Chapter 6: Human Settlements for the Limpopo Province, South Africa

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<th>Full Form</th>
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<tr>
<td>BR</td>
<td>Biosphere Reserve</td>
</tr>
<tr>
<td>CBA</td>
<td>Critical Biodiversity Area</td>
</tr>
<tr>
<td>CoP</td>
<td>City of Polokwane</td>
</tr>
<tr>
<td>CRR</td>
<td>Cumulative risk rating (Green Drop)</td>
</tr>
<tr>
<td>DEA</td>
<td>Department of Environmental Affairs of South Africa</td>
</tr>
<tr>
<td>DHS</td>
<td>Department of Human Settlements of South Africa</td>
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<tr>
<td>DWA</td>
<td>Department of Water Affairs of South Africa</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EMI</td>
<td>Environmental Management Inspectors</td>
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<td>EXCO</td>
<td>Executive Council of the Limpopo Provincial Government</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>HDA</td>
<td>Housing Development Agency of South Africa</td>
</tr>
<tr>
<td>IRPTS</td>
<td>Integrated Rapid Public Transport System</td>
</tr>
<tr>
<td>IWRM</td>
<td>Integrated Water Resources Management</td>
</tr>
<tr>
<td>LCP</td>
<td>Limpopo Conservation Plan</td>
</tr>
<tr>
<td>LDP</td>
<td>Limpopo Development Plan</td>
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<td>LPG</td>
<td>Limpopo Provincial Government</td>
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<tr>
<td>LRAK</td>
<td>Limpopo River Awareness Kit</td>
</tr>
<tr>
<td>LPFTDB</td>
<td>Limpopo Province Freight Transport Data Bank</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
</tr>
<tr>
<td>NMT</td>
<td>Non-motorised Transport</td>
</tr>
<tr>
<td>SANBI</td>
<td>South African National Biodiversity Institute</td>
</tr>
<tr>
<td>SEA</td>
<td>Strategic Environmental Assessment</td>
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<tr>
<td>SANGONET</td>
<td>South African NGO Network</td>
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<tr>
<td>TB</td>
<td>Tuberculosis</td>
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<tr>
<td>TFCA</td>
<td>Trans-Frontier Conservation Area</td>
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<tr>
<td>UNDESA</td>
<td>United Nations Department of Economic and Social Affairs</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>WB</td>
<td>World Bank</td>
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1. Introduction

Human settlements are among the most important drivers of environmental change. Although they cover only 7% of the total area of the country, they generate more than 90% of all economic activity and nearly two thirds of the population is housed in urban areas. It should however be noted that Limpopo province is essentially a rural area, with approximately 12% of the population living in urban areas, while 88% live in non-urban areas. Human settlements drive the depletion of renewable and non-renewable resources, the destruction of ecologically sensitive land and habitats, and the pollution of natural systems through the use of natural resources and the production of waste products. Moreover, the impact of human settlements on the environment increases as the population grows and human settlements expand.

The relationship between human settlements and the natural environment or ecological system is complex and continually changing. The natural environment provides the basic elements that human beings need to survive such as food, water and shelter. Most human settlements are therefore located in areas with abundant natural resources such as next to rivers, close to minerals or high potential agricultural land. In the process of harvesting the natural resources human beings impact on the environment firstly by overuse or exploitation of resources and secondly through the production of waste materials and pollution. This leads to a degradation of the very environment that human beings depend on. The environmental impacts of settlements are often negative but the impact can be mitigated or reversed by timeous planning, a change to alternative and sustainable management methods and ensuring the continued improvement of the socio-economic conditions of affected communities (DEA, 2012).

This chapter presents trends in the quality and condition of the natural environment affected by human settlements and infrastructure in Limpopo province, through indicators reflecting the state of human settlements and infrastructure in relation to the natural resource base and their impact on the natural environment.

2. Drivers, Pressures and State

The following indicators have been considered within the Limpopo Environmental Outlook.

