MBHASHE GREENING STRATEGY

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1. INTRODUCTION AND CONTEXT

1.1. BACKGROUND

An Urban Greening Strategy is a strategic document with a long-term perspective that fall within the compass of a municipal development policies and integrate well with other policies. It deals with all urban green spaces, regardless of type or ownership. To be most effective and for the greatest efficiency the strategy should be integrated with the planning system of the municipality.

The strategy should embrace the development of a major approach, which is suitable for attaining goals and resolving specific issues. In the case of green spaces, a strategy is required to address a variety of (ecological) environmental, social and economic policies and sustainable development objectives.

Therefore, in the process of developing the strategy, it is very important to recognise the spatial potentials and problems of urban green spaces in town as well as the needs, values and priorities of the community. In creating the Urban Green Strategy opportunities will arise to bring together many different aspects and prospects for improving the quality of life within the Mbhashe Local Municipal towns of Idutywa, Willowvale and Elliotdale.

Additionally, improvements can be made in securing the cooperation of different stakeholders and in raising public awareness about the many important questions that need to be addressed.

People should be encouraged to acknowledge and 'sign up' to the fact that green space opportunities are related to the public good and that they need public support, or even involvement, in order to develop and manage in the right way.

An URBAN GREEN STRATEGY confronts the present situation of green spaces (with all problems, conflicts, potentials and needs) and the future collective vision and goals. It covers all aspects and subjects dealing with green spaces management and development.

1.2. OBJECTIVES OF DEVELOPING AN URBAN GREENING STRATEGY

The objectives of developing an Urban Greening Strategy are, therefore:

- To safeguard the future of green spaces;
- To improve the quality of urban areas and especially the neighbourhoods;
- To make urban areas more attractive and thereby attract more resources;
- To enhance the well-being of local people and tourists.

1.3. AIMS OF DEVELOPING MBHASHE MUNICIPAL URBAN GREENING STRATEGY

The aim of this project is to put forward a vision for a network of new urban parks, making accessible heritage green spaces and refurbishment of existing green spaces and play areas through a development of a Greening Strategy.

In addition, the Strategy puts forward an area wide tree planting strategy which champions best practice and promotes innovation.

Lastly, to promote good environmental governance, especially planning, developing and conservation within the municipal area.

1.4. SIGNIFICANCE OF DEVELOPING A GREEN STRATEGY

The basis of the strategy is a collective vision about needs and priorities of residents and the meaning, value and importance of urban green space within the municipality. It usually expresses a collective vision on green space development and management and defines the main goals and the ways to secure them.

In the process of developing the strategy it is very important to recognise the spatial potentials and problems of urban green spaces in the municipality as well as the needs, values and priorities of the community. In creating the Urban Green Space Strategy opportunities will arise to bring together many different aspects and prospects for improving the quality of life in the area.

Additionally, improvements can be made in securing the cooperation of different stakeholders and in raising public awareness about the many important questions that need to be addressed. People should be encouraged to acknowledge and 'sign up' to the fact that green space opportunities are related to the public good and that they need public support, or even involvement, in order to develop and manage in the right way.

In the case of green spaces, strategies are required to address a variety of (ecological) environmental, social and economic policies and sustainable development objectives. It must also be able to effectively defend the objectives against other issues of urban development and planning in the political discourse of decision-making and resource allocation.

The purposes of greening strategy are, therefore:

- to safeguard the future of green spaces;
- to improve the quality of urban areas and especially the neighbourhoods;
- to make urban areas more attractive and thereby attract more resources;
- to enhance the well-being of local people and tourists.

1.5. BENEFITS OF URBAN GREENING IN TOWNS

1.5.1. Environmental Benefits

Urban trees have been linked to various environmental advantages. By providing shade for roads and rooftops, trees reduce the warming of urban environments and help to combat the urban heat island effect.

Similarly, by regulating urban temperature fluctuations, trees contribute to reduced energy use and heating and cooling costs.

In terms of air quality, trees act as biological filters to remove particulate pollutants such as smoke, dust, ash, and pollen as well as gaseous pollutants from the urban atmosphere. Of particular importance is the ability of trees to sequester CO2 and store it as wood biomass as they grow thereby slowing the effects of climate change.

Through natural water absorption and filtration, trees have the ability to drastically reduce water quality problems by intercepting and storing rainfall through their leaves, branches, and roots trees reduce volumes of stormwater runoff, decrease erosion, and improve soil quality.

It has been evident that urban trees contribute in reducing noise pollution particular in towns where there is busy traffic.

1.5.2. Psychosocial Benefits

The presence of urban greening also has notable psychosocial benefits. Individuals' perceptions of the beauty of their neighbourhoods, pleasure in their surroundings, and pride in their community have been shown to be closely related to features of the urban greening and urban trees.

They provide accentuation of architectural elements, offer relief from the monotony of pavement and masonry that make up the concrete jungle, make for inviting play areas, and unify visually chaotic scenes.

Urban trees provide important spiritual and emotional experiences and play a significant role in providing residents with a sense of place, community, and home. The presence of urban trees has been linked with a perceived increase in safety and civility, as well as a reduction in crime.

1.5.3. Economic Benefits

Trees do cost a significant amount of money to plant and maintain, however, the value of the ecosystem system services which they provide is generally between two and four times greater than the cost of tree planting and maintenance.

It should be acknowledged that urban trees are associated with increased property values within the urban setup.

Table. 1: Benefits of Urban Greening

Benefits	Individual	Local	Global
Environmental Benefits	• Reduce radiation exposure	• Improve air quality • Reduce stormwater runoff • Water filtration • Decreased erosion • Improve soil quality • Reduce noise pollution • Cooling of urban heat island	• CO2 sequestration • Slow climate change
Psychosocial Benefits	• Increase neighborhood beauty • Increase pride of place • Improve physical health • Reduce stress	• Increase safety and civility • Community empowerment	
Economic Benefits	• Reduce heating • Improve food security	• Reduce energy use • Increase property values	

	• Creation of alternative livelihoods	• Economic value of ecosystem services	

1.6. POLITICAL SUPPORT IN DEVELOPING URBAN GREENING STRATEGY

The acceptance and success of this strategic approach will depend heavily on the political support for the strategic planning process. This should commence right at the beginning and needs to be constantly approved during the whole range of activities.

It is advisable, therefore that the political decision makers in the Mbashe Local Municipality are informed at the beginning, about such activities, in order to gain their support for any task or activity that is part of the process and their backing for the positive results.

In order to secure the continuous support for the strategy building process and content, the strategy group can address the city council and mayor about the process and it's potential. Through this process they can present documents that explain the vision of the strategy, its expected results and the likely benefits from the outcomes of the strategy for improving the quality of life within Mbashe Local Towns (Idutywa, Willowvale and Elliotdale).

1.7. PUBLIC SUPPORT IN DEVELOPING URBAN GREENING STRATEGY

Urban Greening Strategy requires the cooperation of a variety of public actors and interest groups. This is particularly the case when green spaces are managed by public organisations.

The identification and involvement of these key stakeholders is important from the very beginning of the process. Residents should also be informed about the strategy and invited to actively take part in the strategy building process.

They can introduce important aspects of local knowledge and skills into the whole process and communicate any needs and expectations they have.

2. PLANNING CONTEXT (LEGISLATIVE FRAMEWORKS)

One of the important aspects of the analytical work involves checking over the planning and legislation context for the Urban Greening Strategy. There is a need to identify any links and connections with complementary policies, strategies and other legal documents at the national, regional and local, as well as the international levels.

2.1. National Heritage Resources Act (No.25 of 1999)

The Act is intended to introduce an integrated and interactive system for the management of the national heritage resources mainly to promote good government at all levels and empower civil society to nurture and conserve their heritage resources.

2.2. Occupational Health and Safety Act (1993)

Occupational Health and Safety Act of 1993 is mainly intended to provide for the health and safety of persons at work, including aspects associated with hazardous to health and safety. During the implementation phase there will be dangerous machinery. Therefore, it will be crucial and highly important to ensure that all health and safety rules are adhered to by employees.

2.3. PLANNING AND PREPARATION

Based on the general observations and knowledge of the area, some of the areas in the region are densely infested by number alien species and invasive species. This therefore clearly indicates that during the implementation phase of the strategy couple of contractual workers would be required to be contracted and as the Government Job Creation initiatives. Local recruitment of Unemployed Youth and Women will be highly prioritized so to enhance socio economic standards of the surrounding communities.

Therefore, proper planning and preparations are fundamental to achieving cost-effective and success of implementation phase, which means preparations will include procuring the required equipment and materials, having staff undergo the required training, and ensuring that the relevant land-owners and households are officially engaged and notified of the activities before they are undertaken at least to observe and comply with public participation process in this project.

2.4. National Environmental Management Biodiversity Act No. 10 of 2004 (NEMBA)

In terms of Chapter 5, Section 76(2)(a) of the National Environmental Management: Biodiversity Act (NEMBA), all organs of state in all spheres of government must prepare species monitoring, control and eradication plan for land under their control. It is said that, this proposed Strategy must form part of a municipality's environmental plans, and be part of a municipality's Integrated Development Plan.

National List of Invasive Species

(Category 1b) plants requiring control as part of species management programme. Permits must be issued for these plants to be kept on a property, and their management and control must be in terms of an approved species management plan.

2.5. National Environmental Management Act (107 of 1998 as amended)

Sections 28 (1) and (3) of NEMA 107 of 1998 set out the duty of care principle, which is applicable to all types of pollution and will be taken into account in considering any aspects of potential environmental degradation during the rehabilitation process and its activities.

It states that every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorized by law or cannot reasonably be avoided or stopped, to minimize and rectify such pollution or degradation of the environment.

