CHAPTER 6: AN ASSESSMENT OF SUSTAINABLE COMMUNITY PLANNING AND DEVELOPMENT

Introduction:

There are a number of methodologies and tools to assist in gauging progress made towards sustainable development, but there is no standard practise that is generally accepted and applicable across all regions. Yet there are some broad approaches and methodologies that are commonly agreed on to be effective. Indicators so measure sustainability is one such approach.

Figure 6.1 provides a graphical overview of the organization and structure of this chapter.

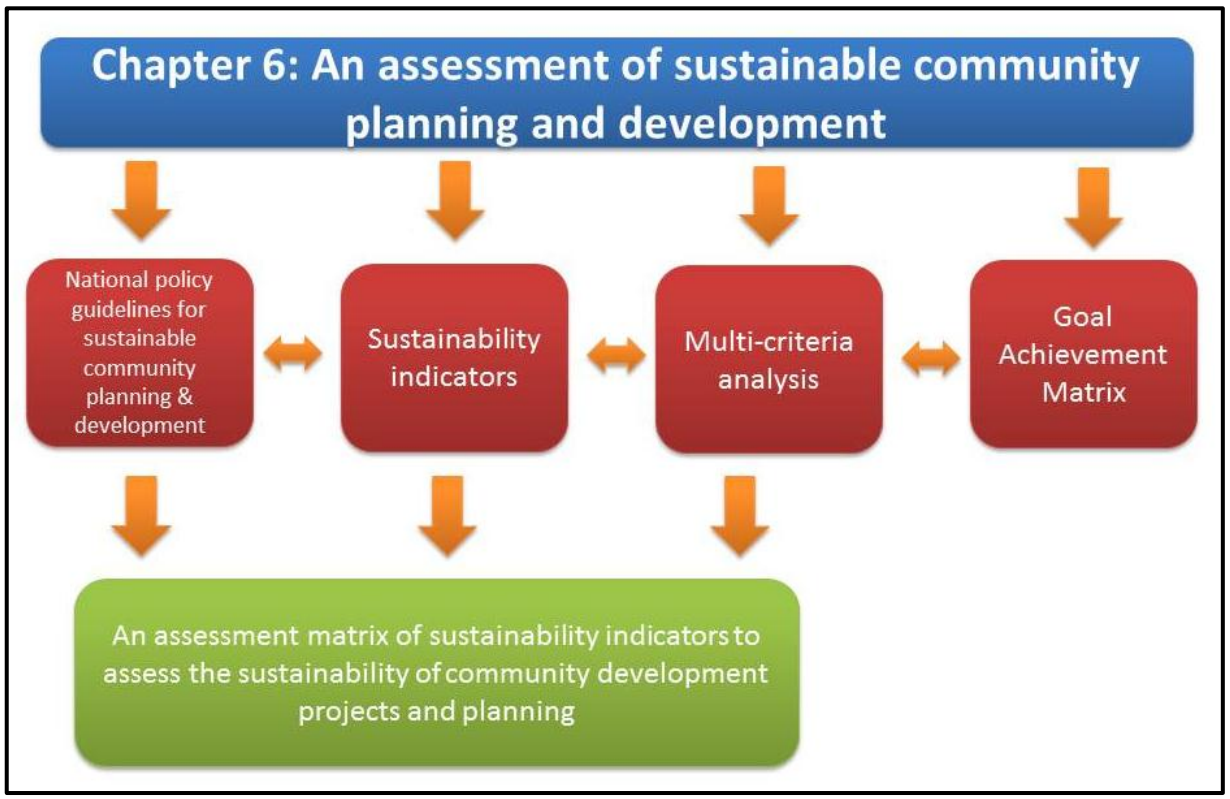

Figure 6.1: A concept map of Chapter 6

Source: Own construction

6.1 National policy guidelines for sustainable community planning and development

A hierarchy of strategic goals and targets for sustainable development exists. The Millennium Development Goals and the Johannesburg Plan for Implementation summarises these goals on a global level. The eight Millennium Development Goals serve as the framework for sustainable development by "setting social equity goals and targets that aim at contributing to economic development while ensuring environmental sustainability". (Department of Environmental Affairs and Tourism, 2008) The National Framework for Sustainable Development (Department of Environmental Affairs and Tourism, 2008) argues that these global goals are supported and augmented at the regional level through multi- / bi-lateral agreements and strategies and at national level by domestic strategies, policies, programmes and plans which not only give effect to international and regional obligations, but also reflect national priorities and goals".

6.1.1 The National Framework for Sustainable Development

South Africa had various strategies and programmes that included sustainable development considerations, but there was no overarching, all-inclusive national strategy for sustainable development. The National Framework for Sustainable Development (NFSD) of 2008 was created to address this void. The NFSD gives a broad framework for sustainable development that serves as a basis for developing national strategies and action plans. (Department of Environmental Affairs and Tourism, 2008)

The NFSD's purpose is to give direction to South Africa's national vision for sustainable development and to highlight interventions to re-orientate South Africa's development path. The Framework does not give detailed strategies and actions for sustainable development, but rather "proposes a national vision, principles, trends, strategic priority areas and a set of implementation measures". (Department of Environmental Affairs and Tourism, 2008)

Social partners and all organisations of state within the national, provincial and municipal levels can use the NFSD to refine and realign the policies and decision-making systems so that a coherent and consistent national system aimed at promoting sustainable development is created (Department of Environmental Affairs and Tourism, 2008). In order to facilitate this, a set of indicators will be developed, capacity building will be undergone and a national sustainable development strategy will be developed.

The NFSD identifies gaps, challenges and constraints on performance on national level. These gaps and challenges are identified by means of reigning trends and used to direct initiatives. Not only constraints in the spheres of society, economy and environment are identified, but also institutional challenges. Pathways and intervention to close the gaps and achieve targets in strategic focus areas are then listed. The five strategic focus areas that were identified are listed below in ***Figure 6.2***.

Figure 6.2: Five strategic focus areas for sustainable development
Source: Own construction from the Department of Environmental Affairs and Tourism (2008)

Focus area four is the most applicable to sustainable community development. The NFSD states that for settlements to become sustainable:

- Neighbourhoods should be mixed-use and socially diverse.
- Neighbourhoods should be planned so that residents can walk or cycle to work in safe and secure environments.
- Residential living should co-exist with urban agriculture and local food markets.
- Buildings should be designed to generate more energy than they consume, use water efficiently and recycle solid and liquid waste.
- Urban infrastructure should be designed taking into account new sustainability design criteria.
- Investments should be made in public transport and non-motorised transport.

- Access to health facilities should be improved. (Department of Environmental Affairs and Tourism, 2008)

While progress has been made in terms of water provision and access to basic education serious challenges still exist, such as combating major diseases, reducing infant mortality, linking sustainable resource use to poverty alleviation, etc. Because of this there are certain proposed interventions and actions within this strategic focus. These interventions and actions are listed in ***Table 6.1***.