Table 1: Indicators Used in the Human Settlements and Infrastructure Chapter

<table>
<thead>
<tr>
<th>Indicators Considered</th>
<th>Indicators Considered</th>
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<tbody>
<tr>
<td>Level of education of adults</td>
<td>Life expectancy at birth</td>
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<tr>
<td>Unemployment figures per age group</td>
<td>Maternal mortality per 100 000</td>
</tr>
<tr>
<td>Population numbers and density</td>
<td>Education expenditure as a % of government expenditure</td>
</tr>
<tr>
<td>Households living below the poverty line</td>
<td>Literacy rate (% of population over 15 years old)</td>
</tr>
<tr>
<td>Inequality (Gini coefficient)</td>
<td>Literacy rate (% of population 15-24 year olds)</td>
</tr>
<tr>
<td>Access to water sources</td>
<td>Literacy ratio (female to male)</td>
</tr>
<tr>
<td>GDP / capita</td>
<td>Roads (km scaled by land area with 99% of population)</td>
</tr>
<tr>
<td>Access to sanitation</td>
<td>Access to safe water (%) (rural &amp; urban)</td>
</tr>
<tr>
<td>HIV/AIDS prevalence</td>
<td>Population with access to sanitation (%)</td>
</tr>
<tr>
<td>Average life expectancy</td>
<td>Control of corruption</td>
</tr>
<tr>
<td>Access to various types of housing (including no housing)</td>
<td>Political stability</td>
</tr>
<tr>
<td>Percentage of urban area in province</td>
<td>Infant child mortality rates per 1000 births</td>
</tr>
<tr>
<td>Households living in informal settlements</td>
<td>Poverty indicators</td>
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<tr>
<td>Urban and rural population</td>
<td>Total fertility rate</td>
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<tr>
<td>Access to services (including waste removal)</td>
<td>Migration into/out of Limpopo</td>
</tr>
<tr>
<td>Quality of drinking water</td>
<td>Death rate from respiratory disease and TB</td>
</tr>
<tr>
<td>Functioning of wastewater treatment works</td>
<td>Governance</td>
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</tbody>
</table>
2.1 Population Dynamics

The global impact of human settlements on the world’s natural environment shows an increase with population growth, density, settlement expansion, economic growth and increased consumption. Nationally, the impact of human settlements on environmental resources is increasing. The ecological footprint of South Africa has increased from 2.32 hectares worth of natural resources per person in 2010 to 2.59 hectares in 2012 (DEA, 2012). The overall impact is a result of a number of anthropogenic drivers and pressures.

South Africa has a relatively low population density of 44.5 persons/km² compared to the world land surface average of 56.5; but is growing rapidly (UNDESA, 2015).

Limpopo has a population density that is almost identical to the national average. Overall population density and growth are not currently high; but this can hide local changes and should be seen in the context of other indicators. The population of Limpopo increased from 4.99 million in 2001 to 5.4 million in 2011, which is an average population growth rate of 0.82%. The share of the provincial population as a proportion of the national population is slowly declining due to out migration, particularly of young people.

The Limpopo province plans coordinated and high-priority development in “growth centres”. Public housing and infrastructure development programmes will be prioritised in these places to unlock the development potential and opportunities for job-creation that they hold (LPG, 2015).

It is therefore important to compare the location of these settlements with areas of high ecological value and consider the vulnerability and possible state of degradation.

The Limpopo Conservation plan indicates a generally high percentage of natural land cover and relatively low correlation between human settlement and degradation. It is however particularly important to monitor settlements situated in ‘Important and Necessary’ and in ‘Irreplaceable’ areas. (LEDET, 2013)
2.2 Poverty and economic development

Global evidence shows that socio-economic development is a more significant indicator for environmental degradation than poverty, and the human ecological footprint increases with income up to the level of middle income. This is generally referred to as the environmental Kuznets Curve as illustrated in Figure 3 below (UNEP, 2011).

Prevalent poverty is however not a sustainable situation and forces ‘quick-wins’ or less preferred policy scenarios and can exacerbate the impact of other indicators such as urbanisation; impact of poor housing, of poor solid and liquid waste management, poor governance, etc.

![Environmental Kuznets Curve](image)

Figure 3: Impact of increasing wealth on environment (Environmental Kuznets Curve)

2.3 Urbanisation

Change in settlement patterns, affecting distribution of the population, is an important indicator of environmental change; in particular the shift from rural decentralised communities to concentration in urban settlements. Limpopo’s rate of urbanisation is low at 12% (LPG, 2015) as compared to the national rate of 62% (SAEO, 2012). The increase in urbanisation from 10% in 2001 is however relatively high and expected to continue.

