ENVIRONMENTAL SCIENCE 301

FINAL REPORT

Future Scenarios for a Sustainable City

Group 10

Sam Munro g09m0311

Cari Haankonsen g07h0298

Sam Vosper g09v1855

Rebone Modipa g08m4961

Shannon Petre g09p4466

Shannon Stone g11s7278

Supervisor:

Sheona Shackleton

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1. INTRODUCTION

As the world's population increases exponentially and becomes more urban, consumption of natural resources also expands and puts added pressure on the life-supporting systems of our planet. In the urgent search for a sustainable balance between increased consumption and quality-of-life, monitoring tools to gather information about the environment to inform more sustainable decisions are becoming increasingly valued. State of the Environment Reporting (SoER) is one such tool designed to communicate and integrate information regarding numerous indicators of environmental health, from energy consumption and gas emissions to demographic growth and land use patterns (DEAT, 2007b; BMA, 2001).

Policies and strategies for sustainable development are becoming increasingly important. At the current rate of growth, the world's population is expected to exceed 8 billion by the year 2020 (UNEP, 1985). South Africa, despite the projection that its population growth rate will slow down by 23.35% between 2000 and 2050, is continuously becoming more urbanized. According to South Africa's Strategic Analysis and Estimating Office (SAEO) in 2008, more than 50% of the country's population lives in urban settlements and rural-to-urban migration will continue (UNEP, 2008).

This rapid increase in urbanization creates a major challenge to the urban local authorities as they need to expand the existing infrastructure at the necessary pace to maintain quality-of-life standards. In addition, increases in socio-economic status in developing countries not only results in surging consumption rates, but also commonly results in the estrangement of people from their natural resource base, which ultimately decreases their knowledge about the consequences relating to over-consumption (DEAT, 2007a). Consequently, developing countries are consuming resources faster than they can regenerate, leading to water shortages, soil exhaustion, loss of forests, air pollution, water pollution, and degradation of coastlines and green areas (Hopkins, 2000). Urbanization is therefore having a severe stressful impact on the life supporting capacities of our planet due to our unsustainable use of resources (Jones, 2003). As a result it is becoming more difficult to conserve and sustain our environment as well as improve the standard of living on all spatial scales (UNEP, 1985). Therefore there is a need to develop sustainable strategies to mitigate the undesirable effects that increasing human populations are having on the environment (Peterson *et al*., 2001).

Over the past decade sustainability emerged as the new paradigm of development and has been adopted as the jargon for developers, the theme of conferences and learned papers, the motto of environmental and development activists and become the latest catchphrase for all types of organisations and agencies (Lélé, 1991)

Sustainable development

The concept of sustainable development emerged from growing awareness of the global links between socio-economic and environmental issues that can be attributed to inequality, poverty and the increasing concerns about the future of humanity (Hopwood *et al.*, 2005; Williams & Millington, 2004). The extensive use, interest and support for the concept of sustainable development is potentially an important revolution in understanding the relationship between humans and the environment (Meadows, 1998) The term sustainable development is used quite loosely now to suit a number of purposes but its most widely accepted definition was that authored by the 1987 Brundtland Commission as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

In order for the most effective and plausible sustainable development strategies to be implemented, better information about an environment's status needs to be provided. Thus, State of the Environment reporting was developed to provide information about an environment with regards to effects, drivers, and human interactions (DEAT, 2007b).

State of the Environment Reporting

A State of the Environment Report (SoER) is a tool designed and developed to communicate and integrate information regarding numerous environmental indicators. SoERs have aided not only in conducting research, collecting data and compiling documents that report on environmental factors but also has aided in the evaluation of factors such as demographic growth, water availability and quality, energy production and consumption, gas emissions as well as a variety of factors that are having or may potentially have an effect on the state of the environment (DEAT, 2007a; BMA, 2001).

SoERs are used extensively in many countries around the world, with reports typically attempting to obtain information about what is taking place in an environment with respect to conditions and trends and their effects as well as consider why these changes are taking place and examine their driving forces (DEAT, 2007b). Furthermore SoERs examine what will

happen if no action takes place to repress the drivers and their effects as well as acknowledging the constraints, opportunities and implications of such action.

A commonly used framework within SoERs is the DPSIR framework. This framework distinguishes Driving forces, Pressures, States, Impacts and Responses which enables feedback to policy makers on current environmental indicators (DEAT, 2007b). The aim of distinguishing these factors is to increase stakeholder awareness and to gain a better understanding of trends with respect to their causes and consequences as well as provide a basis for improved decision and policy making on a global, continental, national, provincial, municipal and local level (BMA, 2001).

By assessing future trends of a particular area through SoERs, we are able to deduce changes that need to be made in order to become more sustainable. Sustainable development strategies require information and insights into both the present and the future. Since the future is unknown and there is a vast amount of uncertainty regarding future trends it is important to develop mechanisms and methodologies to facilitate greater understanding (SAEO, 2008). State of the Environment Outlook reports provide a detailed analysis of the past and present state of the environment, as well as the development of possible future scenarios and trends. The purpose of scenarios within Outlook reports is to inform decision makers of possible alternative options relating to environment and the best possible solutions in going forward (NWDACE, 2008).

Scenarios

There is no common, single definition as to what scenarios are and often definitions are very similar (Kirsh, 2004; Mietzner & Reger, 2005). The purpose of scenarios is not to predict the future specifically but more to assess and indicate numerous potential futures that may arise from a combination of events and decisions that are implemented (May, 1996; Mietzner & Reger, 2005). Several examples of different definitions of scenarios are provided in Box 1.

BOX 1.1

Definition 1: "A means to help one cope with the uncertainty of the future and make better decisions than we would otherwise do, in the present, about matters that have long-term future consequences" (May, 1996).

Definition 2: "A narrative description of a possible state of affairs or development over time that can be useful to communicate speculative thoughts about future development, to elicit discussion and feedback and to stimulate imagination" (Coates *et al*. 1986).

Definition 3: "A representation of the future at a specific point in time and scenarios depicting the evolution of circumstances leading to a specific future" (Mietzner & Reger, 2005).

Devising scenarios is an extensively used strategic planning technique used across various types of organisations and industries. Some authors differentiate between scenario building and scenario planning. Building scenarios considers the speculation regarding the uncertainty of the future and envisions a variety of possible future outcomes for a situation under scrutiny (Schwartz, 1996; Slaughter, 2000). Whereas, scenario planning can be considered analogous to adaptive management, as both scrutinize alternative models or erect stages in the development of policies that can be used in developing plausible forecasts about the future of a study system. However, scenario building is the necessary foundation for scenario planning and often both are linked to each other. Definitions of both scenario planning and building are provided in Box 1.2.

BOX 1.2

Scenario Building: "envisaging a few different possible future outcomes for the situation under scrutiny" (Mietzner & Reger, 2005).

Scenario Planning: "helping to understand the uncertainties that lie before us, and what they might mean. It helps us 'rehearse' our response to those possible futures. And it helps us spot them as they begin to unfold" (Wilkinson, 1996).

The formulation of scenarios provides a framework for developing more resilient conservation policies and aims to explore different predictions surrounding the future consequences of a decision (Godet, 2000; Schoemaker, 1995). It considers a variety of

quantitative and qualitative information and uses it in a systematic way in decision making processes with a diverse group of people building a commonly shared understanding (Godet, 2000). The process of formulating scenarios also serves to challenge assumptions and identify key concerns as well as limitations and weaknesses (Mietzner & Reger, 2005). Through a sustainability perspective, scenarios are likely to encourage the minimization of vulnerability within societal and environmental systems to unfavourable events as well as enhance their resilience.

Using this literature on scenario building and planning, this project proposes to support the larger SoER project for Grahamstown by creating three plausible future scenarios as part of the concluding chapter of a SoER for Grahamstown in the Eastern Cape of South Africa. This project entails the use of broad literature, key stakeholder and public participation of Grahamstown residents. By building and developing scenarios we shall illustrate how different factors and drivers may affect the local environment in a generation to come. We also intend to analyse and discuss the scenarios with regards to their implications for the sustainability of Grahamstown as a city across social, economic and environmental spheres.

2. AIM, OBJECTIVES AND KEY QUESTIONS

2.1. Aim

To construct explorative scenarios for Grahamstown for the next 20 years that highlight the driving forces and pressures which could impact Grahamstown, and examine the effects of these impacts in terms of the environment, economy, and social equity.

2.2. Objectives & Key Questions.

1. To obtain information on the current state of Grahamstown. This includes driving forces of change, trends, and pressures at local, regional, national, and global scales that will continue to affect the future economic, environmental and social systems of Grahamstown.

2. To interpret and analyze the probable effects caused by the identified key drivers of change and pressures as well as highlight important uncertainties for future assumptions.

3. To construct three plausible scenarios for Grahamstown through analysis of a combination of different trends or pathways for each of the key driving variables.

4. To seek public feedback and participation in the creation of these scenarios so as to incorporate multiple perspectives and thereby increase the robustness of the scenarios. Public participation will also increase stakeholders' buy-in of the scenarios and provide legitimacy to the scenarios.

5. To conduct a meaningful analysis and derive relevant conclusions regarding the future implications of the scenarios for the future sustainability of Grahamstown.

3. STUDY AREA

3.1. Demographics

Situated in the Eastern Cape of South Africa (Appendix A, Fig 1.), Grahamstown forms part of the Cacadu District region and is located at the centre of the Makana Muncipality at a latitude of approximately 33^0 18' 0'' S and at a longitude of approximately 26^0 28' 60'' E (IES/LFS 2000). It is considered to be the administrative centre of the Makana District. Grahamstown is classified as a medium-sized town with a population of approximately 132 505 people in 2007 comprising approximately 11000 households (IES/LFS 2000).

3.2. Institutions

Grahamstown is considered a centre for education and culture. Rhodes University is the largest institution in Grahamstown with nearly 8,000 students and is the main service industry within Grahamstown (WSDP, 2007). Grahamstown is also home to the South African National Library for the Blind, the National English Literary Museum, the South African Institute for Aquatic Biodiversity (formerly the JLB Smith Institute), the International Library of African Music (ILAM), and the Institute for the Study of English in Africa. In addition Grahamstown annually holds the Sasol Science festival, National Schools Festival, and Makana Freedom Festival as well as the largest Arts Festival in Africa.

3.3. Land Use

Grahamstown is situated in a valley at the headwaters of the Bloukrans River, a tributary of the Kowie River. The altitude ranges from approximately 720m on the highest ridges in the south to approximately 510m in the valleys (Shackleton *et al.* 2007). The town has a diverse natural and physical environment that is largely dominated by livestock and agricultural activities. The agricultural sector within Grahamstown is a significant contributor to its economy (WSDP, 2007). Grahamstown is surrounded by commonage that is managed and maintained by the Makana Parks and Recreation Division, within the Community and Social

Services Directorate of Makana Municipality (Makana IDP 2008). Grahamstown's commonage consists of three regions (Appendix A, Fig 2.): the southern commonage which forms part of the Oldenburgia conservancy, the eastern commonage set aside for subsistence farming by previously disadvantaged people, and a new commonage that surrounds the town in the form of scattered smallholdings intended for emergent farmers (Davenport, 2008). The uses of these commonage areas include raising a variety of livestock such as cattle, sheep and goats (du Plessis, 2001). Other diverse types of farming include johoba oil, tropical fish, and herb farming. Furthermore, the local rural community is highly dependent on the commonage for resources which include firewood, grazing fodder for livestock, the collection of medicinal herbs and plants such as *Aloe ferox,* as well as a place for cultural rituals and ceremonies (Davenport, 2008).

3.4. Climate

According to the South Africa Rain Atlas (2010), the Grahamstown area has an average annual rainfall of 619.7mm with a standard deviation of 129.8mm. It experiences a moderate climate with a mean monthly maximum temperature range between 29 - 32 °C, while the mean monthly minimum temperature ranges between 4-6 degrees Celsius (Davenport, 2008). Furthermore, climate can be very unpredictable as Grahamstown is situated at the intersection of four different climatic zones. The town can often experience lengthy dry spells (Parkin *et al.,* 2006 in Davenport, 2008). The coldest and driest months occur between June and August, while the hottest and wettest months are during the summer between December and March. The national Department of Environmental Affairs and Tourism predicts that climate change will seriously impact summer rainfall areas with an estimated decrease in rainfall of 5-10% by mid-century (DEAT, 2011). Grahamstown's climate variability supports four indigenous biomes on its borders including Cape fynbos, Grasslands, Karoo or sub desert and subtropical thicket. Beyond its borders all of South Africa's major vegetation types can be found within a 150 km radius (Davenport, 2008).

4. METHODOLOGY

4.1. Data Collection and Scenario Creation

The first step in creating future scenarios was to conduct background research in order to identify key stakeholders who should be involved in the process and to then identify the limitations, constraints, and boundaries to the study. Stakeholders included municipal officials and planners, residents from all neighbourhoods and townships of Grahamstown, Rhodes University students and staff members, and various business owners and developers. A flow chart depicting the methodology is provided below (Figure 1).

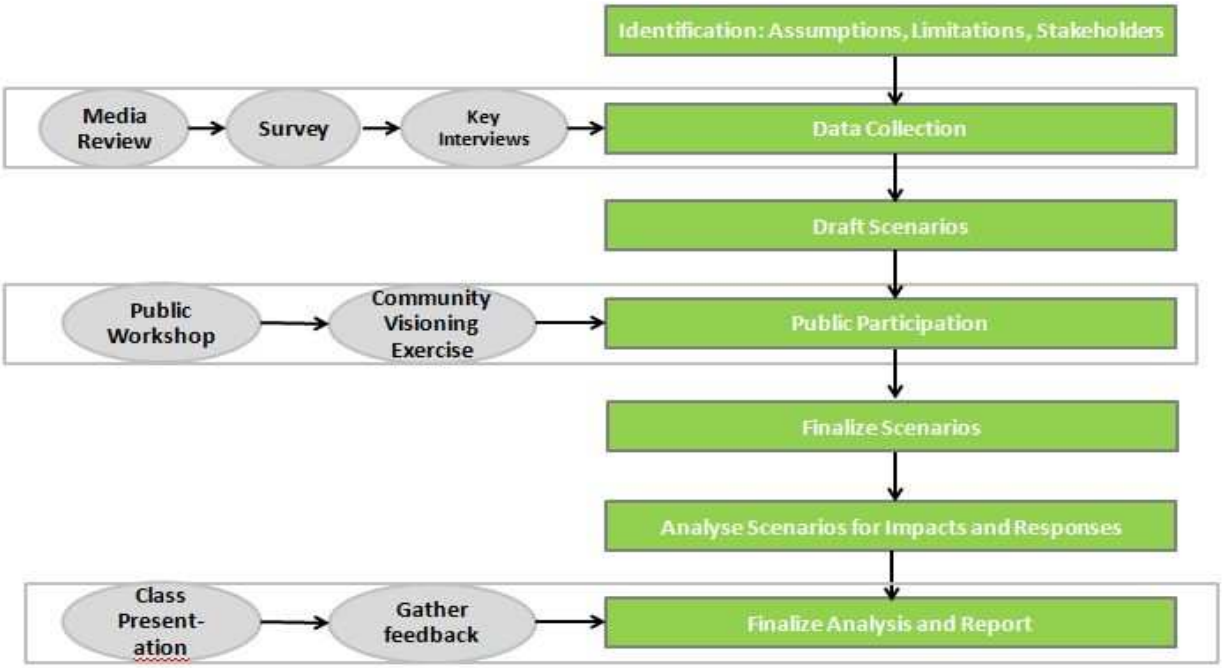

Figure 1. Flow chart depicting the methodology.

In identifying the constraints of our study, we first needed to establish a timeframe and the physical boundaries of the project. Through research we made assumptions about key factors and institutions that would not change in the given timeframe. For example, within a timeframe of 20 years we assumed that Rhodes University and the private schools would still exist. Another assumption is that given the area's environmental history and the forces of

climate change, there is likely to be a continuous shortage of water in the region. The physical boundaries of the project include central Grahamstown as well as the adjacent suburbs and townships, however it does not include all of Makana Municipality so the extent of our project was more manageable.

In order to find out what concerned residents the most about the future of Grahamstown, we first did an extensive literature and media review relating to the issues in Grahamstown, which included a search through the past year's editions of the *Grocott's Mail* and other local publications. We recorded the issues impacting Grahamstown from local, regional, national, and global scales and organized them within a broad range of categories that included governance, economy, housing and land use, green spaces, climate change, Rhodes University, water, sanitation, and energy.