Table 6.1: Proposed interventions and actions for creating sustainable human settlements

Intervention	Action
A shared approach to sustainable human settlements	• Support the spreading interest in sustainable human settlement strategies. • Mixed land-use regulations. • Shorten the distance between work and home. • Enhance the quality of the natural environment. • Match the scale and location of settlements to the opportunities. • Change by-laws to ensure that building plans include resource efficiency measures. • Improve the safety and accessibility of settlements. • Prevent urban sprawl by bringing the poor back into the city.
HIV/AIDS and TB	• Strengthen campaigns to raise awareness. • Improve the Directly Observed Treatment Short Course strategy.
Linking sustainable resource use, poverty eradication and Local Economic Development (LED)	• Incorporate sustainability and a livelihoods approach into LED strategies. • LED projects should focus on mobilising existing resources, social networks, local saving and skills. • Combine BEE procurement procedures with green procurement criteria that aim to reduce consumption of fossil fuels.
Safe and efficient public transport	• Increase investment in public transportation. • Provide new services and upgrade existing services. • Gradually convert to biofuels.

Rural sustainable settlements	• Rebuild rural economies via soil rejuvenation strategies. • Introduce new market opportunities. • Land reform and rural enterprise development.
Waste management	• Promote waste recycling.

Source: Own construction from Department of Environmental Affairs and Tourism (2008)

In order to measure the progress made towards sustainable settlements and sustainability as a whole the NFSD (Department of Environmental Affairs and Tourism, 2008) states that "indicators of sustainable development need to measure changes in social, economic, environmental and institutional conditions in society over a relatively long period of time". The NFSD goes on to say that these indicators should not only provide a static picture for different sectors, but should "reflect the state of dynamic relationships among these sectors". Indicators should be interactive and customised where necessary to reflect the South African context at national, provincial and local level. (Department of Environmental Affairs and Tourism, 2008)

6.1.2 A Comprehensive plan for the development of integrated and sustainable human settlements

In 2004 the Department of Human Settlements released "Breaking New Ground" (BNG) as a comprehensive plan for the development of sustainable human settlements. The BNG policy was divided into three broad parts. The first part provides an outline for the challenges faced by the housing sector while the second part highlights the way in which the approach to sustainable human settlements will shift. It also provides a summary of key programmes and highlights the needed enhancement to ensure successful implementation. The last part of the Plan provides detailed business plans on the programmes.

The challenges that were highlighted in the Plan have to do with housing backlogs and poor delivery. Hardly any mention is given to economic and environmental issues. In Part B (Comprehensive plan for housing delivery) of the BNG plan (Department of Human Settlements, 2004:11) it states that poverty consists of three dimensions: income, human capital and assets. Providing housing for the poor primarily contributes towards the alleviation of asset poverty.

As was mentioned in ***Chapter 3*** functional, social, spatial and economic integration are essential in order to achieve sustainable human settlements. The BNG plan (Department of Human Settlements, 2004:12) states that "informal settlements must urgently be integrated into the broader urban fabric to overcome spatial, social and economic inclusion". The BNG plan

advises upgrading in desired locations and relocation of households where development is not possible or desirable in order to eradicate informal settlements. The plan doesn't prescribe an upgrading process, but rather supports a wide range of tenure options and housing typologies. The Department of Human Settlements further advises densification of urban areas to promote integration. This will integrate previously excluded group into the city and offer them the benefits thereof.

The BNG plan goes on to list a number of other plans to aid housing delivery and achieve sustainable communities. These plans are summarised in ***Table 6.2*** below.

Table 6.2: Plans to aid housing delivery

Plan	Description of content
Enhancing Spatial Planning	Since spatial planning is spread amongst many Departments, there needs to be greater coordination and alignment of the various planning instruments and policies that lie at the heart of sustainable development.
Enhancing the location of new housing projects	The plan advises the following interventions: • Accessing well-located state-owned and para-statal land • Acquiring well-located private land for housing development • Acquisition of funding for land • Introduce fiscal incentives
Support Urban Renewal and Inner City Regeneration	The new human settlement plan aims to support the effort by encouraging medium-density social housing and increasing the effective demand for existing, well-located property.
Developing social and economic infrastructure	The plan acknowledges the need to move away from a housing-only approach and instead follow the holistic approach of developing human settlements. In order to do this social and economic infrastructure must be constructed, new funding mechanisms must be identified and municipalities must become the primary implementation agencies.

Plan	Description of content
Enhancing the Housing Product	In order to develop more appropriate settlement designs and housing products the new human settlement plan proposes the following: • Enhancing the design of settlements • Enhancing housing design • Addressing the slipping quality of housing

Source: Own construction from the Department of Human Settlements (2004:13-17)

The BNG further state that housing delivery can also contribute towards alleviating income poverty through jobs created in the construction sector. This potential is maximized by the implementation of a Job Creation Strategy, the incorporation of labour-intensive construction methods, on-site materials production and by capacity building for job creation.

The BNG plan makes very little mention of environmental factors when discussing the development of sustainable human settlements. It focuses primarily on housing delivery with economic issues mentioned as an afterthought. Despite this it lists expedient plans for housing delivery which can aid in the development of sustainable communities.

6.1.3 The National Development Plan

The National Planning Commission (2011:1) released a Diagnostic report in June 2011 which set out the country's achievements and shortcomings since 1994. The report found that although today's South Africa looks very different from the one left behind in 1994, millions of people are still unemployed and many people still lack the resources to meet their basic needs. The Diagnostic Report (National Planning Commission, 2011:3) highlighted nine main challenges faced by South Africa. These challenges are illustrated in ***Figure 6.3***.

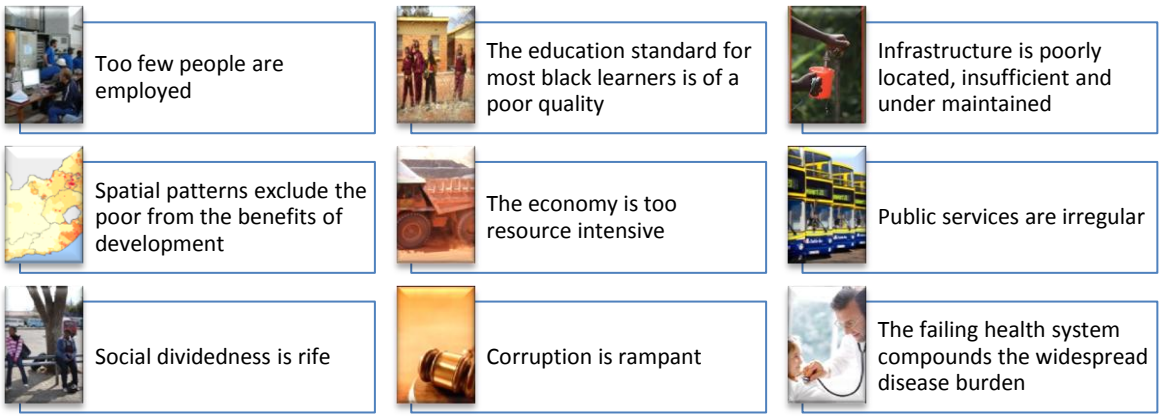

Figure 6.3: Challenges to achieve development in South Africa

Source: Own construction form the National Planning Commission (2011:3)

In response to this report the National Planning Commission released the National Development Plan in November 2011. The guiding objectives of the national plan are to eliminate poverty and sharply reduce inequality by 2030 (National Planning Commission, 2011:2). In order to address the nine main challenges identified by the report, the National Planning Commission (2011:5-6) advised actions in order to develop and upgrade capabilities to enable sustainable and inclusive development. These actions are summarised in ***Table 6.3***.