Limpopo province comprises five district municipalities and 25 local municipalities (see Figure 4). The provincial government has specifically identified the following 10 growth points for co-ordinated and high-priority development support: Lephalale; Greater Tubatse; Musina; Makhado; Greater Tzaneen; Ba-Phalaborwa; Elias Motsoaledi; Mogalakwena; Thabazimbi; Polokwane. The Executive Council (EXCO) developed this concept further by directing immediate attention to Lephalale, Greater Tubatse and the Musina-Makhado Corridor. Public housing and infrastructure development programmes will be prioritised in these places to unlock the development potential and opportunities for job-creation that they hold. (LPG, 2015). The location of these settlements and local environmental conditions and pressures are therefore important considerations.
2.4 Housing

Modern housing requires more natural resources than traditional housing, and drives high-impact industries such as cement and glass; and also generates solid waste (rubble). Incentives for sustainable construction (green building industry) are therefore an important mitigating factor.

Rapidly growing informal settlements, often situated in previously unused unused areas due to their poor suitability for formal settlement, can be a major cause of environmental degradation. It should also be considered that since they are generally situated near existing settlements, the impact is cumulative.

2.5 Access to Services

Liquid and solid waste, produced in high volumes in human settlements, rank among the highest environmental impacts of human settlements. Historically, the Limpopo province faces significant challenges in this area.

Figure 5: Distribution of sanitation needs at community level
There is a general lack of water/sanitation infrastructure in the province as confirmed in Figure 4. Limpopo is one of the regions with high levels of infrastructure maintenance needs. It also has a large number of informal settlements, which poses its own particular set of challenges (DWA, 2012).

Communities living in informal settlements are mainly poor. Poverty can contribute to environmental impact due to the lack of options – e.g. for domestic energy. However, generally poor people use less scarce non-renewable resources, have lower consumption levels of key renewable resources (such as soils and forests) and generate less wastes; and recycle and reuse more (De Vuyst et al, 2001).

While causal linkages between poverty and environmental degradation are tenuous, informal settlements are often drivers for environmental degradation, situated near urban areas in locations that had not been previously used, and near publicly available resources - such as river beds, hill slopes, green urban belts.

2.6 Transportation Infrastructure

Roads infrastructure development causes significant environmental pressure; both in terms of direct physical impact of roads development and impact of roadworks (lack of restoration, waste management), and of habitat fragmentation as a result of the road and roadside developments; and also indirectly in terms of increasing access to resources and driving demand for transport. Improved access can also increase opportunities for illegal biodiversity use (e.g. access to harvesting or poaching of protected species; new illegal dumpsites for solid or liquid waste).

Rail transport infrastructure also has a significant impact on the landscape but if it is extensively used will reduce needs of roads infrastructure and impacts of roads transport. Limpopo plans to strengthen the passenger network; however the potential for goods transport by rail is limited to long-distance bulk transport.

The environmental impact of transport infrastructure also applies to the effectiveness of hubs such as public transport nodes; heavy vehicle resting places and facilities. Urban centres and roads with adequate centres to accommodate buses and taxis; and trucks; will face a significantly reduced transport impact. Such infrastructure is a positive indicator.

Non-motorised transport is per definition low-impact. An enabling environment for non-motorised transport, particularly urban and peri-urban, is therefore an indicator of positive environmental change.

2.7 Water infrastructure

Water infrastructure has a significant environmental impact, including direct impact of infrastructure such as dams, pipes, pumps, canals, etc; as well as the impact of extraction and transfer of water resources, in particular on the ecosystems.

Limpopo has more than 25 dams on all major rivers. New developments include among others, the completion of the construction of the dam wall at the De Hoop Dam in 2014; the Mokolo Crocodile Water Augmentation Project a 46 kilometre pipeline that will deliver water from the Mokolo Dam to the Medupi Power station and for the expected growth in the Lephalale Municipality; and the Komati Water Supply Augmentation Project with a similar line to supply water to Duvha and Matla power stations. (DWA, 2015).

In 2008, the Department of Water Affairs introduced Blue and Green drop indicators to measure drinking water quality management (Blue drop) and wastewater quality management (Green drop) and to provide an incentive to improve management of water infrastructure within the provinces.
2.8 Governance

Good governance and low corruption levels are important factors in environmental sustainability. For human settlements and infrastructure, inappropriate decisions regarding location of housing developments or transport and water infrastructure; e.g. through poor environmental management policy and policy instruments, but also through non-application of policies, can have major negative impacts.

