Reassessing the practices of Green Urbanism in order to generate a Sustainable Urban Renewal in Wellawatte town

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DECLARATION

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ABSTRACT

Under the broad umbrella of 'Sustainable Development', many have discussed and in some instances implemented many means in which human behaviour is changed in order to reduce their impact on the environment, promote economic development as well as enhance social welfare.

This dissertation intends to study sustainability in all its angles, exploring economic, environmental and social sustainability and the concepts of Green Urbanism principals to formulate a list of guidelines for sustainable green urban development.

The research focuses on Sustainable Green Development, which transforms into an Urban Renewal in an already existing scenario. The chosen Case Study of the city of Wellawatte is studied and in turn its elements are manipulated to assess its potential to be sustainable, whilst maintaining its character and importance in the least intrusive manner. The principles of Green Urbanism are juxtaposed and over-laid on the research finding of the case study, presenting research ideology that can be used in future Urban Development.

The case study highlights a city's potential to be a sustainable green city, which will eventually aid in any research and development to be done along the concept of Sustainable Retrofitting in urban environments.

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CHAPTER 01: INTRODUCTION

This dissertation begins by reviewing and evaluating research done pertaining to the study of sustainable development. From thereon, it moves on to exploring the research done, together with assessing Wellawatte as a sustainable city, from there on going into a more micro research segment. The study ends with the analysis of all research juxtaposed with the study of Wellawatte; with the sole purpose of drawing conclusions towards its sustainable future.

1.1 Background

Overcrowding, noise, poor air quality, traffic congestion, waste production and industrial emissions are just a few of the many externalities of contemporary urban production and consumption patterns. Cities are currently facing major challenges to their quality of life and to the range of opportunities that urban environments can offer their residents.

One can speak about three main families of challenges for sustainable urban regeneration which are namely; Environmental (climate change, carbon emissions and resource use), Social (inequality, cohesion and health), and Institutional (governance and geographical disparities).

Previous research on sustainability has been mainly limited to environmental and economic concerns. However in recent years, social sustainability has gained increased recognition as a fundamental component of sustainable development, beginning to receive political and institutional endorsement within the sustainable development agenda, and the sustainable urban regeneration discourse.

Wellawatte, is considered as the southern entrance into Colombo city and is an example of the points mentioned above. Being en route to the business capital of Sri Lanka, Wellawatte today, for a majority of citizens, is simply a pass through to other activities. What is indirectly unforeseen is the character and public component that Wellawatte is truly abundant with; characteristics that only its residents seem to understand.

This research aims at studying Wellawatte through the principals of Green Urbanism, highlighting its potentials which could lead to urban renewal in the future.

1.2 Research Question

The questions asked through this dissertation are as follows:

- What is sustainable development and what concepts are explored in today's context?
- What is urban renewal and how can it be used in measuring modern urban areas?
- How the stakeholders and their interaction shape the environment they live in.
- The formulation of Wellawatte and its key characteristics which make it what it is today
- Can Wellawatte be developed to be a sustainable city with minimum economical intrusion?
- Does Wellawatte have the potential to be self-sufficient?

1.3 Objectives

The main objectives of the research are to:

- Define sustainability and explore the main themes and dimensions at the heart of this concept
- Examine to what extent, and in what ways, sustainability is incorporated within urban renewal projects (based on literature reviews)
- Examine the principals of Green urbanism
- Examine the methods of retrofitting sustainability to cities
- Examine and identify best practices to measure and monitor sustainable urban renewal.

Objectives Continued:

- Critically review existing Wellawatte, identifying potentials for future sustainable development.
- Understanding the users involved in shaping Wellawatte and creating a framework for regeneration and sustainable renewal.

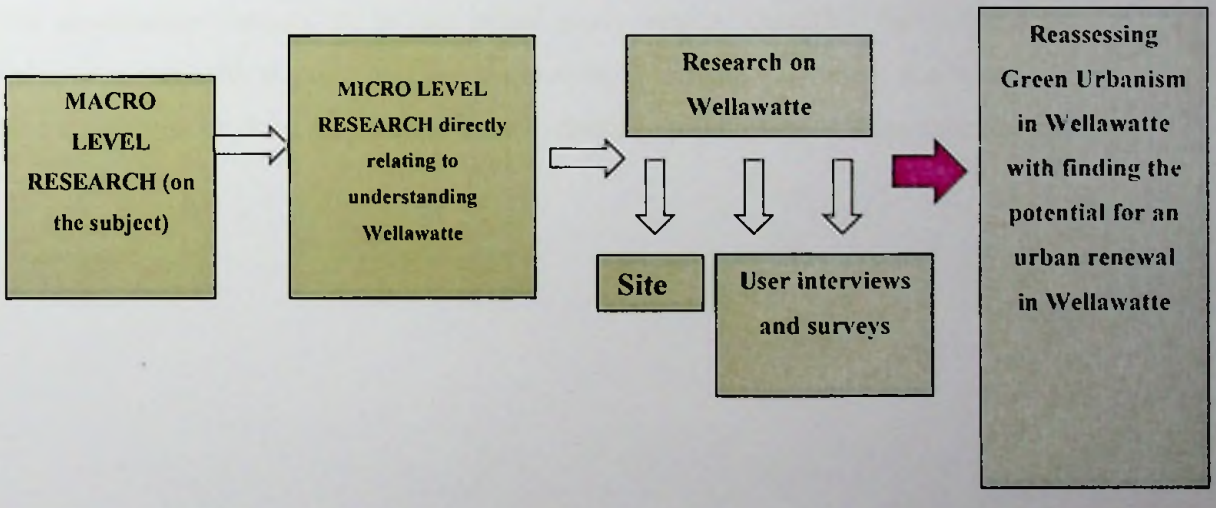
1.4 Scope and limitations:

Following the elaboration of the theoretical research framework, Wellawatte is selected after an in-depth review of many urban areas in Sri Lanka and therefore the scope of the study is limited to Wellawatte. The main reason for choosing Wellawatte is its complexity and attention to detail the research will have to carry out in terms of its character.

The main geographical focus of the study is limited from bridge to bridge. *I.e Dehiwela Bridge to Wellawatte Bridge.* However, Wellawatte as whole, (i.e. Wellawatte North, Wellawatte South, and Pamankada West) is considered to support the study.

The research done on Wellawatte is assessed with Green Urbanism Principals, gathering an insight to Wellawatte's potential sustainable development.

1.5 Methodology



The dissertation begins with research studies based on literature done previously on Sustainability, Green Urbanism and Urban renewal. Thereon, data collected is analysed against data received through the case study to extract parallels.

With regards to Wellawatte, site studies, interviews and surveys were carried out with the idea of drawing conclusions or similarities between the research done and the existing Wellawatte.

The literature reviews and the interviews explore the notion of sustainability, together with its main research approaches, assessment methods and indicators. These elements of work also examine the importance of sustainability and green urbanism in the contexts of urban renewal.

1.6 **Possible outcomes**

In the final stages of the research project, both the literature review and the case study analysis intends to be instrumental in producing a Green urbanism assessment framework, which is the first of its kind in the context of urban renewal in Wellawatte. The survey intends to prepare the stakeholders for a possible urban renewal, creating a framework for development which is influenced by them.

This dissertation intends to be an initial study which identifies the potentials Wellawatte has with regards to Green urbanism principals and paves the way for more research to be done along these lines to make way for a future urban renewal in Wellawatte.

CHAPTER 02: Reviewing Sustainability

This chapter outlines the existing literature relating to the dissertation's objectives. Firstly, it discusses the concept of sustainability in the context of urban development and then investigates concept, which are essential components in the implementation of any model of sustainable urban development in order to successfully analyse the town of Wellawatte as it is now and how its future can transition into a sustainable city.

2.1 Introduction to Sustainability

Sustainability has often been defined as how biological systems endure and remain diverse and productive. However, the 21st-century definition of sustainability goes far beyond these narrow parameters. Today, it refers to the need to develop the sustainable models necessary for both the human race and planet Earth to survive.

> *"A process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations"*
>
> *The World Commission on Environment and Development*

Sustainability has been defined as an ideological description of a system that supports the sustainable use of natural resources (Brown et al. 1987). Different individuals and institutions have their own specific ways of using the term 'sustainability' (including Brown (1981); Daly (1973); The International Union for the Conservation of Nature and Natural Resources; the Global Tomorrow Coalition; and the World Resources Institute, as cited by Brown, Hanson et al 1987), but usually the definition is concerned with the relationship between humans and the global environment (Brown et al. 1987). The West Australian Government's definition of sustainability is 'meeting the needs of current and future generations through the integration of economic prosperity, social advancement and environmental protection' (Government of Western Australia 2003). This definition is fairly general (Pudlowski 2002) and problems can be caused by contradictory social, cultural and ecological interpretations of the concept (Maslow 1970, as cited by Brown, Hanson et al 1987).

These differences in perspectives can result in the perception that the concept of sustainability is 'elusive' (Pearson 1985, as cited by Brown, Hanson et al. 1987) and an ambiguous concept, with no time, space, ecological, technological or managerial dimension' (O'Riordan 1985, as cited by Brown, Hanson et al. 1987).

The concept of sustainability becomes much more useful when applied to a particular anthropological activity using clearly defined values and perspectives. Therefore, for use within this dissertation it is necessary to define sustainability within the context of urban development.

The four pillars of sustainability include;

Environmental Responsibility, Social Equity, Economic Health, and Cultural Vitality.

2.2 Sustainable Development

Whilst sustainability is be defined as the practice of reserving resources for future generation without any harm to the nature and its other components; sustainable development ties together the concern towards the carrying capacity of natural systems with the social, political, and economic challenges faced by humanity.

The term 'sustainable development' goes beyond the boundaries of science, business development and trade to include human development, values and differences in cultures. In fact, many organizations are referring to sustainable human development as opposed to sustainable development, in order to emphasize issues such as the importance of gender equality, participation in decision-making processes and access to education and health.

By changing and developing the natural and man-made environment, people have created many local, regional, as well as global scale problems - increased environmental contamination, depletion of the ozone layer, global climate change, reduction in biodiversity etc. At the same time, social equity is increasingly recognized as being important in ensuring human development, which includes improvement of the quality of life for everyone. Sustainable development provides a possible way of balancing social and economic development, while providing environmental protection that can avert an impending ecological catastrophe and ensure the survival of humans.

The three spheres without which the survival of mankind is not possible are; a functioning economy, harmonious social relations and a healthy environment, all of which are the desired external preconditions for individual development (Figure 1).

Figure 1: Environmental, Economic and Social spheres of sustainable development

Society, economy and the environment, as the three pillars of sustainability, pose three characteristics namely; independency, inter-relation/inter-connection, and equality. Based on those characteristics, an alternative definition for sustainable development is stated as the path to balance social, economic, and environmental needs.

Collin and Collin (2010) states: "The protection of the environment is at the forefront of sustainable development, and this can be accomplished only through collaborative decisions, increased regulations, and each individual becoming a steward of the environment on a personal and global level," which implies that a sustainable future is in the hands of all of us, and the responsibility is shared and not left to politicians and policy decision makers.

Since that time, the importance of sustainable development has continued to grow, transforming and adapting according to the social, environmental, economic, and geopolitical conditions in different jurisdictions.

The growth of sustainable development will depend on advancing **three elements** of the assessment framework: **unification of criteria; common definitions for guidelines, processes, and methodologies; and adequate implementation of concepts to develop best practices.**

As sustainable development evolves, sustainable assessment will likely move toward more pro-active approaches, such as involving decision makers in the very early stages of projects that have sustainability targets.