The measures required in terms of subsection (1) may include measures to: -

- Investigate, assess and evaluate the impact on the environment.
- Inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment.
- Cease, modify or control any act, activity or process causing the pollution or degradation.
- Contain or prevent the movement of pollutants or the cause of degradation.
- Eliminate any source of the pollution or degradation; or
- Remedy the effects of the pollution or degradation.

This act encourages all levels of government to ensure that risks to the environment are identified, avoided, minimized and or mitigated where possible. Should there be any impact on the environment during or after construction, the Municipality together with the appointed Contractor is responsible to take measures to address these impacts and undertake the necessary clean up and mitigation measure

Table 2: Showing Policy, Legislative and Institutional Frameworks

Policy/ Legislation	Key Features
Constitution, 1996	• Everyone has a right to an environment that is not harmful to their health or well-being. • Local government is responsible for creating a safe and healthy environment
Urban Development Strategy, 1995	• Need to improve the quality of the urban environment through various Departments and Local Government. • Immediate steps should be taken to build local government capacity
White Paper on Local Government	• Metropolitan Councils are responsible for ensuring that integrated planning leads to an urban environment where citizens wish to live. • District Councils are responsible for developing Integrated Development Plans, with the consent of constituent municipalities
Local Government Transition Act, Second Amendment, 1996	• District Councils are responsible for preparing Integrated Development Plans with the approval of local and rural councils.
Development Facilitation Act, 1995	• Establishes National and Provincial Development and Planning Commission, and Provincial Tribunals which have the final say over development plans. • Establishes general principles for development planning (e.g. integration of social, economic, environmental aspects of local development). • The local government body with jurisdiction over a specified area responsible for developing Land Development Objectives.
National Forestry Action Programme, 1997	• Support the provincially based integrated planning framework. • Local government driving force for development planning and implementation. • Effectively support self-sustaining urban forestry/greening initiatives that secure economic, environmental and social benefits for urban dwellers.

White Paper on Agriculture	• Urban agriculture is an important aspect of the urban economy and the quality of life in urban areas.
White Paper on Forestry, 1996	• Integrate community forestry into Local Development Plans. • Community Forestry to be a provider of services to provincial government agencies, local authorities, District Councils, and service providers such as agriculture. • Pilot / model projects to demonstrate feasibility of community forestry interventions.
Mbhashe Spatial Development Framework, 2017	• The active management of public open spaces and the natural open space system in and around Idutywa. • The conservation and maintenance of Public Buildings, especially those that are Heritage-protected. • The proper development and management of Idutywa's cemeteries, including the fencing and maintenance of these facilities.

2.6. National Spatial Development Perspective (NSDP)

The National Spatial Development Perspective (NSDP) is an effort by National Government to find the best way of allocating scarce resources in the various geographic regions in the country. The basic premise of the NSDP is that if there are not enough resources to satisfy all needs wherever they may occur then they should be allocated to where the benefits will be greatest.

The NSDP takes the form of a spatial narrative, a set of maps and a strategic response. Using these tools, the NSDP objectives are to:

• Provide a framework within in which to discuss future development.

• Act as a common reference point for national, provincial and local government for the analysis of development potentials.

• Identify areas of tensions / priority in achieving positive spatial outcomes with government infrastructure.

• Provide governments response to the above mentioned for a given time period. The NSDP is unique in the sense that it proposes a mechanism that will link local, provincial and national planning in one integrated system of planning for development.

The NSDP also recognises that development potential tends to be greatest along linear corridors or axes. This is as a result of the relationship between urban nodes of opportunity and the transport and communication routes that connect them. In some instances, a river whose banks also has enhanced economic opportunities could also give rise to linear development corridors as zones of investment priority.

2.7. National Biodiversity Strategy and Action Plan

The Department of Environmental Affairs and Tourism prepared the National Biodiversity Strategy and Action Plan (NBSAP) to develop a plan of action for the conservation and sustainable use of the country's biological diversity.

During the NBSAP preparation, the National Biodiversity Implementation Plan identified objectives, outcomes and activities required for the NBSAP to achieve its goals. These objectives and targets include:

- Strategic Objective One: A policy and legislative framework that allows the integration of biodiversity management objectives into the economy.

- Strategic Objective Two: Ensure good governance in the biodiversity sector by enhancing institutional effectiveness and efficiency.

- Strategic Objective Three: Integrated terrestrial and aquatic management to minimise the impacts of threatening processes on biodiversity, enhances ecosystem services and improve socioeconomic security.

- Strategic Objective Four: Enhance human well-being and development by enhancing the sustainable use of biological resources and equitable sharing of benefits.

- Strategic Objective Five: Maintain key ecological processes across the landscape and seascape.

2.8. Eastern Cape Biodiversity Conservation Plan (ECBP) 2007

The Eastern Cape Biodiversity Conservation Plan (ECBCP) addresses the urgent need to identify and map critical biodiversity areas and priorities for conservation in the Eastern Cape Province. It also provides land use planning guidelines, recommending biodiversity friendly activities in priority areas.

Critical Biodiversity Areas (CBA's) are terrestrial and aquatic features in the land scape that are critical for conserving biodiversity and maintaining eco system functioning. In terms of the Biodiversity Act (Act 10 of 2004), the MEC for Environmental Affairs in the Province may determine a geographic region as a bio region for the purposes of the Act and publish a plan for the management of biodiversity in that region.

This plan is termed a bioregional plan and must contain measures for effective management of biodiversity in the region. Local and District Municipalities should integrate critical biodiversity areas in the relevant bioregional plan into their Integrated Development Plans and Spatial Development Frameworks and should also integrate critical biodiversity areas and other relevant guidelines and recommendations from the bioregional plan into Environmental Management Frameworks (EMF's) and Zoning Schemes.

The ECBCP land use guidelines are based on 10 principles:

- Avoid land use that results in vegetation loss in critical biodiversity areas.

- Maintain large intact natural patches – try to minimize habitat fragmentation in critical biodiversity areas.

- Maintain landscape connections (ecological corridors) that connect critical biodiversity areas.

- Maintain ecological processes at all scales, and avoid or compensate for any effects of land uses on ecological processes.

• Plan for long-term change and unexpected events, in particular those predicted for global climate change.

• Plan for cumulative impacts and knock-on effects.

• Minimize the introduction and spread of non-native species.

• Minimize land use types that reduce ecological resilience (ability to adapt to change), particularly at the level of water catchments.

• Implement land use and land management practices that are compatible with the natural potential of the area.

• Balance opportunity for human and economic development with the requirements for biodiversity persistence.

3. LOCALITY AND SPATIAL ANALYSIS

3.1. STUDY AREA

The Mbhashe Local Municipality is situated in the Eastern Province and is one of 7 Local Municipalities located within the Amathole District municipal area. The study area of this Urban Greenings Strategy only includes towns (Idutywa, Willowvale and Elliotdale) of the Mbhashe Local Municipality.

The Mbhashe Local Municipality forms part of the Greater Amathole District municipal area in the Eastern Cape and is on the Wild Coast stretching from the Qora Mouth in the south to Mpame in the north.

The entire municipal area falls within the former Transkei and is predominantly rural in settlement and covers an area of approximately 3 302 km2 with 32 electoral wards. The rural villages and settlements are scattered over the municipal area and consists of low density and relatively stagnant settlements and peri-urban rural settlements that are reception areas with communal land areas around urban centres and along main transport routes.

These settlements experience increasing influx and densification due to rural urban migration and the main settlements in Mbhashe are Dutywa, Willowvale and Elliotdale with the coastal zone stretching from Qora Mouth to Mpame (Mbolompo Point). The settlement nature of the area provides a clear focus on rural issues of housing while also dealing with some need in the urban and peri-urban areas.

3.2. SPATIAL ANALYSIS

3.2.1. Climatic Conditions

Mbhashe Municipality lies within the transitional zone between the subtropical Kwazulu-Natal coast and the warm temperate Eastern Cape. The climate ranges from cool, humid and subtropical at the coast to hot and sub-arid inland. Maximum temperatures in summer fall

mainly within the 25-27°C range, with the areas on the coast and the north western regions reaching up to 29°C.

Small isolated regions within the municipality have maximum temperatures of less than 25°C in summer. The winter minimum temperatures for coastal region are generally above 8°C, while inland the minimum temperature can drop to between 2-4°C in winter. Rainfall varies from between 600 – 800m per annum north western and western regions to higher rainfall between 800-1000mm per annum in the mid central, south and south eastern and coastal regions. Most of the rainfall (70%) occurs during October – March.

Climate Change refers to the ongoing progression of changes in the earth's general weather conditions as a result of the continual average rise in the temperature of the earth's surface, commonly referred to as Global Warming. This phenomenon is based on various contributing factors including the increase in Greenhouse Gases.

The impact of Climate Change on the Local Authority and its management of land use and scarce resources can be significant. These are:

- Change in rainfall patterns and average rainfall.
- Change in level of fluctuation of general climate patterns and tendencies.
- Increase in flood severity and draught occurrence.
- Change in ecosystems and desertification.
- Impact on bulk water supply resources and agricultural industry.

3.2.2. Topography and Drainage

Topography of the Mbhashe Municipality, stretching from the Qora Mouth / Mpame Coastal Zone to the high lying areas north and west of Dutywa ranges in altitude from 0m to 1210m above sea level. Landscapes vary and include gentle slopes, level plains and dramatic coastal landscapes which complicates east-west accessibility. The municipality is characterised by deeply incised valleys and gorges impact on accessibility and maintenance levels of existing road networks.

The Mbhashe Municipality comprises of 2 large drainage basins, i.e. the Mbhashe Basin and the Mthatha Basin. These drainage basins stretch far inland up to Elliot. Smaller rivers and drainage areas along the coastal belt provide opportunities for tourism development and give the Wild Coast its unique character which the urban greening strategy can contributes towards tourism development.

