to 70-80 percent of residents live below the poverty datum line. Often living beyond the reach of government services, rural families are left without clean drinking water, weak village infrastructure and limited access to basic education and healthcare. In addition, geographical and climatic characteristics leave them to cope with drought, depending on degraded natural resources for survival. This has created living conditions that are particularly detrimental as the majority of residents are small scale farmers who depend on agriculture as their sole source of food and income.

When it was established, the Coastal Rural Support Programme (CRSP) was meant to complement an already existing project of the Aga Khan Development Network, the Mombasa Primary Health Care Programme (MPHC). To support MPHC, CRSP implemented interventions that, by stimulating economic and social development, contributed to sustainable and equitable improvements in the livelihoods of poor households in the Coast Province. As a result of the support that CRSP offers, it is referred to by its beneficiaries as *sombeza* (Mijikenda for "to push up or give a helping hand to those who are already doing something to improve their situation"). This is because communities see CRSP as providing a hand up, not a hand out, in the process of improving their livelihoods.

The programme's overall aim is to improve the livelihoods of poor households in Kinango, Kilifi, and Kaloleni districts of the Coast Province. The objectives of the program are:

- To strengthen community level organisations/institutions to be effectively involved and engage in local/central government and non-public organisations in service delivery, democratisation and governance;
- To improve livelihoods through diversification of income sources and promotion of appropriate agricultural and natural resource management practices;
- To increase water availability and reliability for productive use, improved health status and livelihoods;
- To increase access to quality basic education for marginalised children;
- To enhance knowledge generation, management and dissemination resulting in wide adoption/replication of CRSP poverty alleviation approaches by other organisations.

CRSP's programming is deeply rooted in the idea that the community is the central unit from which equitable and sustainable development takes place. As a result, all of its work in each of its four sectors begins with the establishment of relationships and partnerships at the community level, with community based organisations called Village Development Organisations (VDOs). The VDOs provide community members with a forum and tools to discuss, chart and implement a plan for the future of their village. Although most villages have existing structures for making decisions, they are often not recognised by outsiders as formal organisations with the ability to collaborate with government. This lack of voice, coupled with the structure of government decision making, which gives priority to interests at the divisional rather than community level, means that individual villages are often unable to voice concerns about development in their areas.

CRSP provides VDOs with training on governance, organisational development, participatory monitoring and evaluation, and record keeping. Prepared with these skills, VDOs are then assisted to register as formal organisations with the government. Since 1997, CRSP has facilitated the establishment of 192 VDOs. CRSP also links together VDOs from the same districts, to form Supra Organisations, which collaborate and interact with government officials beyond the divisional level. These Supra Organisations are able to demonstrate competency in management, group leadership and project organisation. A key result of the social organisation process is the institutionalisation of a community based planning process in which villages prepare community development plans which they are then able to forward to government departments or other organisations for planning and funding support.

The development of appropriate technology can raise a farm's productivity. Successful technological developments that aid the rural poor are achieved through bottom-up policies that involve technological innovations that require few external inputs and little monetary investment. The most effective innovations are based on the active participation of small farmers, who are involved in both defining the problems and implementing and evaluating solutions. Smallholder technological developments have focused on processes such as nutrient recycling, integrated pest management, integration of crop and livestock agriculture, use of inland and marine water sources, soil conservation, and use of genetic engineering and biotechnology to reduce fertilizer requirements.

CRSP encourages the diversification of drought tolerant crops. These are promoted at the household and group level. Through field farm schools, farmers are trained on how to prepare the land, plant the crops, carry out weeding, pest and diseases control and harvesting and storage. CRSP also assists in vegetable production through kitchen gardens located at the household level and at small farm reservoir water sites. The main aim is to produce food for household consumption with surplus vegetables sold on the market.

After few years, the outcome of the areas that used water was as follows:

- V*illage organisation and influence*: One-third of households in 192 villages belong to Village Development Organisations and are employing interventions introduced by CRSP.
- *Soil and water conservation*: Three-quarters of households are now using soil and water conservation methods.
- *Livestock production*: Goat improvement has been successfully adopted by more than 40 percent of respondents, raising the income for two-thirds of them.
- *Water and sanitation*: Increased access to safe water during the dry season through pipeline extension.
- *Living standards*: More than half of the respondents' households say that their overall living standard has improved.

Leadership should consider using water to empower their communities; they should involve communities themselves in order to harness development in the rural areas.

2.19.1 Labour Migration in Kavango East Region

According to [43], Contract labourers from Namibia came only from former Ovamboland and the Kavango area and although there were farm labourers from other Namibian ethnic groups, they were not contracted. Many of the farms where labourers got contracted were mainly owned by German settlers and Afrikaners who were engaged in livestock farming, raring animals such as sheep, goats and cattle. Labour migration from Kavango during the German colonial period was low and totalled only 122 men from 1910 to 1913. This is in contrast with Ovamboland, which recorded 9295 labourers in 1911, 6076 in 1912 and 12025 in 1913. The table below, while not a comprehensive statistical compilation, shows the extent of the differences in migration from the Kavango and Ovamboland during the colonization of Namibia covering the years 1920s, 1940s and 1950s.

Year	Kavangoland	Ovamboland
1924	346	3273
1925	243	3269
1926	355	4033
1941	639	4060
1942	351	3137
1943	539	6659
1959	1033	14960

Table 2.3: Labour migration from Kavango during the German occupation. Source: [43].

[43] continues to elaborate on the fact that, this trend continued for the whole period of the contract system and by 1971 it was reported that there were 43000 contract labourers in Namibia of which only 3000 were from the Kavango and the rest were from Ovamboland. The statistics for labour migration indicates that the response to labour migration in the Kavango was not the same as that in Ovamboland and there was never the same value attached to contract labour migration. However the table above indicates that recruitment by SWANLA (1943-1972) was better than its predecessor NLO (1925-1942). The number of contract workers in Namibia provided to the farming sector exceeded the number of workers involved in the mines for the first time in 1934 and remained so during most of the 1940s.

This occurred because after 1948, SWANLA adopted a compelling strategy in order to meet the demands of farm labour by making it compulsory for all new recruits to spend at least one contract as a farm worker before they would be able to travel to the mines.