2.1 Theoretical Framework of Urban Sustainability

"There is no one right path to sustainability that can or should be scientifically determined, but that the path is defined through the collective decisions of all involved, and the more that is understood about the path, the better the chance that collective decisions will actually move society in the direction of sustainability"

Meinhard Doelle and A. John Sinclair 2006

Element	Criteria
Economic sustainability	Growth
	Development
	Productivity
	Trickle Down
Social sustainability	Equity
	Empowerment
	Accessibility
	Participation
	Sharing
	Cultural Identity
Environmental Sustainability	Eco system Integrity
	Carrying Capacity
	Bio Diversity

Table 1: The paradigm of sustainable development in Agenda 21 as elaborated by Kahn (1995)

The advent of 'sustainability' in developmental science, has led planners to apply evolving notions of 'sustainability' to the contemporary debate over how cities and regions should be revitalized, redeveloped, and reformed.

'Sustainability' is regarded alternatively as either the proper means or the proper end of urban development. Today, it is common in planning circles for urban planners to describe efforts to reverse problems of urban sprawl, congestion, and decline as a search for 'urban sustainability' (Basiago,1996) . This is the case even though in

urban theory no consensus exists as to which human settlements embody 'sustainability'.

Economic sustainability, by way of growth, development and productivity, has guided conventional development science in the past. Market allocation of resources, sustained levels of growth and consumption, is an assumption that natural resources are unlimited and a belief that economic growth will 'trickle down' to the poor have been its hallmarks. 'Sustainable development' expands development's concern with monetary capital to consider natural, social and human capital. Restraint upon economic growth and consumption which deplete these is favoured. (Kahn, 1995)

Social sustainability encompasses notions of equity, empowerment, accessibility, participation, sharing, cultural identity and institutional stability. It seeks to preserve the environment through economic growth and the alleviation of poverty. Some commentators have suggested that poor countries must accept environmental degradation as a short term consequence of economic development. Others have argued that an enabling environment that optimizes resource allocation can obviate the need for such a trade-off. (Kahn, 1995)

Environmental sustainability involves ecosystem integrity, carrying capacity and biodiversity. It requires that natural capital be maintained as a source of economic inputs and as a sink for wastes. Resources must be harvested no faster than they can be regenerated. Wastes must be emitted no faster than they can be assimilated by the environment. (Kahn, 1995)

The theoretical framework elaborated by Kahn posits that economic, social and environmental 'sustainability' must be 'integrated' and 'interlinked'. They must be coordinated in a comprehensive manner. A hypothetical case of deforestation in a developing country context follows to illustrate this 'integration' and 'interlinkage'.

2.1.1 Environmentally Sustainable Urban Development

An urban area is characterised by a concentrated population (Webber, 1964), and the use of the term 'Urbanisation' implies a change from a 'state of less concentration to a state of more concentration' (Berry, 1976).

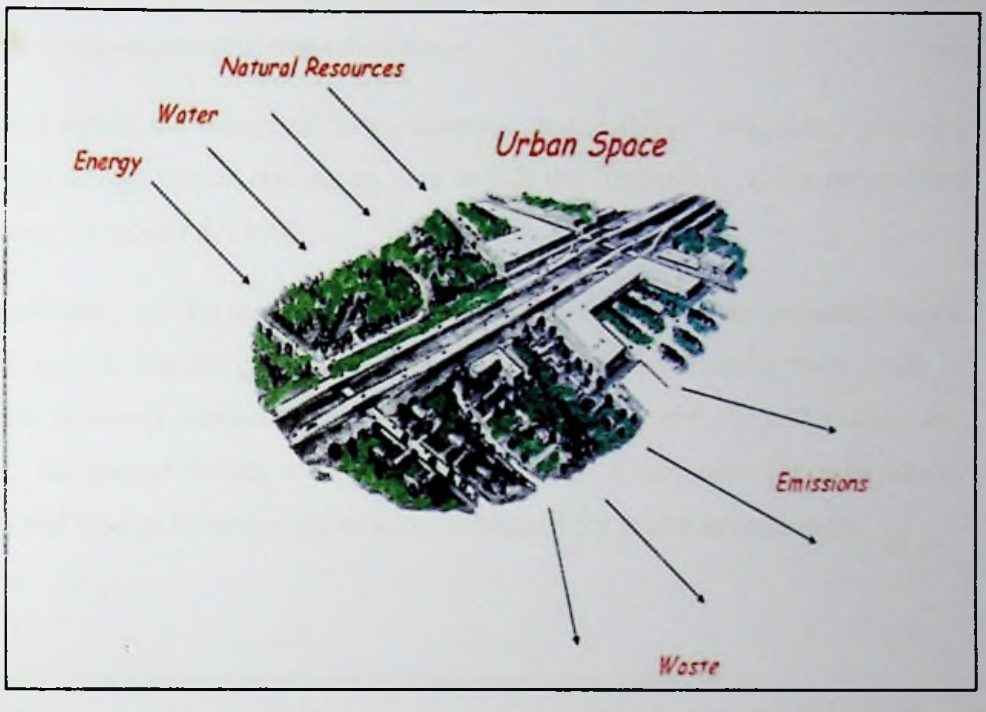


Figure 2: Urban ecological space including sources and sinks of energy, matter, waste and emissions (Alberti, 1996)

If ecology is the study of the interrelationships between organisms and their environment (Fahrig 2003), then the investigation into urban systems is essentially a study of urban ecology, and urban ecological space can be defined as the total natural capital and flows on which an urban system depends to meet the long-term needs of its inhabitants (Alberti 1996).

Wolman (1965) used the term 'urban metabolism' to quantify the flows of energy and materials into and out of the urban system. From an ecological perspective, indicators of sources, sinks, ecological support systems, and human health and welfare can describe the interaction between urban systems and the environment. Key variables describing the interrelationship between urban and environmental

systems include emissions to air, releases to water, waste management, contamination of land, the use of raw materials and natural resources, and other local environmental issues (Heinze, 2000).

Figure 2 illustrates how energy and matter are inputted from environmental sources in order to provide resources for an urban system to function, and how waste and emissions are by-products of that urban space.

In practical terms, the theory of 'environmental sustainability' suggests a planning process that allows human society to 'live within the limitations of the biophysical environment' (Goodland, 1995).

This requirement will be met in the planning regime that has been proposed for the Mexican state of Nayarit (table 2) Puerto Vallarta, the famed resort town south of Nayarit on Mexico's western coast, has been impacted by growth, and tourism has degraded the natural beauty that attracted people to it initially. For this reason, Mexican and foreign investors are looking to Nayarit for future development.

Table 2: Substrates of environmental sustainability in planning practice. Nayarit, Mexico

Element	Criteria	Means
Environmental sustainability	**Eco system Integrity, Carrying capacity, Biodiversity**	Propose a plan to protect natural systems
		Form a team of indigenous resource managers
		Educate the team in environmental planning
		survey the landscapes natural attributes
		Identify natural opportunities and constrains
		Identify cultural opportunities
		Eco principles from other regions
		Nature friendly development plan
		Recommend land development suitability
		Recommend land suitable conservation
		Hear local citizens affected by development

2.1.2 Socially Sustainable Urban Development

Concurrent with these debates has been another influential debate about the importance and nature of social sustainability. The concept of social sustainability has been developed in order to considerate the importance of social interaction and cohesion for the sustainability of communities. The concept has been particularly popular amongst public policy makers because of its resonance with the concepts of environmental and economic sustainability.

Social sustainability is a contested and complex concept (Dempsey et al. 2009). Bramley and Power (2009:31) argue that social sustainability refers simultaneously to individual quality-of-life issues and to the collective functioning of society. A comprehensive definition of social sustainability that includes both these dimensions is provided by Barron and Gauntlett (2002:11):

Social sustainability occurs when the formal and informal processes, systems, structures and relationships actively support the capacity of current and future generations to create healthy and liveable communities. ***Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life.***

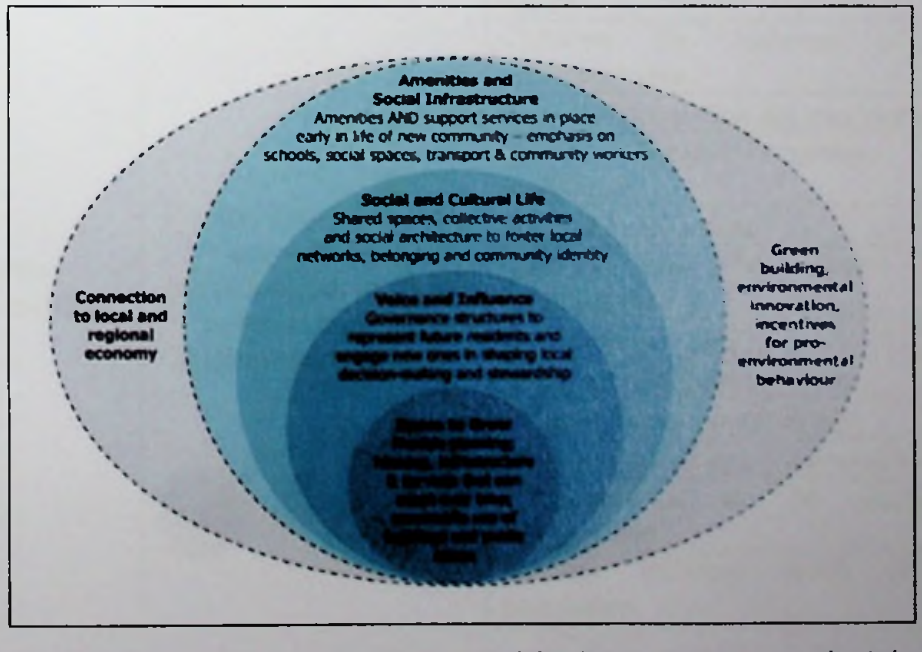


Figure 3: Urban ecological space including sources and sinks of energy, matter, waste and emissions

The theory of 'social sustainability' calls for economic growth constrained by the requirements of social equity. In order to link these, an enabling environment must be created that optimizes resource use, prioritizes resource allocation, and fosters equitable resource distribution. This form of social organization has emerged in the Indian State of Kerala (Table 3)

Visitors to Kerala cannot help but notice how housing there is of a higher quality than in the rest of India; how beggars are generally absent; how women are strong and independent participants in society; and how citizens complete tasks in a relaxed manner, building a society that is both beautiful and efficient. Kerala seems to have passed through 'the demographic transition' in a remarkable way.

Alexander (1994) writes that Kerala may present the best example of how civilization can cope with burgeoning human population in an era of dwindling natural resources. Kerala's fertility rate of two children per female and very low consumption levels, he suggests, characterize the prudence that will permit human society to attain a high quality of life in the 21st century.

Table 3 Substrates of social sustainability in planning practice, Kerala, India

Element	Criteria	Means
Social sustainability	**Equity, empowerment, accessibility, participation, sharing, cultural identity, institutional stability**	View natural resources as limited in nature
		Cultivate the lushness of the settlement area
		Rely on information not machinery
		Value family/community over individuals
		Work for enjoyment
		Cherish folk life rather than entertainment
		Reduce family size
		Eliminate divisions of caste
		Gender neutral opportunities
		Universal education of population
		All citizens to be economic stakeholders
		Address wellness needs of the population

2.1.3 Economically Sustainable Urban Development

"Economic sustainability" implies a system of production that satisfies present consumption levels without compromising future needs. The "sustainability" that "economic sustainability" seeks is the 'sustainability' of the economic system itself.

The notion of 'economic sustainability' was originated by Hicks. In his classic work Value and Capital (1939; second edition 1946), Hicks defined 'income' as 'the amount one can consume during a period and still be as well off at the end of the period'.

Traditionally, economists, assuming that the supply of natural resources was unlimited, placed undue emphasis on the capacity of the market to allocate resources efficiently. They also believed that economic growth would bring the technological capacity to replenish natural resources destroyed in the production process. Today, however, a realization has emerged that natural resources are not infinite. The growing scale of the economic system has strained the natural resource base.