In conjunction with the background research, the team devised a 5-6 minute survey to assess people's concerns and perspectives regarding trends, drivers, and pressures that might impact the future of Grahamstown, and their broader concerns about the future of South Africa. The questions addressed environmental, equity, and economic concerns as social and economic factors will have an impact on the future quality of the environment in Grahamstown. The survey included sets of questions relating to service delivery, factors that would influence the informant's willingness to remain in Grahamstown, and policies which they would possibly support. The questions allowed the respondents to answer based on different sets of scales. The survey was pilot tested on a group of students before being carried out in town and can be found in Appendix B.

In an effort to obtain a representative sample of Grahamstown's population, we conducted the survey at different locations in town, which included Hill Street and High Street, Peppergrove Mall, and the shopping centre at West Street and Raglan Road. Our goal was to complete 20 surveys at each of the sites for a total of 60 surveys.

Once the surveys were completed, we then compiled and analyzed the results in order to determine what drivers and pressures Grahamstown residents were the most concerned about as well as the opportunities and strengths they found the most important for the sustainability of Grahamstown.

We then interviewed municipal officials and town planners to enquire about their perception on the prospective future of Grahamstown. Candidates for interviews were selected based on our research as well as through suggestions and networking.

The results of our background research, survey, and interviews enabled us to devise draft scenarios, exploring in an integrated fashion what could happen in Grahamstown over the next 20 years. The team conducted several brainstorming sessions where we collated our findings and discussed issues we thought may continue to impact Grahamstown, or would possibly emerge within the next 20 years. The group organised the scenarios into a "Dark Days" or worst-case scenario, a "business as usual" scenario that describes the status quo of Grahamstown, and an idealistic scenario describing possible best outcomes for Grahamstown's environment. The resulting explorative scenarios were considered to be both external and strategic. External scenarios examine what can happen if external driving forces and pressures, such as climate change impacts, occur. Strategic scenarios examine what can happen if certain responses are made (Borjeson *et al*., 2006).

The Public Workshop

Once the scenarios were drafted we organized a public workshop whereby we rented the Grahamstown Public Library's Hall between 6:00 and 9:00 PM on Wednesday, 24 August. We submitted our advertisement for the workshop to the *Grocott's Mail* (Appendix C1) and posted flyers (Appendix C2) in English and Xhosa for the event at Pick n Pay, Checkers, and Shoprite, as well as at the Cathedral and other important places throughout Grahamstown which receives a lot of foot traffic. The flyers noted that a Xhosa translator would be available for the duration of the workshop. We then also sent individual invites to the people we interviewed, as well as other key figures in Grahamstown. In addition we tried to encourage our class members to attend as they were simultaneously conducting State of Environment research on the topics that we were assessing.

The Workshop's Approach

We began the workshop with our presentation on the status quo scenario of Grahamstown to warm people up to the idea of envisioning Grahamstown in 20 years. We decided to present only our draft status quo scenario rather than all three draft scenarios so as to not influence our participants in their brainstorming sessions regarding the worst and best case scenarios. During the presentation each person drew a slip of paper from a basket allocating them to one

of five topical groups including: Housing and Land Use, Energy, Water and Sanitation, Economy, and Green Spaces; the latter also incorporated issues of parks, commonages, and agriculture. We gave the groups 20 minutes to discuss how they envision the future of Grahamstown around this theme and the barriers and/or pressures they perceive to achieving this desired future. Each participant was given a printed template that allowed them to list their ideas for the best and worst case scenarios and the corresponding driving forces.

Every member of Group 10 sat with each group to moderate if needed, especially to watch out if one or two attendees were dominating the conversation or an argument becomes too heated. A schedule of our workshop can be found in Appendix C3.

4.2. Scenario Analysis

The input we received from the workshop was examined with the most useful and practical aspects being withdrawn to be included and adjusted into our original draft scenarios. We then further proceeded to analyse the impacts that certain drivers and trends present in each scenario would have on Grahamstown's environment, quality of life, economy, and social sustainability. The scenarios were then analysed and scrutinized for similarities and differences that ultimately lead to their distinctive outcomes. Our analyses were then used to provide policy recommendations and possible approaches to avoid certain dire aspects and trends as well as provide solutions to enhance more sustainable, superior trends.

4.3. Assumptions and Pitfalls

4.3.1. Assumptions

We entered into this study with several basic assumptions, which included:

- The timeframe for the scenarios is 20 years, from 2011 to 2031.
- That all institutions will remain in existence
- The questionnaires will be answered honestly and independently to provide accurate data for analysis.

With regards to the scenarios' timeframe, literature indicated that it is important to establish a time frame or horizon before formulating scenarios, and often the appropriate amount of time is based on the objectives of the scenario or project (Mietzner & Reger, 2005; Therond *et al*.,

2009). It was established that scenarios begin to lose detail with longer timeframes, such as 50 years, and that most State of the Environment Reports are conducted every ten years (Therond *et al.*, 2009). However, scenario planning for only ten years may not be adequate, and therefore we decided on a time frame of 20 years.

Also within our specific time frame it was important to establish factors that may or may not change, as well as identify constraints. Due to most factors within our study area exhibiting dynamic qualities we assumed that the largest institutions in Grahamstown would remain. We do however assume that all other factors such as climate, population and other demographics, density, land use regimes, and consumption may change.

4.3.2. Pitfalls

Pitfalls and general challenges which we faced during the course of this project included:

- Limited time: with a longer amount of time more data could have been collected and a more accurate study could have been conducted.
- The future is filled with uncertainty and therefore we could not accurately predict the future, these are therefore our own interpretations of data.
- We were unable to reach or interview key stakeholders that were of relevance to this project.
- We were often limited with regards to finding information specific to Grahamstown as many documents and information was relevant to Makana Municipality as a whole.
- There were language barriers within surveys conducted which may have resulted in some misinterpretation of questions.

Furthermore there are many limitations involved in scenario planning, primarily due to the fact that we cannot forecast events with a 100% degree of accuracy. Though we can assess many things based on past experience, there are many things that do not follow linear paths, including major policy changes or massive natural disasters.

4.4. Ethical Considerations

Due to a significant proportion of our data being derived through surveys, interviews and workshops most of our ethical considerations we adhered to the people involved in contributing to the project. Therefore, while carrying out these surveys and discussions we abided by the 'Rhodes Research Ethics policy' as this ensured that our group acknowledges the rights of the participants involved, and ensured that no subject was offended or harmed in any manner. It was therefore necessary before each interview or discussion to present a letter signed by our supervisor to our subject explaining the purpose of our project and to ask if they were amenable to how long the interview or discussion might take. Furthermore we needed to clarify that the subject is willing to participate and that they recognize that they are allowed to decline the interview as well as withdraw at any stage. Participants were also made aware that they are not required to answer all the questions. It was also important for us to be professional in our approach, which required us to dress appropriately, listen to the participants with interest and patience and not be rude or disrespectful in any manner. Finally we needed to recognize that participants have given up their time for us and we needed to thank them for their participation. We further went on to get approval from all relevant stakeholders before publishing any comments or feedback given during personal communication.

5. RESULTS AND DISCUSSIONS

5.1 Public Survey

The 48 respondents of our survey were captured from 13 of 16 identified regions in Grahamstown. Furthermore responses from people in every age category were recorded as well as in every category of years they had lived in Grahamstown.

The survey illustrates in Figures 2a and 2b that a majority (over 50%) of the respondents viewed the following as major factors in effecting Grahamstown's future prospects as well as determining their willingness to stay in Grahamstown; employment opportunities, affordable housing, water availability, public health care, public education, energy supply, sanitation and crime. One might infer that a serious deterioration in a number of these factors might promote an emigration out of the city. Similarly it could be said that positive developments with regard to a number of these factors may inspire immigration into the city.

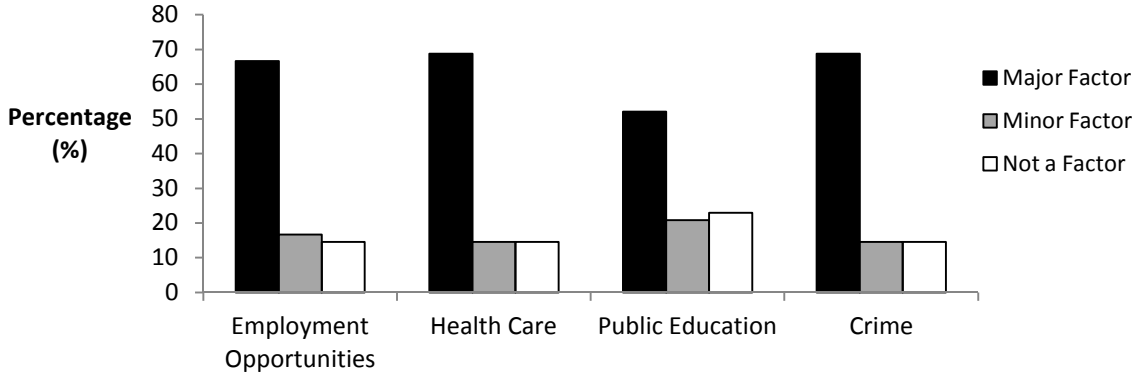

Figure 2a: Factors effecting residents of Grahamstown's willingness to stay

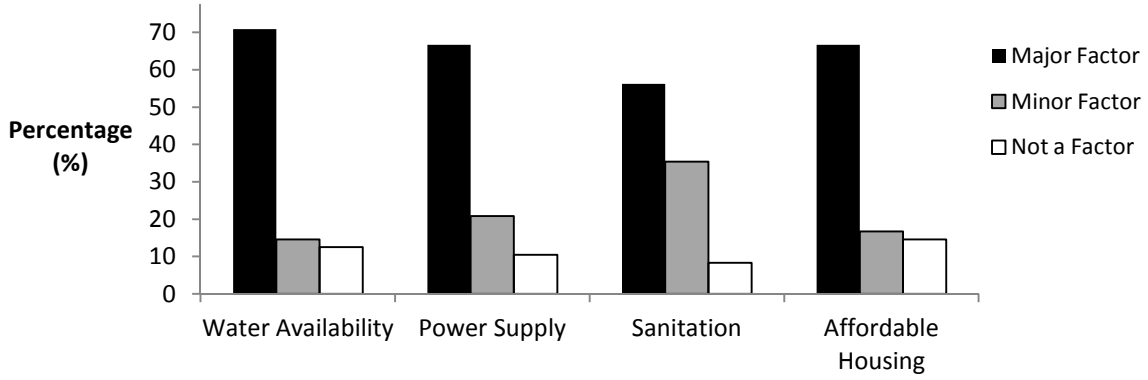

Figure 2b: Factors effecting residents of Grahamstown's willingness to stay

It is also clear from our survey that residents are unsatisfied with the following services, water quality, energy supply, storm water management and green spaces. This is shown in figures 3-5 which summarise the relative frequencies of respondents' levels of satisfaction regarding various services in Grahamstown. These findings give insight into issues that may become more dire concerns in the future if they are not managed adequately.

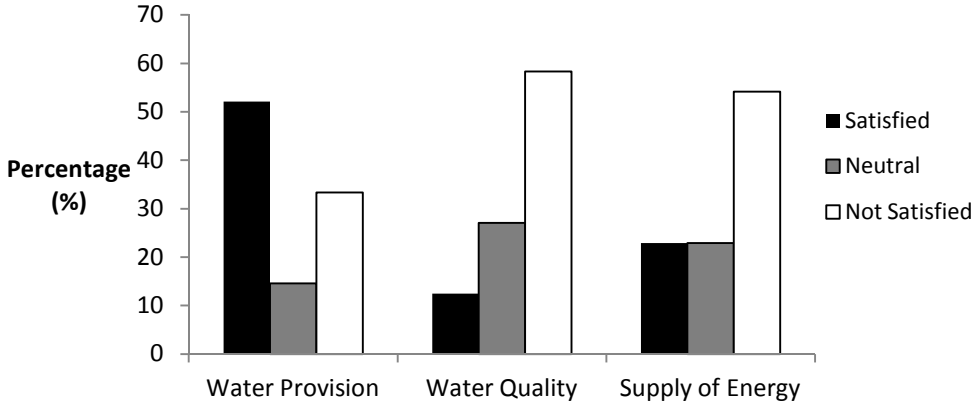

Figure 3: Relative frequency of respondents' levels of satisfaction with water and energy services in Grahamstown

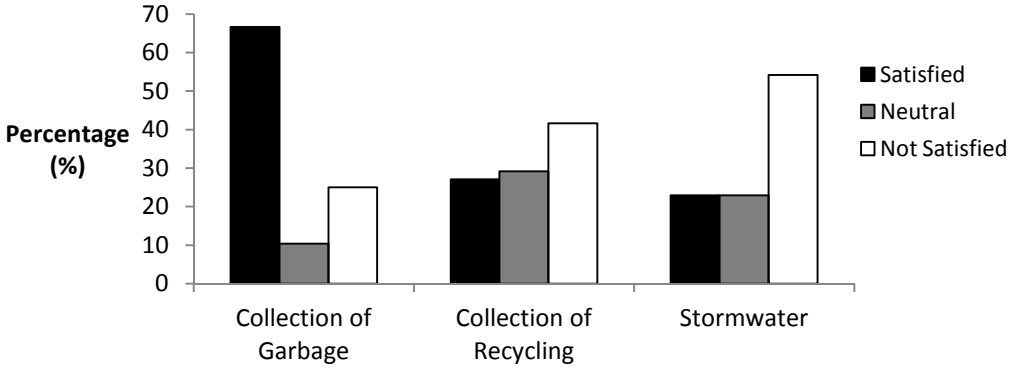

Figure 4: Relative frequency of respondents' level of satisfaction with the provison of waste services in Grahamstown

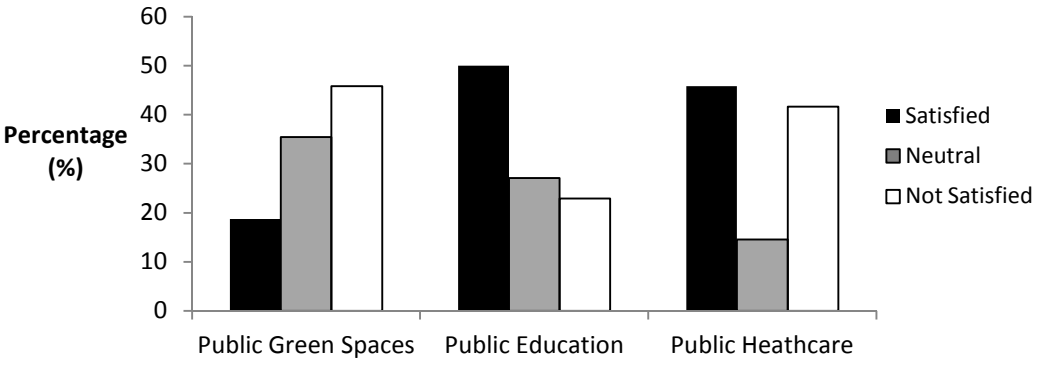

Figure 5: Relative frequency of respondents' level of satisfaction with the provison of public services in Grahamstown

With regard to future developments, shown in figure 6a, more than 50% of participants supported developments both within the centre and on the edges of town. However, approximately 47% of participants were also either neutral or opposed development within the town centre, of which 20.8% strongly opposed this matter. This indicates that people will generally have positive attitudes to any developments on the edge of Grahamstown, however development within the down centre could provoke some residents.

Figure 6b illustrates resident's attitudes to environmental issues such as protecting green spaces from developments, using energy efficient measures for water and electricity and a proposed wind farm. Results show that all these factors were supported by 80% of participants indicating that any environmental propositions made in the future would not be protested and that residents generally have a positive attitude to environmental initiatives.