Good governance is not limited to the public sector. Civil society plays an important role in complementing the public and private sector in developing sustainable human settlements. Urban sustainability therefore relies on government and businesses empowering, training, and partnering with the civil society organisations to address environmental issues (WB, 2013).

It is noted that in South Africa the Social Contract for the Development of Sustainable Human Settlements signed in 2014 under the National Department of Housing, includes Civil Society but no specialised environmental NGOs are among the signatories (DHS, 2014).

3. Impacts and Trends

A number of drivers have been identified in the previous section as highly relevant for the province. Both the current impact and the trend in pressure caused by each indicator have been assessed.

3.1 Population dynamics

Increased human settlement and increased population density are key drivers of environmental change. At 0.82% average annual growth Limpopo’s population growth is however low (LPG, 2015). The population density has only marginally increased since 1996. Population and density growth are therefore currently rated as medium current pressure factors with a medium pressure growth trend.

3.2 Economic Growth and Poverty

Limpopo is the poorest province in South Africa, with 63.8% of the population living below the upper-bound poverty line in 2011. GDP per capita for 2013 was 2.4% which is low. The environmental impact of the indicator is rated medium. Limpopo’s share of national poverty has steadily grown since 2006, although poverty is slowly being reduced throughout the region and GDP per capita is growing. The trend therefore remains stable (SAStats, 2014).

![Figure 6 Population below the upper poverty line](image)

![Figure 7 GDP per capita trends](image)
3.3 Urbanisation

Polokwane is the only major city in Limpopo. The Polokwane Municipality is the second largest local municipality in South Africa with a 1999 population of 628,999. It has a growth rate of 2.13% between 2001 and 2011 and is one of the 5 fastest growing cities in South Africa. Its proximity to the neighbouring countries of Botswana, Zimbabwe, Mozambique and Swaziland makes it a perfect gateway to Africa and an attractive tourist destination. The settlement types indicate that it is more urban than rural (StatsSA, 2011a).

The Lephalale and Nzhelele basins are identified among the most degraded areas in the Limpopo basin - Nzhelele is adjacent to the Musina-Makhado corridor (LRAK, 2010). Both growth areas are also situated in areas classified as Critical Biodiversity Areas in the Conservation Plan. Musina, the border town with Zimbabwe, is the second fastest growing of all South African municipalities with an average growth rate of 5.53% between 2001 and 2011. With a population of 68,359 in 2011, at this growth rate the population will double every 13 years.

3.4 Housing

Limpopo’s housing situation has significantly improved with a reduction of households living in informal housing. Importantly, the number of households living in informal dwellings (“shacks not in backyard”) has decreased by 30% between 2001 and 2010 (HDA, 2013). The number of households living in informal residential areas has decreased, reflecting the focus of authorities to upgrade existing settlements.
High concentrations of poor communities in (peri-) urban areas can contribute to degradation; in particular in function of the chosen areas – e.g. near water sources leading to catchment degradation, soil erosion. Considering the low population growth and the controlled provincial planning of growth points and decrease in informal housing, the current environmental impact is ranked as medium and the trend is downward.

3.5 Access to water and waste management in human settlements

Liquid and solid waste, produced in high volumes in human settlements, rank among the highest environmental impact drivers of human settlements. The Limpopo province faces significant historical challenges in this area.

There is a general lack of water/sanitation infrastructure in the province as pointed out in the previous section. Limpopo is one of the regions with high levels of infrastructure maintenance needs. It also has a large number of informal settlements, which poses its own particular set of challenges (DWA, 2012).

There has been slow but gradual improvement of access to water over the past decade, with nearly 50% of households having access to water on their property; and increase of nearly 10% in 10 years. However, 25% of the households have no access to water infrastructure, an increase of 4% in the same period.

Only 23% of the households in the region have access to the accepted standard of a flush or chemical toilet; the majority (53%) rely on pit latrines without ventilation. In Polokwane, sanitation coverage remains poor, with a ranking of 117 out of 203 local municipalities in South Africa with 44.5% coverage of weekly refuse removal and a ranking of 103/203 with 41.1% of households with a flush toilet connected to sewerage (StatsSA, 2011b). Less than 25% of the population has access to waste removal.