3.2.3. Geology and Soils Characteristics

Geology in the Mbhashe area is dominated by the Adelaide sub-group (between Dutywa and the coast), the Tarkastad sub-group (Dutywa and west of the N2) and ECCA Group (Coastal Zone including Dwesa-Cwebe Conservation area). Geology within the Adelaide and Tarkastad sub-groups comprise of mudstone and sandstone intruded by dolerite dykes and sheets. Geology within the ECCA Group comprises of shale, intruded by dolerite dyke and sheets.

3.2.4. Municipal Environmental challenges

In general, state of environment indicators that are applicable to the municipality are all showing a downward trend, in some cases catastrophically so. It is the view of DEDEAT that the sustainability of the Wild Coast as a tourism and biodiversity conservation resource is rapidly deteriorating and urgent land use management action is required.

The following priority issues as highlighted in the Guidelines (DEDEAT, 2012) are highlighted below:

- Sprawling Unlawful Development in the Coastal Zone Largely as a result of the lack of implementation of sustainable land use management guidelines, unplanned settlements have spread into areas of high environmental importance and sensitivity. This has threatened the longevity of such areas and supporting ecosystem services. The biodiversity and tourism asset of the municipal area is being lost.

- Lack of Service Infrastructure Development in some settlements and nodes has outstripped the provision of service infrastructure. This then leads to unacceptable practices, such as illegal weirs across streams, pipe-lines into the sea, sewerage pollution and dumping of waste in areas that are supposed to be "jewels" of the municipality.

- Mismanagement of Wetlands and Riparian Areas Wetlands in the municipal area are threatened by agricultural and development activities. In particular, wetlands are heavily grazed by stock during the dry season and are typically burnt to promote grazing. Wetlands are also often ploughed for crops due to the higher water table and soil moisture content in the flatter areas. The mismanagement of wetlands and riparian areas has further lead to unprecedented levels of soil erosion and associated topsoil loss. Not only has this lead to a decline in agricultural productivity, this has caused high turbidity in rivers and streams and has adversely impacted on water quality.

- Destruction of Coastal Forest Coastal and riverine forests which are prevalent throughout the area are disappearing at an alarming rate despite levels of statutory protection. Forests are typically cleared for slash and burn agriculture and firewood, cleared for roadways and resources such as bark is harvested at unsustainable rates.

- Some municipal areas are continually threatened by the invasion of alien plants. Areas most affected are those that have been disturbed by agriculture and settlement, coastal forests, riparian areas and vegetated dune systems.

- Illegal mining for building sand is seriously scarring sections of the coast and some of the riparian areas along streams and rivers. These activities are often undertaken by outside contractors, with little or no benefit to local communities.

4. THE STRATEGY

The Greening Strategy is a combination of proposals for new green spaces, enhancement of key streets and civic spaces, refurbishment and enhancements to existing green spaces, greening measures for streets and measures to improve linkages and legibility through the areas of Idutywa, Willowvale and Elliotdale.

In considering the strategy at an area wide scale consideration has been given to ensure a balanced distribution of play facilities, amenities and productive spaces across the towns of Mbhashe Local Municipality.

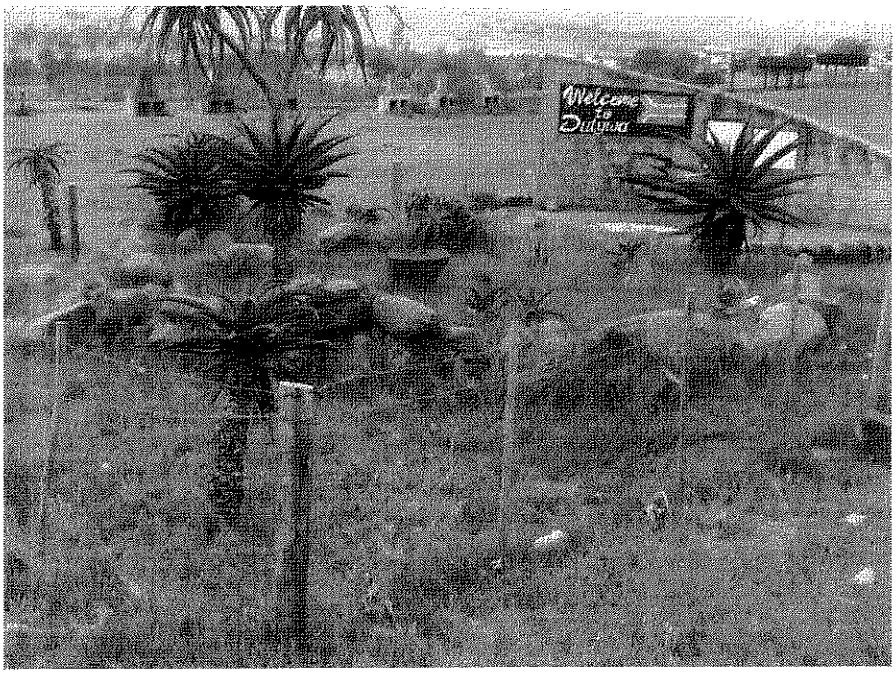
4.1. IDUTYWA TOWN

4.1.1. Green Spaces

Idutywa town signifies ecologically and environmentally potential for implementation of new green space activities. Suitability and quality of site structures around Idutywa poses quality aspects of urban greening.

The identified greening corridors are linked to functional aspects of the surrounding landscape, which therefore means, the areas will provide accessibility and use of green spaces by the public; and contribute to the sustainable development of the town, its climatic conditions and other environmental and ecological values that are so important for the sustainable development and wellbeing of the citizens.

Fig: Beautification of Town Entrance Idutywa Town



Beautification of Open Spaces_Idutywa town

4.1.2. Risks to the Urban Greening in Idutywa Town

Climate Change

Climate change portends a hotter regional weather pattern with amplified episodes of drought and deluge along the riverine areas. It is difficult to predict precisely how the urban greening will react to these changes. At the least, establishing young trees, which have less tolerance for environmental stressors for instance, yellowwood trees, which of course will need more care than old trees.

Changes in cold and heat tolerance zones are likely to require shifts in species selection appropriate for planting in the area. Increasing storm intensity and frequency also causes more storm damage, especially to older trees and damage-prone species.

In addition, as impervious surface cover increases, the likelihood of soil erosion due to higher volume flow at faster flow rates threatens soil resources and downstream water quality. Efforts to infiltrate precipitation at or near where it falls (rain gardens, pervious pavement) would help keep the soil levels more consistently moist, which aids trees during times of horticultural drought.

Development

Mbhashe Local Municipality has as a potential to develop Idutywa as its economic hub. Population on this town is apparently growing, forcing the municipality demarcate more land for residential development. This then will significantly impact on existing trees in the area affecting greening beauty of the town.

It is therefore recommended that during the new development, a tree friendly construction technique could be employed to minimise any impact that can damage existing tree canopy.

Trees on Private Property

It has been evident that existing trees in the town are under private control, meaning significant number of trees exist within the private households. Thus attitudes and practices toward privately owned trees have considerable implications, not only maintained by Mbhashe Local Municipality.

Challenges in this area include trees loss and lack of replacement and maintenance on mature trees. Land management practices by property owners has a huge impact on the value and desirability of trees.

4.1.3. Positive Trends in Idutywa Town

Municipal Commitment

Mbhashe Local Municipality has demonstrated a strong commitment to stewardship of environmental resources and ecosystem services including enhancing green and environmental initiatives. However, successful implementation of this Urban Greening Strategy requires municipal commitment and allocation of adequate fiscal.

Pride of Ownership

Mbhashe Local Municipality should promote, encourage and support home owners to landscape their properties through plantation of indigenous trees to promote greening initiatives.

4.2. WILLOWVALE & ELLITODALE TOWN

Willowvale town imposes challenges to effectively implement landscaping strategy due to the fact that, the town itself is more infested by alien invasive species. This makes it more difficult for any indigenous species to effectively survive.

In the case of Willowvale town, the Strategy will strive to focus more on the control and eradication of the invasive species in and around town. This exercise will assist in enhancing the natural potential of Willowvale town for future greening activities.

Mbhashe Local Municipality shall ensure invasive alien vegetation be removed in Willowvale from environmentally sensitive areas with the least amount of damage to indigenous vegetation, to ensure compliance with the Conservation of Agricultural Resources Act (CARA) regulations through implementation of effective alien clearing programmes, and such budget should be allocated and donor government funding initiatives approached.

Mbhashe previously implemented alien clearing programmes in the area, however, it should be emphasized that before any clearing of alien vegetation is initiated, it must be understood that when the programme starts, it must be implemented until completion. There is no value in ad hoc clearing, with no follow-up programme, which is the case in the previous efforts. Invasive alien clearing efforts shall be earmarked for the entire town.

Current State of Greening Initiatives in Willowvale Town

4.2.1. Vulnerable Ecosystem

Invasive alien plants threaten three main components of the Willowvale landscape

- Agricultural potential of the area,
- Biodiversity value of the area,
- Water quality and quantity.

Some habitats in area are more vulnerable to invasion by alien plant species than other and are therefore more likely to become problematic with respect to management of alien plant species.

This situation requires swift decision by the Municipality to manage and eradicate these invasive plants in the area as they will impact biodiversity as well as the provision of ecosystem services which contribute to human livelihoods and wellbeing.

In recognition of these impacts, South Africa has legislation in place which requires landowners to clear or prevent the spread of certain declared weeds from their properties. Within the context of the residential area and business hub which is the case in Willowvale, alien plant invasion can be problematic as they may increase the risk of fire within the properties, and can spread into the surrounding natural vegetation or be costlier or difficult to control than the indigenous grassland.

Based on sustainability thinking, Mbhashe Local Municipality need to apply new approaches to eradicate invasive alien species in the area. Thus would create unlock the understanding of the potential economic benefits of green infrastructure in Willowvale town.