Table 6.3: Advised action to the challenges faced in development by South Africa

Identified challenge	Advised action
Too few people are employed	Create jobs and livelihoods
The education standard for most black learners is of poor quality	Improve education and training
Infrastructure is poorly located, insufficient and under maintained	Expand infrastructure
Spatial patterns exclude the poor from the benefits of development	Transforms urban and rural spaces
The economy in too resource intensive	Transitions into a low-carbon economy
The failing health system compounds the widespread disease burden	Provide healthcare that is of a good quality
Public services are irregular	Build a capable state
Corruption is rampant	Fight corruption
Social dividedness is rife	Transform society and unite the nation

Source: Own construction from the National Planning Commission (2011:3,5-6)

Several sections of the National Development Plan pertain directly to sustainable community development, for instance improving infrastructure which calls for upgrading informal settlements (2011:14) or reversing the spatial effects of apartheid (2011:16), while all sections as a whole will contribute to sustainability in the long term. ***Figure 6.4*** shows which sections of the plan affect sustainable community development directly and which will only have an impact in the long term.

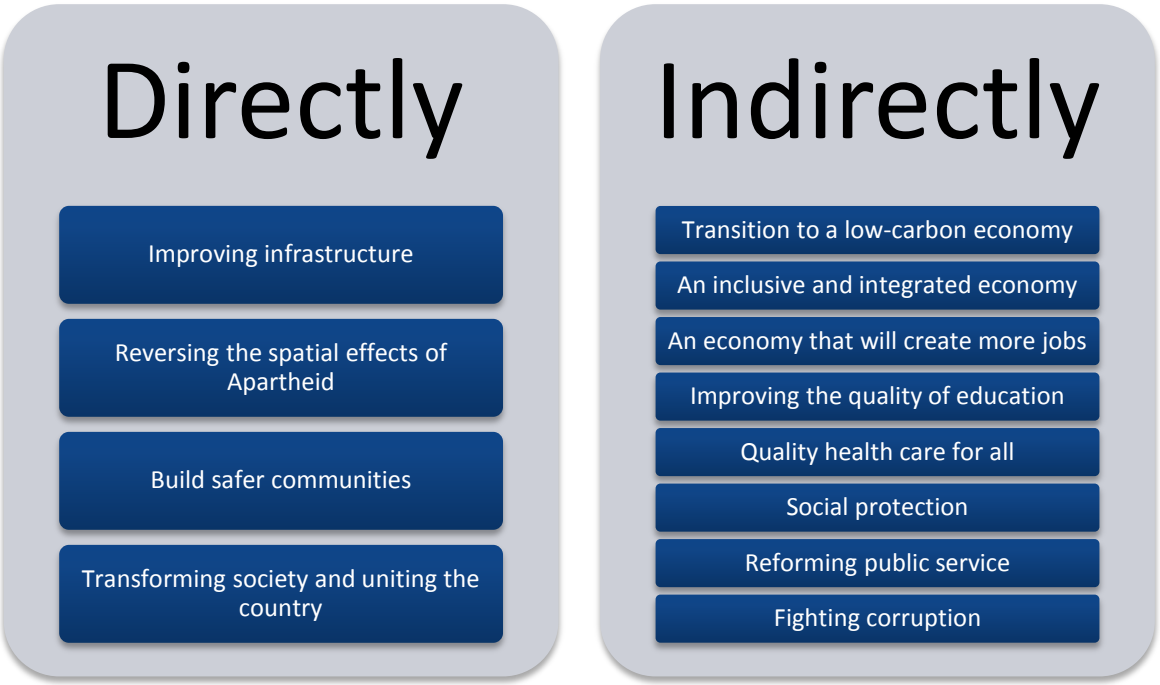

Figure 6.4: Sections of the National Development Plan that directly and indirectly effect sustainable community development

Source: Own construction from the National Planning Commission (2011:10-26)

6.1.4 The Upgrading of Informal Settlements Programme

The Department of Human Settlements (2011:6) initiated the Upgrading of Informal Settlements Programme (UISP) under the Breaking New Ground plan. This programme is aimed at facilitating the structured incremental upgrading of informal settlements. Where upgrading is not possible the UISP makes provision for communities to be relocated. The main aims of the UISP according to the Department of Human Settlements (2011:6) are to "promote tenure security, health and welfare and community empowerments amongst those residing in informal settlements".

With the UISP the Department for Human Settlements (2011:6) are shifting their focus from a purely quantitative approach (the amount of housing built) to a view of building communities. The Department of Human Settlements (2010) states that the UISP is already in operation across all provinces, “although the extent of its use varies”. Municipalities are the developers for the UISP and undertake projects through cooperative governance partnerships.

6.1.4.1 The National Upgrading Support Programme

According to the Department of Human Settlements (2010) the National Upgrading Support Programme (NUSP) was created to support Department of Human Settlements in its implementation of the UISP. The NUSP refines the national informal settlements upgrading strategy through more flexible approaches to subsidizing and financing informal settlement upgrading. The NUSP will also prioritise the development of a strategy to guide the “sustainable human settlements creation” section of informal settlements upgrading. (Department of Human Settlements, 2010)

The Department of Human Settlements (2010) provide a NUSP resource kit that covers nine subjects to assist the UISP:

- Subject 1 – Understanding your informal settlements
- Subject 2 – In situ upgrading principles and policy
- Subject 3 - Partnership building
- Subject 4 – Survey, registration and tenure
- Subject 5 – The planning process
- Subject 6 – Financing upgrading
- Subject 7 – Design and implementation
- Subject 8 – Monitoring and evaluation
- Subject 9 – Sustaining improvement

6.1.5 Other policies and legislation for sustainable community planning and development

The **Constitution of South Africa**, Act 108 of 1996 defines the fundamental values of sustainable communities, such as equality, human dignity and freedom of movement and residence (Department on Human Settlements, 2011:10).

The **Housing Act**, Act 107 of 1997 gave legal foundation to the implementation of government's Housing Programme. In Section 2(1)(a) of the Housing Act all spheres of government are compelled to give priority to the needs of the poor in respect to housing development.