The impact of this situation should be seen in the context of other trends such as economic growth and urbanisation. In a low-density low-income rural context, households produce mainly organic waste and the low density allows the ecosystem to absorb any contaminated liquid waste or cope with low-efficient decomposition of solid waste. In high-density, urban or peri-urban areas, the cumulative impact will be much higher. If the current poor infrastructure situation persists, these trends would increase the environmental impact. However, one of the major advantages of urbanisation is the opportunity for improved infrastructure provision to communities – as long as the housing is mainly formal.
The current status is therefore ranked as poor with particularly high risks for surface and groundwater but the ongoing improvements and the opportunity offered by formal urban settlements lead to a stable trend.

### 3.6 Transportation infrastructure

Limpopo Province has a total road network of about 22,200 km, with 14% of national roads, 33% provincial roads and 53% local roads. An estimated 31% is tarred and the rest is gravel and dirt roads. (LPFTDB, 2012).

In a province with high imperatives for economic growth, investments in infrastructure are planned; which are key drivers for environmental change, particularly around the growth corridors. Roads infrastructure development is a significant driver; both in terms of direct physical impact, and in terms of increasing access to resources and driving demand for transport. Improved access can also increase opportunities for biodiversity-related crime.

The four sub-corridors in the province are Dilokong Sub-corridor, Phalaborwa Sub-corridor, Trans-Limpopo Sub-corridor and East-West Sub-corridor. From a transport perspective these corridors need to be supported in terms of passenger and freight transport as well as road infrastructure.

The transport sector also plans to improve rail transport. Within the priority projects for Limpopo is the development of a high-speed train link between Pretoria and Polokwane and a Moloto corridor regional passenger system. In South Africa, the rail system currently offers limited benefits for goods transport.

The desktop study undertaken for the Limpopo Transport Strategy in 2007 notes that only the Sekhukhune Municipality had a non-motorised transport (NMT) plan. The transport sector identified lack of coordination...
between public transport services including absence of a major transport interchange with facilities for truck drivers and public transport users (DRT, 2007)

Today, Polokwane is investing in an integrated public transport hub (Integrated Rapid Public Transport System – IRPTS), and in NMT infrastructure (cycling and walking paths) (CoP, 2015). Other districts have also included NMT in the IDPs.

With Limpopo actively advertising as transport corridor and tourism venue, and other mainly socio-economic factors increasing transport needs and opportunities, the current pressure of the transport indicators is high. The trend is clearly that this pressure will even increase. It should be noted that this does not consider the responses already in place to address this.

3.7 Water infrastructure

The Green and Blue Drop scores provide a good insight in management of water infrastructure and trends. The 79.4% Blue Drop score is averaged nationally. Lephalale obtained the highest provincial score of 92.84% with Mookgopong rated 31.73%, which categorises it as being in a critical state. (DWA, 2012b)

![Figure 15 Provincial Blue Drop Scores](image)

![Figure 16 Blue Drop Trends per Municipality](image)

The Green drop cumulative risk rating (CRR) related to waste water management was the highest in South Africa in 2011 but has improved since. (DWA, 2012c)

![Figure 17 Provincial Green Drop CRR comparison](image)

![Figure 18 CRR analysis for Limpopo](image)

Challenges with management of water quality and infrastructure carry a high environmental risk. The current impact is ranked as high; the trend is improving.
3.8 Governance

Civil society capacity in the area of environment and human settlements in Limpopo is weak. The environmental NGOs present in the region are focused on wildlife. No environmental NGOs specifically working on sustainable human settlements appears in the SANGONET list of NGOs in Limpopo (PRODDER, 2015). Some development NGOs do look at issues of water and sanitation in settlements. It is imperative to involve civil society as a key stakeholder in the initiatives mentioned in this chapter and provide incentives to develop their capacity to fill this niche. There is no information on trends regarding increased or decreased NGO involvement with environmental impacts of human settlements.

Overall, based on available information, the current (negative) impact of governance is observed as low and given the priority given to this issue the trend is downwards.

3.9 Summary of status and trends for the key indicators

The following table summarises the findings.