Table 4: Substrates of economic sustainability in planning practice

Element	Criteria	Means
Economic sustainability	**Growth, development, productivity and trickle down**	Programs to reduce automobile usage
		Establish a modern bus mass transit scheme
		Enhance bus system efficiency which draws more people in
		Make bus transit fast, cheap and comfortable
		High density living near major arterials
		Zone for mixed residential
		Make downtown streets pedestrian malls
		Expand green zones to safe guard open space
		Enlarged per capita green space
		Regulations which protect the trees
		Enable poor to swap garbage for food
		Encourage separation of garbage
		Set up programs to recycle
		Low emission industrial zones
		Free medical and dental

A way to implement the theory of 'economic sustainability' in a practical sense is to fashion a method of urban design that meets the urban service needs of the general public, particularly the urban poor, while enhancing the naturalness of the urban environment. This planning approach is found in Lerner's work for the Brazilian city of Curitiba (Table 4) (Moore, 1994)

2.2 A Framework for Sustainable Cities

It has been suggested that the building of a "green" city is equivalent to the building of sustainability (Beatley, ed., 2012). Many countries are planning and engaged in building green cities and "eco-cities" as starting points for the building of sustainable development. Yet, it is important to understand cities' sustainability as a broader concept which integrates social development, economic development, environmental management and urban governance, which refers to the management and investment decisions taken by municipal authorities in coordination with national authorities and institutions.

In 1991, the United Nations Centre for Human Settlements (UNCHS) Sustainable Cities Programme attempted to define a sustainable city as one "where achievements in social, economic and physical development are made to last" (United Nations Human Settlements Programme (UN-Habitat), 2002, p. 6). However, this definition was still too general and neglected the fact that a sustainable city must have a low ecological footprint and reduces risk transfer (economic, social and environmental) to other locations and into the future (Rees, 1992).

The concept of sustainable cities and its links with sustainable development have been discussed since the early 1990s. Sustainable cities should meet their 'inhabitants' development needs without imposing unsustainable demands on local or global natural resources and systems" (Satterthwaite, 1992, p. 3). In this sense, consumption patterns of urban middle- and high-income groups as indicated in chapters I and II are responsible for the use of a significant portion of the world's finite resources and contribute significantly to the production of polluting wastes.

Achieving the sustainability of cities can be conceived as entailing the integration of four pillars: **Social Development, Economic Development, Environmental Management, and Urban Governance.**

Figure 4 is a presentation of the four pillars for achieving urban sustainability encompassing the balanced accomplishment of social and economic development, environmental management and effective governance.

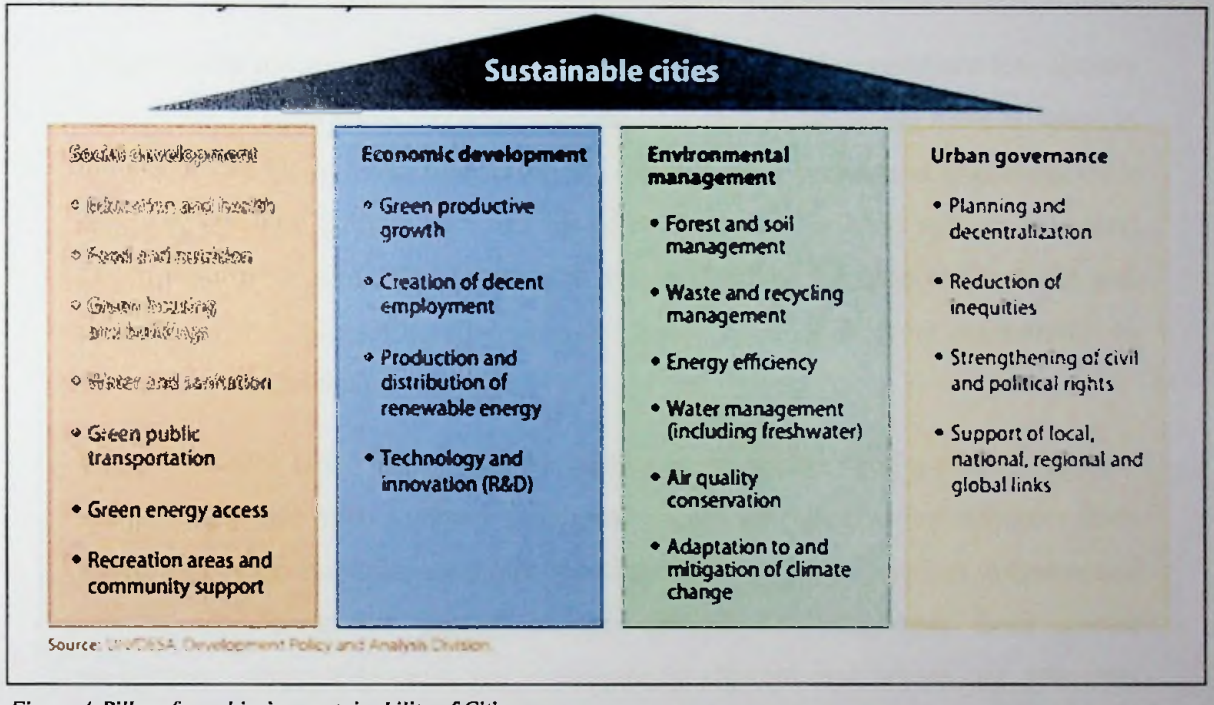


Figure 4:Pillars for achieving sustainability of Cities

The integration of the four pillars can generate synergies, for example, between waste and recycling management (environmental management) and access to water and sanitation (social development); between air quality conservation and green public transportation; and among production and distribution of renewable energy sources, green energy access, and adaptation to and mitigation of climate change, as well as between the goal of reducing inequities (urban governance) and that of ensuring adequate access to green housing, education and health (social development). *(World Economic and Social Survey. 2013)*

2.3 Challenges associated with building sustainable cities in developing countries

For city governments, the challenges include securing the necessary resources for investment in disaster-proof public infrastructure, and renewable sources of energy, and providing incentives to the private sector to create decent employment for large urban populations that are underemployed and have limited access to good housing conditions, clean water, sanitation, drainage and schools (table 5).

Upper middle income and high-income countries with urban populations that already have access to basic public services, face the challenge of becoming more efficient in the use of energy and water, reducing the generation of waste, and improving their recycling systems. Growth of cities has often gone hand in hand with an increased use of natural resources and ecological systems, driven by economic growth and changes in the economic structure—in terms of a shift from agriculture to manufacturing and then to services.

While wealthier cities and people, in particular, may have well-managed resource systems, they also have a greater ecological impact through drawing resources from larger areas. For example, wealthier residents in New York City, Los Angeles and Mexico City contribute greatly to the demand for freshwater from distant ecosystems, whose capacities are consequently affected and whose use generates significant levels of pollution and greenhouse gas emissions at the national and global levels (McGranahan and Satterthwaite, 2003). Thus, urbanization can be an important contributor to high resource use and waste generation, both with ecological effects at the local, regional and global levels.

	Main urban trends	Challenges	Opportunities
SOCIAL	**By 2025, urban population will live mainly in small cities (42%) and medium-sized cities (24%)**	Improve access to housing, water, sanitation; improve public infrastructure; foster institutional capacity	Investment in public infrastructure (including transportation); construction of compact buildings in middle-income countries; strengthen links between cities and rural areas
	Number of urban people living in slums continues to grow	Reduce number of urban poor and disease risk; improve social cohesion; reduce youth unemployment	Investment in universal access to affordable water and sanitation; establishing public transportation, and creation of jobs to reduce growth of slums; employment of the "youth" dividend in low-income countries
	Inefficient use of public services (water, electricity	Improve waste and recycling management; support consumption of local produce; change overconsumption patterns of high-income households	Subsidies to households and small firms to reduce non-saving water systems and waste; incentives to local communities to improve recycling systems
	Ageing	Create productive employment for older persons	Investment in universal pensions; extension of working age; support for family networks

Table 5: The Challenges associated with Social Sustainability

	Main urban trends	Challenges	Opportunities
ECONOMIC	**Inequality and financial fragility**	Create policy space for inclusive development; reduce underemployment; promote economic diversification	Investment in green industry, adaptation to climate change, structural economic change (industrial and service leapfrogging for least developed countries); strengthening regional cooperation
	Food insecurity	Improve access to food; increase productivity	Investment in urban agriculture, local crops, storage facilities; R&D

Table 6: The Challenges associated with Economic Sustainability

	Main urban trends	Challenges	Opportunities
ENVIRONMENTAL	**Energy access Provide access to clean**	Provide access to clean energy and reduce use of "dirty" energy in poor households (e.g., least developed countries); discourage high-energy consumption in high-income households	Investment in capacity development, energy-saving devices, production and use of renewable sources of energy; subsidies and incentives for efficient energy use and water use for middle- and high-income households
	Climate Change	Reduce impact on livelihoods; reduce carbon emissions; generate financial resources for adaptation	Investment in health and education infrastructures and facilities; adaptation and mitigation technology, early warning systems, green public transportation; strengthen regional cooperation for green technology transfer

Table 7: The Challenges associated with Economic Sustainability

2.4 The Concept of Sustainable Cities

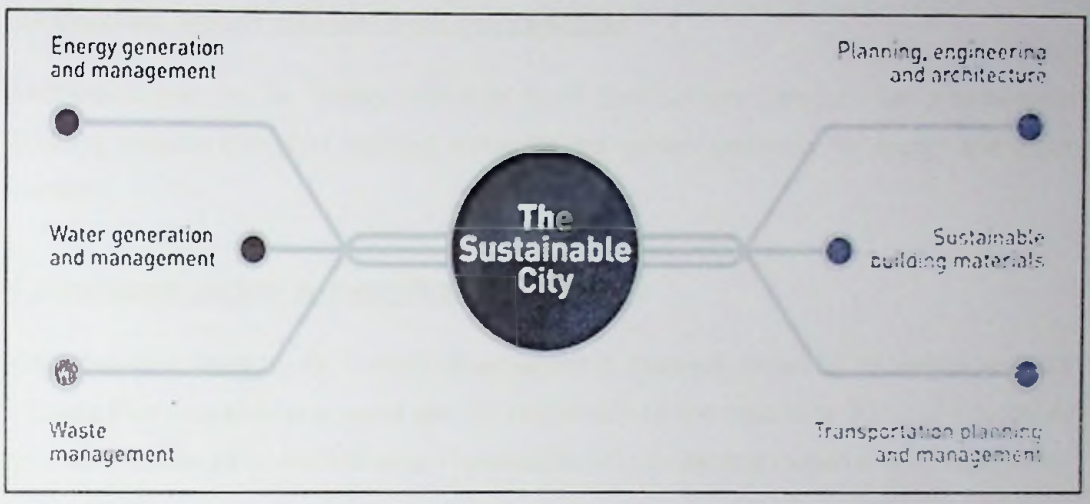


Figure 5: Elements of a Sustainable City

Cities are responsible for up to 70% of global carbon emissions and 75% of the global energy consumption. By 2050, it is estimated that 70% of the world's population will live in cities and as a result the critical challenge for contemporary urbanism, therefore, is to understand how to develop the knowledge, capacity and capability for public agencies, the private sector and multiple users in city-regions to re-engineer systemically their built environment and urban infrastructure in response to climate change and resource constraints.

Today many countries are taking the initiative to be sustainable – phased out visions which in turn would be self-sustained in the next couple of decades.

2.4.1 Cities that are leading the way in urban sustainability

Melbourne: energy efficient built environment

Melbourne won in the Energy Efficient Built Environment category for a sustainable building program that gives building managers and owners financing for energy and water retrofits.