Likuwa's paper uses the recorded oral interviews of former contract labourers from the Kavango in northeast Namibia, supplemented by archival sources from the National Archives of Namibia (NAN) and written sources to reflect on the experiences of farm labourers under the contract labour system during Namibia's colonial period. The paper explores journeys to and from the farms, the living and farm work experiences and farm workers' perception of their experiences under the contract labour system.

The aim was to provide a historical basis to extract lessons in order to understand the current challenges faced by farm labour practices in postcolonial Namibia where the plight of farm workers remains a pertinent and persistent concern. The paper stipulates that the paradigm of exploitation, suppression and entrapment under the contract labour system remains dominant in the narratives of former farm labourers. Furthermore, many farm labourers still view their mistreatment under the contract labour system as colonial exploitation at its worst as the wages were too low. Although many of them renewed their contracts in the hope of accumulating more money in order to improve their social and economic conditions, this remained an everlasting hope that was never realized.

He further suggests that, the colonial administration aimed at maximizing profit from black Namibians' labour power and therefore put control measures and infrastructure in place

to ensure that contract labourers from the Kavango were delivered to their work stations in the police zone. In the early days of colonialism in Namibia, migration was under the escort of the visiting colonial officials and later through labour escorts and eventually through organised recruiting agencies.

The journey to the work stations was a tightly controlled process and an overt control over labourers. All their personal and family details, for example, were recorded at Rundu and reproduced and kept in the recruiting centre at Grootfontein. Apart from the D.P. disease control, the labourers were also inspected for security purposes at the police border posts of Nurugas and Tsintabis, which were entry points to the police zone from the Kavango. After 1936 when the office of the Native Commissioner operated from Rundu, all new labour recruits began to report at his office. The contract labourers slept at a labour compound that consisted of thatched roof houses and was situated near the river side but in the late 1950s another compound was constructed further away from the river with permanent brick structures. The grouping of contract labourers at Rundu ensured that the administration had an easily available pool of labour force from which to extract labourers who would have passed their medical testing process.

A contract labourer was first examined in Rundu and then in Grootfontein and this medical procedure degraded and embarrassed contract labourers. While in Rundu, labourers were stripped naked and taken to a hall surrounded by a short wall made of reeds near the SWANLA shop where they were medically examined. Afterwards they proceeded to the hospital to what they called the 'wahahesera' (don't breathe) machines to test if they had tuberculosis (TB). They called the x-ray machines the 'don't breathe' machines because labourers were usually asked to breathe in and hold their breath for several seconds while an x-ray was taken. The medical testing process therefore displayed lack of respect for the dignity of the labourers. The tagging with a metal alphabetic tag around the hand ensured that labourers were aware of their job categories before they left Rundu.

The B symbol indicated that labourers were fit for heavy farm work such as extensive milking, dam building, herding of large flocks of sheep or goats while the C symbol was given to labourers who were fit for light farm work such as milking a few cows, herding small flocks of sheep, goats and other forms of light work.

The provision of symbols on labourers at Rundu was for classification purposes only and the labourers were still at a loss as to what employer they would be assigned to and to which work destination they would be sent to. Contract labourers were exposed to personal hardship and danger during the journey. For example, in the earlier stages, they carried their load of goods on their shoulders and had to provide for their own meals and were also exposed to Bushmen attacks, hunger and starvation.

Transport was introduced by NLO from Kavango to the south only in 1938 and Mr Gaerdes Kemp (locally known as Kemba) was appointed to transport contract labourers and to run the only NLO shop at Rundu. The Lorries that transported migrant labourers followed the road from Rundu via Karukuvisa–Tsintsabis to Grootfontein. This was a deep sandy road, which slowed down the speed of the Lorries and made the journey to the recruiting depot very long and tiring. A key image constructed by contract labourers about recruitment at the Grootfontein recruiting depot is that of sale or purchase. The needy white men (employers) placed an order for their required number of people at SWANLA at a fee that went to the colonial administration's coffers and this practice was seen as a sale. As one labourer indicated:

Since labourers already knew what job category they had been assigned to in Rundu, their objection at Grootfontein was not against the type of employment but rather against the area of employment or a particular employer. After a labourer was given an employer or place of work, he was provided with a blanket, a long-sleeved shirt and a short-sleeved one (regardless of the size of the labourers), some bread and two cans of jam. The quantity of the goods labourers received depended on the length of the journey. As one interviewee said: 'The number of loaves of bread you were given depended on the distance one was to travel. For instance if you were going to Walvis Bay they got three loaves of bread with two tins of jam'.

Each labourer was provided with a train ticket attached to a permit of employment, which indicated their names, the name of the area where they were to work in and the name of the employer. Contract labourers travelled by coal trains, the 'kataghura' (the cutter/breaker), to their various work destinations but dreaded them because these were usually used to transport cattle and thus labourers felt degraded and dehumanised.

The taking away of the personal documents of contract labourers, which they received back from employers only after the contract period had expired, ensured that labourers could not travel elsewhere without the permission of their masters and could not change work (unless he broke the contract and left without his papers). Some pondoks were old with leaking roofs and cracked walls and were usually not fumigated and became the breeding ground for bugs 'ntjanya', which tormented the labourers during their sleep, a situation that got worse when it rained.

The labourers could also be assigned any available structure such as a storage room for accommodation. This was the case for Shindimba Shihungu during his first contract at Outjo farms in the 1950s. When a new labourer arrived on a farm, they familiarised themselves with their new places and determined how they would fit in by inquiring from other labourers about life on that farm.

Since Kavango labourers usually worked with labourers from other ethnic groups they established friendships across ethnic lines and usually learned Otjiherero, Damara and Oshikwanyama languages as the lingua franca. The Kavango labourers could easily learn these other Bantu languages as they could relate to them easily since most of the words existed in their own language as well.

Shindimba Shihungu recounts that "Damara came to me one day and said 'let us go and look for the cattle'. I said 'ok, let us go' but he spoke in Otjiherero. I understood the word 'let us go' and the word 'look for the cattle' sounded the same way as it does in my language. So then, we left and went on to look for the cattle".