6.2 Sustainability indicators

To date the most popular approach for gauging sustainable development has been the use of indicators and indices. Miller (2007:5) states that an indicator is "anything that gives an indication to its reader of a key feature or state of a human or environmental system". Sustainability indicators are used as a means of assessing progress and monitoring performance. They provide the means to evaluate and enable sustainable development (Monto, Ganesh & Varghese, 2005:37). Indicators are a logical tool to use in sustainable development because of their proven record in use in the fields of economics, social accountability and environmental science. (Bell & Morse, 2003:17)

Indicators are developed based on available scientific and technical information and aid researchers in understanding past and future trends in the living environment. According to Bell & Morse (2003: 31) an indicator should be:

- Specific – it must clearly relate to the outcomes
- Measurable – it must be a quantitative indicator
- Usable – it must be practical
- Sensitive – it must change as circumstances change
- Available – it must be fairly easy to collect the needed data
- Cost-effective – it must not be very expensive to access the needed data

Indicators such as the GDP (gross domestic product) or GNP (gross national product) serve to illuminate national economic well-being and progress. Monto et al (2005:38) state that human sustainability on the other hand "operates in the intersect between the interdependent and mutually reinforcing pillars or spheres of sustainable development – social development, environmental protection and economic development". This would mean that more than just economic indicators are needed to assess sustainability on human settlement level. Miller (2007:5) says that indicators of sustainability more often take the form of "quantitative measures of key features of human or environmental systems that relate to the long-term viability of human communities".

In order to measure human progress beyond economic perceptions, indicators were added to quantify human and ecological well-being. This group of indicators are known as sustainability indicators and are related to the quality of life of a community. According to Monto et al (2005:39) “they judge whether the economic, social and environmental systems that make up the community’s living environment provide healthy, productive and sociable life for all”.

Table 6.4 represents a framework of indicators created by the Commission of Sustainable Development (CSD).

Table 6.4: CSD’s sustainable development indicators framework.

CATEGORY	THEME	SUB-THEME	INDICATORS
Social	Equity	Poverty	Percentage of population living below the poverty line
			Gini index of income inequality
			Unemployment rate
		Gender equality	Ratio of average female wage to male wage
	Health	Nutritional status	Nutritional status of children
		Mortality	Mortality rate under 5 years old
			Life expectancy at birth
		Sanitation	Percentage of the population with adequate sewage disposal facilities
		Drinking water	Percentage if the population with access to safe drinking water
		Health care delivery	Percentage of the population with access to primary health care facilities
			Immunization against infectious childhood diseases
			Contraceptive prevalence rate
	Education	Education level	Percentage of children reaching grade 5
			Adult secondary achievement level
		Literacy	Adult literacy level
	Housing	Living conditions	Amount of floor area per person
	Security	Crime	Number of recorded crimes per 100 000 of the population
	Population	Population change	Population growth rate
			Population of urban formal and informal settlements.
Environmental	Atmosphere	Climate change	Emissions of greenhouse gases
		Ozone layer depletion	Amount consumption of ozone depleting substances
		Air quality	Ambient concentration of air pollutants in urban areas
	Land	Agriculture	Arable and permanent crop land area
			Use of fertilizers and agricultural pesticides
		Forests	Percentage of land area that is forest area
			Wood harvesting intensity
		Desertification	Percentage of land affected by desertification
		Urbanization	Area made up of urban settlements

CATEGORY	THEME	SUB-THEME	INDICATORS
	Oceans, seas and coasts	Coastal zone	Algae concentration
			Percentage of total population living in coastal areas
		Fisheries	Annual catch by major species
	Fresh water	Water quality	Biological oxygen demand in water bodies
			Concentration of faecal coliforms in freshwater
		Water quantity	Annual withdrawal of ground and surface water as a percentage of total available water.
	Biodiversity	Ecosystem	Area of selected key ecosystems
			Protected area as a percentage of total area
		Species	Abundance of selected key species
Economic	Economic structure	Economic performance	GDP per capita
			Investment share in GDP
		Trade	Balance of trade in goods and services
		Financial status	Debt to GNP ratio
			Total ODA given or received as a percentage of GNP
	Consumption and production patterns	Material consumption	Intensity of material use
		Energy use	Annual energy consumption per capita
			Share of consumption of renewable energy resources
			Intensity of energy use
		Waste generation and management	Generation of industrial and municipal solid waste
			Generation of hazardous waste
			Management of radioactive waste
			Waste recycling and reuse
		Transportation	Distance travelled per capita by mode of transport
Institutional	Institutional framework	Strategic implementation of sustainable development	National sustainable development strategy
		International cooperation	Implementation of ratified global agreements
	Institutional capacity	Information access	Number of internet subscribers per 1000 inhabitants
		Communication infrastructure	Main telephone lines per 1000 inhabitants
		Science and technology	Amount of expenditure on research and development as a percentage of GDP
		Disaster preparedness and response	Economic and human loss due to natural disasters

Source: Own construction from Monto et al (2005:167-169)

This broad framework provided by the Commission of Sustainable Development gives an example and guide as to what should and could be included when developing indicators for sustainability.

The UN (2003:1) uses quantitative indicators to monitor the progress made towards the MDGs. The indicators are not intended to be prescriptive, but to take into account each country's unique setting. These indicators are useful when compiling national-level reports on the MDGs. According to the UN (2003:2) indicators that are compiled based on standard concepts, definitions and methods enable cross-country comparisons.

South Africa is currently well positioned in terms of environmental indicators, but still lacks adequate social, economic and institutional indicators. There is sufficient information available that can be used to populate these indicators, but it remains a challenge to undertake this in a "co-ordinated way and to present the different data sets in standardised format". (Schwabe, 2002:14)

6.3 Multi-criteria analysis application

Every problem that involves making a decision (having more than one objective) is actually a multi-criteria problem. People make multi-criteria decisions every day and are most often not even aware of it. When decisions become too complex to be solved in the basis of daily decision making an aid is required (Omann, 2004:99). Multi-criteria analysis (MCA) is one such aid. Hobbs and Meier (2000:6) state that it is the intention of MCA methods to "improve the quality of decisions involving multiple criteria by making choices more explicit, rational and efficient".

Omann (2004:100) argues that MCA is not a new concept having been used as early as the 18th century, but it was not until the late 1940's that this concept became widely known. Omann (2004:110-111) goes on to say that during the past three decades MCA has become a recognized tool to aid decision making. The areas on which it is used ranges from human resource management to regional planning to transportation and urban management.

According to the Department for Communities and Local Government (2009:19) multi-criteria techniques provide an explicit relative weighting systems for the different criteria. They further state that the core function of these techniques are to deal with the difficulties that human decision makers have in handling large amounts of complex information in a consistent way. MCA can establish a preference between options by referencing them to a clear set of objectives that are identified by the decision making body, and for which they have established measurable criteria to assess the extent to which these objectives have been achieved.