Social perception should be encouraged to get rid of invasive species in their properties and this approach should be facilitated through awareness raising campaigns to emphasise the value of green urban infrastructure towards the property value.

Decision makers and Municipal politicians shall be addressed with the current situation of Willowvale and encouraged to infiltrate the value of green infrastructure, in terms of social-, environmental- and economic benefits, captured and interpreted into monetary terms through the Municipal Integrated Development Plan (IDP).

4.2.2. Greening Approach for Willowvale Town

Having highlighted the current situation, which hinder the greening potential of the town, implementation of greening strategy can find life in Willowvale through the implementation of effective greening approach and community acceptability.

(a) Green Network Establishment

- Plantation of 50l of yellow wood trees on the town entrance (1km from Idutywa direction) to maximize Willowvale greening.
- Eradicate invasive plants on vacant land parcels to make space for rain gardens and allotment gardens.
- Eradicate alien trees along kerbsides within the town and replace them with plantation of 50l yellow wood trees.

- Eradicate illegal dumping in open spaces within town and establish outdoor seating spaces.
- Encourage green roof installation and earth or green colours on walls.

(b) Embed Sustainability and Resilience Thinking into Municipal Planning

- Review existing regulations within the Municipality to accommodate the current situation of Willowvale and monitor on how these regulations impact on green planning initiatives.
- Modify and change zoning regulations to allow green planning initiatives such as urban agriculture in and around town and encourage property owners to eradicate invasive alien and practice urban agriculture.
- Provide guidelines and training with regards to greening and the implementation thereof, through various forums and media.
- Implement ordinances and laws that require integrated green infrastructure systems in every residential development.
- Explore opportunities within SPLUMA.
- Construct master plans and policies with green infrastructure planning and conservation as leading objectives.
- Plan proactively even when there is no immediate threat of climate change or environmental shock.
- Ensure that plans and policies incorporate the mandates of various departments and integrate goals and procedures with integrating core environmental objectives. Protect and maintain urban green space and expand green networks even when these spaces come under pressure for infill development.

(c) Address Community perceptions about Value of Greening

- Green infrastructure could be considered on a household level by incorporating construction techniques to include green roofs, green wall surfaces and rain gardens.
- On the street level, it should form part of street design.
- On the neighbourhood level, it should be considered how existing roads, paths and surrounding developments can be integrated.
- Masterplans should ultimately knit developments into the wider green network (Scottish Government, 2011).

Therefore, green infrastructure planning can be used to strive towards urban resilience (Harrison et al., 2014:57), as from a strategic perspective green infrastructure offers a unique opportunity for adaptive planning and design through natural resource management (Ahern, 2011). This however requires a shift in thinking, incorporating multifunctional services of green infrastructure planning and integrating them with grey infrastructure to release multiple benefits of various dimensions (social, environmental and economic) in the area. This implies, as stated by Giordano (2013:4), considering green infrastructure features as greening principles in the planning process.

The move towards green(er) infrastructure include a wide range of greening levels, from the plug-in of a green component on traditional infrastructure (such as filters on industrial equipment, and solar water heaters on roof tops) to the provision of traditional services through changes in infrastructure building practices (such as insulated housing and green roads), greening these services (such as addressing mobility requirements) and including ecological infrastructure (such as natural or artificial wetlands instead of sewage plants) (Giordano, 2013:4) within mainstream planning. Such a greening spectrum should be considered as part of the green infrastructure planning process to ensure that the study area adapts naturally to the greening initiatives.

4.3. Urban Greening Goals

Mbhashe Local Municipality should prioritize neighbourhood for tree planting efforts. Target tree planting efforts on private property to neighbourhood with a high ratio of grass/shrub to tree cover (i.e., post-1990 development areas). Target tree planting efforts in the streets to neighbourhood with limited existing street trees. Prioritize streets within neighbourhood for tree planting efforts.

5. Characteristics of Urban Dwellers

Urban greening aims to improve the quality of life of urban residents, so it is important to understand the characteristics of the wide variety of urban dwellers in South Africa. The variety of groups include recently arrived poor migrants, well established urban dwellers, single workers, families, people from various economic strata, groups with varied educational levels, those with and without rural links, and those with and without tenure to their residence.

The poor make up the majority of populations of the cities, and the quality of the urban economy and environment are shaped by people with middle to low incomes, peddlers, those making clothes, foods and crafts in their homes, government clerks and professionals, miners and factory workers. Given the numbers and needs of the lower income population, it is imperative that they play a central role in planning and implementing urban greening.

Many of the people migrating to urban centres in South Africa are economic refugees. In general, the poor arriving from rural areas or small cities gravitate to high density, low cost housing in an urban centre or to squatter settlements on this outskirts. Squatter settlements (also known as illegal settlements, illegal occupations, or invasions) are found in most cities.

These settlements vary greatly in how they originated and then evolved e.g. Mshenguville in Soweto, Alexandra north of Johannesburg and Khayelitsha in Cape Town.

The term informal settlement is used for migrant communities where the residents settle without title to their land. Inadequate potable water, sewage disposal, electricity and other public services typify these lands. In general, such informal settlements are created illegally and, once established, are not acknowledged by planning authorities and thereafter suffer from inadequate infrastructure. Nevertheless, after several years of existence as viable communities, many of the region's informal settlements become integrated into their cities'

overall planning and eventually may receive some public services. Many of these squatter communities are established on the worst possible sites for building.

The South African population is increasingly becoming urbanised. The result is congestion due to high population densities in cities, towns, townships as well as informal settlements. The result of high population densities is environmental degradation, especially in areas where no planning for parks and tree planting in streets and open spaces. It is a fact that rapid urban development is characterised by a lack of environmental planning.

Effective environmental planning, including urban greening, can assist greatly in improving the quality of the urban environment and the livelihoods of the people who live in urban areas.

6. Benefits of Urban Greening and Urban Forestry

Trees have considerable applications in the development of better urban livelihoods and Environments. Briefly, these are:

1. Provision of food and fruit
2. Amenity purposes, including shade, windbreaks, climate amelioration and beautification
3. Provision of medicine
4. Agroforestry purposes, such as fodder, soil reclamation and live fences
5. Waste water treatment
6. Flood control
7. Air pollution reduction
8. Noise reduction
9. Reclamation of waste land
10. Fuel production
11. Wood products
12. Conservation of bio-diversity
13. Recreation, including parks and sports grounds
14. Income generation for local economic development
15. Environmental education

Community Forestry is in the process of developing a list of appropriate tree species for each of these categories of application.

Partners

There are numerous service providers with a role to play in urban greening, who need to be encouraged to fulfil their urban greening mandates and provide support to the local government planning process.

Urban Greening Role Players:

Role Player Roles / Potential Roles

Department of Education
• Link urban greening issues in to curriculum 2005, or its Successor
• Support Edu Plant, the Trees for Africa school greening project
• Support Arbor Week
• Provide a link to educational institutions throughout provinces
• Provide a means of distributing materials to educational institutions, teachers and pupils within a province.

Department of Agriculture • Support the urban agriculture aspects of urban greening
• Provide a means of including a tree component in urban agriculture.
• Support EduPlant, the Trees for Africa school greening project
Local Government
(Municipalities and councils)

• Act as the hub through which all local development interventions are planned, implemented and managed, often through the LDO/IDP process
• Collect rates and taxes which could be channelled to urban greening
• Manage municipal nurseries
• Provide support to the watering and aftercare of trees in urban areas
• Develop and support the management of urban parks and open spaces, including a tree component

Department of Environmental Affairs

• Support the planting of indigenous trees in urban areas
• Support integrated environmental planning
• Manage a Departmental Nursery in Bloemfontein
• Provide specialist knowledge in horticulture / landscaping

Non-Governmental Organisations and Community Based Organisations

• Support community mobilisation and empowerment, and act as a conduit for their participation in local development planning
• Initiate and manage community nurseries where viable (for example, in Elliotdale and Nqabara Areas
• Initiate national awareness campaigns and specific interventions (for example, the work of Trees For Africa, or Siyazondla programmes and Community Environmental Network in Grahamstown)

Department of Health
• Implementing a national food gardening programme to improve nutrition, including a tree component
• Supporting a fruit tree programme, to which Community Forestry can link for fruit tree support

Department of Human Settlements
• Supporting the establishment of new housing projects, which could include a tree component that can link with the Trees For Africa Trees for Homes Project

Private Nurseries

• Providing free trees or subsidised trees where possible (for example, if they have over-produced a certain species)

Non-Governmental & Service Organisations
• Providing sponsorship or contributions in kind to specific urban greening projects

South African Nursery Association
• Providing information on location and type of nurseries
• Supporting efforts to encourage private nurseries to provide free or subsidised trees for urban greening in disadvantaged areas

Private Companies • Providing sponsorship support to specific areas of urban greening, for example, Total support to Arbor Week, and Business Forum support to school greening and environmental education.
In terms of other service providers, Community Forestry has a strategic partnership with Trees for Africa. This revolves around three partnership projects:
Urban Greening Fund
With limited staff and resources across South Africa, Community Forestry recognises that it is important to make strategic interventions that maximise a return to investment in urban greening. For this reason, financial support is being provided to an Urban Greening Fund run in partnership with Trees For Africa. This will act as a draw down fund, publicised to organisations involved in urban greening.
Organisations can submit proposals to an evaluation committee, which will be evaluated according to strict criteria.

Trees for Homes
Community Forestry provides support to the Trees for Africa Trees for Homes Project. This seeks to strategically influence local government and developers to include greening in any new housing development.

EduPlant
Community Forestry is committed to the environmental education and awareness aspects of urban greening. Working with the Department of Education and schools is particularly important. For this reason, financial support is being provided to support the Trees For Africa EduPlant programme over the next five years. This programme aims to stimulate schools to plan and implement environmental projects on their grounds, in the form of a competition. Where there are tree components, provincial Community Forestry staff will provide direct support to finalist schools.