Copenhagen: carbon measurement & planning

Copenhagen scooped up the Carbon Measurement & Planning award for its ambitious 2025 Climate Plan—an attempt to make the city completely carbon neutral by 2025. If it succeeds in cutting emissions to 400,000 tons, Copenhagen will be the first carbon neutral capital city in the world.

Mexico City: Cleaner air

Although at one time identified as the most polluted city in the world, Mexico City took the Air Quality award for ProAire, a program that has dramatically cut CO2 emissions and air pollution over the last 20 years through everything from vehicle emissions reductions to containment of urban sprawl. It's proof that a solid plan can significantly improve air quality.

Munich: green energy

Munich received the Green Energy award for its initiative to power the city in 2025, by completely using renewable sources. So far, the city is 37% of the way there— and in 2017, wind projects will cause that number to climb to 80%.

Rio de Janeiro: sustainable communities

The Morar Carioca Program aims to "formalize" and re-urbanize all of Rio's favelas by 2020, with a combination of better landscaping, infrastructure, educational tools, and more—a move that will help with health and wellness for the 20% of the city population that lives in these settlements.

New York: adaptation & resilience

New York City won in the Adaptation & Resilience category for its now-famous post-Sandy action plan, dubbed A Stronger, More Resilient New York. The program consists of 250 ambitious infrastructure resilience initiatives across a number of categories, including transportation, telecommunications, parks, insurance, and buildings.

San Francisco: waste management

San Francisco took the Waste Management award for an incredibly effective 11-year-old zero waste program, which now sees 80% of all trash diverted from landfills. By 2020, the city hopes to bring that up to 100%

Singapore: intelligent city infrastructure

Singapore is the Intelligent City Infrastructure recipient—an award given for its Intelligent Transport System, which is made up of an amalgam of smart transportation initiatives, like real-time traffic data from GPS-equipped taxis and an electronic road toll collection system. The result: Singapore has lower congestion rates than most cities.

Tokyo: finance & economic development

Tokyo won in the Finance & Economic Development category, for its launch of the world's first cap and trade program in 2010. Today, the program has 1,100 participating facilities, which have cut emissions by a total of 13% in the city and prevented over 7 million tons of CO2 from being released.

Take all of the best qualities of these municipalities—effective road management, cap and trade, sustainable energy, excellent public transportation, a zero waste program, and so on—and you have an urbanism's dream city. Whilst that dream city may not be a reality yet, but the first step to creating one (or many) is learning from cities that already excel in specific areas. Because, while the United States may have a hard time adapting resilience lessons from Japan, New York City might be much more willing to learn from Tokyo.

2.5 Moving Cities towards Sustainability

Sustainable cities have become a highly desired goal for future urban development. However, there are several differentiating descriptions of what exactly a sustainable city should look like. According to the think-tank Sustainable Cities International (2010), a city should adopt city-specific sustainable development strategies in order to foster innovation and advancements within infrastructure and technology, whilst also increasing efficiency gains.

Bulkeley and Betsill (2005) address how strongly cities and local governments actually can influence the challenges of sustainability. Several obstacles are faced when creating a sustainable city, and the interpretation and implementation of sustainability are shaped by the various forms of governance, which challenges the traditional distinctions between local, national and global politics. Bulkeley and Betsill (2005) further argue for long-term approaches that centre on sustainability, to ensure that cities can better anticipate and cope with rapidly changing conditions. Cities can be seen as motors used to move towards sustainable development, and the management of these complex systems requires innovative and sophisticated planning tools and concepts (Rotmans, Asselt, and Vellinga 2000).

Rather than being independent from one another, Nam and Pardo (2012) state that the existing planning tools and concepts are mutually connected and overlap with each other. This can result in vast confusion in terms of definitions, which in turn complicates the application and usage of such tools and concepts.

Jabareen (2006) identifies four types of sustainable urban forms, and describes how their design concepts contribute towards sustainability: neo-traditional development, the urban containment, the compact city, and the eco-city. Schatz (2007) identifies the three types of developments within our increasingly urbanised habitats as being the digital city, the intelligent city, and the smart city. Murray, Minevich, and Abdoullaev (2011) identify three solutions for cities moving towards sustainability: **knowledge cities**, which focus heavily on education, lifelong learning and personal growth; **digital cities** or cyber-cities, driven primarily by investments from large information and communications technology vendors aiming to enable vast

interconnectedness; and **eco-cities**, which focus on environmental sustainability through the widespread adoption of renewable resources.

Murray, Minevich, and Abdoullaev further state that a holistic and systemic integration of these three city types results in a new urban planning approach, namely, **the smart city**. Batagan (2011) states that this systemic approach can address the sustainability challenges in the urban context.

This dissertation based on the regeneration of Wellawatte analyses the studies revolving the concept of the "eco city" and green urbanism which are further discussed below.

2.5.1 The Eco City Concept

Urban planning and regeneration over the last one hundred years or so have been significantly influenced by attempts to redress the perceived detrimental effects of large-scale urbanisation, such as environmental degradation, social inequalities and urban sprawl. The Garden City, New Town and Techno-City are nineteenth and twentieth century exemplars of such attempts to reinvent the city in the (post)industrial era (e.g. Kargon & Molella).

2.5.1.1 Eco Cities

The term **'eco-city'** surfaced in the 1970s, when a US-based movement known as Urban Ecology first used it. Founded in California, the group launched the journal, The Urban Ecologist.

"An eco-city is an ecologically healthy city. That also means the city design is strongly informed by knowledge of ecology and its design principles." (Register, 1993)

Eco-cities come in all shapes and sizes. Research conducted in 2011 by the International Eco-Cities Initiative claims there are more than 170 such places globally, with this number set to rise over the next decade. Furthermore, the size,

scale and types of eco-cities vary widely. In the developing world, for instance, purpose-built eco-cities are being built at breakneck pace, whereas in the West, urban regeneration is more common.

The "eco-city" initiative is not new, but it had been in conceptual level till the last century. Building an eco-city started in the last couple of years (Joss, 2010) and this phase has started specifically in the mid-2000 with concurrent international initiatives. Presently, 79 eco-city initiatives have been identified all over the world with the largest concentration in Europe followed by Asia/Australia.

2.5.1.2 Guidelines for Eco City Development

Eco city development is a whole systems approach integrating administration, ecologically efficient industry, people's needs and aspirations, harmonious culture, and landscapes where nature, agriculture and the built environment are functionally integrated.

Eco city development requirements

Based on Guidelines adopted by the 5th International Eco city Conference delegation, Shenzhen China, 2002

- **Ecological security**

  Clean air, and safe, reliable water supplies, food, healthy housing and workplaces, municipal services and protection against disasters for all people.

- **Ecological sanitation**

  Efficient, cost-effective eco-engineering for treating and recycling human waste, grey water, and all wastes.

- **Ecological industrial metabolism**

  Resource conservation and environmental protection through industrial transition, emphasizing materials re-use life-cycle production, renewable energy, efficient transportation, and meeting human needs.

- **Ecological infrastructure integrity**

  Arranging built structures, open spaces such as parks and plazas, connectors such as streets and bridges, and natural features such as waterways and ridgelines, to maximize accessibility of the city for all citizens while conserving energy and resources and alleviating such problems as automobile accidents, air pollution, hydrological deterioration, heat island effects and global warming.

- **Ecological awareness**

  Help people understand their place in nature, cultural identity, responsibility for the environment, and help them change their consumption behaviour and enhance their ability to contribute to maintaining high quality urban ecosystems.

Finally, in contrast to the UN guidelines the eco-city concept has a wider approach to sustainability with a wider focus on fundamental changes including lifestyles. Yet the ideas are far undeveloped making it difficult for cities to apply in practice. The UN guidelines have a universal standard including written documents on guidelines for actions. The problem still remains that the definitions in the documents are too diffuse making it possible to interpret in a multitude of ways.

CHAPTER 03: Reviewing Green Urbanism

Chapter Three focuses on the concept of Green urbanism, researching concepts and principals in order to create a framework for evaluating the concept of 'Green' in the city of Wellawatte.

3.1 Introduction to Green Urbanism

Green Urbanism is a conceptual model for zero-emission and zero-waste urban design, which arose in the 1990s, promoting compact energy-efficient urban development, seeking to transform and re-engineer existing city districts and regenerate the post-industrial city centre. It promotes the development of socially and environmentally sustainable city districts. (Mainguy, 2010)

Over the last thirty-five years or so, an international debate on eco-city theory has emerged and has developed as a relevant research field concerning the future of urbanism and the city itself. During that time, a number of architectural schools of thought have been implemented worldwide.

One such school is ***Technical Utopianism*** (a technological idealism that relied on the quick 'techno-fix', as expressed, for instance, in the work of Archigram). Other early writing on green urbanism was available from Ebenezer Howard, whose 1902 book was entitled 'Garden City of Tomorrow', and whose political and social agenda has recently made a comeback. (Mainguy, 2010)

Much later, in 1969, Reyner Banham pioneered the idea that technology, human needs and environmental concerns should be considered an integral part of architecture. Probably no historian before him had systematically explored the impact of environmental engineering and services on the design of buildings (Howard, 1902; Banham, 1969). Some other early significant writing on green urbanism has come from Lewis Mumford and Jane Jacobs – although they didn't call it green urbanism.

From 'Silent Spring' (by Rachel Carson, 1962), to Victor Olgyay's 'Design with Climate' (1963), to Reyner Banham's 'Architecture of the Well-tempered Environment' (1969), to Ian McHarg's 'Design with Nature' (1969), to the pivotal publications by authors re-connecting urbanism with the climatic condition (such as Koenigsberger, Drew and Fry, or Szokolay, in publications in the 1970s and 80s), to the remarkable 'Brundtland Report' (Brundtland, 1987); the important contributions from Robert and Brenda Vale ('Green Architecture: Design for an Energy-conscious

Future', 1991), and the 'Solar City Charter' (Herzog et al. 1995/2007), the field of sustainable city theories and climate-responsive urbanism has constantly been expanded. An important contribution came from Guenther Moewes with his book 'Weder Huetten noch Palaeste' (1995), which is a programmatic manifesto for designing and constructing longer-lasting buildings. More recent theories for 'Compact Cities' and 'Solar Cities' (Burton, E., 1969-2006); Jenks and Burgess, 2000; Lehmann, 2005) encapsulate the visions based on the belief that urban revitalization and the future of the city can only be achieved through 're-compacting' and using clearly formulated sustainable urban design principles.

In the meantime, 'Sustainability Science' has emerged as a conceptual and theoretical basis for a new planning paradigm. Today, we can probably recognize two major breaks in the continuous development of cities. The first is connected to the introduction of the automobile, which made possible an entirely different, dispersed city model (the decompacted 'Functional City' of the 20th century). The second is the full awareness of problems posed by climate change and consumption of fossil fuel, is of equal importance and just as far-reaching, raising the possibility of entirely new city models and typologies that are likely to emerge: Green Urbanism. (Lehmann, 2010)

Cities can and must become the most environmentally-friendly model for inhabiting our earth. It is more important than ever to re-conceptualize existing cities and their systems of infrastructure, to be compact, mixed-use and polycentric cities while research head towards creating a renewal in Wellawatte.

3.2 Formulating the Principles of Green Urbanism

Green Urbanism is by definition interdisciplinary; it requires the collaboration of landscape architects, engineers, urban planners, ecologists, transport planners, physicists, psychologists, sociologists, economists and other specialists, in addition to architects and urban designers. Green Urbanism makes every effort to minimize the use of energy, water and materials at each stage of the city's or district's life-cycle, including the embodied energy in the extraction and transportation of materials, their fabrication, their assembly into the buildings and, ultimately, the ease and value of their recycling when an individual building's life is over.