At the farm, the farmer had the final say and allocated any work to the labourers, sometimes in contrast with the contract agreement. This meant that a labourer contracted to work in the kitchen could end up working as a herd boy. Since some labourers had preconceived ideas about what they would do on the farm, their new condition of work was therefore a shock to them. Matamu, who left for his first contract after 1936 and

worked at a farm in Okahandja thought, for instance, that he would do light work because he was of a small stature.
Contract labourers' preconceived ideas about the nature of work turned out to be different from what they experienced at home. At home, for instance, a young man learned by imitation from the elders while on the farms he was commanded and at times compelled to work.

At home, the men visited neighbours with no limits as to what time to return home or else sat around 'shinyanga' (the social gathering place around the fire in the evening) to discuss their experiences of the day and plans for the next day. However, on farms, visiting days were only on Sundays and workers only visited friends at the various campsites situated within the same farm. Unlike at home where cooking was the women's responsibility, contract labourers on farms had to cook for themselves. Labourers on farms also had to work in the kitchen to help the mistress cook for their master.
The space of the kitchen on the farm, unlike at home, became central to labourers and those who worked there felt closer to the farm authorities in the sense that they developed a closer relationship with the mistress (this was the farmer's wife who was also referred to as the 'Missis'). Although working in the kitchen was regarded highly among the labourers, sometimes there were problems as labourers felt the authority more directly. Some of these former labourers point out that although some farmers were likely not to bring trouble on them; it was mostly their wives who incited them to do so. The 'Missis' usually reported every mistake of the labourer to her husband and expected him to deal with the respective labourer. The short temper of the 'Missis' lingers on in the memory of some of the contract labourers.

2.19.2 Inducements/stimuli for labour migration
Labour migration issues started before Independence, it was induced by the regulation of black labour which was inseparable from the objectives and operations of colonialism and apartheid with its system of influx control, passes, native reserves and job reservation. Black people served as a source of cheap labour for white farmers, mining companies and other white employers. The greatest supply of black labour came through the notorious contract labour system, in which all workers were temporary employees on fixed-term contracts, to be relegated to unemployment on native reserves at the end of their contracts. Their status as workers was akin to chattels. Breaching a contract was a crime. Those workers who were not on contract were subject to any kind of employment, where they could be fired with impunity for any reason or for no reason at all. Black workers did not enjoy the right to form trade unions and to bargain collectively with their employers.

2.20.Gender and empowerment, and water usage in General
Gender and empowerment is an issue of concern around the globe, very few countries have managed to use water to empower women. The most recent literature reflecting this effort is only found at international level, like in the case of Jambar in India, a study conducted by Gupta in 2013.
The support provided by the Aga Khan Rural Support Programme (India) to the Jambar Women Irrigation Group in Bharuch, Gujarat, and increased women's benefits from irrigation intervention and fundamentally challenged prevailing patterns of male ownership and management of irrigation equipment. The experience highlights the often-untapped potential for gender-balanced irrigation intervention wherever women share in farm activities and decision-making.

Their report is based on various visits to the group during 1999 and the insightful discussions held with its 22 members, with some of their husbands, and with the staff of the Aga Khan Rural Support Programme (India) (AKRSP [I]) who also provided background material. Aga Khan Rural Support Programme (India) AKRSP (I) is a nongovernmental organization (NGO) working in Gujarat State since 1983. Its mission statement is "to enable the empowerment of rural communities and groups, particularly the underprivileged and women, to take control over their own lives and manage their environment, to create a better and more equitable society." Based on a participatory needs assessment and planning process in each community, a range of activities are undertaken, for example, agriculture, forestry, biogas, soil and water conservation, joint input supply and marketing, and water resource development, including canal irrigation, lift irrigation, groundwater recharge and provision of drinking water.
According to Gupta (2013), AKRSP (I) channels its support through formal and informal village institutions. At village level it organizes a Gram Vikas Mandalor GVM (Village Group). AKRSP (I) has found it more effective to reach certain communities—especially villages that consist of different communities divided by caste, class, religion, gender and occupation—to create separate institutions each of which focuses on one particular community, gender, or user group. To address the needs of women, they are organised into Mahila Vikas Mandalsor MVMs (Village Women's Groups). At the initial stage, activities like monthly saving and credit programs and training in bookkeeping are taken up. As groups mature, training on group dynamics and leadership is provided. Depending on the needs that women express, further activities are initiated, such as income-generating activities, agricultural training and biogas promotion. Education and awareness raising with regard to the deeper roots of gender hierarchies are an integral part of the support. The AKRSP (I) encourages women to participate in all its programs to improve the management of natural resources, and at the same time to reduce the drudgery of women and bring recognition to their productive roles, considered to be essential for improving their status.

3. Methodology

The research design of this study is a case study. [47] define case studies as "in-depth studies of a specific 'unit', which may be individuals, organisations, events, programmes or communities". Directed by this definition, this research selected a case study to investigate a specific case of the role of leadership in water technology innovations in enhancing job creation.
A case study design is selected for this study because it draws upon a range of methods, such as interviews and questionnaires, focus group interviews by village communities, observation and document artifact collection and analysis. In this regard, the researcher enters the subjects' world or life-setting in the Kavango East Region to understand and interpret the meaning that subjects give to their everyday life in the use of water in their villages. In this case, the experiences of the

people living in the Kavango East Region in terms of economic, social and cultural ties as well as water usage, were a major denominator of the results of this study.

The study utilises an applied research aimed at solving both policy and real problems regarding regional leadership involvement in water technology innovations to enhance job creation in the Kavango East Region and Namibia in particular. As stated in the statement of the problem above, this study was geared towards exploring answers to the research question, 'To what degree may the full regional leadership involvement in water technology innovations enhance job creation in the communities of Kavango East Region?"

The objective of the methodology used in this study is an amalgam of exploratory and descriptive approaches. The researcher selected this method because this study arose out of lack of basic information concerning perspectives and understanding by the communities at grassroots level in the Kavango East Region on the role of regional leadership in water technology innovations to enhance job creation phenomena. [7], indicate that exploratory research is conducted to gain insight into a situation, phenomenon, community and/or individuals.

In qualitative studies such as this one, [7], suggest that description is more likely to refer to a more intensive examination of phenomena and their deer meanings, thus leading to thicker description, hence a research strategy such as a case study can be used.

Furthermore, the purpose of this study is to provide qualitative and quantitative information on various factors, which are hypothesised as being related to leadership involvement in water technology innovations to enhance job creation in Kavango East Region.