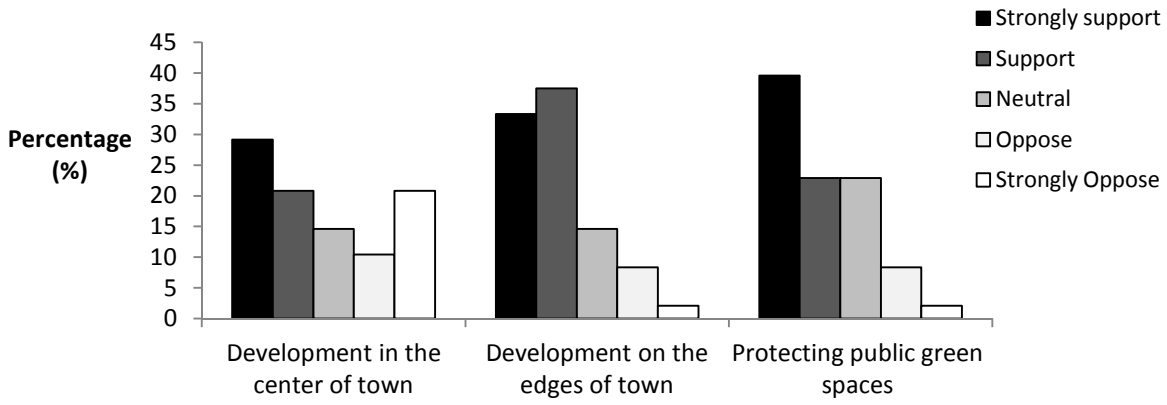

Figure 6a: The approval of Grahamstown residents regarding future developments

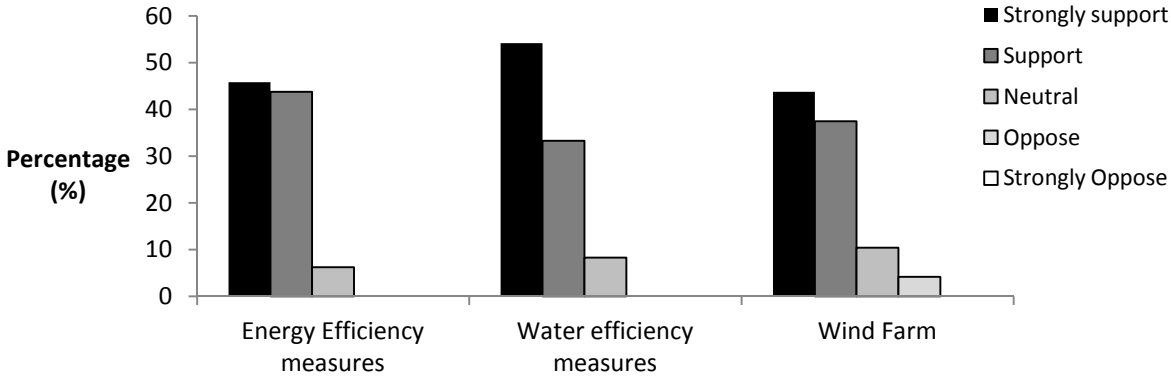

Figure 6b: The approval of Grahamstown residents regarding future developments

These notions of new future issues become even more significant when one considers the perceived changeability of Grahamstown as a city. Figure 5 suggests that over 40% of respondents had noticed moderate to drastic change over their stay in Grahamstown. Considering that exactly half of the respondents have lived in Grahamstown for more than 10 years one is tempted to suggest that the 20 year time frame intended for the study is a period with a sufficiently high changeability potential. The qualitative survey responses revealed that some of the changes that had been experienced included; housing developments, new businesses, increased levels of crime and the growth of Rhodes University.

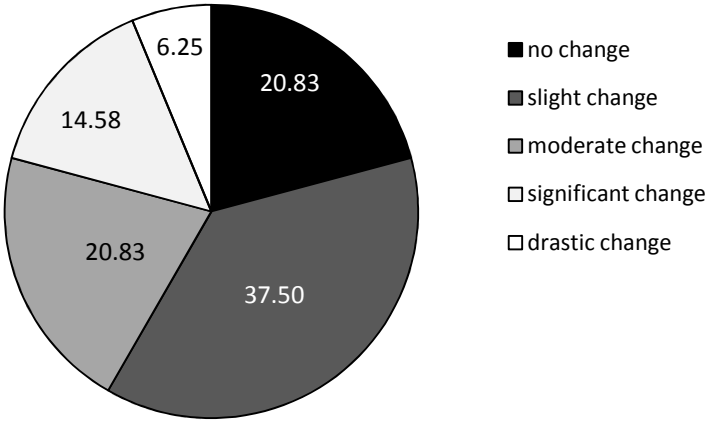

Figure 7: levels of change experienced by respondents

With regard to Grahamstown's strengths, respondents identified Rhodes University an educational hub which acts as an important draw factor for people (students in particular) to the city. In addition to this the strong sense of community fostered by the small town feel of Grahamstown was also identified as a strong point with regard to local initiatives. On the other hand, things that were commonly mentioned as weaknesses of Grahamstown included; crime, unemployment, municipal infrastructure, poor service delivery, housing backlogs and lack of political initiative at a municipal level.

Perspectives on Grahamstown in 20 years time varied greatly amongst the few respondents who answered the optional question. Ideas were generally conflicting and included a range of suggestions such as; an increased population, larger university, more employment, more crime, becomes a ghost town, more water issues, the first green city, more businesses and very few changes at all.

5.2 Key Stakeholder Interviews

Interviews were conducted with a few identified key stakeholders whom we believed could inform us on issues relevant to developing our scenarios. The identified stakeholders were thought to be able to provide us with possible internal information to the way certain aspects in Grahamstown are controlled and monitored. The informants included the Rhodes University Environmental Officer, Ms. Nikky Kohly; Makana Municipality Environmental Manager, Mr. Ndumiso Nongwe; Mr. Mark Ford, a renowned Property Proprietor in Grahamstown; ex-DA Councillor and winner of the Grahamstown Citizen of the Year in 2009, Professor Michael Whisson; The editor of Grocotts magazine, Mr. Steven Lang; The Vice Chancellor of Rhodes University, Dr. Saleem Badat; Manager of Rhodes University Grounds and Gardens, Mr. Mark Hazell; the town planner, Mr. van der Merwe and finally Professor Fred Ellery of the Rhodes University Environmental Science Department. These interviews were aimed at gaining more knowledge about the past and present state of Grahamstown, and what is being done to improve the standard of living for Grahamstown citizens.

One of the vital directions that Ms. Kohly pointed us in was that of The Makana Municipality LEAP (Local Environmental Action Plan) which involved a large number of stakeholders from the Makana District, including numerous Rhodes University departments and institutions. From this information we further contacted Mr. Nongwe and discussed his knowledge on the current issues of concern. These issues were extracted from the environmental audit, part of the LEAP process, identifying the main areas of concern, which are: air quality, biodiversity, built environment, energy needs, environmental management/compliance, fresh water, environmental education and land.

Information was provided with regards to the water shortages experienced earlier in the year, which he says is a result of very old infrastructure that has a low storage capacity. As a result the municipality did what it could to create an awareness of the water shortage with water tanks being provided and people encouraged to harvest their roof water.

The quality of water provided to residents is currently being addressed as the Makana Municipality aims at forming a permanent partnership with the Amatola Water Board, which will assist with the water-purification plant. Issues of water specifically regarding the unsustainable use of the spring were also discussed with Mr. Steven Lang and he illustrated

to us the deterioration of the spring over the years with demands clearly outstripping the spring's water supply. He also noted that Grahamstown would continue to have water problems due to mis-priorities of funding and mismanagement of water distribution.

Other issues discussed with Mr. Nongwe included waste within the township, lack of environmental education, constant littering and illegal dumping as a result of poor system of governance and control. He further informed us of the implementation of a Makana Youth initiative which involves education of the youth regarding environmental issues.

Furthermore Mr. Lang also noted that many of the issues in Grahamstown regarding service delivery are due to lack of skills and incompetence which stem from lack of education. He noted that there was only a 63% matric pass rate which he believes is a result of teachers not being highly regarded, language barriers, lack of incentives and poor salaries. He also believes the poor quality of current education will have long term consequences in Grahamstown. Mr Lang also emphasised the issues of crime within Grahamstown and claimed that they had seven reported rape cases over that previous weekend. He highlighted that plans need to be put into place to improve leadership and law enforcement.

Furthermore in terms of development Mr. Lang proposed that without an economic driver Grahamstown cannot develop further especially with the current economic driver, Rhodes University, being limited and constrained in terms of their growth. As a result Grahamstown will face continuous unemployment and will result in a migration of people to Port Elizabeth and East London to seek job opportunities. He also believes that in terms of climate change and if current trends continue, Grahamstown will experience more water and power outages and people will also leave.

Prof. Mike Whisson is very knowledgeable on the past and present state of Grahamstown, and also discussed in depth the problems that the town faces with regard to the infrastructure and accessibility to water. He claimed the central issue relating to the water supply is that the municipality is increasing the demand for water rapidly, both through reticulating new housing projects (e.g.Mayfield 2 with over 1600 sites) and approving a substantial number of building programmes (e.g. Rhodes residences and the blocks of flats popping up around the middle of town) without augmenting the sources of supply other than through increasing access to Glen Melville and the Gariep-Fish supply. This method is ultimately

rationed by the national Dept of Water Affairs which has a (flexible) policy of not using highveldt water for coastal areas - and which is also under some pressure to increase its supply to the Port Elizabeth (NMMM) area. Prof. Whisson also believes that water harvesting (from roof tanks) and recycling at the reclamation works at Belmont Valley and the Makana works could add 25% to the existing supply. The technology is available, the professional and research expertise is located in EBRU and in the Rhodes Institute for Water Research, but these have not been utilised, even when they have offered to assist. Other initiatives, such as water harvesting and recycling by Rhodes on its own site, are also possible, as is the increased use of waterless toilets, although the latter need to be seen as acceptable to the middle classes before they are imposed on the poor, if they are to be viable.

In terms of Rhodes University the interview with Dr. Saleem Badat addressed many of the institutional issues which were discussed later on in the year at the 2011 Imbizo. Basically, Dr. Badat informed us of the processes and factors by which Rhodes University's decisions were driven and how numerous variables shape Rhodes University. One of the main variables included the funding framework which is relevant over three-year cycles. Rhodes University funds are received mainly through government subsidies, student fees and research contracts and donations. The University will continue to remain dependent on these subsidies and will therefore be obligated to continue growing unless a very generous donation is given that can cover the funds that the government subsidy provides. He said that otherwise, Rhodes University will continue to face the opportunity costs of having a small number of students and receiving low subsidies, with students consequently having to pay more fees.

Furthermore Dr. Badat spoke about how any increase in student enrolments generally requires new residences. However, considerations regarding new infrastructure include not only the costs of buildings, power, water, sewage services and rates but also the capacity of the town's infrastructure. The University currently depends on the municipality to provide these services and will continue to do. Rhodes would continue to inform the municipality of its growth plans and also, where necessary, provide water specialists and electricians to help the municipality as it is in the universities own interest to do so. Dr. Badat stated that in the past the university has considered buying generators but these are quite expensive. The university also faces various dilemmas in "going green," as currently this is also costly. A Green Fund has been initiated to support more energy saving and efficiency features.

With regards to Rhodes University's future developments the Vice Chancellor assured us that Rhodes was not striving to become a large university competing and would remain small. However in order to do this, remain sustainable, and for good academic reasons the University will increase its focus in Postgraduate studies and become more research orientated. This will put less pressure on the university with regards to residences. He was keen for the University to monitor and blacklist landlords who do not meet certain accommodation benchmarks, including security.

Dr. Badat advised us to get in contact with Mr. Mark Hazell of Grounds and Gardens to review the Rhodes Campus Spatial Framework, which we did. He also informed us that after the new Education building planned for next year, no new buildings will be developed in the St. Peters area. Finally, with regard to new programmes Dr. Badat enlightened us that Rhodes has and will continue to keep land aside for a possible Veterinary Science initiative, if Government funds were forthcoming. No engineering or medicine studies would be offered at Rhodes University.

In terms of Grahamstown's developments, Mr. Mark Ford has lived in and around Grahamstown for many years, and has noticed a drastic increase in the number of residential flats, traffic congestion, and that the CBD has moved from High Street towards African Street. Something Mr Ford views as a strength in Grahamstown are its educational centres, namely Rhodes University, St Andrews College, DSG, Kingswood College, Graeme College etc., in that these are the very few remaining resources drawing people to the town. He sees infrastructure as a major problem, as there is no infrastructural strategic plan in place. This allows anyone owning a property that has been zoned residential to build as many flats on their property as they like accrording to the building regulations of the town, without any regard for status and ability of the infrastructure to handle the extra pressures. He envisions Grahamstown to have numerous lock-up-and-go complexes which are secure in the future.

The interview with Mr. van der Merwe, Makana's town planner, was long and informative. We had met previously to arrange the interview and he provided us with his personal copies of the 2007-2012 IDP and the most recent Spatial Development Framework (2008). The interview with him gave us a clearer picture of how and where Grahamstown developments will occur in the future.

The municipality received 13,000 applications for subsidized housing last year and estimates it has to provide approximately 7,500 subsidized houses to people who actually qualify for the subsidy. The municipality is looking to establish townships so that the province can build subsidized housing on space further northwest of Joza. The new township development to the northwest would be a mixed-use development with not only residential uses but with businesses, institutions, and medical offices as well. In contrast, the East Commonage will not be developed within another 5 to 10 years. Regarding the Township Regeneration Strategy created by consultant Metroplan, Mr. van der Merwe reported that the strategy referred not to new construction but was a plan for areas that had been identified for urban renewal and redevelopment, such as Fingo Village. Regarding rural in-migration to Grahamstown, he believes the migration of people after the repeal of the acts on influx control has largely stopped. Regarding the social sustainability of Grahamstown, Mr. van der Merwe believes that Grahamstown is physically integrated but that the municipality cannot force people to socially mix.

The potential for more infill housing in the centre of Grahamstown is very limited and future growth will have to expand outwards. If there is enough demand then new development will expand beyond a 6 kilometre radius from the centre. Regarding the development of flats in the centre of Grahamstown, he reported that the current zoning often allows for it but many homeowners may not realize it until there is a proposal.

We also discussed the historical origins and possible future of the commonages. The commonages were established so that people would have a place to water their animals at overnight stops. While the East Commonage and the North Commonage will be partially developed, the Southern Commonage is earmarked as a conservation area. The Southern Commonage is undevelopable because the land is very steep and the N2 is very curvy there making it a dangerous place for people to turn into.

Professor Fred Ellery of the Environmental Science Department at Rhodes University had points very similar to our previous informants. The emerging issues that Prof. Ellery pointed out which he thinks need immediate attention are (1) a constant water supply of adequate quantity and quality which can be used for daily human consumption, (2) adequate and efficient waste disposal - especially wastewater disposal – should be done in ways which are satisfactory from a human health and environmental perspective, (3) collapsing

infrastructure which should ensure delivery of basic goods and services to all citizens of Grahamstown (urban and rural), (4) the widening income gap between the wealthy and the poor, and associated problems of disconnection between humans and the environment, and (5) continuous elitist developments including game farming which is occurring in areas of arable land where food production should occur which will benefit the entire community.

Prof. Ellery noted numerous driving forces relating to these issues, which he listed as a lack of political will, corruption within the government, institutional failure and employment of cadres rather than individuals best suited to do the work. He also noted that a major issue which Grahamstown needs to face is the greed and the notion that success is measured by individual and household wealth, rather that ensuring sustainability for future generational use. With regard to infrastructure, Prof. Ellery stated that Grahamstown is an old city in which much of the infrastructure is ageing and failing and this poses serious problems which requires huge investments in order to repair the problem. At present nothing is being done to sort this problem out, however the necessity for the Municipality to provide the Grahamstown community with basic needs remains an extremely serious problem.

Through our interviews it is clear that there are certain driving forces that need to be monitored and addressed. Specific drivers include that of water and water quality, deteriorating and old infrastructure, unemployment, lack of skills, education and funding.

5.3 Literature Review

5.1.1. Governance and Economy

The current Makana Municipality vision is that they "shall strive to ensure sustainable, affordable, equitable and quality services in a just, friendly, secure and healthy environment, which promotes social and economic growth for all" (Makana Municipality, 2011). This being said, it is evident that Makana Municipality are not on target with meeting their vision as a result of services which are not always up to standard and not equitable throughout the town. These services include water, sanitation, waste management, discrepancies in the costs between electricity for urban and rural areas, and an extremely high unemployment rate.

The key pillars for economic growth and development in the Makana region are agriculture and tourist development, trade and investment (mining and manufacturing), human resources and skills development, small medium and micro enterprises and information and communication technology (Makana Municipality, 2011). Grahamstown in itself however makes the largest contribution to the Makana economy mainly in the form of educational services and tourist related activities.