Today, urban and architectural design also has to take into consideration the use of energy in the district's or building's maintenance and changes in its use; not to mention the primary energy use for its operation, including lighting, heating and cooling. (Lehmann, 2010)

This part introduces the *15 Principles of Green Urbanism* as a conceptual model and as a framework for how the challenge of transforming existing neighbourhoods, districts and communities, are rethought of resulting in a designed, built and operated future urban settlement.

The principles of *Green Urbanism* can be effective in a wide variety of urban situations, but they almost always need to be adapted to the context and the project's scale, to the site's constraints and opportunities.

Specific approaches must be developed for each unique site and situation, adapting the principles to the particular climatic conditions, site context, availability of technology, social conditions, project scale, client's brief, diverse stakeholder organizations, and so on. It is an approach to urban design that requires an optimization process and a solid understanding of the development's wider context and its many dimensions before the designer can produce an effective design outcome.

Figure 6: The three pillars of Green Urbanism, and the interaction between each pillar

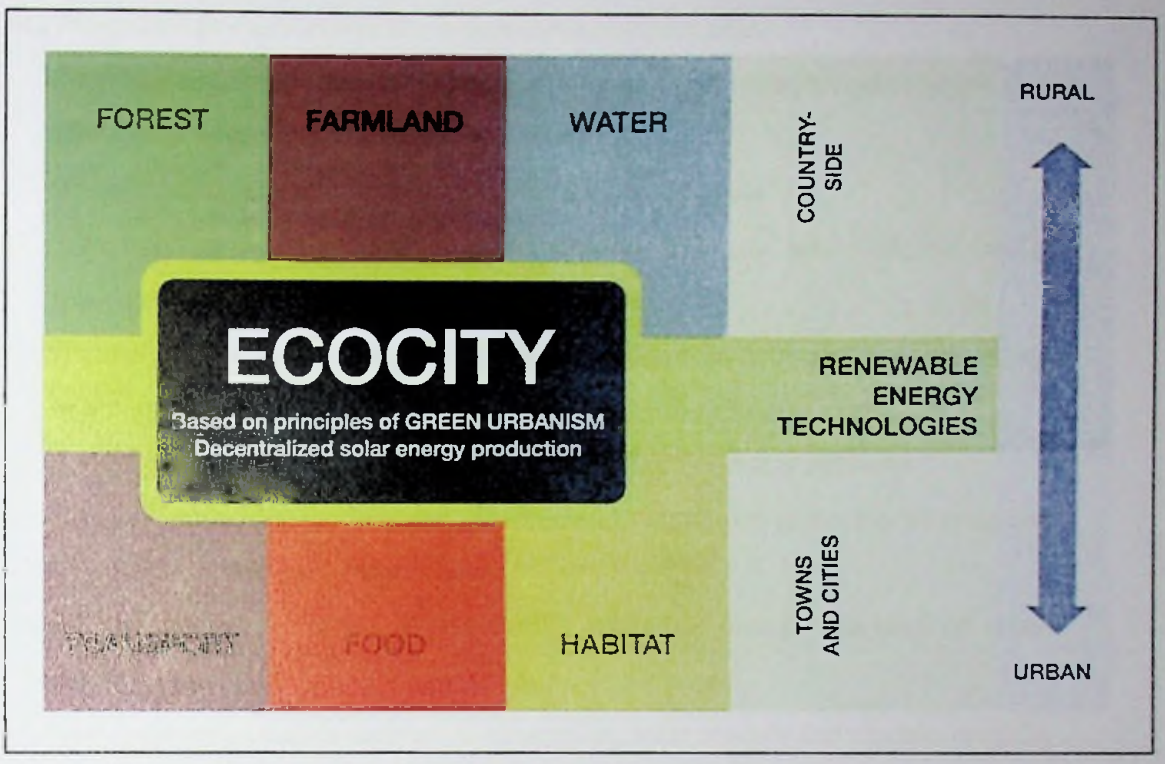


Figure 7: The holistic concept of Eco-City has again a balanced relationship between the urban area (city) and the rural area (countryside).

The districts and cities where the Principles of Green Urbanism have been applied and integrated in every aspect are urban environments that:

- respond well to their climate, location, orientation and context, optimizing natural assets such as sunlight and wind flow
- are quiet, clean and effective, with a healthy microclimate
- have reduced or have no CO2 emissions, as they are self-sufficient energy producers, powered by renewable energy sources
- eliminate the concept of waste, as they are based on a closed-loop ecosystem with significant recycling, reusing, remanufacturing and composting
- have high water quality, practicing sensitive urban water management
- integrate landscape, gardens and green roofs to maximize urban biodiversity and mitigate the urban heat island effect
- take only their fair share of the earth's resources, using principles of urban ecology,
- apply new technologies such as co-generation, solar cooling and electric-mobility
- provide easy accessibility and mobility, are well interconnected, and provide an efficient low-impact public transport system
- use regional and local materials and apply prefabricated modular construction systems
- create a vibrant sense of place and authentic cultural identity, where existing districts are densified and make use of urban mixed-use infill projects
- are generally more compact communities around transport nodes ('green Transit-Oriented Developments, TODs'), with a special concern for affordable housing and mixed-use programs,
- use deep green passive design strategies and solar architecture concepts for all buildings, with compact massing for reduced heat gain in summer
- are laid-out and oriented in a way that keeps the buildings cool in summer, but which catches the sun in winter
- have a local food supply through community gardens and urban farming and which achieve high food security and reduced 'food miles',

3.3 Guiding Principles of Green Urbanism

The following is a short list of the principles for local action and a more integrated approach to urban development.

It must be noted, though, that in order to enable sustainable urban development and to ensure that eco-districts are successful on many levels, all urban design components need to work interactively and not looked at separately.

The principles are based on the triple zero framework (triple-bottom line) of:

- zero fossil-fuel energy use
- zero waste
- zero emissions (aiming for low-to-no-carbon emissions)

'Zero waste' means that buildings are fully demountable and fully recyclable at the end of their life-cycle, so that the site can return to being a Greenfield site after use. Understandably, it requires a holistic approach to put the principles in action and to guide the available know-how to the advantage of the city. The principles describe the strategies necessary for eco-districts, although they need to be adapted to the location, context and scale of the urban development.

It may be difficult at first to achieve some of the principles, but all are important; they can potentially save money, reach early payback, improve liveability and increase opportunities for social interaction of residents. The principles offer practical steps on the path to sustainable cities, harmonizing growth and usage of resources. The truly 'carbon-neutral' city has not yet been built, but all projects in this direction are important steps towards turning the vision into a reality. (Lehmann, 2010)

3.3.1 Principle 01: Climate and Context

Statement: *The city based on its climatic conditions, with appropriate responses to location and site context.*

The Question: *What are the unique site constraints, climatic conditions and opportunities?*

The city is based on its climatic conditions, with appropriate responses to location and site context. Every site or place has its own unique individual conditions in regard to orientation, solar radiation, rain, humidity, prevailing wind direction, topography, shading, lighting, noise, air pollution and so on.

The various aspects of this principle include: Climatic conditions, which are seen as the fundamental influence for form-generation in the design of any project; understanding the site and its context, which is essential at the beginning of every sustainable design project; optimizing orientation and compactness to help reduce the city district's heat gain or losses; achieving a city with minimized environmental footprint by working with the existing landscape, topography and resources particular to the site, and the existing micro-climate of the immediate surroundings.

Maintaining complexity in the system is always desirable (be it biodiversity, eco-system or neighbourhood layout), and a high degree of complexity is always beneficial for society. Enhancing the opportunities offered by topography and natural setting leads to a city well adapted to the local climate and its eco-system.

A buildings' envelope can be manipulated to filter temperature, humidity, light, wind and noise. Due to the different characteristics of every location, it is advisable that each district comes up with its own methods and tailored strategies to reach sustainability capturing the spirit of the place.

As an aim, all urban development must be in harmony with the specific characteristics, various site factors and advantages of each location and be appropriate to its societal setting and contexts (cultural, historical, social, geographical, economic, environmental and political).

Green urbanism therefore encourages all future cities to be developed with climate-adapted envelope technologies, with facades that are fully climate-responsive.

3.3.2 Principle 02: Renewable Energy for Zero Co2 Emissions

Statement: *The city as a self-sufficient on-site energy producer, using decentralized district energy systems.*

The question: *How can emission-free energy be generated and supplied and in the most effective way?*

The various aspects of this principle include: Energy supply systems and services, as well as efficient use and operation of energy, promoting increased use of renewable power, and perhaps natural gas as a transition fuel in the energy mix, but always moving quickly away from heavy fossil-fuels such as coal and oil; and the transformation of the city district from an energy consumer to an energy producer, with local solutions for renewable and the increasing de-carbonizing of the energy supply.

The local availability of a renewable source of energy is the first selection criteria for deciding on energy generation. In general, a well-balanced combination of energy sources can sensibly secure the future supply. A necessary aim is also to have a distributed energy supply through a decentralized system, utilizing local renewable energy sources.

This will transform city districts into local power stations of renewable energy sources, which will include solar PV, solar thermal, wind (on- and off-shore), biomass, geothermal power, mini-hydro energy and other new technologies. Some of the most promising technologies are in building-integrated PV, urban wind turbines, micro CHP and solar cooling. That is to say, there should be onsite electrical generation and energy storage in combination with a smart grid, which integrates local solar and wind generation, utilizing energy-efficiency in all its forms. (Burton, E., 1969-2006)

Too often, it is found that savings from energy-efficiency programs are absorbed by a rise in energy use. Genuine action on climate change means that coal-fired power stations cease to operate and are replaced by renewable energy sources. (Lehmann, 2010)

Some other systems that need to be put in place are: the remanufacturing of metals, glass, plastics, paper into new products needs to be a routine (without down-grading the product); waste-to-energy strategies are needed for residual waste; and an 'extended producer responsibility' clause is needed for all products.

In this context of waste, better management of the nitrogen cycle has emerged as an important topic: to restore the balance to the nitrogen cycle by developing improved fertilization technologies, and technologies in capturing and recycling waste. Controlling the impact of agriculture on the global cycle of nitrogen is a growing challenge for sustainable development.

3.3.4 Principle 04: Water

The statement: *The city with closed urban water management and a high water quality*

Question: *What is the situation in regard to the sustainable supply of potable drinking water?*

The various aspects of this principle include, in general, reducing water consumption, finding more efficient uses for water resources, ensuring good water quality and the protection of aquatic habitats.

The city can be used as a water catchment area by educating the population in water efficiency, promoting rainwater collection and using wastewater recycling and storm water harvesting techniques (e.g. solar-powered desalination plants). Storm water and flood management concepts need to be adopted as part of the urban design, and this includes storm water run-offs and improved drainage systems and the treatment of wastewater.

As part of the eco-district's adequate and affordable health care provisions, it needs to ensure the supply of safe water and sanitation. This includes such things as algae and bio-filtration systems for grey water and improving the quality of our rivers and lakes so that they are fishable and swimmable again.

Eco-districts will need to operate on renewable energy sources as close to 100 per cent as possible. As a minimum, at least 50 per cent of on-site renewable energy generation should be the aim of all urban planning, where the energy mix comes from decentralized energy generation and takes into account the resources that are locally available, as well as the cost and the availability of the technology. Therefore it is essential that the fossil-fuel powered energy and transportation systems currently supporting our cities are rapidly turned into systems that are supplied by renewable energy sources. (Lehmann, 2010) High building insulation, high energy-efficiency standards and the use of smart metering technology is essential, so that if a part of an office building is not in use, the intelligent building management system will shut down lights and ventilation.

3.3.3 Principle 03: Zero Waste City

The Statement: The zero-waste city as a circular, closed-loop eco-system
The Question: How to avoid the creation of waste by changing behaviour of consumption?

Sustainable waste management means to turn waste into a resource. (Braungart, 2002).