This mixed method of study made use of the case study design to assess the role of Regional Leadership involvement in water technology innovations in enhancing development in the Kavango East Region. The study shows a detailed and intensive analysis of a single case. It will be a single location (one Region) study. A case study research involves the study of a case within a real life contemporary context or setting [71]

Since the study involved both exploratory and descriptive approaches it used both qualitative and quantitative data presentation and interpretation in Chapter 6. As stated above, this study is focused within the Kavango East Region of Namibia. Interviews with the communities were conducted in the villages of the Kavango East Region.

Twenty one villages were randomly selected, for the purpose of the focus group interviews conducted among the communities in that area. At this phase, the researcher only presents a primary indication of the design and methodology of the research.

This study is analytically descriptive, using a mixed-method approach. It exploits inductive generalised reasoning, since it uses statistical inferences in which the researcher generalises from a non-probability sample to the research population of the Kavango East Region. The data was collected by means of observations, while the primary data of the study was obtained through focus group interviews. This means that the focus group interviews constituted support for the non-probability results. Focus group interviews were used for this purpose. Observations, interviews and open-ended questionnaires are qualitative methods of collecting data.

The researcher prepared a focus group interview schedule in the form of a meeting organised amongst the grassroots community villages of the Kavango East Region as discussed above. The structured research questions have been prepared in English, but could be administered in vernacular such as RuSambyu, Rumanyo and Thimbukushu where necessary. To contextualise this research into the Kavango East Region, the researcher included current information regarding leadership involvement in water technology innovations to enhance job creation issues in reports, books, journals and periodicals. This section on methodology consists of the following concepts: data collection procedures and techniques; the team of researchers, study area, population, sampling methods and strategy.

1. 3.1 Population

According to [41], 'population' is the aggregate of all the cases that conform to some designated set of specifications. Hence, by the specifications of people residing in the villages of Kavango East Region, this sub-section defines a population consisting of all the people residing in the villages of Kavango East Region. As alluded to above, the sampling selection for research is rooted in the 2011 Population and Housing Census conducted by the National Planning Commission (NPC). However, there are strong assumptions that uncontrollable movements of people within the Constituencies and villages of the Kavango East Region, as well as to other Regions would affect the area population. Therefore, this research includes a probability technique to obtain more information from people living in the grassroots villages of Kavango East Region.

This is done because, it is not always easy to obtain statistics of people moving from one village to another, or from one constituency to another on a daily basis by means of probability techniques. The problem is based on the complexity of recording the movement of people daily.

According to the [46], supported by the delimitation commission report of 2013, the Kavango East Region has a total population of 115 447 people, with 343 villages (excluding Rundu town and Divundu Village Council), with an average household size 6.7 and an area of 25 576 square Kilometres. Based on this, for the sake of this study, the unit of analysis is a village. A sample of 21 villages were identified within a radius of 15-222 kilometres along the Kavango River, eastern side of Rundu town.

2. 3.2 Sample

[41], maintains that, sampling is refers to the group of elements selected with the aim of investigating something about the population from which they are taken.

Two sampling techniques were used in this study. The probability sampling in the way of random sampling technique was used to select representative villages from the total of 343 villages in the Kavango East Region. The non-probability sampling technique was used by way of a purposive sampling to select the headmen/headwomen of the village and their community representative to elicit both qualitative and quantitative data on the role of leadership in water technology innovations to enhance job creation in the Kavango East Region. This was done based on the experience of the grassroots communities in the villages. Below is how the number of villages was selected:

The sample of this study will consist of 19 randomly selected villages out of 343 villages. For each village there were 8 members (1 headman and 7 advisors) x 19 villages = 152 members, which were interviewed in focus groups. Each

village had 1 headman who was automatically part of the 8 members. The 19 villages were randomly selected by using research randomizer, a computer program.

The sample size was calculated using the 95% interval formula shown below:

$$n = \frac{N}{1 + N(e)2}$$

Where:
N= Population
n= Sample size
e= $(0.05)^2$

$$n = \frac{343}{1 + 343(0.0025)}$$

n= 343/1+0.8575 =1.8575
Sample Size=21villages

In this regard, twenty one (21) villages, with a total of 777 grassroots community members were interviewed at their villages where the headmen/headwomen helped to facilitate this research project in order to obtain information without any restrictions on people. All people who come to the headmen/headwomen tree where interviewed, since turning some away could cause embarrassment, which could cause the remaining respondents to avoid giving information to the researcher.

In addition, Six hundred and eight (608) females and one hundred and sixty nine (169) males participated in the focus group interviews; three hundred and seventy four (374) were between twenty three (23) and thirty five (35) years of age, while the rest were above thirty five (35) years of age. About forty six (46) participants were disabled from albinism and dwarfism.

3. 3.3 Research Instruments

The study used focus group discussions for collecting data. During the focus group interviews open ended and closed ended questionnaires were administered to the village participants.

4. 3.4 Procedure for data collection: Focus Group Interviews

The researcher sought approval from Kavango Regional Governor, informing Regional Leaders that he will be in the Region to conduct research. After that, the researcher meet with the village headmen/headwomen to explain to them about the research and its processes, and then make appointments with randomly selected villages on different dates and time. Twenty one (21) villages (the headmen and senior advisors) were asked to participate in focus groups interviews; participants were asked questions concerning the role of leadership in water technology innovations to enhance job creation. The standardised open-ended questions had 31 sub questions to cover the two research objectives namely:

(1) to investigate successes and limitations surrounding leadership involvement in water technology innovations to enhance job creation and;

(2) to investigate the relationship between leadership, water technology innovations and job creation.

5. 3.5 Data analysis

After the focus group interviews had been conducted at all the sampled villages, the qualitative data was coded, on which a data dictionary was created to explain the meaning of each code. Then the data entry process started, using Statistical Packages for Social Scientist (SPSS). Univariate analysis has been tested for categorical variables, and bivariate analyses were tested to test for any correlations. Multivariate analyses was conducted to test multiple linear regression analysis. This was followed by data display, which went a step beyond data reduction to provide an organized, compressed assembly of information that allows one to draw a conclusion. The research established patterns of interrelationships that suggest why the success or limitations in leadership involvement in water technology innovations to enhance job creation and how leadership involvement in water technology innovations contribute to job creation. After all this was done then the data was interpreted, in the form of a report.