Education levels have a direct impact on economic development and overall quality of life and the two are inextricably linked. In 2007, statistics showed however that 6.19% of Makana had received no schooling and only 22.07% had completed their schooling to a matric level (Makana Muncipality, 2011). This shows that the overall employability of Makana residents is low despite its high ability to attract highly educated individuals due to the presence of Rhodes University and the numerous primary and secondary schools within Grahamstown. This can be substantiated as in 2007 only 32.1% of Makana was employed with 21% of the workforce consisting of professionals and senior officials, which is a result of the significant impact of Rhodes University. Furthermore in 1999, agriculture accounted for 20% of all employment, therefore environmental and climatic changes could have significant impacts on employment (Makana Muncipality, 2011).

It is important for the municipality to have the capacity to implement local economic development through facilitation of initiatives as this will overall impact employment, education and the overall quality of life of residents. However, the Auditor-General recently cited Makana as the 4th worst municipality in the province regarding misspending with 2,507

incidents reported in the 2009-2010 general audit of the Eastern Cape. The misspending referred to by the auditor specifically means “expenditure made in vain and would have been avoided had reasonable care been exercised” (Auditor-General South Africa, 2011). Makana later admitted to some of the misspending which included overtime paid out to employees whose income levels did not allow them to receive overtime payment and unauthorized payment of councilors telephone bills (Mini, 2011c).

The South African government launched Operation Clean Audit in 2008 with the goal of all 283 municipalities receiving clean audits by 2014. The purpose of achieving clean audits is to enhance the delivery of services. The Auditor-General reported that the Eastern Cape is progressing too slowly to meet the goals of Operation Clean Audit with Makana receiving an “adverse” critique.

Most recently, Makana Municipality did not spend R53.7 million of its national grant. The inability to spend the money sends a strong signal to the Auditor-General of South Africa that the municipality is incapable of managing its finances and budget (Auditor-General South Africa, 2011). Projects that had been approved by the Municipal Council were not carried out by the municipality. Makana has asked for assistance from the National Treasury to help plan its budgets through 2014 and has to apply to the National Treasury to keep the remaining funds. The new Executive Mayor, Zamuxolo Peter, is demanding that Ntombi Baart, the Municipal Manager and acting accounting officer write a report explaining how the municipality failed to spend the grant. The municipality will be reprimanded by the Auditor-General and may even face a penalty (Mini, 2011d). In response to Makana’s request for help, the National Treasury has sent a temporary replacement for Makana’s Chief Financial Officer, Jackson Ngcelwane, who was suspended for unknown reasons in May (Mini, 2011b). It may be another several months before the disciplinary process for Jackson Ngcelwane is concluded (Mini, 2011e).

The inability of Makana Municipality to receive a clean audit or spend all of its funding from the national government reveals the extent of the municipality’s inaptitude to provide services and infrastructure. In addition, the lack of transparency regarding the suspension of the Chief Financial Officer and the municipality’s incapacity to proceed with the disciplinary hearing in a timely manner is also troubling. It is obvious that the municipality requires better skilled management for more efficient operations. Until the capacity of the municipality increases Grahamstown and the environment will continue to suffer and the economy will continue to

slump. The sluggish performance of economy will undermine struggles against poverty, unemployment and crime (Makana Municipality, 2011). Slow growth also results in insufficient generation of permanent jobs resulting in more households falling into poverty becoming exposed to social ills such as crime and poor health. This may also facilitate the migration of skilled workers who are unable to find permanent jobs to seek better employment and economic opportunities elsewhere.

Additional constraints for economic development arise as a result of poor transport facilities and road maintenance between Grahamstown and bigger cities, such as Port Elizabeth and East London. Consequently large industries avoid locating themselves in Grahamstown as the time and cost of getting produce to market is not viable for businesses (Whisson, 2011). Small-scale farming within the Makana region remains limited as farmers are not able to get their perishable produce to market efficiently, and the cost of living has increased exorbitantly over the past 10 years causing these famers to move to Grahamstown and find a different source of income (Baiphethi, 2009).

Antrobus and Antrobus (2008), interviewed numerous small-scale and commercial farmers, and identified the chief obstacles to development perceived by small-scale and emergent farmers, farm workers and farm dwellers. These include a need for training in management and marketing and for mentoring; the assistance of Agricultural Extension Officers; the lack of schooling in rural areas; insecurity as far as tenure rights were concerned; and a lack of finances to obtain land and the necessary working capital to undertake farming.

According to Antrobus and Antrobus (2008), in a document entitled “Towards a Local Economic Development (LED) Strategy” dated May 2006, under the heading titled “Strategies for Accelerated LED initiatives in Makana” it contains what is called “Radical interventions on Agricultural Development, Management and Mentorship.” with specific LED agricultural and agri-tourism related programmes. Some of these programmes include; Makana Mass Agricultural Food Production (food garden, fresh and dry vegetable market) and Makana Ostrich Tourism Farm.

If the municipality implemented these LED programmes into the community, one would see a vast change in the economic profitability, as well as the unemployment rate within Grahamstown. Although the costs to start such projects would require a large capital, it would be profitable in the long run if it is managed efficiently, and if the management and staff are

honest and reliable. This would increase economic growth providing jobs and a better standard of living.

5.3.2. Development and Housing

Since the fall of apartheid and the revocation of the Group Areas Act in 1991, informal housing settlements have drastically developed in Grahamstown. As migrants relocated from farms to town at the end of apartheid, informal settlements grew as supply of formal township housing could not keep up with demand (Fox, 2009). Another important driver of migrants was the conversion from domestic livestock to game farming areas around Grahamstown, which lead to forced removal of workers into surrounding townships. Since 1995, a reconstruction and development programme that builds houses is expanding within both formal and informal areas of Grahamstown and continues to expand today (Fox, 2009). In 2000 Makana Municipality took over Grahamstown, which lead to the city area increasing from 100 km^2 to 2500 km^2. Furthermore, the continual expansion of Rhodes University has lead to a booming housing market, which has resulted in new gated housing developments on the outskirts of the central town (Fox, 2009).

The current Makana Municipality's housing vision is to have an accredited Housing Institution which eradicates the housing backlog and provides a range of quality housing to meet the needs of the community. In order to live up to the vision the Makana Municipality housing sector plan came up with numerous land and housing delivery objectives. Objectives included acquiring more hectares of land, addressing needs for rural housing, making provision for up to 1000 stands for non subsidized housing and updating the beneficiary list (Makana Municipality, 2008).

In 2006 it was estimated that Makana was facing a backlog of 12 000 units. At the time the existing list of people in need of housing in Grahamstown contained 13 000 people. In 2007 the beneficiary list was updated and the real housing need was accurately established and only contained 8993 families in all the towns within the Makana Municipality (Makana municipality, 2008).

According to the Makana Municipality's Spatial Development Framework of 2006, the municipality will continue to build more infill housing throughout Grahamstown, formalizing

informal housing trying to eradicate the uneven spatial patterns inflicted by apartheid with numerous developments taking place within Grahamstown in the future (Naidoo, 2006).

Numerous projects include that of the Tantyi and Fingo Village Urban renewal project which is aimed at fighting urban decay and promoting better land use of the communities. This requires identifying specific needs of the area, preparing a precedent plan and sourcing funding. The municipality currently owns approximately 31 ha of land between the industrial area and suburban sub-divisions and also hopes to develop approximately 165 middle-income homes on Hill 60. Furthermore the municipality also owns approximately 193 ha of land north of Oatlands North between the military base and Mayfield Cemetery which is said to possibly be used to develop approximately 1,500 middle-income homes (Makana Muncipality, 2006).

Further development of middle income housing has been proposed between Fort England Hospital and the Belmont Valley Sewer Treatment Works, of which 40% of 193 ha of land has been established as suitable for the eventual development of approximately 1000 units of housing. The Municipality further proposes developing the 750 ha East Commonage from Joza, which is currently zoned for agricultural use, for major commercial development and both subsidized and middle income housing. The East Commonage Development Plan includes the preservation of the Vukani Greenbelt (Makana Municipality, 2006).

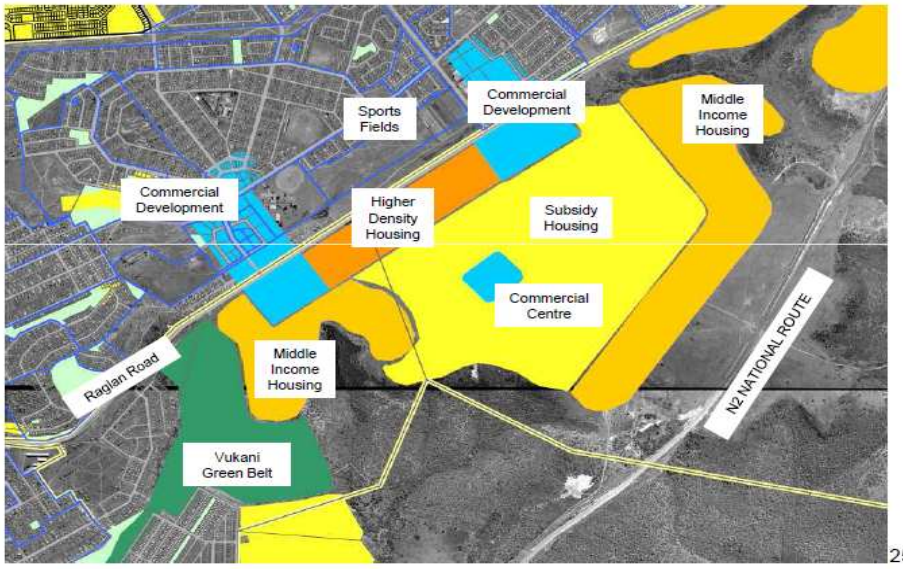

Figure 8: Development Plans for the East Commonage by Metroplan.

Source: (Makana Municipality, 2006).

Since the Spatial Development Framework's publication, Makana has hired a consultant, Metroplan, to prepare a Township Regeneration Strategy along Raglan Road in this area with

seven nodes of development (See Fig above). The seven nodes include plans for residential, office, and commercial development as well as provision for public space, space for new SMME businesses and light industry, clinics, sport fields, and tree planting (van der Vyver, 2011).

The municipality has further recognized that it must foster more organized development along African Street where there is high pressure for higher-density housing and more commercial uses. An intrusion of commercial uses into previously residential areas has decreased the quality of life there and led to traffic and parking concerns. It has also been noted that the land along the major thoroughfare of the Beaufort Street/Raglan Road Area is underutilized and there are too many conflicts between the road's heavy traffic and pedestrians. The municipality would like to see the development of middle-income housing along this thoroughfare (Makana Municipality, 2006). The Municipality has also set out to Improving Existing Housing and Services in Grahamstown and in 2010 as many as 440 homes in Transit Camp, a section of Extension 9, have been improved with the construction of four room houses. This is an improvement over the old RDP houses which only had a single bedroom and a small window. The money for the upgrade was provided by the Reconstruction Development Program (Kalenga, 2011:5).

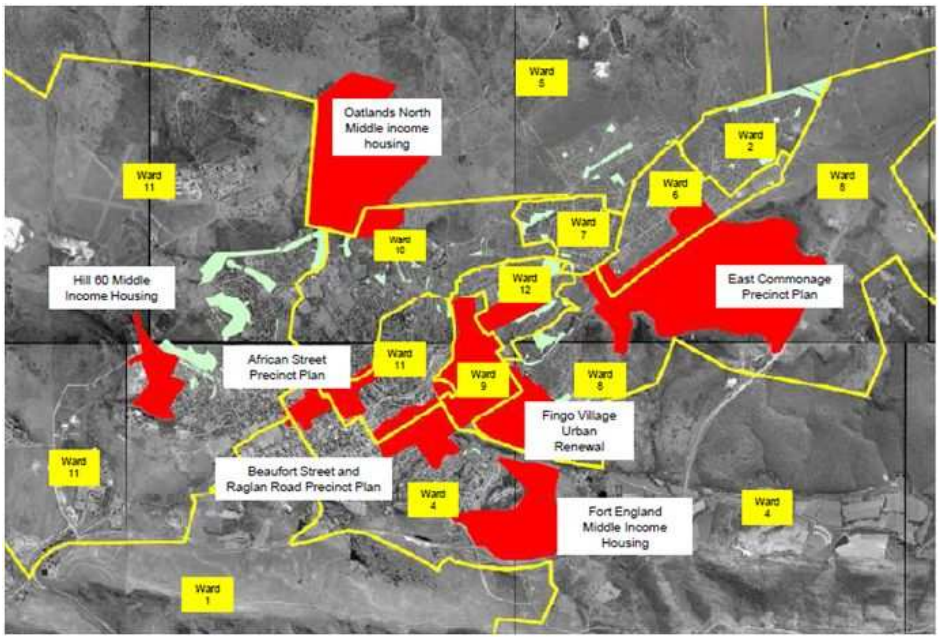

Figure 9: A map highlighting proposed future development of Grahamstown.

Source: (Makana Municipality, 2006)

Within the Hlalani Township the Municipality has recently spent R7 million towards eradicating pit toilets and building sewer lines for flush toilets. The pit toilets, enclosed by corrugated iron, were constructed in the mid-1990s. The project employed 21 people. (Nokhubeka, 2011). There has however been some social conflict of interests such as service delivery protests in Phaphamani and Zolani townships in February 2011. Residents were protesting the recent tarring of the main road between the two townships. They felt the tarring of the road should have been a low priority in comparison to their need for housing, services, and jobs (Jijana, 2011a). Zolani is one of the poorest townships in Grahamstown where most of the houses are made of mud, there is no electricity, nor is there running water or flush toilets (Jijana, 2011b).

Other Private Development Initiatives include the recently approved Belmont Development Company's plans to build a multi-sport and lifestyle project on the Grahamstown Golf Course on Cradock Road. Makana waived its right to buy the golf course on the condition that the developers build a new golf course in Belmont Valley (Mini, 2011a).

According to the IDP (2011-2012) provision of quality housing was one of the key priorities that emerged from consultation and from public participation conducted as part of the local perspective shaping the 2011–2012 IDP. This was also consistent with the results we obtained from the public surveys we conducted where the over 50% of the respondents indicated that affordable housing was a major issue facing the future of Grahamstown and their willingness to stay in the city.

Although we do not know for sure what the future holds in terms of the outcome or progress of housing provision in Grahamstown we can infer based on our survey findings, that availability of housing is a major concern that is very important to the people of Grahamstown when they consider their futures in the city. Furthermore we can also infer based on the fact that Makana Municipality is already in a backlog of many housing units, that should people's needs for housing not be met soon people may emigrate to other cities in search of better and affordable housing. The development of housing and buildings also need to be simultaneously developed in accordance with the town's infrastructure to cope with the increase in capacity, with funding and the availability of services such as water being key drivers.

5.3.3. Rhodes University

According to the Rhodes Spatial Development Framework constructed in 2009, Rhodes was projected to reach its design limit of 10000 students by 2014 if it continued to grow at a projected growth rate of 8%. This growth would require the additional building of 38 new residences within the next 5 years. The framework emphasized that a projected growth rate of 2% per annum would result in Rhodes reaching its student capacity after 2023, thus only requiring 26 new residences over the next 15 years (Rhodes Spatial Development Framework, 2011). The framework would enable and guide any future developments and expansions of the University so that factors such as pedestrianisation would be enforced, the provision for future sports facilities could be considered and the construction and expansion of academic facilities, residences and staff housing would be strategically placed to ensure effective and responsible use of land (Badat, 2011b).