Plant Supply for Urban Greening

Community Forestry prefers not to provide free trees for urban greening programmes. There are three preferred alternatives:

- Private nursery supply - where private nurseries are encouraged to sponsor or subsidise trees for urban greening in specific underprivileged areas.
- Community nursery supply - where community nurseries are encouraged to provide trees to urban greening under contract to either the municipality or another service provider, or perhaps community Forestry in relation to Arbor Week. Community

Forestry can support community nurseries in market appraisals and the preparation of business plans to ensure long term sustainability and income generation.

- Municipal nursery supply - where the municipality retains or takes on the role of plant production, with technical advice from Community Forestry, under their own budget.

Free trees will only be provided directly by Community Forestry for Arbor Week, or where all the following conditions are met:

- There is a promotional element that will result in a multiplier effect
- Preparations to plant the trees have been made (there are holes dug, water is available, and adequate arrangements for protection exist)
- There is no alternative source of plant supply, either from the private sector, community nurseries, or municipal nurseries
- There is no alternative budget from which to buy trees
- The programme is included in a clear local development plan supported by local government, or a clear strategy by another service provider (government or nongovernment) operating in a framework acknowledged by local government
- There are clear arrangements for the after care and maintenance of trees, including watering and pruning
- There is a clear timetable for the phasing out of free tree support, possibly leading to the recovery of transport costs, or full costs (there must be an exit strategy)
- The benefits of free tree support are clearly directed to the most needy urban dwellers

There is full community participation in the planning and implementation of urban greening, including the planting and care of trees, through forums such as street tree committees

There are Community Forestry nurseries operating in South Africa, and the long term aim of government is to move out of direct plant supply. The nurseries are in East London and Umtata. Clearly, free trees can only be provided to urban and peri-urban areas within a reasonable distance of these locations. Community Forestry will not respond to ad-hoc requests for free trees.

Monitoring and Evaluation

Monitoring and evaluation can be conducted through the appraisal of implementation performance under the:

1. Urban Greening Strategy
2. Provincial Community Forestry Strategies
3. Service Delivery and Budget Implementation Plan
4. Integrated Development Plan

In addition, there are specific performance indicators for urban greening:

- Urban forestry is included in urban greening as part of local government development plans (Integrated Development Plans and Land Development Objectives)
- Urban greening support is included in Provincial Annual Business Plans and Budgets

- Funds are made available through the private sector to support urban greening
- Formal linkages are established between local government and urban greening role players, including regular meetings
- Trees are planted, cared for and survive in urban areas
- Noticeable changes in the urban landscape (recorded by photographs, aerial photography and mapping)
- Constraints to urban greening support are identified and resolved
- Urban greening role players are aware of their specific role, and fulfil their mandates
- A neighbourhood park on the site of the demolished Erf 1 along the N2 in Extension 8 low costs housing development. The site has been reworked from degradation due to human activities particularly mining, it had previously imposed death threats to children of the area and also served as a dumping site to solid waste material. As part of the proposal the existing allotments would be to close down the mining area adjacent to the housing development and rather create an open spaces (parks) for recreational activities.

The park could comfortably accommodate:

- A substantial children's playground.

- A lawn area for informal play and events.

- The park can be self-sufficient for drainage purposes by using softfall and hard surfaces and cross-falling paths to swales and filter drains.

- A diagonal linking route from the location to the business zone of Idutywa. (CBD)

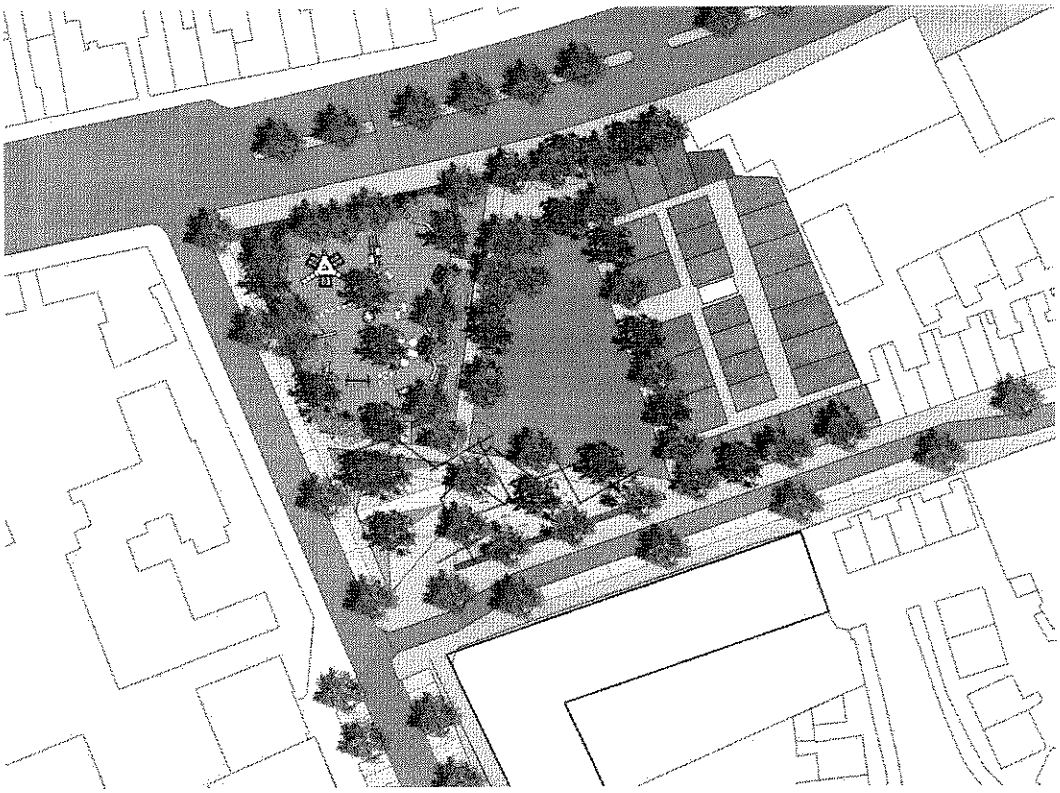
- Primary routes though the park should ideally be lit and accessible day and night. Primary routes will be designed to accommodate emergency vehicles and security patrols (Gardaí, Park Wardens).

- Skate opportunities in the form of incidental sloped edges and ramps incorporated into the park design.

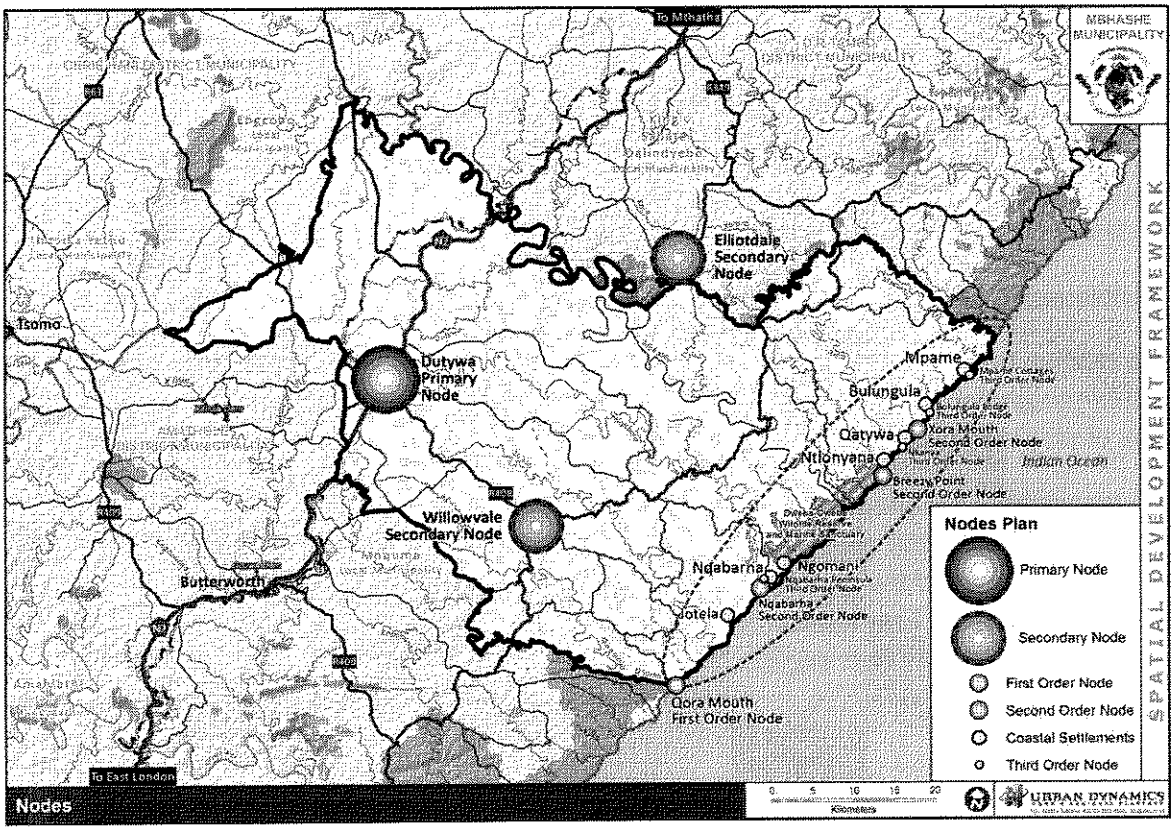
- Possible outdoor gym area.

- The design of the park should reflect the importance nature and city viewing. There is particular scope for playful interpretation by incorporating over-sized textile paraphernalia as pieces of play equipment.