The research instrument used was an eight-page questionnaire developed for interviews with focus group interviewees in the grassroots community villages of the Kavango East Region, using a random sampling technique. The questionnaire was written in English, but it was administered in the vernacular (RuSambyu, Rumanyo and Thimbukushu respectively) in order to make it easy for the interviewees. The inclusion of open-ended questions in the questionnaire enabled the researcher to elicit the respondents' unique views on particular issues of concern. The questionnaire consisted of 22 questions and was organised into three sections namely:

Section A: Demographic information
This section contained items that identified details about the respondents in relation to their gender and number of respondents.

Section B: What are the roles of leadership in water technology innovations to enhance job creation?
This section probed the Regional Leaders' visits to the villages in the last five years, and how many times Regional Leaders visited the particular villages. The section also probed if the visitations took place, if so, how many times were they engaged in discussions between community and Regional Leader and why such discussions? It also probed the number of times the community had come together with their Regional Leaders to discuss issues concerning water technology innovations at their villages. The section sought to know if Regional Leaders ever suggested the allocation of resources for water technology innovation, and how much that was. It also sought to confirm if the Regional Leaders really allocated financial resources for water technology innovations and how much that was.
The section further probed if the Regional Leaders had not visited their respective villages, what the village leaders did to seek audience/engagement with the Regional leaders concerning water technology innovations at their village and what were the reactions of their Regional Leaders on the matter.

The section also sought to understand if the respective villages were geared for using water technology innovations to create jobs for themselves. It therefore, asked if there was a technical group/committee at the respective villages, which was responsible for speaking to Regional Leaders concerning the need to use water technology innovations to enhance job creation at their respective villages. If their technical group is in place has it managed to speak to the Regional Leaders on the need to use water technology innovations to enhance job creation. The section furthermore, sought to understand from the community point of view, how they viewed leadership involvement or lack thereof, in water technology innovations and how this will influence job creation at their respective villages. The section concluded by probing how many jobs had been created at the respective villages through the use of water technology innovations and the reasons behind the number of jobs created.

Section C: How does leadership involvement in water technology innovations contribute to job creation?

This section started to probe the community on how they want their Regional Leadership to be involved in water technology innovations in order to contribute to the economic development of their respective villages and their region in particular. It also sought to establish how many times the local community met with their regional leaders to discuss the role of leadership in water technology innovations to enhance job creation.
The section further probed the community's views on whether they thought their regional leadership has a role in water technology innovations to enhance job creation at their villages. It continued and probe the community on whether they thought water technology innovation use at their respective villages would contribute to wealth creation and a reduction of inequalities. The section further probed the community, if their regional leadership was involved in water technology innovations to enhance job creation at their villages. The section also sought to understand from the community how their regional leadership was involved in water technology innovations to enhance job creation.

4. Research ethics

Permission to conduct the study was sought from the Kavango Regional Governor, in writing. The researcher ensured that all focus group interviews started by explaining a statement of intent where the researcher assured the respondents that the information and data collected will be used solely for the research and that the respondents would have open access to the results once they were published. Informed consent from the respondents was also sought before the necessary information was collected. During the entire investigation, anonymity and confidentiality was maintained by not recording any names and not disclosing any information between focus groups. Data was stored in a locked cabinet and will be destroyed by shredding and burning after 5 years.

5. RESULTS AND DISCUSSION

5.1 Leadership issues in the Kavango East Region

The Kavango East Region has seven (7) Constituencies, namely: Rundu Urban, Rundu Rural, Mashare, Ndonga linena, Ndiyona and Mukwe. Each constituency has one elected leader called Regional Councilor, who has a 5 year term of office. The Regional Councilors are firstly nominated through political party structures and then they are brought forth as eligible candidates for election as Regional Leaders to community. In most cases, grassroots communities have no choice but to vote for the candidate already nominated through the political party's structures. Therefore, after election most Regional Leaders become more loyal to the political party which nominated them in order for them to secure the next term of office. They pay little or no attention in most cases to the grassroots community that elected them because the community has less power concerning their stay or removal from office.

A political party has power to recall a particular candidate if the candidate fails to respect any orders of the political party and its structures, but it is very difficult for any particular community to recall a Regional Councillor who fails to deliver service to the grassroots community or who does not pay attention to the needs of the community. In other words, the Regional Councillor is accountable to the political party, which he/she belongs to, but not to the community that voted for him or her. One can say that grassroots communities are just used to accomplish the desires of the party structures. At some point the grassroots communities does not feel the impact of their Regional Leaders in terms of socio-economic developmental efforts. Therefore, poverty, inequality unemployment and many other social ills still prevail in the lives of the grassroots communities of Kavango East Region.

5.2 Constituencies and Traditional Authority

The Kavango East Region have got two lines of authority, political authority and traditional authority. Political authorities are the elected Regional Councillors, who are in office for five (5) years. Their area of jurisdiction is the constituency. Sometimes a constituency covers more than one (1) traditional authority. There are six (6) constituencies in the Kavango East Region, with each constituency having one (1) councilor. A constituency cannot have more than one (1) councilor at the same time, unless one dies and is replaced by another through a democratic election. Regional councilors are governed by the Regional Council's Act of 1992, which states the functions and powers of the Regional councilors.

The second line of authority is the traditional authority; this authority is not elected. It is inherited if the incumbent hompa or fumu passes on then the next in line takes over. This is in accordance with the Kavango customs. Their time of serving is based on the lifetime of the particular hompa or fumu. There is no given specific period. For each traditional authority there is only one (1) hompa or fumu. The area of jurisdiction of a hompa or fumu is a traditional authority. The traditional authority is still governed following national laws. The Traditional Authority Act, directs how the traditional authority should run their affairs. This act also guides the Council of the traditional authority on succession plans, as well as the functions and powers of traditional authorities The Kavango East Region has three (3) traditional authority areas namely; Sambyu, Gciriku and Hambukushu. It is very important to note that Regional councilors and traditional authorities have different functions and powers.