**Table 2: Selected drivers with rated current impacts and trends**

<table>
<thead>
<tr>
<th>Driver</th>
<th>Current Impact level</th>
<th>Trend</th>
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<tbody>
<tr>
<td>Population dynamics</td>
<td>Medium</td>
<td>Stable</td>
</tr>
<tr>
<td>Economic Growth and Poverty</td>
<td>Medium</td>
<td>Stable</td>
</tr>
<tr>
<td>Urbanisation</td>
<td>Medium</td>
<td>Increasing</td>
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<tr>
<td>Housing</td>
<td>Medium</td>
<td>Decreasing</td>
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<tr>
<td>Access to services</td>
<td>High</td>
<td>Decreasing</td>
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<tr>
<td>Transportation infrastructure</td>
<td>High</td>
<td>Increasing</td>
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<tr>
<td>Water infrastructure</td>
<td>High</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Governance</td>
<td>Medium</td>
<td>Decreasing</td>
</tr>
</tbody>
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4. Global Change Aspects

The increase in world population; global demand for natural resources and cumulative impact of humans on the environment is part of what is generally referred to as ‘globalisation’. Many factors affecting Limpopo are driven by global trends.

In September 2015, the world’s nations have identified 17 global sustainable development goals (SDG) indicating common challenges which can often not be addressed in isolation. In comparison with the previous Millenium Goals (MDG), more explicit environmental goals have been included, indicating a shared and growing concern for the planet resources. (UN, 2015)
Nations have therefore committed to progress in terms of areas relevant to the environmental sustainability of human settlements such as clean water and sanitation; clean energy; responsible consumption; climate action; life on land; as well as explicitly sustainable cities and communities.

For each province in South Africa this will imply expectations to support the national targets; it will also provide opportunities to attract support.

The most published global environmental impact is certainly what is commonly referred to as ‘climate change’, implicitly referring to human-induced changes in the planetary climate. This change is driven by accelerated conversion of natural resources, resulting in generation of ‘greenhouse gases’.

The projected impact of climate change for Limpopo from different models suggests that temperatures will continue to increase, either drastically, with projections of 1-3°C or 3-5°C for the mid-future period (2040–2060) or less rapidly with similar increases by the end of the century. Rainfall anomalies projected for Limpopo exhibit a clear pattern of drying under some scenarios, however, even for the far future (2080–2100) these anomalies are within the range of present-day climate variability. Other scenarios show no clear pattern of drying (DEA, 2013).

The built environment has not been assessed in the long-term adaptation scenarios (LTAS) project undertaken by DEA, which represents a significant gap, given the growing importance of cities as locations of particular exposure to climate change. No impact studies have been done for urban impacts in South Africa other than eThekwini and Cape Town (WIRE, 2014).
5. Responses

Important progress has been made in the province in terms of integrated development planning. All districts have integrated development plans; and a significant number of municipalities have also developed these. The integrated approach is an opportunity for improved resource planning and assessment of cumulative impacts of planned settlement development. The Limpopo Development Plan also incorporates strong elements of sustainability.

The deliberate planning of specific growth points with attention to reducing the number of informal settlements offers opportunities for a positive transition to an inevitably more urbanised future demography, with the benefits of scale for water and waste management and other improved infrastructure such as domestic energy, and with mitigation of the risks of rapid and uncontrolled colonisation of the landscape. The low population growth rate offers a significant advantage in this regard.

In this improved provincial planning one should also include the emerging landscape approach with attention for human settlements in the landscape; particularly the emergence of Biosphere Reserves (BR) in the province. Limpopo and the Western Cape are the leading provinces that have rolled out the development of BR as model sites for sustainable development at landscape level. One of the differences between BR and other landscape approaches - for instance the Transfrontier Conservation Area (TFCA) model - is precisely the explicit inclusion of human settlements.

There are currently 3 BRs in the Province: Kruger to Canyons; Vhembe and Waterberg. The BR model is unique in its integrated view of conservation; buffer and transition zones, with the latter including human settlements; and the approach of multi-stakeholder coordination platforms offers opportunities for improved landscape sustainability, including biodiversity off-sets for urban development and infrastructure. Historically, BR have nonetheless been focused on the core (protected) and buffer areas, and experiences with planning of transition areas and urban BR is more recent and requires explicit planning and capacity building. Strengthening the fulfilment of the functions (conservation, sustainable development, and related research and education) in these BR with attention to human settlements is more urgent than developing additional BR.