In the longer term it is proposed to relocate the allotments to nearby sites within the Elliotdale area; as identified in the area wide spatial planning strategy (SDF). This will then release a site on the east side of the park for future development in line with those uses proposed in the Spatial Development Framework. This will provide greater passive surveillance of the park and a more satisfactory built edge or 'bookend' to the existing apartment scheme.



Mbhashe Local Municipality Nodal Plan



Elliotdale Parks and Open Spaces System

The purpose behind having the recreational park in Elliotdale is mainly as follows:

To develop an area as a high quality neighbourhood park that provides for a range of recreation and events, improves urban permeability and delivers a range of ecosystem services. An 0.3 hectare area incorporating the vacant site adjoining The Maltings apartment complex is proposed for a mixed-use development. The indicative designs developed propose the realignment of the existing road (Bonham St.) that traverses the site to create a deeper development site and also to place the corner of a future building as a visual terminus to the proposed Roe's Lane (Digital Hub Site).

The indicative plan shows the arrangement of three terraces stepping down from south to north with the natural contours of the site. The old Parish Boundary of St. Audeon's and St. Catherine's forms the edge between the upper and middle terrace.

The park could comfortably accommodate:

- A community garden and allotments.

- A local playground - with the emphasis on providing for children under ten years of age.

- A market place – as a focal space for allotment growers across the city to have gatherings and sell or barter produce and seed.

- A lawn area in the heart of the park; a place to play, picnic, kickabout and for events. But also to reinforce the feeling of a green room within the city.

- The lower (northern end) of the park could accommodate a swale or pond as a SuDS and biodiversity feature. The wetland feature also reflects the pre-urban river landscape of Ushers Island, a small river island that sat at the edge of a broader river channel.

- A direct pedestrian link from Bonham street to Bridgefoot Street

- East-West route across park to link from Bridgefoot St. to Watling Street and Victoria Quay.

- Primary routes though the park should ideally be lit and accessible day and night. Primary routes will be designed to accommodate emergency vehicles and security patrols (Garda, Park Wardens).

- A Community Garden which can be used for training and environmental education.

- Skate opportunities in the form of incidental sloped edges and ramps can be incorporated into the park design.

- The park can be self-sufficient for drainage purposes by using porous softfall and hard surfaces and cross falling paths to swales and filter drains. The park will also be used to manage surface water flows from hardstanding areas around the park, thereby reducing surface water discharge to the combined sewer system in the area.

- There is also scope within the park to accommodate outdoor gym equipment.

The green space at Pimlico is not of a sufficient size to be considered as neighbourhood park; it is none the less a high profile space in the urban structure and a key linking space between Marrowbone Lane, Ardee St / Cork St.,Meath St. and Thomas St. At present the overall urban character is one of disorientation as the scale of well-defined residential streets suddenly breaks down and is juxtaposed with the flat blocks set back from the street edge in addition to the scale and mass of the buildings on the Guinness Brewery site.

The proposals for the space are described as follows:

- At the centre of the proposal for Pimlico is making an attractive resting space within the existing green.

- Threading a number of pedestrian desire routes through the space to bring surveillance and vitality.

- Incorporating the unused hardstanding fronting the flats to the east to enlarge the space.

- The design of the space will be a hybrid of green and hard landscape. It is proposed to make the space open and visible from Marrowbone Lane, School St. and Earl St.

- The existing Whitethorn will be retained and its setting enhanced.

- A specimen Conifer on the corner of Marrowbone Lane / Earl St. can be decorated and illuminated for Christmas.

- The soft landscape areas can function as rain gardens to intercept runoff from adjoining roads and add an ephemeral layer of interest to the space.

- Localised realignment at the road intersection is proposed to make it easier for pedestrians to cross, including, tighter corner radii, narrower road carriageway width and/or raised table.

- The proposed Marrowbone Lane off road cycle track would terminate here. Cyclists can continue towards the city centre on road via Earl St. and Meath St.

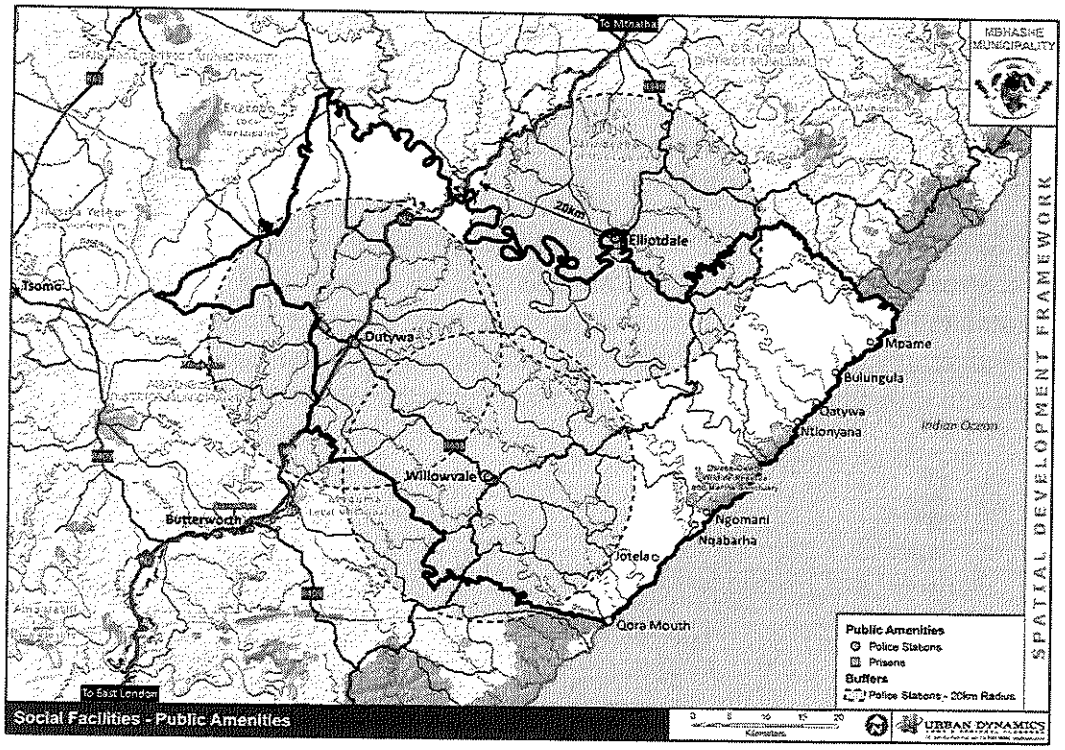
- It is proposed to rationalise the on street parking bays along Marrowbone Lane and introduce street trees.

- The hardstanding areas to the front of the flats on the south side of Marrowbone Lane could accommodate low cost transitory landscape in advance of future infill development.

- The existing play area on the School Street flats complex could be improved with an additional planting to the edges and replacement of the

macadamia and softfall surfaces with softer and organic materials; gravel, sand / bark mulch.

- The space could also accommodate a Dublin Bikes station as part of a future phase of expansion.



The tree planting strategy looks to maximise the opportunities for tree planting along the streets of The Liberties. The tree planting strategy will place emphasis on maximising the potential for long lived tree species where possible and to utilise native species where feasible. Including the tree planting proposed for parks and green spaces it is hoped to increase tree cover in The Liberties by up to 50% over the lifespan of the strategy.

Typically opportunities for street trees along streets can be created with pavements build outs (in particular at street corners) and where on street parking or loading bays can be omitted. This ensures that new trees are not planted too close to existing building frontages and on top of utilities and services underneath the footpaths. A worked example of this tree planting approach applied

The strategy proposes that tree species selection should reflect the scale of street or space for which it is chosen. Therefore wide streets and spaces such as Newmarket and the South Quays can accommodate large tree species such as London Planes and Lime trees, medium scale streets can accommodate moderately large trees such as Turkish Hazel, Robinia and Birch and smaller trees such as Hornbeam, Pear, Crab Apple and Honey Locust are better suited to narrow residential streets.

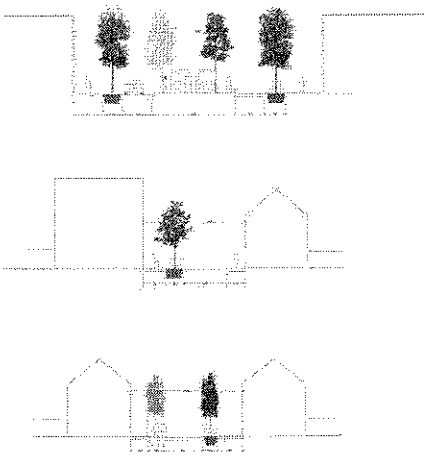
By omitting every third parking bay on a street for a tree will give a spacing of 18 metre approx. from centre to centre; a spacing ideal for larger urban trees. Smaller tree species could be planted in

groups to accentuate their presence on the street. The surface of the tree pit could be planted or where required can accommodate seating and/or cyclestands. In order to achieve the best possible outcomes for the trees it is important that tree pits are adequately sized and well prepared. Every street tree pit should have a minimum rooting volume of 4 cubic metres of good quality growing medium (soil). Where possible rooting volumes in the order of 12- 16

cubic metres should be provided; which would be equivalent to a tree pit covering the area of an on-street parking space.

On busy sections of streets it may be necessary to utilise load bearing soils in order to carry paved surfaces over the top of the tree pit.

The Greening Strategy seeks to maximise the multi-functionality of green spaces and this extends to the street tree planting. It is proposed that all streets tree pits will serve a Sustainable Drainage Function (SuDS), whereby surface water run-off from buildings and hard surfaces can be directed to tree pits. The soil in the tree pits can then filter and clean the water before it infiltrates to groundwater or overflows to the stormwater sewer network.