Table 4.2: Demographic Profile of the Village Focused Groups Interviews

Constituency (Strata)	Village Interviewed	**Number of people in the focused group**	**Number of females in the group**
Rundu Rural (4 Villages)	Vhungu-Vhungu	32	20
	Ngone	23	19
	Muhopi	40	32
	Katimba	18	13
	Total	**113**	**84**
Mashare (4 Villages)	Gove	21	19
	Tjeye	48	40
	Muroro	27	21
	Mashare	31	27
	Total	**127**	**107**
Ndonga Linena (4 Villages)	Shighuru 2	60	46
	Shikenge	28	24
	Ndonga linena	18	16
	Shankara	34	28
	Total	**140**	**114**
Ndiyona (4 Villages)	Kaduva	24	14
	Karukuta	41	28
	Guma	36	28
	Katere	39	30
	Total	**140**	**100**
Mukwe (5 Villages)	Kangongo	29	22
	Tjova	48	41
	Kake	63	55
	Popa	63	40
	Bagani	54	45
	Total	**257**	**203**
Total (21 Villages)		**777**	**608**

Sources: From the study findings

There were more female responses compared to male. This is attributed to the fact that Kavango East Region has more females than males.

Table 4.3 Correlation of leadership and distance from Urban Centre

Constituency	**Village Codes**	**Range Rundu Town in Kilometers**
Rundu Rural	1 – 4	15 - 25 Km
Mashare	5 – 8	26 -70 Km
Ndonga Linena	9 – 12	71 - 80 Km
Ndiyona	13 – 16	81 - 140 Km
Mukwe	17 – 21	141 - 222 Km

Sources: From the study findings

Table 4.4, Mean and Standard Deviation of jobs created, number of people in the focus group and number of female in the group

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Q1.13 How many jobs have been created	21	.00	101.00	458.0	21.8	22.0
Number of people in the focused group	21	18.0	63.0	777.0	37.00	14.3
Number of females in the group	21	13.00	55.0	608.0	28.95	11.6
Valid N (listwise)	21					

Sources: From the study findings

The Interviews started from the villages closer to Rundu Town (15 Kilometre at Vhungu vhungu) and then proceeded to those in remote areas and ended at Bagani village (222 km away from Rundu Town). The research found that there is a strong correlation between the village distances and the number of time Regional Leaders were engaged in discussion with community members at those villages ($r = 0.576$, $p=0.06$). The same applies to the number of times Regional Leaders were

engaged in discussions on water technology innovations (r =0.484, p= 0.026). (See Table 4.5 below).

The closer the village is to the urban area, the less the number of times, the Regional Leaders visit that particular village. This can attribute to the fact that Regional Leaders in a radius of 80 kilometers and below reside in Rundu Town. Most of the time they are just in urban areas. If they want to go to the villages, they will always commute, and if regional leaders attempt to visit their community they mostly visit the nearby villages in their constituencies first. This is the case with the regional leader for Rundu Rural East who mostly visits the closest village from the town (Vhungu Vhungu village). (See table 4.3 above).

Regional leaders from the radius of 81-222 kilometres reside within their community. This gives them more opportunities to meet their community from time to time. Therefore, Regional Leadership impact on development is felt stronger in the villages which are situated far away from Rundu Town (r =0.74, p =0.00). (See table 4.5 below).
This can also be linked to support the fact that the 56 percent of poverty level in the Kavango East Region reported by Namibia Statistics agency can be true because much of the population of the Kavango East Region live in villages near Rundu Town. In addition to that regional leaders do not attend to those villages that is why the poverty level is higher in the Region.

The Kavango East Region concurred that leadership involvement in water technology innovations will impact on poverty eradication, job creation, improved economic activities and sustainable development. From the spearman correlation of the research findings (Table 4.5 below), on village distance from Rundu Town, we see that at least 54.76% ($r = 0.74$)^2 of the predictability of regional leadership impact on development is the result of distance from the urban centre (Rundu Town).

The spearman correlation of the research findings also indicates that there is a strong negative correlation between having a committee to discuss development (water) problems in villages and the impact of Regional Leadership on development, especially, when communities try to seek an audience with the regional leaders and the leaders do not accord them such a chance (r =0.439, p=0.05).

Table 4.6 Role of Leadership in Water Technology Innovations

Variable	Description	Frequency	Percentage
Number of times the Regional Leaders visited the village in the last 5 years	None	7	33.3%
	Once	3	14.3%
	Twice	2	9.5%
	Three	1	4.8%
	Four Time	0	0.0%
	Five Or More	8	38.1%
Number of times the Regional Leaders were engaged in discussion	None	7	33.3%
	Once	5	23.8%
	Twice	2	9.5%
	Three	1	4.8%
	four time	0	0.0%
	five or more	6	28.6%
Number of times the Regional Leaders were engaged on water technology innovations	None	12	57.1%
	Once	2	9.5%
	Twice	2	9.5%
	Three	1	4.8%
	four time	0	0.0%
	five or more	4	19.0%
How much has been allocated to Water in the Regional Budget	None	9	42.9%
	Proposed but no allocation	12	57.1%
	Proposed and allocated	0	0.0%
	Allocated without proposing	0	0.0%

Sources: From the study findings

Table 4.7 Leadership Communication in Water Technology Innovations

Variable	Description	Frequency	Percentage
How do you seek an audience with the Regional Leaders	Sent a letter	3	14.3%
	Went physically to the offices	13	61.9%
	Did not contact the leaders	5	23.8%
How did the regional leaders respond to your requests for meeting	Ignored our request	2	9.5%
	leader listened but did not provide resources	16	76.2%
	leader listened and provided resources	0	0.0%
	not applicable	3	14.3%
Do you have committees to discuss problems in the village	Not in place	7	33.3%
	No, but we would like to have them	1	4.8%
	No, we cannot afford to pay them	7	33.3%
	Yes it is in place and organised	6	28.6%

Impact of leadership on development	Poverty eradication	0	0.0%
	Job creation	0	0.0%
	improved economic activities	0	0.0%
	sustainable development	0	0.0%
	all of the above	11	52.4%
	not aware	10	47.6%

Sources: From the study findings

A total of 61.9% of respondents indicated that communities seek audience with regional leaders, mostly by going physically to their offices. On the question whether their regional leaders respond to their (communities) request for a meeting, 76.2% of the respondents indicated that their regional leaders listened to their concerns but did not provide resources. The rationale behind this is that there is no dedicated budget given to regional leaders which caters for community development, and this is hampering development in the rural areas of Kavango East Region. It might be that regional leaders are willing to allocate resources, but they do not have the resources at their disposal.