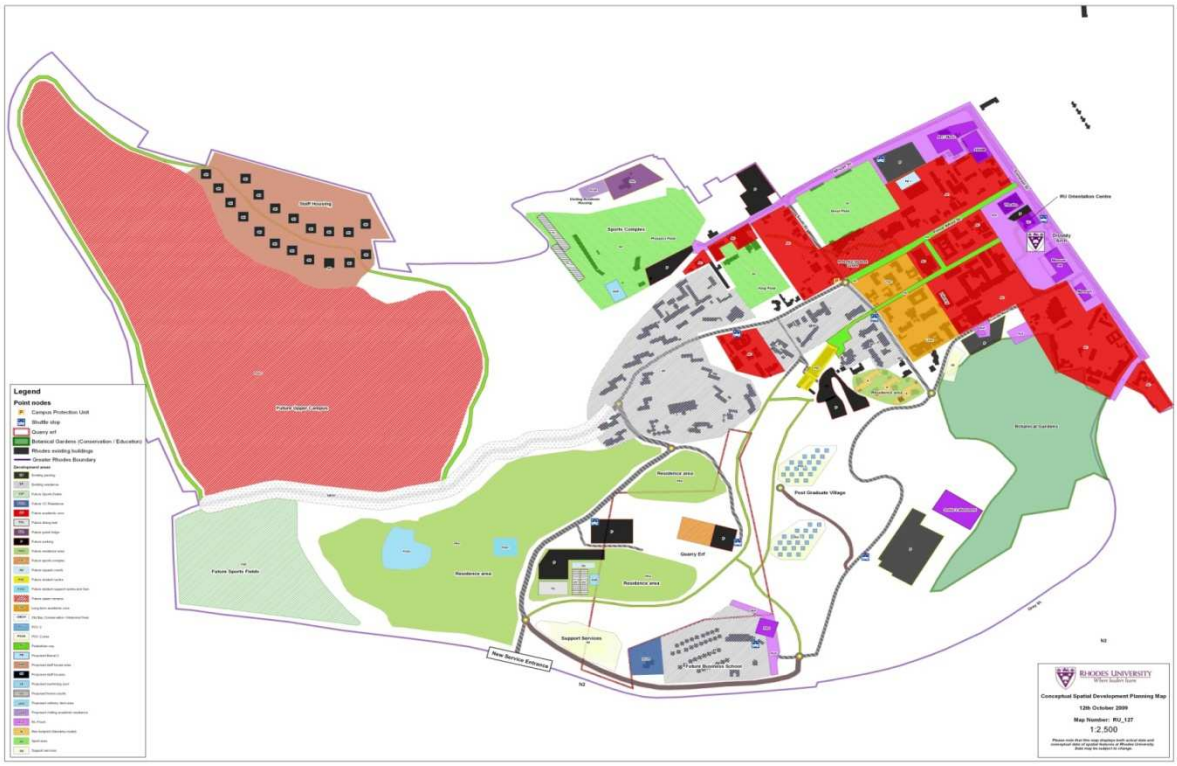

Figure 10: Rhodes University Spatial Development Framework Concept

Source: (Rhodes University Spatial Development Framework, 2006).

So far the enrolment of students in 2010 was 7192 instead of the projected 6500 and 7290 students in 2011 which is less than the projected target of 7390. The 2010 enrolment which exceeded its targets had consequences for infrastructure, staffing and academic student ratios as well as costs regarding teaching inputs subsidy income (Imbizo, 2011).

If Rhodes ensures that it meets its target enrolment projections for 2012 and 2013, Rhodes would obtain an overall growth of 2.2% over 2011-2013 which is a drastic decrease from the average growth rate of 7.5% between 2007 and 2009 (Statistics Digest, 2010). It is projected that Rhodes will maintain a cautious growth of 2-3% on average for the next few years however this growth will not be consistent across all faculties and qualification levels with a proposed minimal increase of undergraduate students as well as a decrease in their proportion (70-74%) and an increase in both number and proportion (24% to 30%) of postgraduate students between 2010-2013 (Bernard, 2011; Statistics Digest 2010). The needs however for postgraduates vary differently from that of undergraduates and therefore the spatial framework would need to be re-examined (Hazell, 2011)

An increase in the proportion of postgraduate students has been acknowledged by the University to have impacts on both the size and shape of Rhodes (Bernard, 2011:1). The introduction of new postgraduate studies will have both staff and cost repercussions, although data already suggests that staffing has not kept up with student numbers that there is already a need to increase staff numbers in certain departments. Furthermore the facilitation of postgraduate growth can only be driven through passion of staff members for research and postgraduate supervision in a top down fashion however needs to be driven from the bottom up.

The decision of Rhodes University to focus on the increasing development of postgraduates has both constraints and positive opportunities. Postgraduate studies can play an important role in supporting academic programmes particularly with regard to undergraduate development and act as catalysts for inspiring and innovating new research and knowledge areas (Badat, 2011b). However there are vast limitations to move in this direction such as the lack of academic staff without masters or doctorates which imposes a limit on the number of academics that can supervise Masters and Doctoral students (Badat, 2011b). The $400 000 Senior scholarship programme funded by the Mellon Foundation could be used to help develop a programme to mentor academics into the role of becoming supervisors (Badat, 2011b). However there is also insufficient academic space, facilities and equipment to

support an increase in postgraduate students and additional funds would be required to not only provide the necessary infrastructure but employ additional staff (Badat, 2011b). Facilities to fulfill postgraduate's needs would include more post graduate residences or increased reliance on Grahamstown for accommodation a possible postgraduate centre or café in addition to the postgraduate research commons. It is also important to note that Eden grove and Barratt lecture theatres were commissioned when Rhodes had 4461 and 6069 students respectively (Bernard, 2011). Therefore if we continue to grow at an undergraduate level a possible new set of major lecture theatres will need to be commissioned, however Rhodes lecture theatres are also currently underutilized (Bernard, 2011).

Although increasing the proportion of postgraduates long term is where Rhodes has the greatest capacity, there is only a certain limit of postgraduates Rhodes will be able to intake and therefore changing the shape of undergraduate should also be considered (Bernard, 2011). New undergraduate programmes would attract possibly 240 students over four years this would change the shape of Rhodes however the overall size could be maintained through reducing undergraduate intake elsewhere which may hinder the channeling of students to postgraduate studies (Bernard, 2011). New courses should be considered when the course is funded and has the potential to attract high quality students as oppose to accepting a greater number of lower quality students in an already existing department (Bernard, 2011).

It is further noted that due to institutional constraints any expansions for postgraduates will hinder any new undergraduate developments and is imperative that the quality of undergraduates does not deteriorate (Badat, 2011b). It is important to note however that over 2005-2011 doctoral students have doubled in proportion, while the number of masters has remained constant and the number of honours students have declined. In 2011 the total enrolment of postgraduate students actually decreased from that of 2010 (Badat, 2011a). It is therefore important that for Rhodes to maintain its standards, sensible and realistic targets need to be set that are sensitive to the variations that exist within the different faculties and disciplines (Badat, 2011b). This may require reconsiderations into how to calculate the optimal student staff ratios and will require better and fully utilized use of lecture theatres (Bernard, 2011; Badat, 2011a).

Rhodes has committed themselves to the development of postgraduate studies through their enrolment, academic and institutional planning (Badat, 2011b). Many positives signal that this is the right path as Rhodes has the highest PhD students as a percentage of masters

students in the country (Badat, 2011b). Rhodes also has the third highest research output per capita staff member in the country out of all universities. In terms of funding increasing postgraduate students is more entirely appreciated by the government (Badat, 2011b). Furthermore the Department of Higher Education, Training and Science and Technology, as well as other state departments have given positive feedback and in terms of the South African higher education funding framework the university will benefit financially (Badat, 2011b). However despite the fact that Rhodes also achieves well above the DHET's 1.25 unit per academic benchmark, only one-third of academics meet this measure in their individual capacities with only 33.6% of academics producing 1.25 or more accredited research units annually with 51% of this group of researchers is from the Science Faculty, and 31% from Humanities (Bernard, 2011). Furthermore the success rate at postgraduate level varies across campus and is not particularly good in places (Bernard, 2011)

In order for Rhodes to become more postgraduate new opportunities and developments within postgraduate studies need to be initiated such as the four new masters programmes in Creative Writing, Social Policy, Bioinformatics and Applied Computer Science and a honours specialisation in Health Journalism in partnership with Discovery Health that were developed this year (Badat, 2011a). However despite the spare capacity that the University currently has for Postgraduates some departments lack prospective students while others the infrastructure and staff capacity (Bernard, 2011).

Change at Rhodes will be driven through opportunities such as funds like the Mellon and the Sandisa Imbewu Fund. Change will also be constrained by the size of its infrastructure as well as the location of departments and their inappropriateness to expand (Bernard, 2011). Currently Rhodes has supported proposals and initiatives related to The Bio-Research Unit (BIOBRU), The Confucius Centre, and undergraduates courses in Mandarin. Current funding initiatives will also be directed toward priorities such as a new life sciences building and the relocation of the business school to the post graduate village (Imbizo, 2011).

Finally one of the key factors that restrict the future of Rhodes is that it is inextricably bound within the economic and social structures of Grahamstown itself. Any funding or projects taken on the university are limited by both the capability and capacity of the Makana Municipality to provide the necessary services to support and maintain new and existing infrastructure (Badat, 2011a). Rhodes has focused one of their main goals as to develop their community engagements however some projects such as the historically disadvantaged

schools Rhodes had to withdraw any further involvement as it proved to be a seemingly uphill battle (Imbizo, 2011). Despite regular contact with the Municipality through some generally good relationships there have also been some incomprehensive and inadequate interactions (Imbizo, 2011).

The implementation of the Rhodes Institutional Development Plan (IDP) and the possible inclusion of it into the Makana IDP and spatial frameworks along with other mechanisms such as the funding framework should allow for Rhodes to ensure the Status Quo continues like it has done over the past years, ensuring Rhodes remained financially sustainable and retained its strong reputation for academic excellence (Hazel, 2011; Stephenson, 2011). However drivers of change and growth depend highly upon the funding and available infrastructure of the town. Further the quality at which Rhodes goes about certain projects and whether they are sustainable will determine its resilience against possible future resource constraints. The recent residential development took place under immense pressure to meet the influx of students for 2011 and therefore occurred without even a scoping report, resulting in inadequate expectations being met (Hazell, 2011). Institutional change and institutional maintenance have to be managed simultaneously and institutional activity needs to be steered and monitored. If not managed effectively and efficiently, parts and areas of the institution that are functioning relatively well could become dysfunctional and create new problems (Badat, 2011b). Furthermore if goals are not set without the financial means, human capacity or widespread support or are not innovative or explore a wide range of possibilities Rhodes will possibly be condemned to intellectual stagnation and potential extinction. (Stephenson, 2011).

5.3.4. Energy

A reliable supply of electrical power is vital for effective economic development in any area. Power cuts, such as those orchestrated by Eskom, negatively affect the productivity of businesses and households. In Grahamstown, "electricity generation and the provision of major infrastructure is the responsibility of Eskom, as is management of a substantial part of the municipal erven," (Makana Municipality, 2011). "The Makana municipality is responsible for electricity reticulation, distribution, resale and plant maintenance," (Makana Municipality, 2011). A backlog in energy provision for Makana Municipality was recorded to be as much as 3500 households in 2008, (Makana Municipality, 2011). In addressing this backlog it must be noted that Eskom, the national energy supplier, will continue to suffer

from severe electricity generation capacity constraints in meeting country wide demand until 2014 at least, (Makana Municipality, 2011). Thus the local government is limited in its ability to address the power shortages and backlogs however it can develop the infrastructure required to eventually connect the houses to the national grid, (Makana Municipality, 2011).

A proposal by Franco-South African wind energy company, InnoWind, to build a local wind farm, outside of Grahamstown has been accepted by the National Department of Environmental Affairs, (Falanga, 2011). Eight turbines were approved and they will generate around 24 Megawatts of energy which does not completely meet Grahamstown's peak winter requirements of about 35 Megawatts, (Falanga, 2011). However there have been appeals and concerns regarding a geological assessment which will have to be undergone before the construction commences, (Falanga, 2011). However, "if the wind farm is established, 26% of the profits will be ploughed back into local education through the Makana *Winds of Change* Trust - to be co-ordinated through Rhodes University," (Rhodes University, 2011a).

It has been proposed that the old power station in the industrial part of Grahamstown be converted into a 3MW wood energy plant, (Rhodes University, 2011a). It will utilise felled alien invasive plants as fuel, (Rhodes University, 2011a). The project is being collaborated by The Nollen group and Working for Water, (Rhodes University, 2011a). EIA is currently under way. A Rhodes University research project by Garth Cambray, in collaboration with the Biotechnology Department has also led to development of a simple and effective technology for the production of an environmentally friendly biodiesel (Rhodes University, 2011a). The fuel is produced from used cooking oil and animal waste and can be used to run vehicles such as the University's tractors and lawnmowers, (Rhodes University, 2011a).

It is clear from our survey that respondents were not satisfied with the supply of energy in Grahamstown it should be noted that majority of respondents supported the proposal of a wind farm. In order to reduce the reliance on Eskom and the consequent problems the municipality should gain initiatives into these new energy proposals. Whether the municipality has the initiative to become more sustainable and acquire funding are two obvious drivers.

5.3.5. Water, Waste and Sanitation

The planning and management of water resources are and have been governed by the Water Services Development Plan of 2007 (Makana Municipality, 2011). Grahamstown currently

has two sewage purification works and two water treatment plans. The Belmont Valley which serves the northern drainage area of Grahamstown and Mayfield Sewage Treatment Works which serves the southern drainage area of Grahamstown are both currently operating suboptimally and require significant capital injections to allow them to meet the municipality's water-based sanitation needs (Mafuta *et al*., 2011).

The Glen Melville and Waainek are the two Water Treatment Works which receive water mainly via the Gariep, Settlers, Howieson, Jameson and Milner dams which receive water via interbasin transfers and through capturing run off from local streams and therefore seize during droughts. Grahamstown uses 8.6 mm3/a of water per year which according to the 2010/2011 IDP this is a sufficient amount of water to supply Grahamstown. However due to challenges brought by perennial drought and old infrastructure particularly reticulation pumps and piping there is inconsistent water pressure and intermittent water supplies. Water is also often of poor quality and at times also does not meet specific standards also as a result of old infrastructure (Mafuta *et al*., 2011). In addition to this, there is a labour shortage within the municipality which inhibits cost effective and timeous pump servicing and motor maintenance (WSDP, 2007:5). According to the Makana 2007 IDP provision of water is provided to 76.5% of the Makana Population through water on site, a further 16.5% have access to water through stands. In terms of sanitation the Makana Municipality is shown to have the fourth highest number (17.5%) of households using the bucket latrine system within the Cacadu District. Statistics show that in 2006 only 57.1% of the population had access to a flush toilet with a sewage system and a high 20.8% of the population had no sanitation services at all. The overall backlogs for Makana are estimated at R233 million for the provision of storm water infrastructure and equivalent to R100 million for bulk water supply and sanitation services (Makana Municipality, 2008).

Many problems regarding water and sanitation arise due to design inadequacies such as the sewer systems in some areas were only designed to drain the toilets resulting inadequate ability for grey water to drain to the sewer due to the insufficient depth of the sewer (WSPD, 2007). This leads to households throwing their grey water into the streets which could have severe consequences if the municipality continues to have delays in upgrading all VIP and Pit Latrines to fully flushed toilet systems as the municipality does not currently have a Grey Water Management Plan in place (WSDP, 2007). Furthermore pit emptying and sludge disposal could continue to cause health related issues (WSDP, 2007).

Grahamstown is currently the main waste service delivery co-ordinator for Makana. Regular waste removal service is provided to all households in urban areas once a week and businesses within the major towns receiving additional collections twice a week (Makana Municipality, 2008b). The majority of the population within the rural areas either buries, burns illegally disposes of their waste.

In terms of waste management Grahamstown has a landfill solid waste disposal which currently has capacity for another 20 years. There are currently several informal waste recycling activities that take place in the municipality (Makana Municipality, 2008b). Makana Municipality in collaboration with IWARS and the Masihlule Project established a 2 bag system for waste collection whereby residents can place their recyclables in a different colour bag. However current recycling incentives are very limited (IWARS, 2011). There is also room for expansion of the Masihule project which promotes social development through recycling initiatives. Record-keeping of incoming waste should be improved and properly recorded. Waste management of sewage and organic material could provide opportunities for SMMEs such as renewable energy (e.g. biomass extractors and digesters) and the production of organic fertilizer (Makana Municipality, 2011; Rhodes University, 2011b). The Makana Municipality has recognised the need for education of the people regarding this practice. The Municipality is considering establishing a covered area on the Grahamstown landfill to do more formal recycling. A schedule to clean these identified areas and streets has been drawn up by the Municipality, but the Municipality is starting to experience manpower problems to properly fulfill this task (Makana Municipality, 2008b).

In 2007 according to the WSDP the Makana Municipality was well on its way to achieving its goals of providing all its consumer units with a full waterborne sanitation system with an individual metered erf connection and full flush sanitation system by 2010. This target was subject to available funding which clearly hasn’t been attainable as this goal is yet to be achieved. Other limitations in reaching this target that also clearly hindered the progress of this goal was the lack of required skills and staff capacity, the continual migration of people from neighbouring towns and farmlands and inadequate capacity of existing infrastructure.