All cities should adopt nature's zero-waste management system. Zero-waste urban planning includes reducing, recycling, reusing and composting waste to produce energy. All material flows need to be examined and fully understood, and special attention needs to be given to industrial waste and e-waste treatment. We need to plan for recycling centres, for zero landfill and 'eliminating the concept of waste' and better understanding nutrient flows (Braungart, 2002).

Eco-districts are neighbourhoods where materials are reused and recycled, in turn significantly reducing the volume of solid waste and toxic chemical releases. All construction materials as well as the production of goods (and building components) need to be healthy and fully-recyclable. Waste prevention is always better than the treatment or cleaning-up after waste is formed.

An integrated urban water cycle planning and management system that includes a high-performance infrastructure for sewage recycling (grey and black water recycling), storm water retention and harvesting the substantial run-off through storage, must be a routine in all design projects. On a household level we need to collect rain water and use it sparingly for washing and install dual-water systems and low-flush toilets. On a food production level we need to investigate the development of crops that need less water and are more drought resistant.

3.3.5 Principle 05: Landscapes, Gardens and Urban bio diversity

The Statement: *The city that integrates landscapes, urban gardens and green roofs in order to maximize biodiversity.*

The Question: *Which strategies can be applied to protect and maximize biodiversity and to re-introduce landscape and garden ideas back in the city, to ensure urban cooling?*

A sustainable city takes pride in its many beautiful parks and public gardens. This pride is best formed through a strong focus on local biodiversity, habitat and ecology, wildlife rehabilitation, forest conservation and the protecting of regional characteristics.

Ready access to these public parks, gardens and public spaces, with opportunities for leisure and recreation, are essential components of a healthy city. As is arresting the loss of biodiversity by enhancing the natural environment and landscape, and planning the city by using ecological principles based on natural cycles (not on energy-intensive technology) as a guide, and increasing urban vegetation.

A city that preserves and maximizes its open spaces, natural landscapes and recreational opportunities is a more healthy and resilient one. The sustainable city also needs to introduce inner-city gardens, urban farming/agriculture and green roofs in all its urban design projects (using the city for food supply) -(Braungart, 2002).

It needs to maximize the resilience of the eco-system through urban landscapes that mitigate the 'urban heat island' (UHI) effect, using plants for air purification and urban cooling. Further, the narrowing of roads, which calms traffic and lowers the UHI effect, allows for more (all-important) tree planting. Preserving green spaces, gardens and farmland, maintaining a green belt around the city, and planting trees everywhere, as trees absorb CO2, is an important mission. As is conserving natural resources, respecting natural energy streams and restoring stream and river banks, maximizing species diversity.

In all urban planning, we need to maintain and protect the existing ecosystem that stores carbon (e.g. through a grove or a park), and plan for the creation of new carbon storage sites by increasing the amount of tree planting in all projects. The increase in the percentage of green space, as a share of total city land, is to be performed in combination with densification activities. (Burton, E., 1969-2006)

3.3.6 Principle 06: Sustainable Transport and Good Public Space

The statement: *The city of eco-mobility, with a good public space network and an efficient low-impact public transport system for post-fossil-fuel mobility.*

The Question: *How can we get people out of their cars, to walk, cycle, and use public transport?*

Good access to basic transport services is crucial, as it helps to reduce automobile dependency, as does reducing the need to travel. Cities need to see integrated non-motorized transport such as cycling or walking, with bicycle/pedestrian friendly environments, safe bicycle ways, free rental bike schemes and pleasant public spaces.

It is important to identify the optimal transport mix that offers inter-connections for public transport and the integration of private and public transport systems.

Some ideas here include: eco-mobility concepts and smart infrastructure (electric vehicles); integrated transport systems (bus transit, light railway, bike stations); improved public space networks and connectivity along with a focus on transport oriented development ('green TODs').

It is a fact that more and wider roads result in more car and truck traffic, and CO2 emissions, and also allows for sprawling development and suburbs that increases electricity-demand and provides less green space. The transport sector is responsible for causing significant greenhouse-gas emissions (over 20 per cent).

3.3.7 Principle 07: Density and Retrofitting of Existing Districts

The Statement: *The city with retrofitted districts, urban infill, and densification/intensification strategies for existing neighbourhoods.*

The Question: *What are the opportunities to motivate people to move back to the city, closer to workplaces in the city centre?*

The various aspects of this principle include: encouraging the densification of the city centre through mixed-use urban infill, centre regeneration and green TODs; increasing sustainability through density and compactness (compact building design means developing buildings vertically rather than horizontally); promoting business opportunities around green transit-oriented developments; optimizing the relationship between urban planning and transport systems; retrofitting inefficient building stock and systematically reducing the city district's carbon footprint.

Consideration will need to be given to better land-use planning in order to reduce the impact of urban areas on agricultural land and landscape; to increasing urban resilience by transforming city districts into more compact communities and designing flexible typologies for both inner-city living and working.

Upgrading the public space through urban renewal programs will bring people back in to the city centre.

This will need some strategic thinking on how to use 'brownfield and greyfield' developments and also the adaptive reuse of existing buildings. Remodelling and re-energizing existing city centres to bring about diverse and vibrant communities, requires people to move back into downtown areas.

This can be achieved through mixed-use urban infill projects, building the 'city above the city' by converting low density districts into higher density communities; and by revitalizing underutilized land for the benefit of the community and affordable housing. In the compact city, every neighbourhood is sustainable and self-sufficient; and uses Energy Services Company principles for self- financing energy efficiency and in all retrofitting programs.

3.3.8 Principle 08: Live-ability, Healthy Communities and Mixed-Use Programs

The statement: *The city with a special concern for affordable housing, mixed-use programs, and a healthy community.*

The question: *How does urban design recognize the particular need for affordable housing, to ensure a vibrant mix of society and multi-functional mixed-use programs?*

Land use development patterns are the key to sustainability. A mixed-use (and mixed-income) city delivers more social sustainability and social inclusion, and helps to repopulate the city centre. Demographic changes, such as age, are a major issue for urban design.

While it is advantageous for any project to maximize the diversity of its users, different sectors in the city can take on different roles over a 24 hours cycle; for example, the Central Business District is used for more than just office work. In general connected, compact communities, for a liveable city, while applying mixed-use concepts and strategies for housing affordability, and offering different typologies for different housing needs.

To this end, we need affordable and liveable housing together with new flexible typologies for inner-city living. These mixed-use neighbourhoods (of housing types, prices and ownership forms) have to avoid gentrification and provide affordable housing with districts inclusive for the poor and the rich, young and old, and workers of all walks of life, and also provide secure tenure (ensuring 'aging in place').

Housing typologies need to deal with demographic changes. We have to understand migration and diversity as both an opportunity and a challenge. Mixed land uses are particularly important as it helps reduce traffic. Master plans should require all private developments to contain 40 to 50 per cent of public (social) housing, and have it integrated with private housing.

Higher densities should centre on green TODs. Essentially, these changes will aim to introduce more sustainable lifestyle choices, with jobs, retail, housing and a city campus being close by with IT and Tele-working from home significantly helping to reduce the amount of travel.

3.3.9 Principle 09: Local Food & Short Supply Chains

The Statement:	*The city for local food supply, with high food security and urban agriculture.*
The Question:	*Which strategies can be applied to grow food locally in gardens, on roof tops and on small spaces in the city?*

The various aspects of this principle include: local food production; regional supply; an emphasis on urban farming and agriculture, including 'eat local' and 'slow food' initiatives.

The sustainable city makes provision for adequate land for food production in the city, a return to the community and to the allotment gardens of past days, where roof gardens become an urban market garden.

It is essential that we bridge the urban-rural disconnect and move cities towards models that deal in natural eco-systems and healthy food systems. The people of the eco-city would garden and farm locally, sharing food, creating compost with kitchen

scraps and garden clippings and growing 'community' vegetables. Buying and consuming locally will be necessary to cut down on petrol-based transport.

3.3.10 Principle 10: Cultural Heritages, Identity and Sense of Place

The statement: *The city of public health and cultural identity: a safe and healthy city, which is secure and just.*

The question: *How to maintain and enhance a city's or region's identity, unique character and valued urban heritage, avoiding interchangeable design that makes all cities look the same?*

All sustainable cities aim for air quality, health and pollution reduction, to foster resilient communities, to have strong public space networks and modern community facilities. This is the nature of sustainable cities. However, each city has its own distinct environment, whether it be by the sea, a river, in a dessert, a mountain; whether its climate is tropical, arid, temperate, etc., each situation is unique.

The design of the city will take all these factors into consideration, including materials, history and population desires. The essence of place is the 'upswelling' of grassroots strategies, the protection of its built heritage and the maintenance of a distinct cultural identity, e.g. by promoting locally owned businesses, supporting creativity and cultural development. New ideas require affordable and flexible studio space in historic buildings and warehouses. Cities will grow according to the details and unique qualities of localities, demographic qualities of the populace and the creativity of the authorities and citizens.

The aim of a city is to support the health, the activities and the safety of its residents. It is, therefore, incumbent on city councils to protect the city by developing a master plan that balances heritage with conservation and development; fostering distinctive places with a strong sense of place, where densities are high enough to support basic public transit and walk-to retail services.

3.3.11 Principle 11: Urban Governance, Leadership and Knowledge Sharing

The Statement: *The city applying best practice for urban governance and sustainable procurement methods.*

The question: *Which networks and skills can be activated and utilized through engaging the local community and key stakeholders, to ensure sustainable outcomes?*

Good urban governance is extremely important if we want to transform existing cities into sustainable compact communities. It has to provide efficient public transport, good public space and affordable housing, high standards of urban management, and without political support, change will not happen.

City councils need strong management and political support for their urban visions to be realized. They need strong support for a strategic direction in order to manage sustainability through coherent combined management and governance approaches, which include evolutionary and adaptive policies linked to a balanced process of review, and to public authorities overcoming their own unsustainable consumption practices and changing their methods of urban decision-making.

Cities are a collective responsibility. As far as bureaucratic urban governance and best practice is concerned, authorities could consider many of the following: updating building code and regulations; creating a database of best practice and worldwide policies for eco-cities; revising contracts for construction projects and integrated public management; raising public awareness; improving planning participation and policy-making; creating sustainable subdivisions, implementing 'anti-sprawl land-use' and growth boundary policies; legislating for controls in density and supporting high-quality densification; arriving at a political decision to adopt the Principles of Green Urbanism, based on an integrated action plan; measures to finance a low-to-no-carbon pathway; implementing environmental emergency management; introducing a program of incentives, subsidies and tax exemptions for sustainable projects that foster green jobs; eliminating fossil-fuel subsidies; developing mechanisms for incentives to accelerate renewable energy

take-up; implementing integrated land-use planning; having a sustainability assessment and certification of urban development projects.

Primary and secondary teaching programs need to be developed for students in such subjects as waste recycling, water efficiency and sustainable behaviour. Changes in attitude and personal lifestyles will be necessary. The city is a hub of institutions, such as galleries and libraries and museums, where knowledge can be shared. We must provide sufficient access to educational opportunities and training for the citizenry, thus increasing their chances of finding green jobs. Universities can act as 'think tanks' for the transformation of their cities.

We also need to redefine the education of architects, urban designers, planners and landscape architects. Research centres for sustainable urban development policies and best practice in eco-city planning could be founded, where assessment tools to measure environmental performance are developed and local building capacity is studied.