A total of 28% of the respondents indicated that they have a committee that discusses problems in the villages. On the same question 33.3% of the respondents said they do not have one, because they can't afford to pay them, since government does not pay them. While the other 33.3%, also indicated that the committee is not in place without any reason. (See table 4.7 above).

On the impact of regional leadership on development, 52.4% indicated that proper leadership will contribute to poverty eradication, job creation, improved economic activities, and sustainable development. Sadly, 47.6% of respondents indicated that they are not aware of anything. This may be attributed to a lack of education in the community to enable the community to know what is expected from their elected regional leaders (also see table 4.7 above for more).

Table 4.8 Jobs Created

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Q1.13 How many jobs have been created	21	0	101.00	458.00	21.8095	22.07627

The mean of jobs created is 21.8095, with standard deviation of 22.07627, the maximum jobs created is 101 at Shighuru village. Results from the research findings indicate that 85.7% of jobs created were mainly in gardening and manual irrigation (see table 4.8 above). This indicates that the community of Kavango East Region is committed to strive and improve their lives with gardening and manual irrigation (using water). All they need is support with water technology innovations to produce at a large scale.

As one moves from Mukwe constituency towards Rundu Rural East constituency the number of visitation declines. This is also linked to the impact of regional leaders on development, as one moves from Mukwe towards Rundu Rural Constituency. The impact of regional leadership on development also declines. The Absence of regional leadership visitations to the grassroots communities, indicates a lack of commitment from the regional leadership towards development of the rural poor communities of Kavango East Region. It is only through leadership visitation to the communities that leader-community relation can be enhanced, and foster common vision and understanding towards what needs to be done at the grassroots level in order to empower them and promote self-reliance, and reduce poverty.

6. CONCLUSTIONS AND RECOMMENDATIONS

In order to examine the role of leadership in water technology innovations in enhancing job creation issues in Namibia by using the Kavango East Region as a case study, the research has investigated the following objectives:

3. The current situation of poverty, unemployment and inequalities in the Kavango East Region. The information was obtained from government statistics reports and poverty profiles.
4. The history of water usage in Kavango East Region. This information was obtained from literature on the history of water usage in Namibia and Kavango East Region, by using Kavango River as a sole source of water.
5. History of water technology innovations in the world. This information was obtained from World Archeology, through literature review.
6. Theoretical perspectives on leadership and its role in sustainable development, this information was obtained by reviewing literature on leadership theories and political influence on leadership including the impact of the colonial and apartheid leadership on development and job creation.
7. The role and impact of regional leadership of Kavango East Region in water technology innovations in enhancing job creation. The researcher consulted the grassroots people in the villages of Kavango East Region for focus group interviews to obtain this information.
8. Community effort in the use of water to create jobs for themselves, the information was obtained during focus group interviews with the communities.

It could be said that the constructivism approach, which obviously informs some theoretical assumptions for this study, shares an interesting point of commonalities with the conclusions of this study. Therefore, informed by the problem and objectives stated above, and based on the Kavango East Region case study this study arrived at the following conclusions as indicated below.

6.1 Conclusins

It was very difficult to identify another study conducted in the Kavango East Region investigating aspects of the role of leadership in water technology innovations to enhance job creation, as well as the impact of leadership involvement in water technology innovations on socio-economic development.

It come to light that there is a problem concerning the role of leadership in water technology innovations to enhance job creation in the Kavango East Region, as well as a lack of leadership involvement in water technology innovations. This contributes to socio-economic development in the region. It was found that while the focus of Botswana's use of the Kavango has been on its tourism, Namibia viewed the river as a passing resource to be exploited before it exits at Muhembo. Thus, the river is perceived as a source of water for irrigation and provides water for domestic and industrial needs in the Central Regions. Private individuals and companies have developed a number of lodges and campsites. A single conservancy has also been established. However, the leadership has paid little attention to the creation of wealth and jobs using water in the Kavango River.

Supported by several reports, the problem identified by the Kavango Regional Council's Operational Audit Report (2013), is that the communities are not using water technology innovations to create jobs for themselves, due to the lack of leadership involvement. This has resulted in high unemployment and high poverty levels. According to the report developed by Mendelsohn and Obeid (2006), while the focus of Botswana's use of the Kavango has been on its tourism, Namibia viewed the river as a passing resource to be exploited before it exits at Muhembo. Thus, the river is perceived as a source of water for irrigation and provides water for domestic and industrial needs in the Central Regions. Private individuals and companies have developed a number of lodges and camp sites including one conservancy. However the leadership has paid little attention to the creation of wealth and jobs through the use of water in the Kavango River. Traditional Leaders (Headmen) should know about water technology innovations and its importance through awareness and training from their regional leaders.

According to [45], the relationship between leadership and sustainable development is very important, because there is no development without leadership especially in the social, human and cultural dimension. It is clear that leadership plays an important role in the administration and in highlighting the human side than in other aspects [45]. The role of leadership in the development and growth of such regions is paramount, with the understanding that leadership is one of the most creative elements of the regional economic development process (Florida, 2002).

This study found that according to the [56], which ranked 144 countries on different performance areas, Namibia has been ranked 93 on water provision and 103 on innovation and sophistication factors. To make matters worse, Namibia has been falling since 2002 by nine (9) ranks overall. This is worrisome statistics, giving the impression that the Kavango East Region is the poorest in Namibia [46]. The situation might be worse for the Region after the National Census of 2011. This study also found that the Ministry of Agriculture, Water and Forestry and the Kavango East Regional Leadership find it difficult to understand the importance of water technology innovation in enhancing development. This has resulted in water technology innovation not being given attention as part of its priorities, which can be used to develop the Kavango East Region through the creation of better living conditions for all.

The study also found that, the previous study conducted by Mendelsohn (2006) focused mainly on land and water usage in the Kavango East Region, while this dissertation goes beyond water and land to include the role of leadership in water technology innovations to enhance job creation in the Kavango East Region. The previous research was conducted 9 years ago, thus the context might have changed since then.