Further initiatives of Makana have included a master water plan which outlines proposed water and waste water projects such as the construction of a four mega litre reservoir at Botha's Hill; the upgrading of the Alicedale Water Treatment Plant, conversion from

ventilation improved pit toilets to waterborne sanitation at Extension 6 and lower Makana; upgrading the Belmont Valley waste water works and the construction of bulk water supply at James Kleyhans. This master water plan proposes an estimated cost of R150 million (Mafuta *et al*., 2011).

Once again funding is a major constraint; however considerations also need to be made into the increased climatic variability of Grahamstown towards mid century. Deteriorating infrastructure will be under severe strain with increased flooding as well as increased shortages of water during harsher droughts (IPCC, 2007). Furthermore due to the historical inequities in service delivery between Grahamstown East and West, with the previously white West receiving comprehensive services, and paying for them, while much delayed and often sub-standard services in the East are combined with a historical reluctance and inability to pay will therefore affect rural areas more severely (Mafuta *et al*., 2011).

Despite the constraints for improved service delivery programmes such as Working for Water have successfully been clearing alien vegetation along some of the local catchments increasing run off into dams such as Grey Dam substantially (Mafuta *et al*., 2011). Furthermore the Amatola Water Board is providing its services to implement the Blue Drop Systems as a regulatory tool and certification system to monitor the quality of drinking water. Rainwater harvesting is also being promoted in key disadvantaged regions within Grahamstown through projects such as the Galela Amanzi Project. Algal ponding processes have been used to treat almost 10 percent of effluent at the Belmont Valley Wastewater Treatment (Mafuta *et al*., 2011). Further, Rhodes University recently had a waterless toilet installed at their new environmental centre. The SANIX toilet, has a cleverly designed conveyor belt which sends solids into a drying chamber with solar/ambient heat and constant ventilation. This devitalises potential pathogens and parasites, and the resultant dry powder may be disposed of in the landfill site or incorporated into the ground as a soil conditioner (Rhodes University 2011c).

Although there are some initiatives in place, the municipality is struggling to comply with its WSDP with many of the key factors including ignorance and lack of staff capacity; failure to manage infrastructure adequately; poorly run and inadequate wastewater treatment works. In order for the municipality to combat some of these problematic drivers a number of skills and training initiatives, including electronic data management, water resource management training, technical training including water chemistry, biochemistry and microbiology, legal

knowledge, and financial management. They acknowledge that such capacity building will be a long-term process (Mafuta *et al*., 2011). Furthermore it is imperative that the municipality considers the poor education of local people on proper maintenance and upkeep of sanitary services as well as considers the new housing developments and the expansion of Rhodes University with regards to planning and maintenance of infrastructure.

The provision of water, sanitation services and proper waste management has an impact on overall community wellbeing, which in turn affects the realization of economic potential. Their provision or lack thereof has an impact on community health, worker productivity, the general quality of life and the attractiveness of Grahamstown as a place to live and work in. (Makana Municipality, 2011). Therefore continual extension, upgrade and maintenance of infrastructure throughout the municipality are critical to improving Makana's competitiveness and its ability to encourage the introduction of new business. The provision of basic services and investment in infrastructure will play a critical role in the long run creation of an environment which is conducive for local economic development (Makana Municipality, 2011).

5.3.6. Environment

Vegetation within an area is representative of numerous biological factors which include, climate and overall determine the vegetation types and biodiversity within an area (Makana Municipality, 2011). There are approximately 8421 ha of municipal commonage surrounding Grahamstown which is situated within the boundaries of four vegetation biomes (Grassland, Thicket, Karoo and Fynbos). The commonages are used by the members of the rural community as grazing lands for their cattle, sheep, goats etc. However there is clear evidence of overgrazing and the fencing provided by the municipality is stolen too often. The economic benefit of subsistence farming, which the commonages could potentially provide the rural community, is not being implemented- this may be due to a lack of education within the rural community, or the lack of income to initiate the project (Martens, 2009).

Although no extensive studies on climate change in the area have been done, it is believed climate change will have a profound effect on the Makana climate and on nature-based tourism in the area (Makana Municipality, 2011). It is expected that global temperatures will rise between 1.4 and 5.8 by 2100. The implications for Makana specifically regarding economic activity may include; changes in agricultural production yields, changes in plant

and animal species habitat cover, changes in agricultural potential as rainfall and temperatures affect sensitive crops as well as changes in the range of diseases (Makana Municipality, 2011). Furthermore Grahamstown being situated with the intersection of four different climatic zones will experience a greater range in climatic variability with more frequent flooding and severe droughts (IPCC, 2007). The implications of these more frequent, severe droughts will exacerbate the already increasing water demands and crisis will continue for the demand of environmental resources (Mafuta *et al*., 2011).

Due to the Makana district exhibiting rich and diverse vegetation and charecterised as part of the Albany Center of Endemism significant proportions of the area are classified as "critical biodiversity areas" (Makana Municipality, 2011). However due to the livelihood patterns of rural areas which rely on the surrounding natural resources, biodiversity is compromised as a result of; urbanization, transformation of land for agricultural purposes, overgrazing by livestock (there is said to be over 2000 cattle within the Grahamstown commonages), habitat loss through preparation of cultivated land for products such as cash crops, overpopulation of alien species, unsustainable resource use, collection of plant species for medicinal and ornamental uses as well as land degradation because of the use of irrigation in areas with poor soils (Martens, 2009; Makana Municipality, 2011).

It is therefore important that conservation efforts are enhanced in order to maintain the high level of biodiversity especially regarding endangered and vulnerable species. Consequently land use planning must enforce improved sustainable agricultural practices in order to be economically viable. Additionally, in the face of climate change any LED initiatives must consider the climatic impacts on agriculture and tourism by identifying agricultural activities that are more resilient to the predicted climatic changes. (Makana Municipality, 2011). Some initiatives are already being considered such as that of hydroponic farming which is a form of agriculture by which plants grow in water instead of soil ensuring successful harvest, and determine the exact harvest time without external influences (Maboko, 2007). This farming method is one currently being considered and in the future may be implemented within the region; however this requires a large sum of capital and water resources which are already under strain. It also requires outside assistance in the form of NGOs or the government itself (Maboko, 2007). Other initiatives include the 'spekboom' (*Portulacaria afra*) rehabilitation project near Somerset East (Gon, 2011).

Furthermore considerations into the environmental impacts of Grahamstowns increasing water demand and treatment of waste water need to be better scrutinized as the regulation, storage and abstraction of water from local rivers disrupt their flow and geographical continuity which have severe consequences to the riverine biodiversity. Furthermore the disposal of even treated water has consequences for the downstream water quality, in terms of increased salinity and nutrients (Mafuta *et al*., 2011). Research shows that the ecological implications of Grahamstown's water footprint are contributing to the broader problems within the geographical area particularly the Orange-River. These problems been extensively documented, and include the introduction of a variety of alien fish species such as the biting black-fly, *Simulium chutteri*, whose aquatic larval and pupal stages have come to dominate the invertebrate fauna of the middle reaches of the river since the inter-basin transfer (e.g. O'Keeffe and de Moor 1988, Rivers-Moore *et al.*, 2007).

Environmental issues have become an increasing concern over the past few years and the municipality is becoming increasingly aware of the problems, however still lack the initiative and educational drivers to address certain problems effectively. The municipality has however supported initiatives through The Rhodes University Environmental Learning Research Centre (ELRC) and the Environmental Science department to try and communicate environmental concerns to the community of Grahamstown through community learning processes (Rhodes University, 2011d).

As part of community engagement and informing the Grahamstown communities, the ELRC hosts a number of community engaged programmes and projects, which form part of the Sustainability Commons initiative (Rhodes University, 2011d). They work in collaboration to promote better and more sustainable livelihoods through imparting skills and knowledge, empowering locals and creating solutions to issues such as waste pollution (Rhodes University, 2011d). They also work in partnership with the Department of Education and the Wildlife Environment Society of South Africa (WESSA) to ultimately form what is called Eco-schools where a holistic and participatory approach to teaching Environmental Education (EE) in schools is promoted (Rhodes University, 2011d). Overall, the main aim of the Sustainability Commons initiative is to promote healthier, more eco-friendly ways of living by trying to discover and re-discover practices that can help in achieving this goal. The areas of focus are: teaching sustainability, youth development, gardening, climate change, health, water, biodiversity, cultural heritage, waste and rural livelihoods (Rhodes University, 2011d).

5.4. Public Workshop

Our Public workshop was attended by a total of 19 people. There seemed to be a diverse group of people from a wide range of age groups. The workshop was an overall success and some useful feedback was generated from the discussions. For the five topics, driving forces and key factors were discussed for the idealistic and dark days scenarios. The feedback received is presented below according to each topic for each scenario.

5.4.1. Dark Days Scenario

5.4.1.1. Economy

Maximum growth is reached and there is not enough energy from other sources to allow us to maintain the current standard of living. There is an increase in unemployment and an overall growth in consumption increases maintenance costs and the ability to maintain infrastructure. With negative attitudes of people the economy is less successful in terms of skills development. Some limiting factors and driving forces include the deterioration of the city, exponentially growing population, high unemployment, lack of financial systems and negative attitudes.

5.4.1.2. Energy

No alternate sources of energy are available and lack of maintenance and infrastructure along with a dependence on Eskom results in more power cuts and load shedding. This has economic impacts for businesses and increases inequities for those who cannot afford generators. Commonages are degraded and over-utilised for firewood. Key driving forces and key factors include lack of will from people and the government to consider alternative energy sources, therefore missed opportunities for sustainable consumerism such that people don't change their attitudes and are wasteful along with a lack of education in efficient energy use.

5.4.1.3. Water and Sanitation

The landfill is used at a greater rate and reaches its expected capacity limit before a projected twenty years owing to mismanagement of waste, increasing populations and illegal dumping. Pit and Latrine toilets can still be found as the population increase has resulted in the continuation of backlogs. Water is scarce and becomes a privilege for many. Water cuts are more frequent and results in discontinued use of flushed toilets and increase use of pit

latrines; increasing health problems within black water areas. Key drivers include mismanagement of water, lack of funding and will of the municipality to educate people on sustainable water use, as well as other ethical and political matters and climate change.

5.4.1.4. Green Spaces

There is a decrease in green spaces, with a loss of species and biodiversity, as well as a decrease in agricultural production and food security with overgrazing and over utilization of the commonages. Key driving forces and factors established were increasing populations putting pressure on resources such as land, the lack and interest in preserving green spaces and biodiversity and rather focusing on other compelling needs such as housing and other basic infrastructure. Further drivers include lack of funding and water to upkeep certain areas, negative attitudes of certain people towards green areas, an increased reliance on social grants and climate change.

5.4.1.5. Land use and housing

Backlogs continue to increase and old infrastructure cannot support increasing housing developments. Conversion and destruction of old aesthetic houses and historical architecture in Grahamstown decreases tourism. Private infrastructure and high density developments such as flats become much more prevalent, with expansion failing to increase proportionally to growth. Increased privatisation of development results in rates no longer being paid - leading to a secondary municipality. The gap between the rich and poor is more visible. Increased overgrazing of stock results in loss of livelihoods and boundaries which leads to conflict regarding ownership of commonage. Key driving forces identified are a lack of job opportunities and unemployment, lack of funding and organisation at the municipal level and lack of expansion of infrastructure.

5.4.2. Idealistic Scenario

5.4.2.1. Economy

Poorer people are more reliant on subsistence living with Makana facilitating economic sustainability and providing incentives for using resources within Grahamstown's immediate biosphere. Better attitudes of trust develop and improve social development with local producers being recognised. Grahamstown is more skills based driven and there are more local markets generating income. Increased safety with more walkways and cycle paths

increase the stability of public transport. The city is marketed in terms of its advantages and its uniqueness, such as tourism and local production. Key drivers include a change in attitudes about self-reliance on the government with regards to social securities, better incentives provided by the municipality to facilitate this dependency and education also plays a crucial role in achieving sustainability.

5.4.2.2. Energy

Solar geysers are placed within government housing and are more prominent features of green housing and energy efficient features around Grahamstown. There is a more decentralised and universal grid consisting of solar, wind, bioenergy, biodiesel and geothermal energy. Grahamstown is independent of Eskom and more affordable electricity is available. The income generated from sales of excess goes back into the green environment in Grahamstown. More cycle paths and walkways reduce dependencies on cars, especially around Rhodes University Campus. Key driving forces and factors include: new legislation which makes it compulsory for all new households to have energy efficient measures, political will, education programmes, incentives for alternative energy use and Makana becoming a net energy producer.

5.4.2.3. Water and Sanitation

There is increased use and greater reliance on grey water and rain water via catchments through legislation in both households and businesses. The increased use of water recycling and other mechanisms such as algal ponding reduces Grahamstown's demand for water. Incentives for recycling allow the land fill to extend its capacity for over its projected period of 20 years. Waterless toilets are placed within new housing and developments - further reducing the demand for water. Driving factors include an increase in water shortages, motivating municipality to develop educational programmes on recycling of waste and water as well as a less water reliant infrastructure, such as the use of waterless toilets. Further, there is better use of funding and there are monitoring programmes to improve water quality and infrastructure.

5.4.2.4. Green Spaces

More land is allocated for green spaces particularly within the township developments and more trees are planted. Legislation requires a certain amount of green space per a certain area. There is increased removal of alien species as more funding is allocated for greening

areas. The commonages are used more effectively and efficiently alleviating poverty. The key driving forces and factors identified were the promotion of biodiversity and water conservation and the introduction of greening programmes that add value to the understanding of ecosystems. The commonages were said to have to evolve and reorganize or be scrapped.

5.4.2.5. Land Use and Housing

More housing is developed closer to the industrial areas for greater accessibility. There is more sustainable housing making use of wood and other ecofriendly materials that are well insulated. Better use is made of commonages and garden spaces for each household to help them self-sustain. People within houses are given the title deeds, thereby increasing ownership of property and leading to increasing capital. Driving forces and key factors include investment of capital but severe restrictions placed on land developers to curb personal profiteering and the normalizing of ownership. Further drivers include the development of a sustained water and sanitation supply and a better more efficiently managed development plan along with the expansion of infrastructure.

The above discussions emphasized some key factors that if managed or controlled differently could either have some idealistic or disastrous effects. Some key driving forces that emerged through a variety of these discussions included the increased role of incentives and better use of funding to maintain and expand infrastructure and get the members of Grahamstown to be more sustainable. Recycling and more environmentally friendly resources were emphasized with a huge focus on education, funding, attitudes and skills being the main drivers of change.

5.5. Scenarios

5.5.1. Dark Days

Economy and Governance

Makana fails to meet their targeted visions and initiate sustainable projects. Misallocated funding and poor service delivery and management within the municipality continue to deter the quality of life in Grahamstown. Makana does not make use of opportunities for sustainable economic growth and is faced with increasing poverty, rising costs and inadequate resources to efficiently operate infrastructure and developments. Furthermore the municipality fails to implement any LED programs pertaining to agriculture or agri-tourism as a consequence of the poor governance which fails to recognize the priority for the need of education and skills development as imperative.

The Municipality is corrupt and nepotism is rife with inadequate skills and training of staff for maintenance and management of the town. The economy continues to slump as funds are inappropriately allocated to unsustainable projects. There is increased conflict between workers and the municipality with more frequent strikes. Lack of service delivery decreases business prospective as well as the poor condition of the highways to major cities. This results in highly skilled residents and businesses leaving which further declines employment opportunities, aggravating the shortage of skilled staff.

This further reduces taxes and the inability of the government to maintain infrastructure and provide adequate service delivery. With lack of appropriate financial systems and negative attitudes, Grahamstown faces declining economic growth characterized by high unemployment, inadequate education and skills, increased crime and poverty stricken social ills which further reduce tourism.

Grahamstown will ultimately shrink in size and productivity and will become a somewhat vulnerable city inhabited by many marginalized people who are reliant on scarce resources.

Housing and Development

Due to Grahamstown's struggling economy, development and property investment in the town is stunted. In particular, a lack of funds inhibits the roll-out of the Tantyi and Fingo Village Urban Renewal project and properties there continue to become blighted. The

property behind City Hall remains an untidy vacant lot. The projected middle-income housing development on Hill 60, in Oatlands North, and Belmont Valley do not happen. Instead, there continues to be some ad-hoc flat development in the centre of Grahamstown but it is of a poor quality that destroys historic buildings, diminishing the town's well-known aesthetic qualities. The conversion of historic buildings into flats increase the use of resources such as water and energy. Some subsidized housing and commercial development is built on the East Commonage but on a smaller scale than originally envisioned. The housing is not mixed-income as originally intended and thus does not advance the social sustainability of Grahamstown. The quality of materials used in the development of subsidized housing is poor with insufficient energy and water hindering the growth of many developments. Backlogs are still significantly evident despite migration of people from the area.