(Department for Communities and Local Government, 2009:20) In this study the objective is sustainability and the criteria to assess the level of sustainability will be sustainability indicators.

Although the process of identifying objectives and criteria alone may provide enough information for decision makers in simple circumstances, where a certain level of detail is needed MCA is used. MCA offers a number of ways of combining data on different criteria to provide indicators of the overall performance (Department for Communities and Local Government, 2009:20). The Department for Communities and Local Government (2009:21) are of the opinion that MCA offers many advantages over using informal judgement unsupported by analysis:

- It is open and unambiguous.
- Objectives and criteria can be changed if they are felt to be inappropriate.
- Scores and weights, when used, can be cross-referenced to other sources and amended if necessary.
- When scores and weights are used and audit trail is provided.

The data needed for MCA is usually abridged in an evaluation matrix (Omann, 2004:119). An example of an evaluation matrix can be seen below in ***Table 6.5***. Omann (2004:119) says that "each entry in this matrix represent the evaluation of an option according to a criterion made concrete through its impact on performance". Depending on the form of the criterion (quantitative or qualitative) the impact data is used in diverse ways. While quantitative data can be used directly, qualitative data can either be used directly or transformed into a cardinal scale.

Table 6.5: Multi-criteria analysis evaluation matrix

Environmental assessment:			
Indicator	**Extreme [5]**	**Moderate [3]**	**Low [1]**
Extent of air pollution in urban areas		**X**	
Presence of faecal coliforms in freshwater		**X**	
Extent of land degradation			**X**
Generation of waste	**X**		
Extent of desertification of land		**X**	
Total:	**5/25**	**9/15**	**1/5**

Source: Own construction

Taking all factors into consideration (Omann, 2004:144; Wang, Jing, Zhang & Zhao, 2009:1) MCA is an appropriate tool to use in the measurement of sustainable development.

6.4 The Goal Achievement Matrix approach

A Goal Achievement Matrix (GAM) assists with the assessment and prioritization of projects and programmes (Department of Transport, 2010:7). According to the Department of Transport (2010:8) "to identify, assess and prioritise projects; specific policy, goals and objectives are firstly required with the aim of measuring individual projects against". Hill (2007:22) states that the goal used in the GAM is "an end to which a planned course of action is directed". These goals should be defined operationally as to be expressed as objectives. Hill (2007:22) says that "in this way the degree of achievement of the various objectives can be measured from the costs and benefits that have been identified".

6.5 An assessment matrix of sustainability indicators to assess the sustainability of community development projects and planning.

6.5.1 Methodology of indicator selection

Segnestam (2002:12) is of the opinion that no universal set of indicators exists that is equally applicable to all scenarios. A small set of well-chosen indicators are advised as the most effective approach. The United Nations (UN) (2007:29) argues that the "selection of indicators is to a large extent determined by the purpose of the indicator set". The purpose of the indicator set used in this study is to formulate an assessment matrix to identify specific areas for remedial action at municipal level for Tlokwe municipality. It is recommended that the chosen indicators be:

- Relevant to assessing sustainable development progress
- Limited in number
- Adaptable
- Broad in coverage of all aspects of sustainable development
- Understandable and clear
- Cost effective (United Nations, 2007:29-30)

Bossel (1999:9) states that crucial indicators are not always obvious. Bossel (1999:9) goes on to say that "learning to handle a complex system means learning to recognize a specific set of indicators". For an indicator to be selected, data availability and relevance are crucial issues (Bossel, 1999:10)(United Nations, 2007:32). Data required for the indicators are generally available at national level for a variety of institutions, but there may be some gaps. Because of this, each indicator as listed by the CSD was classified into one of four categories of availability:

- Class 1: Completely available
- Class 2: Partially available
- Class 3: Related data available
- Class 4: Not available (United Nations, 2007:32)

The first category is the preferred one with the others having less appeal as the list goes on.

Relevance is the other dimension that pertains to the selection of indicators. Again indicators were divided into four categories of relevance:

- Class 1: Relevant
- Class 2: Related indicator relevant
- Class 3: Relevant but incomplete
- Class 4: Non relevant (United Nations, 2007:33)

Again the first category is the most preferable with the others losing preference as the list progresses.

In ***Table 6.6*** the matrix is illustrated that was used to select the indicators for the assessment matrix from those given by the CSD. (United Nations, 2007:15-16)

The black boxes show the indicators that can be incorporated into the assessment matrix without any changes. The dark grey boxes contain indicators that have to be modified for the unique case of Tlokwe Municipality. Indicators that are important for the country, but not included in the assessment matrix are contained in the light grey boxes. The indicators in the blank boxes are not considered useful for this particular evaluation.

Table 6.6: Indicator selection matrix

		RELEVANCY			
		Relevant	**Related indicator relevant**	**Relevant but incomplete**	**Irrelevant**
AVAILABILITY	**Completely available**	Proportion of population living below national poverty line Proportion of population using improved sanitation facilities Proportion of population using improved water sources Share of households without electricity or other modern energy services Proportion of urban population living in slums Percentage of population with access to primary health care facilities Population growth rate	Proportion of population below $1 per day Percentage of population using solid fuels for cooking Adult secondary (tertiary) schooling attainment rate Internet users per 100 population Inflation rate	Mobile cellular telephone subscribers per 100 population	Domestic material consumption
	Partially available	Net enrolment rate in primary education Gross intake ratio to last grade of primary education Land degradation Wastewater treatment Employment-to-population ratio Generation of waste Fixed telephone lines per 100 population Waste treatment and disposal	Dependency ratio Land use change GDP per capita Vulnerable employment Share of women in wage employment in non-agricultural sector Total fertility rate	Morbidity of major diseases such as HIV/Aids, Malaria, TB Investment share in GDP Debt-to-GNI ration Tourism contribution to GDP	Change of threat status of species Gross saving Net official development assistance given or received as a percentage of gross national income Remittance as percentage of GNI FDI net inflows and net outflows as share of GDP Material intensity of the economy
	Related data available	Number of intentional homicides per 100 00 population Percentage of population living in hazard prone areas Ambient concentration of air pollutants in urban areas Proportion of total water resources used Management effectiveness of protected areas Generation of hazardous waste	Under-five mortality rate Adult literacy rate Carbon dioxide emissions Land affected by desertification Arable and permanent cropland area Presence of faecal coliforms in freshwater Proportion of terrestrial area protected, total and by ecological region Area of selected key ecosystems Annual energy consumption, total and by main user category Management of radioactive waste	Ratio of share in national income of highest to lowest quintile Contraceptive prevalence rate Immunization against infectious childhood diseases Life-long learning Nutritional status of children Biochemical oxygen demand in water bodies Labour productivity and unit labour cost	Life expectancy at birth Suicide rate Area of forest under sustainable forest management Fragmentation of habitats Adjusted net saving as a percentage of gross national income Gross domestic expenditure on research and development as a percentage of GDP Current account deficit as a percentage of GDP Share of imports from developing Countries and LDCS Average tariff imposed on exports from developing countries and LDCS
	Not available	Water use intensity of economic activity Share of renewable energy sources in total energy use	Human and economic loss due to disasters Emissions of greenhouse gases Consumption of ozone depleting substances Area under organic farming Intensity of energy use, total and by economic activity Modal split of passenger transport Modal split of freight transport	Use of agricultural pesticides Bathing water quality Abundance of selected key species Energy intensity of transport Abundance of invasive alien species	Percentage of population having paid bribes Healthy life expectancy at birth Prevalence of tobacco use Ratio of local residents to tourists Fertilizer use efficiency Proportion of land area covered by forests Percentage of forest damaged by defoliation Percentage of total population living in coastal areas Proportion of fish stocks within their safe biological limits Proportion of marine areas protected Marine trophic index Area of coral reef ecosystems and percentage live cover