Another important implication of the role of leadership in water technology innovations to enhance job creation in Namibia and Kavango East Region in particular was the aspect of resource allocation, communication and support. Within this implication, and in line with constructivism approach, this study concluded that the grassroots communities depend heavily on leadership if they are to use water technology innovations to create jobs aimed at poverty reduction, and reduction of inequalities. This can enhance the living standards of the rural poor.

It was found that the results of this study can be generalised to the role of leadership in water technology innovations to enhance job creation of all people along the Kavango river as well as along the northern and north eastern regions of Namibia. This is so because a total 777 respondents drawn from a total population of 105 000 of the Kavango East Region inhabitants justifies the validity of the results. However, this study does not claim external validity of the results since these results are generalised in the Namibian context only. This is so because the availability of water differs from the northern regions, as one goes to the central and southern parts of Namibia.

6.2 Recommendations

This study has identified various factors that affect the use of water technology innovations in enhancing job creation in the Kavango East Region. Based on these factors, this study considers recommendations that would help leaders to support the use of water technology innovations in enhancing job creation in the Kavango East Region to:

- Understand the type of tools and equipment, which the communities need to use water technology innovations to enhance job creation.
- To know other sort of support which leaders should offer to the communities in order for them to feel motivated to continue using water technology innovations to create jobs for themselves.
- For leaders to know and understand the barriers affecting the use of water technology innovations by the communities

These recommendations are important to enable regional leaders of Kavango East Region be conscious of the existing gap between leadership involvements in water technology innovations in enhancing job creation to the grassroots communities and the asymmetric nature within the regional economies.

Therefore, this study recommends:

<u>To the Central Government</u>

(1) That there should be a policy to compel regional leaders to live within the community or constituency

from which they are elected during. If Regional Leaders do not live within the communities, which elected them, it will be hard for them to know their community's needs which require their attention.

- That there should be a prescription on the number of villages developmental community meetings based on the number of villages in the particular constituency. These meetings should be convened by regional leaders. At such meetings, the community will be given a chance to rate the quality of their regional leader's engagement.
- That the central government/ the Ministry of Urban and Rural development needs to come up with capacity development program for regional leaders. Regional leaders need extensive training to understand their roles and influence on community development, poverty eradication and job creation, before they can resume their duties and not just a mere induction since some regional leaders lack advanced education in development matters.
- That there should be a mechanism in place, which will give certain power to regional Governors to supervise Constituency leaders (including the Chairperson of the Regional Council) in their activities in the villages including community development issues.
- That the Ministry of Rural and Urban development, should allocate a budget to the Constituencies, to enable regional leaders to fund some critical development projects such as the use of water to create jobs for the rural poor.

To the regional leaders

- That there is a high need for Regional Leaders to implement water technology innovations in Kavango East Region, this will impact on wealth creation, job creation, improve self-reliance, reduce poverty and reduce inequality.
- That there should be a mechanism in place for regional leaders to improve their working relations with the communities.
- That regional leaders should understand the importance of community empowerment, as a key to self-reliance and a way of promoting socio-economic development in their regions.

To the grassroots communities

(a) That there should be a program to capacitate community members to understand the role of their leaders. The community must be trained to understand the roles of the regional leaders. This will make them focused and not give up in their efforts to self-reliance by using their regional leaders.

(b) That their Community should be given legal power to remove constituency (Regional) leaders who are not cooperating with the community or not contributing to development within their communities even when their term of office has not expired.

(c) That there should be a mechanism to make regional leaders account for the promises they make to the communities based on their discussion or during community meetings or visits.

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Prior to joining the NBS consulting team as a marketing expert, Dr. Mwakipesile worked as Marketing and Sales Director for some multinational. He was charged with establishing and overseeing the sales team, managing the Marketing Mix, creating Sales and Marketing plans for the company and seeing to their successful implementation. He also gave direction on market penetration and dealt with key account customers. Amongst the brands marketed under his most recent portfolio were HP, Alva Gas, Jindal Gas, Karbonn Smart, One Stop Solar, Ducellier Batteries, Diplomat Furniture, SKM Motorbikes, Skyworth TVs and Swag, to name a few.

Other Working Experience:
A. December 1989 to April 1990:- PTC HQ - Transport Controller's Assistant:
B. January to February 1991:- Market Research Analyst - SUGAR DISTRIBUTORS
C. March to May 1991:- News subeditor - Analyst ZBC
D. June 1991 to May 1992: - Trainee Manager - OK BAZAARS
E. September 1992:- Acting Supermarket Manager - OK BAZAARS, First Street
F. October 1992 - Acting Sales Manager OK BAAZARS Second Street.
G. November 1992: -Branch Administration Manager - Bon Marche' Borrowdale
H. July 1993 to April 1994 - Sales Manager and Acting Branch Manager - Bon Marche' Borrowdale.
I. August 1994: - Lancaster Industrials as National Sales and Marketing Manager
J. December 1995 - Zimbabwe Pharmaceuticals (ZimPharm) Marketing Manager Consumer.
L. September 1997 - National Sales Manager for ZIMPHARM.
M. December 1997 - Sales and Exports Manager for ZIMPHARM.
N. April 2000 – June 2003 BP And Shell Marketing Services - Senior Category Manager Non Fuel Income Atlantica.
P. October 2003 to current – Director & Board Chairman Reset Investments
Q. April 2004 to current – Director & Board Chairman Highdraw Marketing
R. January 2009 to current – Director & Board Chairman IPGZ

Author Profile 3

Prof Kenneth Kamwi Matengu (born 1978, Katima Mulilo) is a Namibian professor. He was Pro-Vice Chancellor for Research, Innovation and Resources Mobilization at the University of Namibia from 2016 to 2018. On 29 June 2018, Matengu was appointed as the third Vice Chancellor of the University of Namibia becoming the youngest person to assume the position.
Prof. Matengu did his high school at Caprivi Senior Secondary. He holds a Certificate in International Relations from the University of Tampere, Bachelor's degree in Geography and Sociology from the University of Namibia, Doctor of Philosophy, Ph.D (exemia cum laudar) in Innovation Diffusion and Development from the University of Eastern Finland. He has published 50 peer review articles, books and book chapters, as well as international conference papers