Rhodes

The projected growth target of 2% per annum for Rhodes University will continue to relapse over the next 20 years much like 2010. This results due to the substantial reliance that Rhodes University has on Government funds. This leads to an average growth rate of 4% of the next 20 years resulting in Rhodes reaching their maximum capacity according to their spatial design as soon as 2020. This has vast implications on the university's infrastructure and staffing as well as Rhodes's ability to upkeep its residential name.

Due to the increased demands on new buildings and staff, Rhodes compromise their own and international expectations by building inadequately and unsustainably to try and meet the increased demands on time. Unfavourable staff: student ratios arise, and departments fail to meet the quality that Rhodes conducts. Despite the efforts to try and encourage increased ratios of postgraduates the university fails to provide adequate space and facilities with certain departments that are unable to expand. This leads to a decrease in completion rate of postgraduates over the years, making Rhodes an unattractive place of study for postgraduate students.

The municipality struggles to meet the needs of Rhodes growth with regards to service delivery. Rhodes is forced to look into private and other sources of energy and transporting of water at extremely high costs. This leads to fees having to substantially increase more than their annual 10%, leading to less students being able to afford the luxury of attending Rhodes which further dampens their budgets. The collaboration and relationship with the

Grahamstown community deteriorates leading to less involvement in community projects due to minimal success rates.

Other conflicting interests occur between that of postgraduates and undergraduates as institutional changes and maintenance are not managed simultaneously, creating dysfunctionalities within the structure of the University. Many of the new developments that take place over the years such as a new life sciences building, school of languages and current lecture theatres will be underutilised by undergraduates resulting in suboptimal use of building spaces and infrastructure. Furthermore no new developments within undergraduate programmes are initiated due to concerns of further increasing student numbers too rapidly.

Growth of the University is stagnated and there is a decrease in the quality of standards Rhodes once offered making Rhodes an unattractive place for investment and prospective students.

Water, Waste and Sanitation

The government continues to face backlogs with regards to providing fully flushed toilets. With more increased seasonal flooding current sewer systems and infrastructure are unable to cope resulting increased grey and black water being deposited into the streets. Without a full grey water management nor a formal pollution contingency plan in place this has serious health implications within certain areas. Harsher droughts result in increased water shortages and cuts, with the western rural part of Grahamstown being more drastically affected. The fully flushed toilets the municipality have installed in households over the years are of little use due to the increased scarcity of water which also further worsens the black water problems.

Continued migration of people from surrounding areas increase the town's demand for water, and with the continuing deterioration of existing infrastructure, water rates will increase drastically in order to continue supplying water to the new developments both informal and formal. The inability of the master water development plan to be completed due to lack of funds result in continued deterioration of infrastructure. Furthermore new infrastructure is not used to its capacity due to the municipalities failure to acknowledge that Grahamstown has met its limits in terms of expansion of catchment areas and the building of dams. Failure to upgrade and maintain infrastructure results in the continuation of poor water quality due to the aging remediation plants such as Waainek Water Treatment Works.

Despite collaborations with IWARS continued lack of recycling initiatives and incentives result in the landfill site exceeding its capacity before projected and illegal dumping becoming more frequent. The municipality although improving their ability to provide waste services such as refuse collection, sanitation and water over the years fail to simultaneously education the community on how to recycle, use water efficiently and properly dispose of waste which leads to a decrease in the quality and standards of living.

Energy

The wind farm will not go through as a result of further appeals and unsatisfactory results from the geology assessment. Grahamstown will continue to be dependent on non-green energy and will not reap the benefits of energy security that the wind farm would provide. Grahamstown will continue to suffer from energy backlogs as a result of Eskom's capacity constraints. This has detrimental effects for the productivity of businesses in the city. The heavy reliance on fuel wood as an energy source will continue and as a result so too will there continue to be pressure on woody species as a natural resource.

Environment

Makana Municipality fail to consider or educate communities on climatic change patterns. Communities are therefore more vulnerable to periods of excessive drought and flooding. These climatic variations cause a decrease in agricultural productivity and food security which increases the dependency of the town on more expensive outsourced produce. The increase in unemployment as a result of the decrease in agriculture production puts more people into poverty, increasing the demand on local resources further deteriorating the environment. Lack of adequate monitoring and education programmes along with the inadequacy of the municipality result in the loss and deterioration of endemic species, and more species becoming vulnerable.

Over grazing and overutilization of commonages aggravate the loss in agricultural production and biodiversity as a consequence of land degradation. Resources further decline as more land is converted to try and account for lost production due to the poor soil quality of as a result of overgrazing. Priorty of funding is allocated mainly to service delivery and housing with the environment not being highly considered. The municipality also fails to consider the environmental impacts of increased water demand which leads to deterioration in broader ecological effects which ultimately affect the quality and quantity of water provided.

Increased use of fuelwood due to frequent power cuts all further have further negative impacts on the environment

Furthermore the initiatives of Rhodes University and the Environmental Learning Research Centre are unsuccessful due to the low level of education and there is difficulty in terms of communicating environmental concerns and environmental education to the community. As a result of people not taking interest and not doing what they are advised.

Overall the unsustainable use of resources consequently results in communities not being able sustain their livelihoods because there are no longer resources to support them and those who cannot afford to pay for basic resources migrate.

5.5.2. Status Quo

Economy and Governance

Makana Municipality as a result of social pressures invests in more sustainable and economically viable projects. Their visions are still however compromised and inadequate skills within certain sectors limit the viability and sustainability of certain projects. Certain projects such as LED programs pertaining to agriculture or agri-tourism are implemented which alleviate employment and increase profitability, however lack of education limits the effectiveness of these projects. The reduction in unemployment does however promote social growth allowing citizens the affordability of producing their own crops, reducing the cost of living. Only sections of the N2 are dual carriage, whereas many lengths of the highway remain single carriage and are heavily potholed in some regions. Therefore there are still limited opportunities for new industries.

The municipality recognizes that there are staff capacity shortages within certain sectors however the municipality is unable to hire as many skilled people as needed due to a lack of resources and Grahamstown's relatively remote location. The municipality flounders and is unable to make breakthrough achievements which will liberate it from focusing only on emergencies and service delivery. Tourism is only largely evident during the annual National Arts Festival period and therefore overall employment is still high and seasonal. Education is still a major inhibiting factor towards economic growth and there is still conflict between the municipality and the community, particularly regarding its reputation of mismanagement of funding.

Standard of living is similar to that of today with a similar size and level of productivity due to new economic developments being limited by lack of education and resources.

Housing and Development

There are some small successes in the beautification of Tantyi and Fingo Village but it cannot completely mask the poverty there. The vacant land behind City Hall is developed into student flats as there is little market demand for more office space in Grahamstown. There is some cookie cutter development on Hill 60, within Oatlands North, and in Belmont Valley with heavy ecological footprints. For example, extensive impervious surfaces increases stormwater runoff and the Kowie River Catchment's water quality continue to decline. The new developments are surrounded by tall fences and barbed wire and laid out in a cul-de-sac form so that they do not integrate into the surrounding community and rather reinforce a culture of fear in the town. On the East Commonage there is some marginal commercial development and some mixed-income housing along Raglan Road but not enough to meet demand. Due to the overstretched budget, poor craftsmanship and quality of materials diminishes the success of the new development. As a result, the community's sense of pride for the development is hindered and the development is poorly maintained.

Rhodes University

Rhodes University takes better control of its growth rate and continues to grow at 2% per annum. Sustainable growth is ensured through its proportion of post graduate students in the short term, from its current 24% to 30% by 2013. The increase in postgraduate students extends the current design capacity of the Spatial Development Framework of 10000 students to beyond 2031. The university will expand its staff capacity particularly to assist with postgraduate studies. Given government's multi-term expenditure framework, it should be possible to calculate public subsidies with a measure of certainty and to also project tuition fees and other income, as well as expenditure with some certainty. On this basis The University develops realistic three-year budgets. These budgets will continue to allow for more efficient spending plan for adequate staff and infrastructure for both undergraduates and postgraduates. The increase in postgraduates will diminish the need for new residences and despite minimal increases in undergraduates Rhodes will still implement new undergraduate developments in order to make room for efficient use of postgraduate developments in certain departments. Growth will be slow and decision making will be meticulous.

The University will continue to provide assistance to the municipality particularly with many postgraduate housing reliant on the service delivery of municipality. Rhodes acknowledges that its growth is nearing towards the carrying capacity of the town and begins to invest in more sustainable measures as it is not fully able to rely on the municipality. The University is forced to increase its budget and funds toward more expensive greener measures, such as the use of solar panels on every north facing building as well as implement the use of rainwater tanks for cooking and showering in residences, some of which will be aided by the Greenfund. The remaining funds will have to come from an increase in fees, making Rhodes University less affordable.

Rhodes learns from their past mistakes made in the past, specifically regarding the development of the new residences which were built without a scoping report and have since faced some structural implications. Rhodes grows at an extremely slow pace of change but becomes more research orientated but still however limited by finances.

Water, Waste and Sanitation

The municipality continues to provide more people with access to fully flushed toilets and the systems as well provide all erven with access to water on-site. Backlogs on water and sewage continue to increase due to increased migration of people from neighbouring towns and farmlands and full replacement of removal of all bucket toilets and pit latrine sanitation is never complete.

Furthermore water shortages and cuts continue despite the completion of replacing and upgrading water and waste treatment plants as part of the Master Water Development Plan. The inability of Makana to retain the necessary human resources to operate and maintain the functioning of the plants is inadequate. Collaboration with the University and other institutions such as the Working for Water programme that helps to improve the quality and supply of water and helps better waste and water recycling initiatives that help improve the sustainability of Grahamstown.

Facing increasing climatic variability which causes more flooding and droughts, the municipality provides the informal settlements with additional rain water tanks and rolls out programmes to educate people on using water sustainably. The lack of funding and misuse of finances over the years, however, have resulted in only a slight increase in the level of

education and therefore their efforts make only a slight improvement to the efficient use of water which is not used efficiently an often becomes unusable. Fully flushed toilets are not sustainable during droughts with more frequent water cuts in the eastern part of Grahamstown. The divide between the east and west is more prominent with inequality and a sub standard of living.

Energy

Although the wind farm is approved, successful appeals result in fewer turbines built than the 8 that were initially approved. As a consequence, the wind farm produces less than 24 megawatts of power and cannot completely supply all of Grahamstown's electricity needs. Grahamstown will still be dependant to some extent on non-green energy and will not have full energy security. Yet, the wind farm will greatly assist in supplementing the town's electricity supply. However, the town's ability to steadily receive the electricity will depend on other infrastructure developments such as the repair of old cables and substations and the connection of households to the electrical grid. Very few other initiatives take off. However, solar panels are installed but by only those who can afford them. Furthermore their power supply is on a very small scale (to generate power to the building itself, without storing excess power).

Environment

Makana Municipality in collaboration with Rhodes University and the Environmental Learning Research Centre (ELRC) communicate environmental concerns to the community of Grahamstown through community learning processes. However these initiatives are not sufficient to prepare communities for the climatic variability as a result of climate change. Communities therefore still suffer from loss of agricultural production and employment decreases. Despite initiatives lack of education and migration continues to hinder the development of sustainable resource use. As a result some species are protected however biodiversity is still vulnerable with many species still declining. Commonages are not being used efficiently and parts are allocated to housing developments. The informal settlements continue to expand and areas which were once protected by distance are now also susceptible to degradation.

Without the help of outside assistance in the form of NGOs or the government as well as inadequate water resources, there is little hope of establishing hydroponic enterprises. Furthermore inadequate maintenance of infrastructure continues to have broad ecological effects on surrounding areas.

5.5.3. Idealistic

Economy and Governance

Makana Municipality facilitates economic sustainability and LED programs pertaining to agriculture or agri-tourism through skills development and education initiatives. The municipality also provides incentives for using resources within the immediate biosphere of Grahamstown. Poorer people living within the rural communities are more reliant on subsistence survival, decreasing their living costs. Increased attitudes of trust develop over the 10 municipal election cycles with better management of funds allowing the municipal budget to be fully spent each year in a timely manner. Educational incentives result in Grahamstown becoming more skills based driven and there are more local markets generating income and employment. As a result the standard of living increases.

Increased safety with more walkways and cycle paths, which are alight at night, increase the stability of public transport. The city is marketed in terms of its advantages and its uniqueness which include tourism and local production. The expansion of the N2 and better maintenance provide opportunities for local producers to expand their produce distribution.

The capacity of staff shortages within the Grahamstown decrease through the education programs employed by the municipality which educate and provide skills to the numerous unemployed citizens within the rural area. The Municipality also provides free transport to and from the major business areas, which assists in economic empowerment for the poor people. Better standards of living and sustainable growth initiatives allow Grahamstown sustainably increase in productivity and size.

Housing and Development

The Tantyi and Fingo Village Urban Renewal project, buoyed by a more prosperous Grahamstown, is successful and inspires homeowners to invest in their neighbourhood. It becomes cleaner and greener and spurs real social integration. Housing tenure is regularized

in the informal settlements spurring private development and enabling the environment to recover from overly intensive land use. Some subsidized housing is built between Rhodes and the industrial area. The housing is in high demand because of its proximity to work. Behind City Hall, there is a new office building housing budding IT companies. Compact student housing is still developed in the downtown area but a stricter zoning and land use scheme ensures that historic buildings are protected and that new development matches the existing character of Grahamstown. The improved aesthetics and compactness of the area encourage walking rather than driving. Mixed income housing with low environmental impact is developed on Hill 60, Oatlands North, and Belmont Valley. Solar hot water systems and rain tanks are a common feature of new homes.

Grey water systems irrigate the new surrounding community gardens. The municipality's new and expanded infrastructure is able to absorb the new development. Some of the new developments even feature waterless toilets, made desirable by the promise of low water bills. The new developments are also landscaped to absorb the erratic, intense rainstorms that are more common now and slow down the stormwater runoff they created. The layouts of the developments are also designed to have larger garden plots so that residents have the option of growing their own food. The new neighbourhoods link with the old encouraging residents to walk more rather than rely on their automobiles for every errand.

The East Commonage is transformed into a bustling and vibrant mixed-use community. Flats look over new commercial development and there are blocks of townhouses and a variety of mixed-income housing. The new community is flanked with sport fields and community gardens, also irrigated by grey water systems from the new housing. Rainwater tanks and solar hot panels are also a common feature. The new buildings are built with locally sourced brick and other low impact building materials.

Rhodes

The initiatives and goals to increase postgraduate students from 24% to 30% in 2013, and then to a further 40% over the remaining years are achieved through new developments and programmes similar to the 2011 advances in Masters programmes and new honours specialisations. Rhodes continuously gives attention to identifying and potentially introducing new postgraduate and research niche areas and programmes. Post graduate growth is

facilitated in a top down fashion driven from the bottom up. By focusing in introducing postgraduate programmes in departments that have a high driven passion for research and postgraduate supervision, completion rates of postgraduates improve. The need for additional funds due to decreased growth rates and less external government funding is compensated through increased funding for postgraduate education which is more fully appreciated on the government's part.

Possible funding initiatives through the municipality and other bids such as the UNESCO Institute for Water Education and Research may allow relevant research to Grahamstown's water and other debilitating sectors possibly alleviating some of the problems. Better collaboration of the university and municipality has develops through increased participation and the development of the Rhodes IDP, allows for this better communication. This allows for better planning on behalf of Makana to supply the necessary services for new and old infrastructure of Rhodes. Furthermore increased community engagement on Rhodes' behalf, aids in educating the community particularly with regard to being more sustainable. An increased postgraduate student proportion initiates the development of more postgraduate facilities such as a Postgraduate Learning Cafe at the ground zero of the library as well as a postgraduate centre. The need for postgraduate residences will decrease due to the increased ability of the municipality to supply services, therefore allowing the university to rely more on the town for student accommodation. This decrease in demand for residences and dining halls allows money to be used for more productive academic purposes such as the upgrading and expansion of departments and faculties and more sustainable infrastructure such as solar panels and rainwater tanks.

Furthermore, the quality of undergraduate education is not undermined due to the increase in staff capacity funded by postgraduate studies as well as fees and funds such as The Sandisa Imbewu fund. Student staff ratios therefore remain favourable and more efficient use of current buildings is implemented as well as additional buildings such as a new life sciences building and a school of languages.