Limpopo has developed the Green Economy plan with sections on water; waste; building, transport and infrastructure sectors with priorities for the province including Limpopo priorities relevant to the human settlement and infrastructure impact: Reduced household water consumption; Regulation of swimming pools; Efficient Waste Management; Waste Beneficiation; Concentrated Solar Plants; Energy Efficiency; Greened government buildings; Proper Town planning based on Green principles; Improve public transport; Energy-efficient urban design including NMT; Regulations to reintroduce rail transport.

In addition there is a specific section on Green Municipalities.

National measures include solar water heating in new houses; awareness and skills development on solutions to green cities; guidelines on legislation/regulations regarding economic instruments (rebates/subsidies/grants, low-interest loans, tax concessions, import duties, etc.); efficient spatial development frameworks with NMT; cities’ reuse of water resources; buildings with lower electricity and water demand; solar grid feeding; reduce/reuse/recycle waste; use of buffer strips for densification or urban agriculture and promote mixed-use and mixed income communities – bring people closer to work opportunities to reduce need for transport, water security; pricing of ecosystem goods and natural systems; promote municipalities as custodians of the environment; use natural capital indicators and define the carbon sync value of ecosystems within cities; carbon financing for sustainable energy interventions in RDP households.
Some of these measures are clearly in line with environmentally sustainable human settlements. Others may need to be assessed on a case by case basis, such as the use of buffer strips to densify population or to promote urban agriculture which may have negative impacts.

The Limpopo strategy includes a Green Municipality competition where Sustainability practices in 5 districts and 25 local municipalities are assessed based on Waste management; Water management; Energy management; Landscape; Public participation; Governance and capacity building; Review all municipal by-laws, IDPs, Sector Plans and Calculate Ecological footprint of municipalities (LEDET, 2013b)

![Figure 19 Results from the 2012 Green Municipality Competition](image)

6. Identifying Scenarios

For each of the drivers assessed above, it is important to assess what would be required to mitigate environmental impacts of human settlements if the observed trend continues, is accelerated, or is reversed.

Many drivers are clearly linked and can be considered jointly.

For instance, in terms of population dynamics the slow growth could continue; or socio-economic development policies could reduce out-migration. Events in other regions or countries could increase in-migration. Population decrease could occur if out-migration increases due to economic or other negative events in the province.

The impact on human settlements of accelerated poverty reduction and economic growth gives very similar scenarios; especially with a population shifting from poverty to low income and from low to medium income (the lower part of the Kuznets curve with increased impact). Accelerated economic growth would also drive population growth through an increase in migration balance. This would also drive accelerated urbanisation. Population and/or economic growth acceleration also drive changes in housing trends with more informal housing when housing programmes cannot cope. This would also slow down or reverse the improved access to services.

Given the current situation and trends, a scenario with reduced population/urbanisation/economic growth would not require special environmental measures. The main scenario that would increase the environmental impact is the acceleration of population growth and/or economic growth and/or urbanisation and/or poverty reduction.
### Scenario: Slow population and economic growth, medium urbanisation

<table>
<thead>
<tr>
<th>a) Trend maintained (acceptable)</th>
<th>Continued slow/medium growth</th>
<th>See recommendations in the next section.</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Increased trend (negative – from an environmental perspective; but desirable in terms of Human Development)</td>
<td>Accelerated population growth and/or economic growth and/or urbanisation and/or poverty reduction</td>
<td>Settlement development plans to accommodate accelerated growth (IDPs) for existing urban centres and planned and likely growth points with environmental mitigation measures. Improved collaboration between sectors required. Improved capacity for EIA attention for cumulative EIA or preparation of SEAs for settlement expansion. Acceleration of integration of settlements in landscape approaches (BR). Support for Civil Society to address gaps due to pace of change and their capacity to respond more quickly/flexibly. Priority for urban water and waste management infrastructure development.</td>
</tr>
<tr>
<td>c) Reversed trend (positive)</td>
<td>Population decrease.</td>
<td>None</td>
</tr>
</tbody>
</table>

In addition to the slowed/accelerated growth scenarios, it is important to consider scenarios for the factors that are enabling for sustainable human settlements. This includes trends regarding integrated vs. sectoral planning; human capacity growth vs. ‘brain drain’ within the province.