Source: Own construction from United Nations (2007:24)

After separating the useful indicators from the rest, the gaps left open were identified and filled with additional indicators. Bossel (1999:39) says that attention has to be given to all the basic orientators of all the different subsystems and the total system. Again only indicators that are seen as relevant and available are selected.

6.5.2 Assessment matrix compilation

The assessment matrix applies the same thematic / sub-thematic framework as used by the UN (United Nations, 2007:9) The United Nations (2007:10) advises that indicators no longer be divided only along the four pillars (social, economic, environmental and institutional) as this does not reflect the multi-dimensional nature of sustainable development. Theme-based frameworks are the most commonly used type of framework. In this type of framework indicators are grouped into numerous issues pertaining to sustainable development. (United Nations, 2007:40) This entails identifying a core theme, such as environment, and identifying specific sub-themes pertaining to the core theme, such as deforestation.

A core indicator is then identified with which to measure the indicator, such as the rate of deforestation seen as hectares per year. Indicators can be either quantitative or qualitative. Not all indicators relate to just one theme and thus emphasises the multi-dimensional character of sustainable development. A matrix showing the inter-thematic linkages of the chosen indicators for the assessment matrix can be seen below in ***Table 6.7***. The black boxes indicate the main theme associated with the indicator while the grey boxes are sub-themes.

Table 6.7: Indicators and inter-thematic linkages

	Social					Environmental					Economic			
	Poverty	Governance	Health	Education	Demographics	Natural Hazards	Atmosphere	Land	Oceans, seas and coasts	Freshwater	Biodiversity	Economic development	Global economic partnership	Consumption and production patterns
Portion of population living below national poverty line as a percentage of the total population.	■		▒	▒	▒							▒		
Portion of population living on less than $1 (R8.67) per day as a percentage of the total population	■		▒	▒	▒							▒		
Portion of population using improved sanitation facilities as a percentage of the total population	■	▒	■							▒		▒		
Portion of population using improved water sources as a percentage of the total population	■	▒	■							▒		▒		
Portion of the population residing in inadequate housing as a percentage of the total population	■	▒										▒		
Portion of the population that own the housing in which they live as a percentage of the total population	■	▒										▒		
Share of households without electricity or other modern energy services as a percentage of the total households	■	▒	▒					▒				▒		▒
Portion of population using solid fuels for cooking as a percentage of the total population	■		■				▒	▒				▒		▒
Portion of urban population living in slums as a percentage of the total urban population	■	▒	▒		▒			▒		▒				▒
Number of intentional homicides per 100 000 of the population		■	▒											
Under five mortality rate	▒		■	▒	▒									
Number of primary healthcare facilities per 100 000 of the population	▒	▒	■									▒		
Gross intake ratio to last grade of primary education	▒	▒		■								▒		
Net enrolment rate in primary education	▒	▒		■								▒		
Adult secondary schooling attainment level as a percentage of the total population				■								▒		
Adult literacy rate as a percentage of the total adult population	▒			■								▒		
Number of primary schools per 100 000 of the population	▒			■								▒		

Number of high schools per 100 000 of the population														
Population growth rate														
Total fertility rate														
Dependency ratio														
Portion of population living in hazard prone areas as a percentage of the total population														
Amount of carbon dioxide emissions														
Extent of air pollutants in urban areas														
Amount of land use change														
Extent of land degradation														
Portion of land affected by desertification as a percentage of the total land area														
Portion on arable and permanent cropland as a percentage of the total land area														
Portion of total water resources used as a percentage of the total available water sources														
Extent of presence of faecal coliforms in freshwater														
Wastewater treatment														
Annual energy consumption, total and by main user category														
Amount of hazardous waste generated in tonnes														
Amount of waste generated in tonnes														
Waste treatment and disposal														
Management effectiveness of radioactive waste														
Employment-population ratio														
Vulnerable employment														
Share of women in wage employment in the non-agricultural sector as a percentage of the total employment														
Internet users per 100 of the population														
Telephone users per 100 of the population														
Inflation rate as a percentage														
GDP per capita in Rands														
Population density														
Portion of built-up area for residential use as a percentage of the total built-up area														

Source: Own construction from United Nations (2007:15-20)

When the indicators, and their subsequent themes and sub-themes, are identified a methodology sheet is created for each indicator. Each methodology sheet contains the following information for each indicator:

- Basic information: Name, brief definition, unit of measure and placement within the indicator set.
- Purpose and relevance of the indicator.
- Underlying definitions and concepts.
- Measurement methods.
- Assessment of data: Data needed, availability of data sources and data references. (United Nations, 2001:4)

An illustration of the methodology is given in ***Table 6.8***.

Table 6.8: Methodology and application sheet

METHODOLOGY SHEET	
GENERAL:	
Indicator name:	*Insert the name of the relevant indicator*
Brief definition:	*Insert a brief definition of the indicator to give a broad overview*
Unit of measure:	*The unit in which the indicator is to be measured.*
Placement within the matrix:	*The placement of the indicator to demonstrate how it is linked to the other indicators.*
DESCRIPTION:	
Precise definition & underlying concepts:	
The definition states what should be measured. Variables that help in measuring change are given. This definition must be detailed enough that any person would be able to understand the concept of the indicator and be able to collect the correct data.	
Purpose & relevance:	
Describe the purpose of the indicator and the relevance it has to sustainable/unsustainable development.	
Measurement methods:	
Describe the measuring methods of the different variable in order to calculate the indicator. Measurement can be either qualitative or quantitative.	
DATA ACQUISITION:	
Data required / applied:	
List the data needed in order to do the calculation for the indicator	
Availability of data sources:	
List the sources from which the data is obtained. This can be government departments, international organizations, NGOs, etc.	
Data reliability:	
State the reliability of the data. E.g. is the data recent and was it collected by a reputed source?	
Data references:	
Give the reference of the data source used.	