3.3.12 Principle 12: Strategies for Cities in Developing Countries

The Statement:	*Particular sustainability strategies for cities in developing countries, harmonizing the impacts of rapid urbanization and globalization.*
The Question:	*What are the specific strategies and measurements we need to apply for basic low-cost solutions appropriate to cities in the developing world?*

Developing and emerging countries have their own needs and require particular strategies, appropriate technology transfers and funding mechanisms. Cities in the developing world cannot have the same strategies and debates as cities in the developed world. Similarly, particular strategies for emerging economies and fast-growing cities are required, as is the problem of informal settlements and urban slums and slum upgrading programs. Low-cost building and mass housing typologies for rapid urbanization are required in cooperation with poverty reduction programs. It is essential that we train local people to empower communities, creating new jobs and diversifying job structures, so as not to focus on only one segment of the economy (e.g. tourism). Achieving more sustainable growth for Asian metropolitan

cities is a necessity. Combating climate change, which was mainly caused through the emissions by industrialized nations and which is having its worst effect in poorer countries in Africa, Asia and Latin America, with a focus on small Island States, is a priority.

3.4 Conclusion

Much of Green Urbanism is common sense urbanism. In the future, Green Urbanism has to become the norm for all urban developments. Increased material and energy consumption worldwide, coupled with an inadequate and unsustainable waste management system and a lack of resource recovery, has forced governments, industry and individuals to explore how to rapidly put into practice new measures to achieve responsible, closed loop solutions in waste management and resource recovery. Achieving sustainable materials flow in cities and 'zero waste' remains difficult and requires continued and combined efforts by the industry, government bodies, university researchers and the people and organizations in our community.

The construction and demolition (C&D) sector has hereby a particular urgency to catch up with other sectors in better managing its material and waste stream, and increase the focus on reusing entire building components at the end of a building's lifecycle.

The 12 Principles of Green Urbanism are practical and holistic, offering an integrated framework, encompassing all the key aspects needed to establish sustainable development and encouraging best practice models. The replicability of models is hereby very important. The principles form a sustainability matrix, which will empower the urban designer – to borrow Richard Buckminster Fuller's words – to find ways of 'doing more with less.' (Buckminster Fuller, 1973)

Chapter 04: The Concept of Urban Renewal

Wellawatte, the way it stands today is severely built on.

Every inch on either sides of the Galle road sees development. with buildings partitioned horizontally and vertically in order to ensure more services and activities have been given space within the boundaries of Wellawatte.

As a result of this high density and with little or no room to 'make space' for sustainable development, the research for Sustainable development needs to look into the concept of Urban regeneration, exploring ways in which Wellawatte can be regenerated or renewed as it were, to transition into a sustainable city.

4.1 Introduction to Urban Renewal

Urban renewal has been regarded as a sound approach to promoting land values and improving environmental quality (Adams & Hastings, 2001); rectifying the urban decay problem and meeting various socioeconomic objectives (Lee & Chan. 2008a); and enhancing existing social networks, improving inclusion of vulnerable groups, and changing adverse impacts on the living environment (Chan & Yung, 2004).

In order to help tackle these issues, many studies have been conducted in this field. As sustainable development corresponds to urban renewal in terms of social, economic and environmental sustainability, it has been recognized that urban renewal and sustainability should be combined together. The urban renewal process involves various planning issues and different stakeholders, with the relationship between complicating the process. In order to achieve effective and efficient sustainable urban renewal practices, it is first necessary to understand the mechanism behind it.

4.2 Background of Sustainable Urban Renewal

Urban renewal has become a major element of urban policy in many countries and regions. Couch (1990) gave two reasons for its growing importance. Firstly, people increasingly moving to and living in urban areas, in particular old urban areas, give rise to the need for renewal of the urban fabric.

Secondly, urban renewal responds to the concern of urban sprawl and large quantities of abandoned urban areas. **Today, it is closely involved with sustainable development.**

4.3 Definition of Urban Renewal

Urban renewal, urban regeneration, urban redevelopment, and urban rehabilitation share similar meanings in the fields of urban design and planning but are significantly different in terms of scale.

Urban renewal and urban regeneration have very similar meanings and both involve work of a relatively large scale: urban renewal is defined as the process of slum clearance and physical redevelopment that takes account of other elements such as heritage preservation (Couch, Sykes, & Boerstinghaus, 2011); while urban regeneration is a comprehensive integration of vision and action aimed at resolving the multi-faceted problems of deprived urban areas to improve their economic, physical, social, and environmental conditions (Ercan, 2011).

In summary, urban renewal aims at improving the physical, social-economic and ecological aspects of urban areas through various actions including redevelopment and rehabilitation.

4.4 The Links between Urban Renewal and Sustainability

The term 'sustainable development' dates back to the 1970s, but it was not until the 1990s that it was used in the context of urban renewal policy (Bromley, Tallon, & Thomas, 2005).

No matter what conceptualization of sustainability is applied, the consensus appears to be that sustainable development has three pillars which are social, economic, and environmental. This has therefore become the popular approach to achieving a more sustainable society in most contexts, and urban renewal is closely linked to it. Urban renewal aims at solving a series of urban problems, including urban function deterioration, social exclusion in urban areas, and environmental pollution.

It is regarded as a sound approach to promoting land values, and improving environmental quality (Adams & Hastings, 2001); to rectifying the urban decay problem and meeting various socioeconomic objectives (Lee & Chan, 2008a); and to

enhance existing social networks, improving inclusion of vulnerable groups, and changing adverse impacts on the living environment (Chan & Yung, 2004). Specifically, urban renewal projects facilitate good-quality housing and reduce health risks to the community (Krieger & Higgins, 2002); promote the repair of dilapidated buildings (Ho, Yau, Poon, & Liusman, 2012); and improve the effective use of the building stock and land resources in the city (Ho et al., 2012).

In these respects, urban renewal can significantly contribute to sustainable urban development if it follows a sustainable path. However, most urban renewal policies have tended to focus on economic regeneration rather than on environmental or social regeneration (Couch & Dennemann, 2000). Thus, although the relationship between sustainability and urban renewal is complex, it does provide a direction for a sustainable urban future.

"Considering the city a spatial-constructional and social system, we may outline two large sub-systems: town planning and social sub-system. While the town-planning sub-system includes all material elements of a city, including environmental factors that form the territorial structure, the social sub-system consists of the number of inhabitants as beneficiaries of the whole system." (Ristea et al 2010, P103).

The above statement shows that in order to achieve sustainable urban renewal in a city, addressing the two systems properly is the only approach.

Studies relating to sustainable urban renewal cover a broad range of topics, many of which overlap and thus cannot be easily classified into a certain field.

To gain a better understanding of the research area and to identify possible gaps in the knowledge base, this dissertation discusses the findings of recent studies based on the following structure:

1) Planning sub-system in sustainable urban renewal.
2) Stakeholders and their engagement.
3) Evaluating sustainable urban renewal.

Figure 7 shows the planning subsystem in urban renewal. This subsystem involves various material elements including land, housing, infrastructure, heritage, and transportation.

Urban design serves to address these complex issues for sustainable urban renewal. The second part discusses social sub-system in urban renewal.

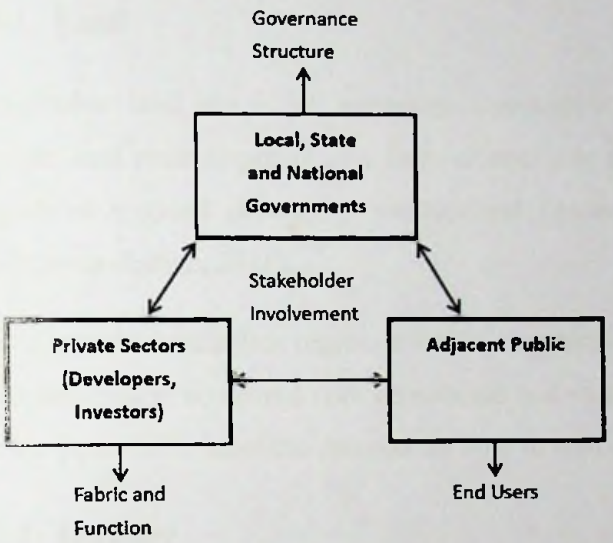


Figure 8: Planning subsystem in urban renewal

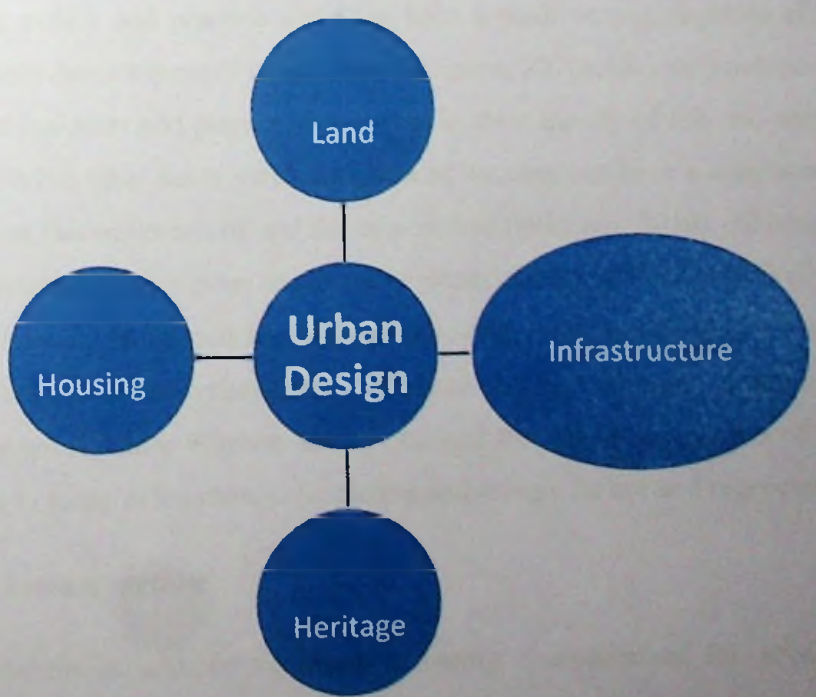


Figure 9: Social sub-system in urban renewal

Figure 8 indicates the various stakeholders involved, and how they contribute to the operation mechanism in urban renewal. The final part reviews the evaluation of urban renewal in terms of the two sub-systems.

4.5 Planning Sub-System in Sustainable Urban Renewal

4.5.1 Land

Sustainable land use is an important component of sustainable urban renewal because land redevelopment is a form of resource and adaptive re-use and is now considered a sound strategy in architectural conservation and urban regeneration (Mahtab-uz-Zaman, 2011).

Urban refurbishment-led regeneration is regarded to be a cheaper, faster, less disruptive option compared with demolition and redevelopment (Turcu, 2012) and it has the potential to meet the demand for land resources.

4.5.2 Housing

Housing policy and practice can have both a positive and negative effect on the sustainable development of urban areas (Winston, 2010). On one hand, housing is the home of residents and plays a crucial role in their quality of life and sense of well-being. On the other hand, various aspects of housing can have a significant negative impact on the environment and the eco-system (Winston, 2010). Although housing and regeneration have been relatively neglected topics, Garner (1996) discussed the role of housing and social housing in improving a city's competitiveness as well as the revitalization and reintegration of areas of economic and social exclusion in urban renewal, while Winston (2010) outlined the key characteristics of sustainable housing in terms of location, construction and design, its use and regeneration.

4.5.3 Infrastructure

Infrastructure is another necessary planning consideration for urban renewal. Equitable access for residents is necessary for delivering social benefits through

provision of social infrastructure in urban regeneration areas (Brown & Barber, 2012). Mell (2009) addressed the planning of green infrastructure to promote human integration, ecological sustainability and economic regeneration in the UK. Green hubs were discussed, showing their potential to enhance community sustainability, cohesion and engagement in the UK context (Burrage, 2011). Commercial facilities were studied in Romania based on territorial disparities by using the 'point method', which quantifies the equipment levels reached and makes space comparisons available (Ristea, Ioan-Franc, Stegaroiu, & Croitoru, 2010).