### Scenario: Integrated planning and landscape initiatives improve settlement sustainability

<table>
<thead>
<tr>
<th>a) Trend maintained (acceptable)</th>
<th>Gradually (slow) improving of integrated approaches</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Increased trend (positive)</td>
<td>Integrated planning of human settlements; inclusion of sustainability of settlements in landscape planning (IWRM; BR)</td>
<td>Support for implementation of IDPs with effective integration and intersectoral cooperation; support for integration of environmental sustainability and human settlements in IWRM and BR; e.g. through the ecosystems approach for IWRM; and effective planning of the transition zones of BR.</td>
</tr>
<tr>
<td>c) Reversed trend (negative)</td>
<td>Sectoral planning of settlements and infrastructure, exclusion of settlements from landscape planning (IWRM, BR)</td>
<td>Weak intersectoral cooperation and failed integrated approaches would require stricter environmental controls. Sectoral SEAs and higher EIA standards and controls will be required (including cumulative impacts)</td>
</tr>
</tbody>
</table>
### Scenario: Provincial capacity increases to mitigate environmental impacts of human settlements

<table>
<thead>
<tr>
<th>Description</th>
<th>Actions Required</th>
<th>Relevant Implementer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Trend maintained (acceptable)</td>
<td>Gradual (slow) increase in capacity in relevant sectors is maintained.</td>
<td>None</td>
</tr>
<tr>
<td>b) Increased trend (positive)</td>
<td>Accelerated ability to attract skills and expertise to the province – including specialist individuals, companies, initiatives, NGOs, etc</td>
<td>Measures taken to reverse brain drain and become attractive for skilled persons. Effective implementation of the green economy development plan would drive this scenario; in particular supporting growth focused on the tertiary sector. Provincial Government – Private Sector (DBSA; other investors)</td>
</tr>
<tr>
<td>c) Reversed trend (negative)</td>
<td>Brain drain and increased reliance on outside skills and expertise</td>
<td>Mitigation measures – develop strong knowledge networks with experts outside the province; including approaching outside environmental agencies and NGOs to implement projects in the region.</td>
</tr>
</tbody>
</table>

### 7. Conclusions and Recommendations

A number of drivers of environmental change stemming from human settlements and infrastructure are important for the environmental outlook.

Current population density and growth; economic performance and poverty levels; level of urbanisation; the overall housing situation and governance have a medium impact on the environment. The current status of access to services; transportation infrastructure and water infrastructure is a high concern given the pressure resulting from these drivers. Poor waste, waste water and waste water infrastructure management; a poorly organised transport sector in terms of public transport and non-motorised transport, should be addressed in view of a strong drive for economic growth including water-dependent sectors such as mining and agriculture and the north-south transport corridor.

If current trends are maintained for these indicators, the impact of low population density and continued low growth with the responses in place would remain medium. Continued relatively low economic growth and gradual poverty reduction combined with improved integrated planning and improved governance would also maintain the medium impact level. The emergence of informal settlements is seen as the highest risk but if current trends continue this would reduce; and the green economy plans for more sustainable housing would allow this to shift from medium to low. With continued implementation of legislation and control mechanisms, governance could develop towards a low pressure factor.

Urbanisation has accelerated in the past decade and is likely to increase; resulting in increased pressure on other factors such as housing and services. Although the outflow from rural to urban is mainly to other provinces, the trend of urbanisation within the province could double its urban population in the next 25 years. This would be a high driver in increasing the environmental impact of settlements.

Access to services and water infrastructure management is gradually improving; at current trends the high pressure should therefore shift to medium. Transport faces a number of environmental pressure factors: expansion of the roads network and the high irreversible impact of roads; economic growth; the national
and regional policies of transport growth corridors; additional corridors for the mining sector; poor public and non-motorised transport infrastructure; and the trend therefore remains as a high impact driver.

It is further recommended that:

1. Adequate support is given to implementation of policies and plans. IDPs; IWRM; BR; Green Economy; public and non-motorised transport plans; anti-corruption strategies - all are only effective if they are adequately implemented.

2. Urban development has a higher environmental impact than pressure from rural settlements. Infrastructure for urban waste and waste water management; sanitation; settlement planning; public and non-motorised transport in towns and cities should therefore take precedence in provincial investments. Sufficient investment in rural nodes needs to be maintained to avoid additional urbanisation incentives.

3. Access to sustainability options should be provided and promoted in all centres. This could for instance include incentives for “green shops” providing low-impact building materials; low-flush toilets; energy efficient lighting and heating/cooling solutions; solar installations; etc; and develop incentives for citizens to invest in these.
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