Source: Own construction

The proposed methodology sheets for all the indicators used are illustrated in ***Annexure 1***.

6.5.3 Empirical application to case study

Subsequent to the completion of the methodology sheets, the indicators are slotted into their positions in the assessment matrix according to their related themes and sub-themes. It is beneficial to compare the Local Municipality (LM) with the three main spheres of government within which it falls, namely the District Sphere, the Provincial Sphere and the National Sphere. For the purpose of this study the Tlokwe Local Municipality is compared to the Dr Kennith Kuanda District Municipality (DKKDM), the North West Province (NWP) and South Africa (RSA) as a whole. Indicators for each of these four areas are then populated.

There are gaps in the available data needed to populate the assessment matrix of indicators. Two assessment matrixes are therefore created. The first, as seen in ***Table 6.9***, is the ideal assessment matrix that would be used if all necessary data is available. ***Table 7.1*** is the refined assessment matrix populated with the indicators for which data is easily and affordably available.

Table 6.9: Ideal assessment matrix

Pillar	Main Theme	Sub Theme	Indicator	National	Provincial	District	Local	Deduction
Social	Poverty	Income	Portion of population living below the national poverty line as a percentage of the total population					
			Portion of population below $1 (R8.67) per day as a percentage of the total population					
		Inequality	Portion of income earned by women as a percentage of the total income					
		Energy	Portion of households without electricity as a percentage of the total households					
			Portion of population using solid fuels for cooking as a percentage of the total population					
		Living conditions	Portion of the population that own the dwelling in which they live as a percentage of the total population					
			Portion of urban population living in slums as a percentage of the total population					
			Portion of population living in inadequate housing as a percentage of the total population					
	Governance	Crime	Intentional homicides per 100 000 of the population					
		Public participation	Degree of public participation					
	Health	Health care delivery	Number of primary healthcare facilities per 100 000 of the population					
		Mortality	Under-five mortality rate					
		Sanitation	Portion of population using improved sanitation as a percentage of the total population					
		Water	Portion of population using improved water sources as a percentage of the total population					
		Education	Portion of population without basic education as a percentage of the total population					
			Net enrolment rate in primary education					
			Adult literacy rate as a percentage of the total adult population					
			Number of primary schools per 100 000 of the population					
			Number of high schools per 100 000 of the population					
	Demographics	Population	Population growth rate					
			Total fertility rate					
			Dependency ratio					
Environmental	Natural Hazards	Vulnerability to natural hazards	Portion of population living in hazardous areas as a percentage of the total population					
	Atmosphere	Air quality	Extent of air pollutants in urban areas					
			Amount of carbon dioxide emissions					
	Land	Desertification	Land affected by desertification as a percentage of the total land area					
		Agriculture	Portion of arable and permanent cropland area as a percentage of the total land area					
	Land Change	Land use & status	Population density					
			Amount of land use change					
			Extent of land degradation					
			Portion of built-up area for residential use as a percentage of the total built-up area					
	Fresh Water	Water quantity	Portion of total water resources used as a percentage of the total water sources					
			Type of access to water by the population					
		Water quality	Presence of toxins/faecal coliforms in freshwater					
			Waste water treatment					
	Ecosystems	Ecosystems	Size of area of selected key ecosystems as a percentage of the total land area					
			Management effectiveness of protected areas					
Economic	Employment	Employment	Employment-population ratio					
			Vulnerable employment					
			Share of women in wage employment in the non-agricultural sector as a percentage of the total employment					
	Economic development	Information and communication technologies	Internet users per 100 of the population					
			Telephone users per 100 of the population					
		Macro-economic performance	Inflation rate					
			GDP per capita					
	Consumption and production patterns	Energy use	Annual energy consumption, total and by main user					
		Waste generation & management	Amount of waste generated in tonnes					
			Management effectiveness of radioactive waste					
			Waste treatment & disposal					

Source: Own construction

6.6 Applying Multi-criteria analysis as an evaluation tool

When the indicators are incorporated into the assessment matrix multi-criteria analysis, in the form of a performance matrix is used to score each indicator. A performance matrix is a table in which each row gives an indicator and each column describes the performance of the indicator against a certain criterion. An example of this can be seen in ***Table 6.4***. In the case of this study each row gives an indicator of sustainability and each column gives the performance of each indicator for each region measured against the objective of sustainability. This performance is scored using three levels of achievement namely: Better, The Same and Worse. A numerical weight was given to each of these qualitative scores on a strength of preference scale for each, namely Better = 1, The Same = 0 and Worse = -1.

The steps for using MCA and how they are implemented in this study are shown in ***Figure 6.5.***

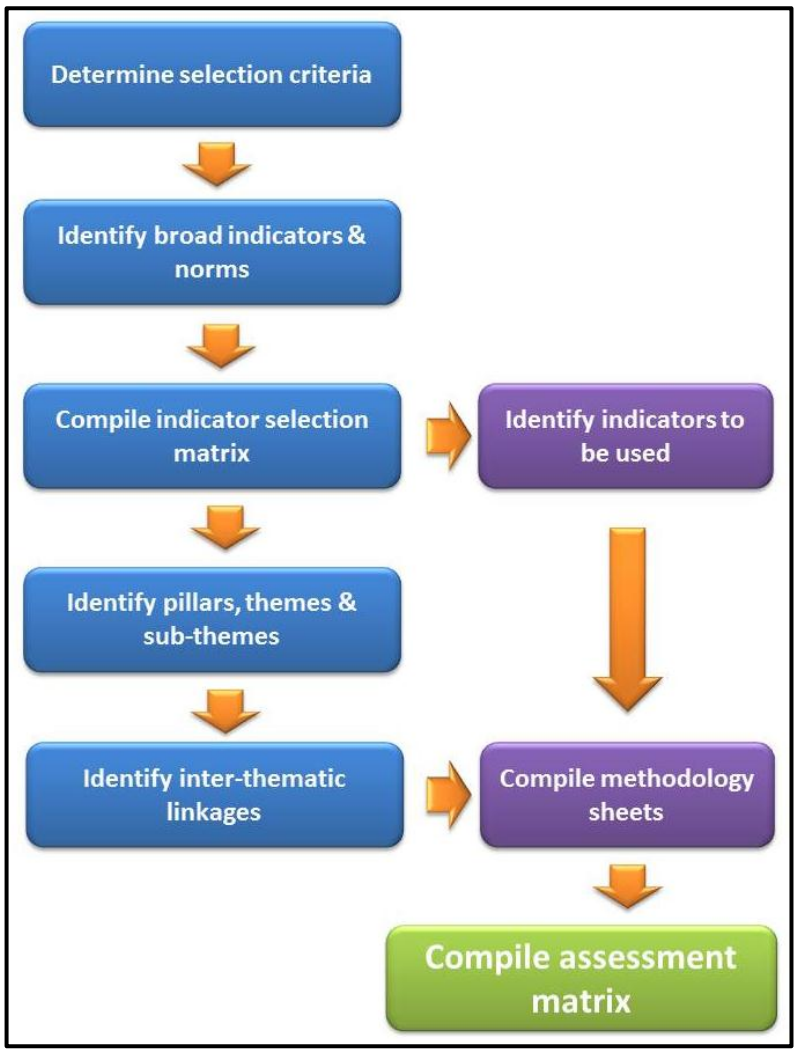

Figure 6.5: Steps for implementing multi-criteria analysis

Source: Own construction

The application of the performance matrix approach to the assessment matrix can be seen in ***Figure 7.2***.