Large trees for wide street and big spaces

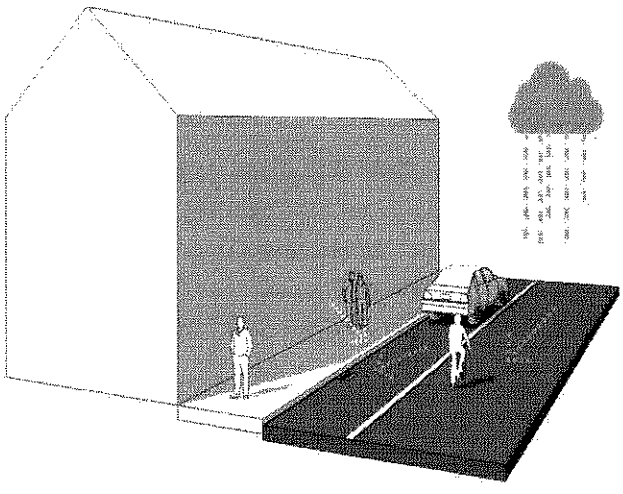


Figure 1 Existing situation- street with side parking along with Kerb

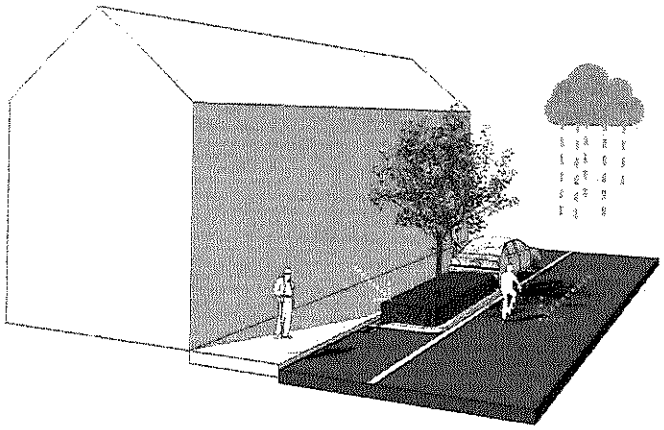
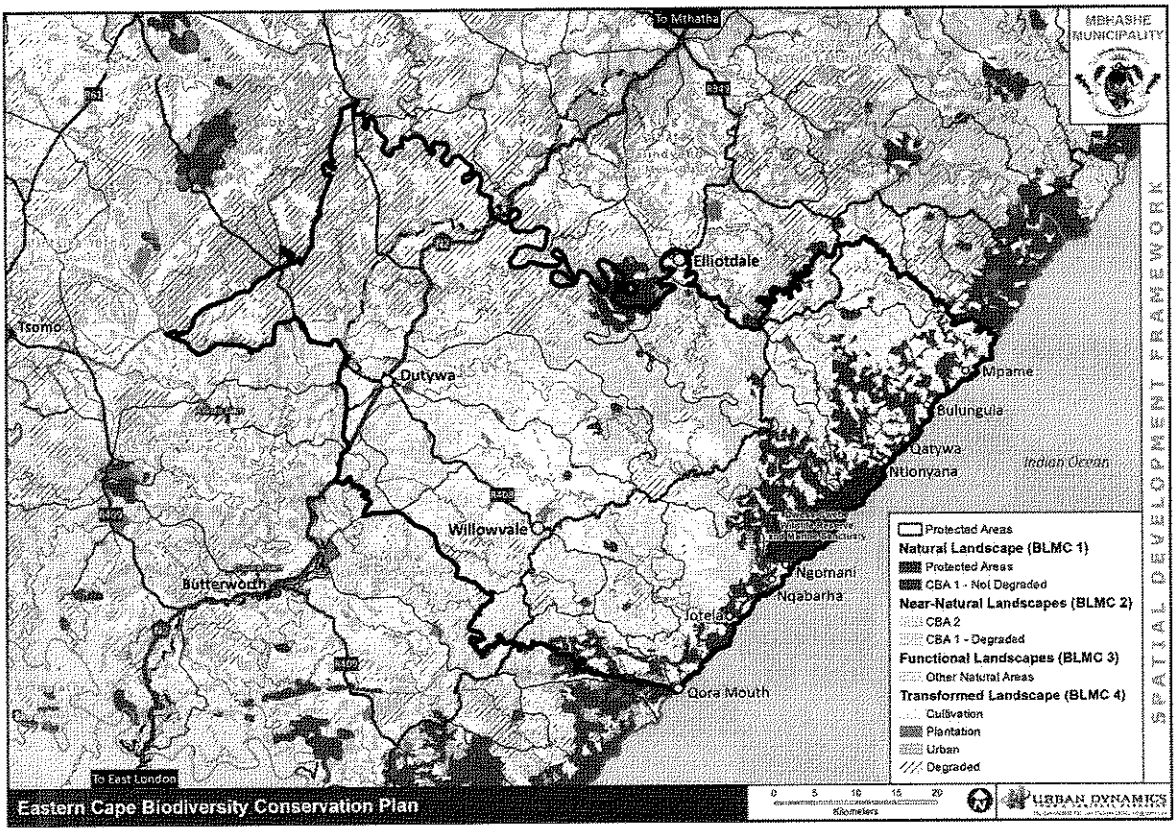


Figure 2 parking omitted to make way for tree pit

URBAN PLANTING FOR BIODIVERSITY ENHANCEMENT

This section sets out additional guidance on how to improve local biodiversity through planting and advises on the preferred trees, shrubs and groundcover planting. The general aim is to create urban habitats which support as many native flora and fauna species improve conditions for species such as butterflies and song birds which are appreciated by the public and where possible to create or mimic semi-natural habitats which are rare in the area such as wetlands and hedgerows.

Within green spaces it is desirable to have a diversity of complementary habitats such as low grass, tall grass, shrubbery, trees, wetlands, allotments and walls. If not planting native trees or shrubs cultivated varieties of these species are a good alternative and if planting non-natives choose species which produce flowers and set seed, or have structural features which support wildlife such as fissured bark or dense foliage. When selecting herbaceous plants as far as is possible choose the older non-improved varieties.



Guidelines for Walls

Landscaping of bare vertical walls can dramatically improve their biodiversity value. Ivy (Hedera helix) is particularly useful, but also Cotoneaster horizontalis and Pyracantha as these two will provide food for birds. Bird boxes could be added to suitable trees or walls. Robin, Blue Tit and possibly Great Tit are the species most likely to use artificial nest boxes in the Liberties. Therefore the type chosen should be suitable for these species.

Features can be added to walls such as cavities containing natural materials where insects could overwinter, bats roost etc. As management of bird nest boxes is important they should be places where they can be accessed each year to clean them or/and discover if they have been used.

Guidelines for Tall Grass/Wildflower Meadows

Tall grasslands/wildflower meadows can either be created by allowing the local flora to appear after the topsoil is removed or by spreading wildflower seed or hay. Existing grasslands can be managed to become more like wildflower meadows. If fertilizer is not added and grass is cut regularly (and cuttings collected and removed), nutrient levels will decline naturally thus encouraging the growth of non-grass species. If a tall grassland/wildflower meadow is developed using a wildflower mix then on-going management will be needed to ensure the regular appearance of many of its colourful species as these are probably annuals. Management should involve early cutting in March/April to limit the growth of grass and late cutting after plants have flowered in August or September. All cuttings should be removed, a few days after the late cut to allow seeds to disperse. Scarifying may also be needed. Grassland type habitats can also be created on roofs.

Guidelines for Shrubberies

Shrubberies can be of varying size in many types of locations, including roofs. A low shrubbery can be of value to invertebrates and can be created using hawthorn or wildlife friendly non-native species: Cotoneaster, Lavandula and Hypericum. Medium height shrubberies could use native spindle (Euonymous europaeus) with native ivy (Hedera helix) as ground cover or/and the non-natives; Berberis, Escallonia ('Apple Blossom') and Buddleia. A tall shrubbery c. 2.0metres is of greatest value for wildlife, for feeding and nesting birds. Many species are suitable including Ilex (Holly), Ribes, Syringa (Lilac) and Cotoneaster. It could be planted to resemble a semi-natural hedgerow e.g. a Holly hedge with honeysuckle and guilder rose.

Guidelines for Wetlands

Wetlands can include incidental puddles in the ground (which provide drinking water for birds) to various types of semi-natural and man-made rain gardens of varying degrees of wetness. The type of habitat created depends on the degree of wetness. These can include open water, emergent habitats, wet grassland and scrub all of which can support different plant species.

Open water habitats are of particular value as they will support large invertebrate populations, thus enhancing bird and bat numbers.

What is Green Infrastructure?

There are various definitions for Green Infrastructure. The definition, published by Comhar Sustainable Development Council in their research and policy document; Creating Green Infrastructure for Ireland describes GI on a national scale.

'Green Infrastructure is a strategically planned and managed network featuring areas with high quality biodiversity (uplands, wetlands, peatlands, rivers and coast), farmed and wooded lands and other green spaces that conserve ecosystem values which provide essential services to society).

The definition developed by Natural England (2011) is more relevant to an urban area:

Green Infrastructure is a "strategically planned and delivered network of high quality green spaces and other environmental features which should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities".

Based on current understanding of Green Infrastructure in the literature and the priorities for development in the Liberties, our definition of GI is:

Green Infrastructure = biodiversity + social and economic benefits + services

Green Infrastructure Benefits

GI in the Liberties describes all 'green and blue spaces', including parks, graveyards, yards and gardens, urban allotments and rivers. The GI is multifunctional in the sense that it provides interlinked Environmental (biodiversity), Social (quality of life) and Economic services and benefits:

- Environmental /Biodiversity Services

Climate change: Mitigation and adaptation:

- Vegetation sequesters carbon and mitigates the Urban Heat Island

Effect; both functions are important in inner city areas and likely to become more important with climate change. Biodiversity and Wildlife:

- GI is likely to contain valuable habitats. A good GI network will allow for the movement of species via green corridors which will also provide pollination services.