The slower growth of Rhodes University allows for other funded developments such as implementation of a veterinary sciences programme. A shuttle service is also implemented to reduce the number of cars on campus, thus less space for parking is required. The new developments for both postgraduate and undergraduate are all guided by a revised long-term campus development plan that guides and allows for effective and responsible use of

available land and where we site new buildings and facilities, therefore remaining a beautiful campus that has over the years incorporated environmental considerations.

Water, Waste and Sanitation

The municipality recognises that upgrading RDP houses with fully flushed toilets is unsustainable during severe droughts and therefore implements waterless toilets in any new developments. Furthermore legislation requires surrounding industries to use grey water as oppose to fresh water, therefore there is incentives for industries to collect grey water from the communities. This along with waterless toilets eliminates human waste as a problem as well as grey and black water problems. The municipality recognises its inability to fund the master development plan and focuses its funding toward upgrading the deteriorating infrastructure as well as initiating a number of training skills, providing educated employment and therefore better maintenance and management of operations.

Further strategies are implemented to combat for climate change and for the more sustainable use of water sources. These strategies include increased education with regards to harvesting of rainwater and recycling of wastewater. Increased use of rainwater tanks and other water-stores are utilised to capture rainwater efficiently, decreasing the demand for water.

Furthermore collaboration with IWARS and the Masihule Project, ensure the efficient and environmentally sustainable disposal of waste. There is also the introduction of incentives to recycle water and waste allowing the landfill to be sufficient for more than 20 years and reducing illegal dumping. Further through initiatives of the Amathole Waterboard the Blue Drop System is implemented as a regulatory tool and certification system which monitors the quality of drinking water.

The increased in post graduate studies aid in other sustainable initiatives similar to that of the Galela Amanzi project which installs rainwater tanks in key disadvantaged locations in Grahamstown providing water for irrigating community vegetable gardens, cooking and drinking. Some future initiatives may include waste management of sewage and organic material that provide opportunities for SMMEs such as renewable energy (e.g. biomass extractors and digesters) and the production of organic fertiliser. The university and municipality work collaboratively helping solve any waste and water related issues efficiently and sustainably. Furthermore institutions such as Working for water will continue to remove and eradicate alien species further increasing run off of water. The increased skills and

technical capacity of workers as well as sustainable education of the community, aid in the efficient use of water create better access to high quality services improving the overall standard of living.

Energy

All 8 approved wind turbines are built on budget and on schedule. They will effectively supply nearly 70% of Grahamstown's peak winter power demands making Grahamstown the first "green city" regarding power consumption. The farm will also give Grahamstown increased energy security and make it less affected by load shedding. Makana's Winds of Change trust fund associated with the farm will put money back into local education initiatives. Furthermore the farm will also offer research opportunities for Rhodes University. The wind farm project may spark increased interest into other green energy initiatives such as; biodiesel, methane, bioenergy, solar and geothermal. This may result in a more decentralised and stable grid. Ultimately Grahamstown becomes a net energy producer which it can then sell back to Eskom. Other small scale initiatives take off such as solar geysers being fitted to government housing as well as the development of foot and cycle paths which will reduce dependencies on cars.

Environment

Makana municipality in collaboration with Rhodes University educate the various communities of Grahamstown about the importance of biodiversity and the detrimental effects that climate change is likely to have on biodiversity. The local communities are helped to understand that if they continue to harvest resources in an unsustainable manner they will not only lose some of their important everyday resources such as fuel wood and medicinal plants but they will also make what's left of the biodiversity even more vulnerable to the impacts of climate change.

Rhodes University also makes available people to educate the local communities about the different species in the area and also about which species are best to harvest at which time of the year. People can also be taught how to harvest certain species in a manner that will not damage the plant. This will give people more insight about the species around them why they should not harvest species before they get a chance to regenerate.

As a result of the communities being more environmentally educated combined with increased funding and initiatives from the municipality educating and training the community allow for the success of LED projects. Furthermore a decrease in the demand for water due to recycling initiatives allow for water to be available for projects such as Hydroponic farming. With an increase in employment and standard of living as communities become more self sufficient there are incentives for locals to look after the land and its resources. As a result of this the commonages are taken better care of and areas that were badly degraded are rehabilitated back to maximum functionality, more land is allocated to green spaces especially in the townships, trees are planted along roads and people begin to treat their backyards as green spaces.

The development of skills allow for infrastructure to be properly maintained as well as the decrease in water demand improve the downstream and negative impacts on the broader ecological environment, enhancing water supplies and quality.

5.6. Scenario Analysis

In examining our scenarios it is clear that ignorance and an inadequate capacity to monitor and control certain drivers may result in adverse effects for Grahamstown. On the other hand positive attitudes and effective skills management can drive Grahamstown to become a thriving, successful and sustainable city. Although some key drivers such as external economic conditions and positive attitudes are beyond the scope of Rhodes University or the Municipalities control, certain decisions can extend Grahamstown's capacity to cope.

The scenarios indicate that education and political will are clearly key drivers in the outcome of Grhamstown's future. The ability and capacity for the municipality to think sustainably and cleverly about how they use their resources and finances will determine whether outcomes fall into the dark, status quo or idealistic scenario. Furthermore it is imperative that there is communication and collaboration within the community, particular regarding Rhodes University and the municipality. It is in Rhodes University's best interest to help and aid the municipality where they exhibit weaknesses. Postgraduate studies accompanied by incentives given by the municipality for research in certain areas may be very beneficial. The municipality must however be supportive and see Rhodes as a strong partner in the city.

Positive attitudes from the municipality and a clearer view of future problems and concerns will assist in the prioritization of initiatives. Priorities should be; education, environmental conservation and LED's. If the municipality, with the assistance of Rhodes University, can improve the education and skills development within Grahamstown the city as a whole could benefit and become more sustainable. Through better skills and education, more sustainable initiatives could be enforced such as rainwater harvesting and the recycling of water and waste. Furthermore skills development would ensure the maintenance of infrastructure and promote efficient high quality service delivery. This would not only increase employment, creating more tax revenue, but also increase the overall standard of living within Grahamstown.

Future weaknesses and constraints need to be addressed particularly in the face of climate change. With increased droughts and flooding the municipality needs to consider the outcomes of both flooding and droughts. The feature of waterless toilets and hydrophonic farming would be ways to ensure seasonal agricultural outputs and a less dependence on water supplies.

Land use techniques also need to be advanced with commonages being developed with a certain number of people using a proportion of land to decrease use pressures and ultimately degradation. Idealistically the commonage would be used for housing development but green spaces for farming and domestic livelihoods would be incorporated within this and then allocated to a specific number of users. The ability of the municipality and authority to enforce rules and regulations will play a critical part in the success of many developments.

Although many initiatives to become more sustainable are expensive and finances are limited it needs to be recognized that they will decrease costs in the future. Sustainable development needs to ensure that goals are long term and are not driven by current social pressures. If Grahamstown can adopt more sustainable measures now by making more appropriate long term decisions residents will ultimately be much better off in 20 years time.

6. CONCLUSIONS

While it is recognised that, the future of Grahamstown is unforeseeable and that scenario building as a predictive tool is only speculative, valuable conclusions can be drawn from as study such as this one. Such conclusions may help key decision makers such as the Makana Municipality or Rhodes University, make more informed choices.

The study does indeed explore a wide range of possibilities for the various aspects of Grahamstown. However it was established that the idealistic scenario showed various trends of sustainability that were not present in the status quo scenario and in many ways contradictory to the unsustainable dark days scenario. The fundamental drivers that affect the changes across scenarios were identified as; social attitudes, political will and education levels.

It is clear that if we seek to attain sustainability in Grahamstown as illustrated in the idealistic scenario significant steps need to be taken to positively direct the drivers that are within our control such as better management of allocated funds. Much of this responsibility falls to leaders and decision makers in the community, however residents should also take initiative in trying to effect positive change. Sustainability is about ensuring our ability to meet our needs in the future, and in many ways this may mean making provision today despite the short term costs and efforts required.

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8. APPENDIX

A. Maps of Grahamstown

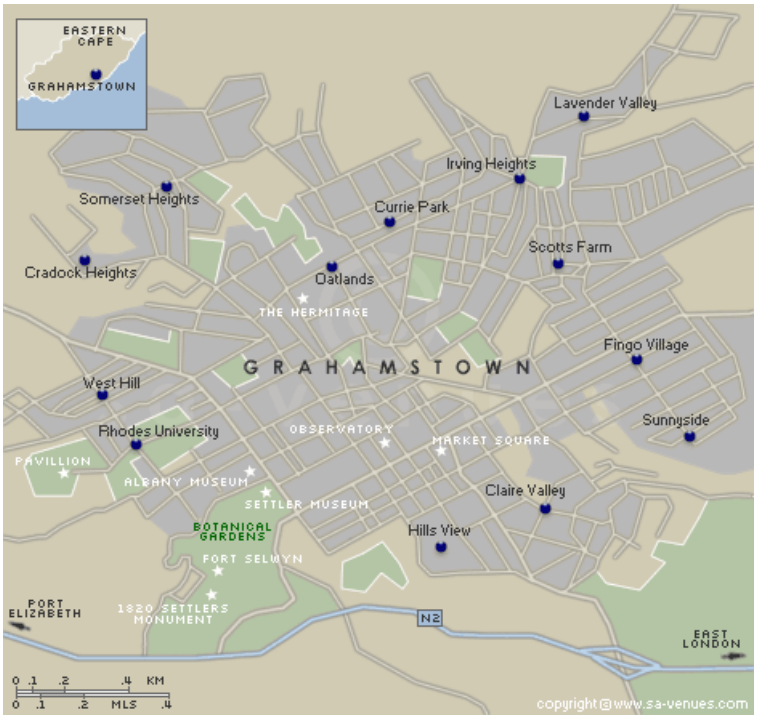

Figure 1. Map of Grahamstown.

Source: (http://www.sa-venues.com/maps/eastcape_grahamstown.htm)

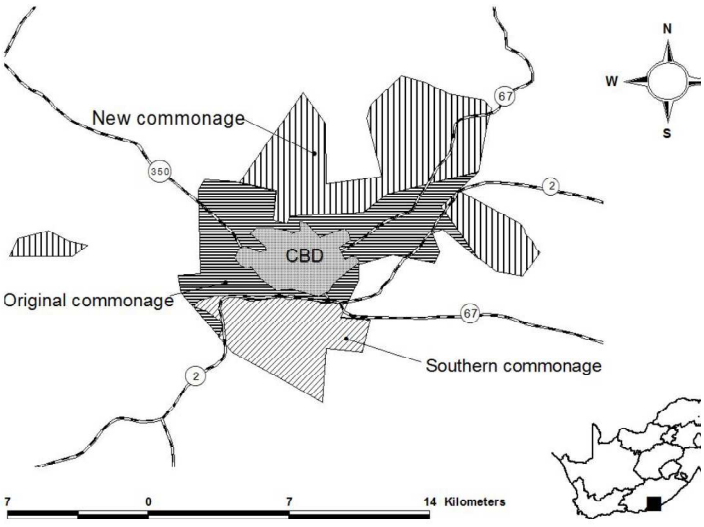

Figure 2: The Grahamstown Commonage.
Source: Davenport, 2008

B. Public survey

The objective of this survey is to determine what Grahamstown residents are the most concerned about now and in the future.

The results of the survey will be used to inform the development of future scenarios of Grahamstown as part of the concluding chapter of a local State of the Environment Report the 3rd Year Rhodes' Environmental Science students are writing. Makana Municipality will be presented with the report.

Your participation in this survey is COMPLETELY ANONYMOUS & CONFIDENTIAL.

1. **Age Group**

   13-18
   19-25
   26-45
   45-60
   Over 60

2. **How long have you lived in Grahamstown?**

   Less than a year
   1-5 years
   6-10 years
   10-20 years
   More than 20 years

3. **What area in Grahamstown do you currently reside?**

   - ☐ Claire Valley
   - ☐ Currie Park
   - ☐ Cradock Heights
   - ☐ Fingo Village
   - ☐ Hills View
   - ☐ Irving Heights
   - ☐ Lavender Valley
   - ☐ Rhodes University
   - ☐ Oatlands
   - ☐ Scotts Farm
   - ☐ Somerset Heights
   - ☐ Sunnyside
   - ☐ West Hill
   - ☐ Other: _____

4. **What is your household's monthly income?**

   Less than R800
   R801 - R1600
   R1601 - R3200
   R3201 - R6400
   R6401 – R12000
   Greater than R12000

5. **How long do you plan on staying in Grahamstown?**

- ☐ 0-5 years
- ☐ 6-10 years
- ☐ 11- 20 years
- More than 20 years

6. **On a scale of 1-5 how much has Grahamstown changed since you have first lived here?**

1- no changes
2- slight changes
3-moderate changes
4- significant changes
5- drastic changes

7. **If you ticked '3' or above on Question 6, can you list some of these changes?**

_____
_____
_____

8. **What is your level of satisfaction with the provision of these services?**

A. Provision of Water:

Are you:	Satisfied	Neutral	Not Satisfied

B. Water Quality:

Are you:	Satisfied	Neutral	Not Satisfied

C. Supply of Power:

Are you:	Satisfied	Neutral	Not Satisfied

D. Sanitation- Collection of garbage

Are you:	Satisfied	Neutral	Not Satisfied

E. Sanitation- Collection of recycling

Are you:	Satisfied	Neutral	Not Satisfied

F. Traffic- The level of traffic

Are you:	Satisfied	Neutral	Not Satisfied

G. Road Conditions

Are you:	Satisfied	Neutral	Not Satisfied

H. Pedestrian Walkways and Crossings

Are you:	Satisfied	Neutral	Not Satisfied

I. Public green spaces

Are you:	Satisfied	Neutral	Not Satisfied

J. Public education

Are you:	Satisfied	Neutral	Not Satisfied

K. Stormwater Control

Are you:	Satisfied	Neutral	Not Satisfied

L. Public Health Care

Are you:	Satisfied	Neutral	Not Satisfied

9. <u>What are the most important factors that will influence your willingness to stay in Grahamstown or affect Grahamstown's future prospects?</u>

A. Employment Opportunities	Major Factor	Minor Factor	Not a factor
B. Economic Development	Major Factor	Minor Factor	Not a factor
C. Regional Transport Routes & Transportation	Major Factor	Minor Factor	Not a factor
D. Diversity of Housing Types	Major Factor	Minor Factor	Not a factor
E. Affordable Housing	Major Factor	Minor Factor	Not a factor
F. Water Availability	Major Factor	Minor Factor	Not a factor
G. Power Supply	Major Factor	Minor Factor	Not a factor
H. Health Care	Major Factor	Minor Factor	Not a factor
I. Quality of Public Education	Major Factor	Minor Factor	Not a factor
J. Quality of Life-Crime	Major Factor	Minor Factor	Not a factor
K. Quality of Life-Sanitation	Major Factor	Minor Factor	Not a factor

10. <u>Would you support the following policies in Grahamstown?</u>

A. Increasing density of development in the center of town?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

B. Increasing development on the edges of town?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

C. Protecting public spaces from development?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

D. Requiring energy efficiency measures in new construction?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

E. Requiring water efficiency measures in new construction?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

F. A wind farm just outside of town?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

G. A solar farm just outside of town?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

H. Investment in public transport around town?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

I. Investment in public transport to Port Elizabeth?
(1) Strongly support (2) Support (3) Neutral (4) Oppose (5) Strongly Oppose

11. <u>Do you think you will have a better standard of living in the next 20 years?</u>

Yes No Unsure

<u>OPTIONAL QUESTIONS</u>

12. <u>What do you think are Grahamstown's strengths that could help the town prosper in the next 20 years?</u>

_____

_____

13. <u>What do you think are Grahamstown's weaknesses that will be a disadvantage to the town in the next 20 years?</u>

_____

_____

14. <u>What do you envision Grahamstown will look like in 20 years?</u>

_____

_____

C. Public workshop

1. Advertisement in *Grocott's Mail*.

Title: Future Scenarios of Grahamstown – A Public Workshop

When: 6:30-8:30 PM

Where: Grahamstown Public Library Hall, Hill Street

What: Rhodes' Environmental Science students seek public input on the future of Grahamstown. What would Grahamstown residents like to see in 20 years? Students will first present 3 draft scenarios and then ask residents for feedback. The final project will be delivered to Makana Municipality.

Who: Samantha Munro at g09m0311@campus.ru.ac.za or 083-448-6066 or

Shannon Stone at shstone82@gmail.com or 076-917-4813

2. Advertisement Posters