Municipalities can then use this assessment matrix to identify the themes and sub-themes of sustainability in which they fare better or worse than the other selected regions and in which areas intervention is needed.

6.7 Applying the Goal Achievement Matrix as an evaluation tool

In order to prioritise projects and programmes contained in the IDP and sectoral plans (SDF, EMF and ITP) of a municipality the GAM approach is used. ***Table 6.10*** shows the GAM based

on the functional elements of sustainable community development discussed in section 4.1 of this document.

Table 6.10: Goal Achievement Matrix for IDP and sectoral plan evaluation

Sustainable Community Development Fundamental	**Score/Weight**		
	1	**3**	**5**
1. Creating an integrated and sustainable human settlement system (refer to section 4.1.1)	Maintaining the status quo.	Provide adequate housing and amenities.	Contribute largely to a quality urban living environment through quality housing.
2. Supporting LED development and delivery (refer to section 4.1.2)	Maintaining the status quo.	Provide some economic and spatial development opportunities.	Contribute largely to the facilitation of economic activities and spatial opportunities.
3. Provide good quality services, both bulk and internal (refer to section 4.1.3)	Maintaining the status quo.	Provide a limited improvement in the availability and quality of services.	Contribute largely to relieving the need for bulk services and improve the quality and accessibility of internal services.
4. Contribute to an effective public and private transport system (refer to section 4.1.4)	Maintaining the status quo.	Provide a limited improvement in transport linkages and accessibility.	Contribute largely to the improvement of linkages and accessibility of transport.
5. Foster an inclusive community spirit and a sense of togetherness (refer to section 4.1.5)	Maintaining the status quo.	Provide some improvement to community spirit and sense of togetherness.	Contribute largely to community development, positive social interaction and diversification.
6. Contribute to a community character of accountability and social identity (refer to section 4.1.6)	Maintaining the status quo.	Provide some improvement to character and social identity in the community.	Contribute largely to fostering positive and responsible attitudes in residents.

Source: Own construction

Each project identified in the sector plans will be adjudicated in terms of how well it contributes to the set of sustainable community development fundamentals in ***Table 6.10***. The total sum of its contribution is referred to as the GAM score and ranked from highest to lowest based on this score. Projects should be implemented from the highest to the lowest score with the top six highest ranked projects to be considered crucial. A project is ranked according to its GAM score, meaning that the top six GAM scores are selected to identify the crucial projects. These crucial projects should receive the highest level of effort to ensure their implementation. Any

project scoring below 16 will not be considered a crucial project since it achieved a score of less than 50% (out of a possible 30).

The implementation of the GAM evaluation tool on the study area can be seen in section 7.5 of this research document (***Tables 7.3*** – ***7.7***).

6.8 Conclusion

There are many National legislative documents that pertain to sustainable development, yet the execution thereof remains unsatisfactory. Supporting tools are needed to inform policy makers and planners when developing for sustainability. Sustainability indicators can be used to assist in planning better for sustainability. ***Figure 6.6*** shows the process used to compile an assessment matrix of sustainable indicators.

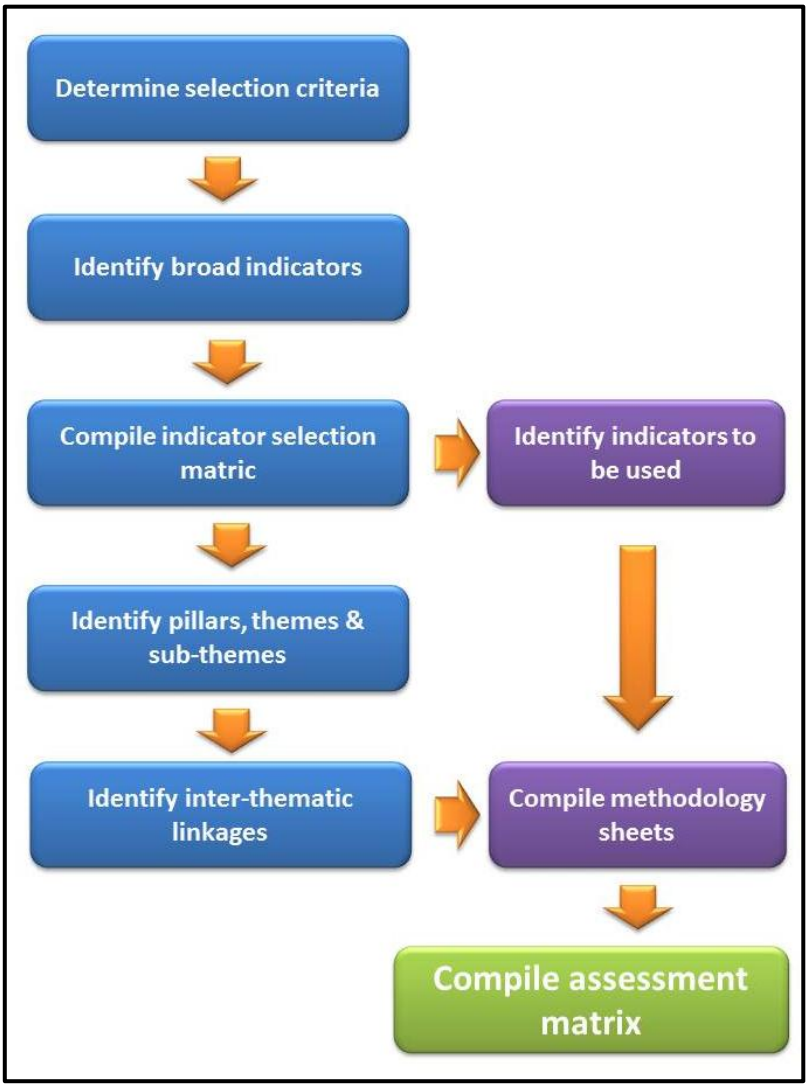

Figure 6.6: Assessment matrix compilation process
Source: Own construction

This process has to be started anew for each municipality to compile their own distinctive assessment matrix since each scenario is unique and not all indicators are applicable to all municipalities.

The use of MCA assists in the interpretation of the complex data, simplifying it into qualitative scoring sections and providing an at-a-glance supposition of the data.