- Improving soil quality:

- Soil micro-organisms and other flora and fauna will assist in the development of soil in abandoned land, leading to improved permeability and reduced loading on drainage systems.

- Sustainable water management:

- Vegetation and soils intercept and attenuate rainfall/ storm water and thus improve water quality and reduce loading on drainage systems and waste water treatment plants, services which could easily be costed and are likely to become more important with climate change

- SuDS. Planned areas (of various types from rain gardens to permeable surfaces) which allow for more sustainable management of rainfall and surface water now accepted as good practise in all

developments.

- Social (Quality of Life) Benefits

Cultural and aesthetic:

- Well planned and managed GI in public spaces provides positive sense of place to residents and tourists travelling through the area.

- Social cohesion:

- GI can support area regeneration and community cohesion through the provision of easily accessible public spaces which are safe and attractive and allow for enjoyable communal activities.

- Air quality:

- Vegetation (particularly if dense, coniferous and tall) actively and passively removes pollutants from air and mitigates noise impacts.

- Environmental education:

- In convenient local settings GI provides opportunities for formal and informal environmental education and the possibility of establishment of new social networks.

- Archaeological and built heritage assets:

- As GI is commonly associated with cultural assets, appropriate management of GI will support the protection, enhancement and appreciation of these heritage items.

- Health and Recreation:

- Proximity to and use of green spaces for recreation enhances human physical and mental health.

- Walking and cycling GI adds to the attractiveness of walking and cycling routes, and offers enhanced options for improving permeability.

- Economic Benefits:

- Property Investment in GI (development and management) is known to add to financial value of nearby properties and support regeneration initiatives.

- Tourism: GI provides amenities for tourists (destinations and routes) which will enhance prospects for employment in local service sectors.

- Food production: Cultivated private and communal areas provide direct financial benefits to residents. Communal gardening activities allow for sharing of local knowledge.

GI Disservices When reflecting on Green Infrastructure within an established urban environment one must also be cognizant of GI disservices. Within urban areas open spaces can provide opportunities for criminality and anti-social behaviour such as drug taking and excessive drinking. Where such activities occur in quieter and little used open spaces the anti-social activity can be perceived as the dominant human activity and discourages usage by other members of the community and visitors. In busier and larger parks and public spaces a degree of anti-social behaviour can occur without dominating the overall character or discouraging other park users. In addition, busier spaces benefit from passive and active surveillance by members of the public, park staff, parks wardens and Gardaí.

The physical attributes that make an area of open space beneficial for flora and fauna such as dense shrubby growth, tall meadow vegetation and the absence of dogs and cats can also make a space less visible and vulnerable to domination by anti-social activity or criminality. In considering the Green Infrastructure value of any single open space it is always important to consider to what the degree the space is perceived as safe and secure. A space which is considered unsafe by the general public is not serving a social benefit and is contributing to a negative "sense of place".

Green Infrastructure Benefits of the Greening Strategy

Qualitative and Quantitative Benefits

The Green Infrastructure Benefits of implementing the Greening Strategy are many and can be described as quantitative benefits that can be easily measured and qualitative benefits that are more difficult to measure but generally acknowledged.

The Quantitative Benefits of implementing the proposals within the Greening Strategy can be summarised as follows:

- Biodiversity. New and enhanced urban habitats and the diversification of local flora and fauna.

- Improving air quality and carbon sequestration (maturing and mature trees).

- Climate adaptation. Increased tree cover will provide additional shading during warm summers and percolation of high wind.

- More sustainable water management by introducing porous groundwater. A range of measures are proposed to divert surface water runoff from the Victorian sewer network; resulting in energy and cost savings in wastewater treatment and improved water quality.

- Access to green space and recreation. The Environmental Improvement Plan seeks to ensure all children living in The Liberties will be within a short 5-8 minute walk of a high quality and secure neighbourhood scale play space and all residents are within a short 2-5 minute walk of high quality green space.

- High quality urban linkage for walking and cycling providing shorter routes and enhanced permeability.

- Products from the land. Food, timber etc. The Environmental Improvement Plan provides long term proposals for food production within The Liberties in the form of allotments and community gardens.

- Environmental education resources for local schools and adult training initiatives. Qualitative Benefits can be summarised as follows:

- Enhanced landscape, quality and sense of place.

- Protection and enhancement of the setting of major archaeological assets and built heritage.

- Perceptions of safety and security.

- Enhanced health and well-being of residents through recreation and access to high quality urban landscape.

Additional Green Infrastructure Benefits

An enhanced landscape quality and sense of place arising from new and improved green spaces and planting of street trees can in turn support higher property values and rental yields. It may be possible to use international benchmarks to project estimated increases in property value and in turn property tax or rates yields or to undertake a baseline of property values and rental yields prior to Strategy implementation for later evaluation.

An enhanced public realm may also attract and support additional inward investment in high quality work space and learning facilities and investment in evening economy and tourist accommodation.

The Greening Strategy seeks to maximise opportunities for tree planting along the streets of The Liberties. The tree planting strategy will place emphasis on maximising the potential for long lived tree species where possible and planting native or biodiversity friendly species where feasible.

Including the tree planting proposed for parks and green spaces it is hoped to increase tree numbers in The Liberties by up to 50% over the lifespan of the plan. Where feasible it is proposed that tree pits will serve a Sustainable Drainage Function (SuDS), whereby surface water run-off from buildings and hard surfaces can be directed to tree pits. The soil in the tree pits can then filter and clean the water before it infiltrates to groundwater or overflows to the storm water sewer network. These storm water tree pits are well established in the United States cities of Seattle and Philadelphia and in Stockholm. The diversion of storm water to the tree pit also provides irrigation for the tree and enhanced growing conditions. It is also worth mentioning that tree pits provide extra habitats for invertebrates.

Measure for Improving Water Quality

The Greening Strategy proposes greening measures that can make positive contributions to water quality and divert surface water from the sewer network:

- Making new parks and green spaces self-sufficient for surface water drainage by utilising the following: porous hard landscape surfaces, swales, wetlands and/or rain gardens within green spaces, draining surface water off hard surfaces to large free draining tree pits and planting beds.

- Replacing surplus hard standing with soft landscape.

- Where appropriate and feasible developing rain gardens. The garden is a Sustainable Drainage feature; storm water run-off is channelled rain from hard surfaces (roads, footpaths) and buildings towards shallow depressions or hollows formed in the green and attenuated. When the hollow reaches capacity the excess water overflows to another hollow or to the storm water sewer network. The rain garden approach provides habitats for invertebrates, drinking water for birds and in suitable locations may involve the establishment of native plants adapted to water logged soils.

Conclusion

The Green Infrastructure Benefits of the Liberties Greening Strategy are clearly demonstrated by the preceding sections of this report. The strategy will deliver a multi-functional green infrastructure network that takes account of the physical challenges, constraints and social context of a dense inner urban area. The overwhelming benefit of the implementing the proposals will be of social benefit for the residents of the Liberties by providing high quality, accessible urban green space with new opportunities for play and recreation whilst increasing opportunities for food production in allotments and community gardens. By incorporating a Green Infrastructure mandate as part of the strategy making process, the Liberties Greening Strategy also optimises the ecological benefits that can be delivered. It provides new and enhanced habitats for urban flora and fauna, improves water management benefits by diverting surface water run-off from the combined sewer network and alleviates local spot flooding by providing alternative outlets into green spaces and tree pits. The increased tree coverage will provide micro-climatic benefits of shelter (reduced winds speeds) and mitigation of the urban heat island effect in summer (shading). The additional vegetation will also improve air quality and sequester carbon.

The implementation of the Liberties Greening Strategy represents a commitment by Dublin City Council to sustained investment to regenerate physical fabric of the Liberties area and will be transformative in areas blighted by dereliction and vacant sites with a paucity of high quality and usable green space. The green spaces and public realm projects proposed will bring readily identifiable quality of life benefits to the residential and working population. Although more difficult to quantify, the strategy will also lift the character and identity of the area and support sustained private sector investment in new housing, enterprise and workspace and visitor attractions.

The Green Infrastructure audit of existing green spaces together with background surveys undertaken as part of the Greening Strategy establishes a firm baseline with which to monitor and measure the benefits of the strategy. The methodology applied in the Green Infrastructure audit has been adapted specifically for this project. It is however a robust methodology that could be re-applied to other urban locations within Dublin or elsewhere in Ireland, providing a

scoring method to benchmark the Green Infrastructure performance of green spaces and entire urban areas.

Recommendations for Further Research

Baseline data unavailable at the time of undertaking this project but that would be of great benefit in assessing the impact of implementing Liberties Greening Strategy going forward would be:

- Baseline of property values and rental yields within the Liberties area prior to strategy implementation for later evaluation.

- Register of Vacant sites for the Liberties area.

- Commercial property vacancy.

Future improvements in property values and reductions in commercial vacancy could never be attributed exclusively to environmental improvement as the major factors for such trends will be macro-economic. However it may be instructive to monitor whether environmental improvements lead to above average trends over time. Without an established baseline it will not be possible to do so. Dublin City Council could potentially partner with local 3rd level institutes in undertaking the additional and specialised research to establish the above baseline data.

It would also be instructive to establish a baseline of cultural values of residents and visitors as applied to The Liberties area; utilising interview based questionnaires. For example such an interview process could ask questions related to perceptions of quality of green space, public realm and access to play space and recreation.

The Liberties Greening Strategy proposes to add an additional 600 trees within green spaces and along streets; an increase of 50% on the existing tree cover. Based on an estimated annual carbon sequestration of 6-12kg per tree per year the proposed tree planting will remove 3.6-7.2 tonnes of CO2 from the atmosphere per annum. The rate of Carbon sequestration will increase as the trees mature. For example mature London Planes can sequester 27 kg of co2 per year (after 2012). In the future it may be possible to fund green space works and street tree planting as Carbon Offsets for carbon emitting industries.