4.5.4 Culture and Heritage

Culture is one part of urban design considerations. Degen and Garcia (2012) explored the changing relationships between urban regeneration, the use of culture and modes of governance in the 'Barcelona model', which is a prominent cultural regeneration example, and concluded that culture has the potential to improve social cohesion and market the city's' brand. Tweed and Sutherland (2007) outlined the broad contribution that cultural heritage could make towards sustainable urban regeneration and highlighted a survey that was conducted to assess people's perceptions of cultural heritage in urban regeneration. They suggested that planners should promote the importance of a better understanding of how people interact with the urban environment and its heritage.

4.6 Stakeholders and Community Involvement

In considering Wellawatte as the key study area, this study cannot be complete without the active involvement of the opinions of its users. Whilst the key stakeholders are the residents of Wellawatte and those who frequent the town, this study also explores the other stakeholders involved and their role in the urban renewal process.

4.6.1 Stakeholders

The various stakeholders in urban renewal projects include local, state, and national officials in both environmental and economic development departments, as well as those in the private sector, both institutional and individual, who seek to place capital, reduce risks, gain profits and enhance their reputation; in view of the possible impact on their health and quality of life, the public living in close proximity to urban renewal projects should also be included.

Different stakeholders guide sustainability in different situations. Under some circumstances planners take a lead, while under others it may be the developers. It's important to remember that stakeholders do not have equal rights and powers in the renewal process.

Government plays the most important role in the governance structure of urban renewal, which directly influences the planning strategies involved. When studying sustainable urban renewal, some scholars pay attention to the governance structure

Stakeholders in the private sector also contribute to the regeneration process. In most cases, private sector stakeholders are developers who invest and build renewal projects and they greatly influence landscape and urban space, the supply and design of domestic space, and in turn, residents' lives (Kriese & Scholz, 2011). Additionally, the role of the private sector in property investment and financing is identified although their negative impacts are also discussed. In order to shed light on the specific role and responsibility of housing builders and investors in achieving sustainable urban regeneration, the evolution of sustainability positioning in residential property marketing was explored by Kriese and Scholz (2011).

As end users of a renewal community, the residents are the ultimate stakeholders. Whether an urban renewal community is sustainable or not, it influences their daily life, while their behaviour and their preferences simultaneously have a significant impact on the decision-making of government and the private sector.

4.6.2 Community Involvement

In the current urban renewal context, social inclusion has become a crucial objective. When discussing achieving sustainable urban renewal, it is seemingly impossible to avoid the issue of 'community involvement' or 'public participation'.

For example, Fordham (1993) concluded that improved co-ordination of public programmes, the promotion of sustainable development, and the involvement of the local community are required for solving urban problems.

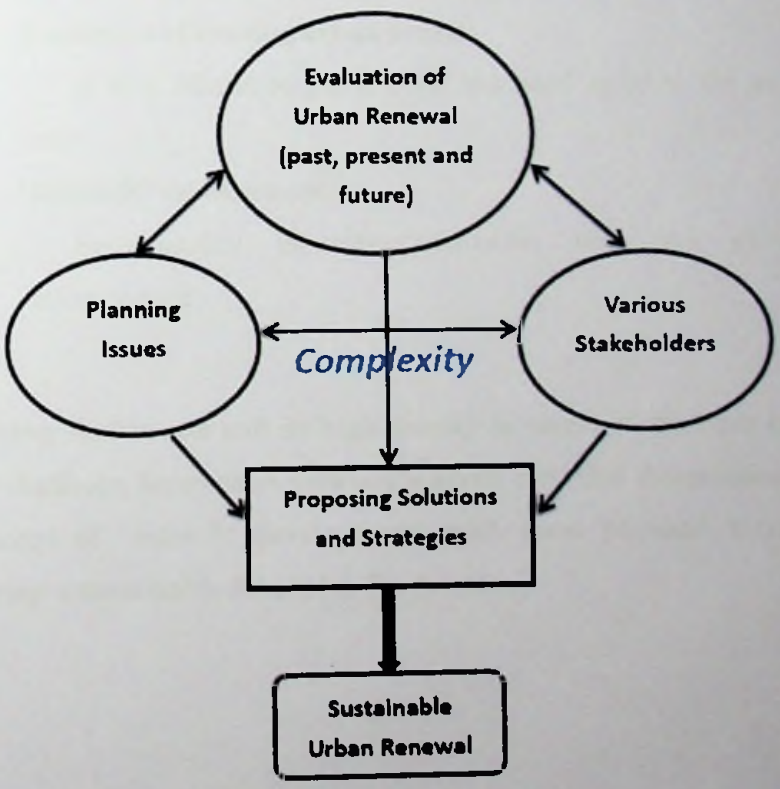


Figure 10: Path to sustainable urban renewal

4.7 Considering Sustainable Development in Wellawatte

Wellawatte, in comparison with the other cities in Colombo is known to be the most densely populated, the most densely built on and the most difficult in handling- in terms of development due to its current context without too much of an invasive development plan.

As a result, this chapter explores research concepts which are intimately selected in connection with reassessing Wellawatte in order to present a more sustainable solution for the future.

Analytically, studies represent three approaches to sustainable development:

i) **New development:** City built from scratch

ii) **Expansion of existing urban areas:**

A new district/neighbourhood has been assed to the existing urban area;

iii) **'Retro-fit' development**

Sustainability innovation/adaptation with the existing urban infrastructure

Considering Wellawatte and its high density in terms of the built environment and the challenge foreseen in creating a green city, this dissertation focuses on the concept of 'retro-fit development' with least physical intrusion when considering a sustainable future for Wellawatte.

4.7.1 Introduction to Retrofitting Sustainability into Cities

In recent years, the need to 'retrofit' or re-engineer existing buildings and urban infrastructure has gained increasing prominence. At a global scale, increasing concentration of our growing human population within urban centres has focused attention on the role of cities in climate change mitigation and adaptation, and in achieving the broader goals of sustainable development.

Whilst cities are seen as the source of many of our most pressing environmental and resource depletion problems, the creativity and innovative potential of cities may also provide their solutions.

In the UK as with many parts of Europe and the US, particularly those with a long history of urbanisation, a critical challenge is how best to deal with an ageing building stock and urban infrastructure. In the UK for example, less than 1-2% of total building stock each year is new build, and some 70% of total 2010 building stock will still be in use in 2050; renovation and refurbishment rates are between 2.9% and 5% of the existing stock for domestic buildings and 2-8% for commercial stock, depending on the sector.

In the UK, the Climate Change Act and related 80% emissions reduction target for 2050, have done much to focus attention on the impact of the built environment in cities on carbon emissions. This is not surprising, given that emissions from buildings (35%) and industry (35%) account for more than two thirds of total greenhouse gas (GHG) emissions, with the residential sector responsible for 23% and the non-residential sector 12%.

Urban sustainability requires much more than reductions in carbon emissions. It is a multidimensional problem which requires a strong and integrated focus on energy, water, and waste and resource use, in order to underpin the provision of a healthy and socially sustainable environment within which diverse communities can flourish. By itself a carbon emissions reduction target, no matter how important, can tell us rather little about the sort of future cities in which we might want to live. Now more than ever, cities need to envision and strive for a more sustainable future. Shared visions

help people make sense of the future; they can open-up and make transparent societal choices; they help us to determine what sort of future we want; they promote discussion and debate; and they allow us to see how we can mobilize, deploy, and manage resources to achieve a desired future.

This dissertation sets out three contrasting long term visions for retrofit city regional futures, developed through an in-depth participatory back casting and foresight process. These contextual scenarios are intended as a tool which can be adapted and used by a wide variety of stakeholders and organisations to stimulate discussion and inform future policy and long-term planning.

Based on studies done on the concept of retrofitting, there exist three visions for development. The three visions set out each describe distinctive long-term visions of what a sustainable future might look in the future.

These scenarios are not predictions: instead, they are intended to open up debate and inform current societal choices, through illustrating a range of possible sustainable urban futures. Each represents a distinctive articulation of urban sustainability.

The Three Visions Are:

1. **Smart-Networked City:** Envisages the city as a hub within a highly mobile and competitive globally networked society.
2. **Compact City:** Envisages the city as a site of intensive and efficient urban living.
3. **Self-Reliant-Green City:** Envisages the city as a self-reliant bio-region, living in harmony with nature.

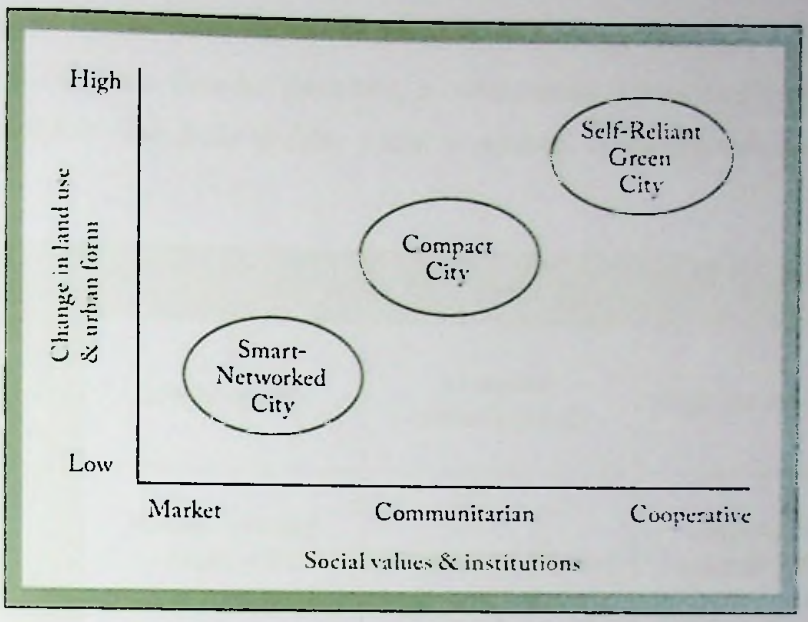


Figure 12: The impact the three visions have

Each of these futures is located within a 'possibility space' described by two key dimensions of change for systemic urban retrofitting.

Change in land-use and urban form:

This dimension describes the extent of change in patterns of land use and urban form within the city-region, on an axis from 'Low' to 'High'. At the low end of this axis, changes in the built environment and urban infrastructure are largely overlaid upon or accommodated within existing patterns of land use and urban forms. At the high end, land use and urban form are radically reconfigured.

Social values and institutions:

This dimension describes the structure of social relations and patterns of economic activity, including policy styles and consumption behaviour. At one end of this axis, market oriented solutions to delivery of public goods predominate, together with individualist values emphasising short term private consumption.

At the other end public goods are delivered through cooperative and collective institutions, with a strong role for civil society. The individual is seen as part of a

wider community and mechanisms for the allocation of resources are aligned with long term social goals. Between these two, communitarian values couple with strong local governance institutions to drive social investment at neighbourhood and city scales.

	Smart Networked City	Compact City	Self-reliant Green City
Change in land use and urban form	Low Moderate	Moderate (densification)	High (intensification)
Social Values and Institutions	Market oriented values, with emphasis on private consumption. Light touch, networked governance with public sector, local authority and intermediary organisations acting as facilitators for business	communitarian and localist values expressed at a city and neighbourhood level, coupled with strong local governance and planning systems and an emphasis on social investment	cooperative and collectivist values underpin new models of participation and shared ownership, in which mutualism and local self-reliance are coupled with strong concerns for social equity and a questioning of materialism
Economic Growth	3% per annum	2.30%	less than 1.6% per annum

Table 8: A brief summary of the key characteristics and indicative indicators for each vision is provided based on UK initiatives

4.7.1.1 The Smart Networked City :

The city as a hub within a highly mobile and competitive globally networked society.

Pervasive and information-rich virtual environments integrate seamlessly with the physical world. ICTs provide real time information to drive efficiencies through automation and intelligent control, and advanced market oriented solutions allow for the internalisation of environment costs. This is an open, outward looking society in which the mobility of people, goods and services remains high.

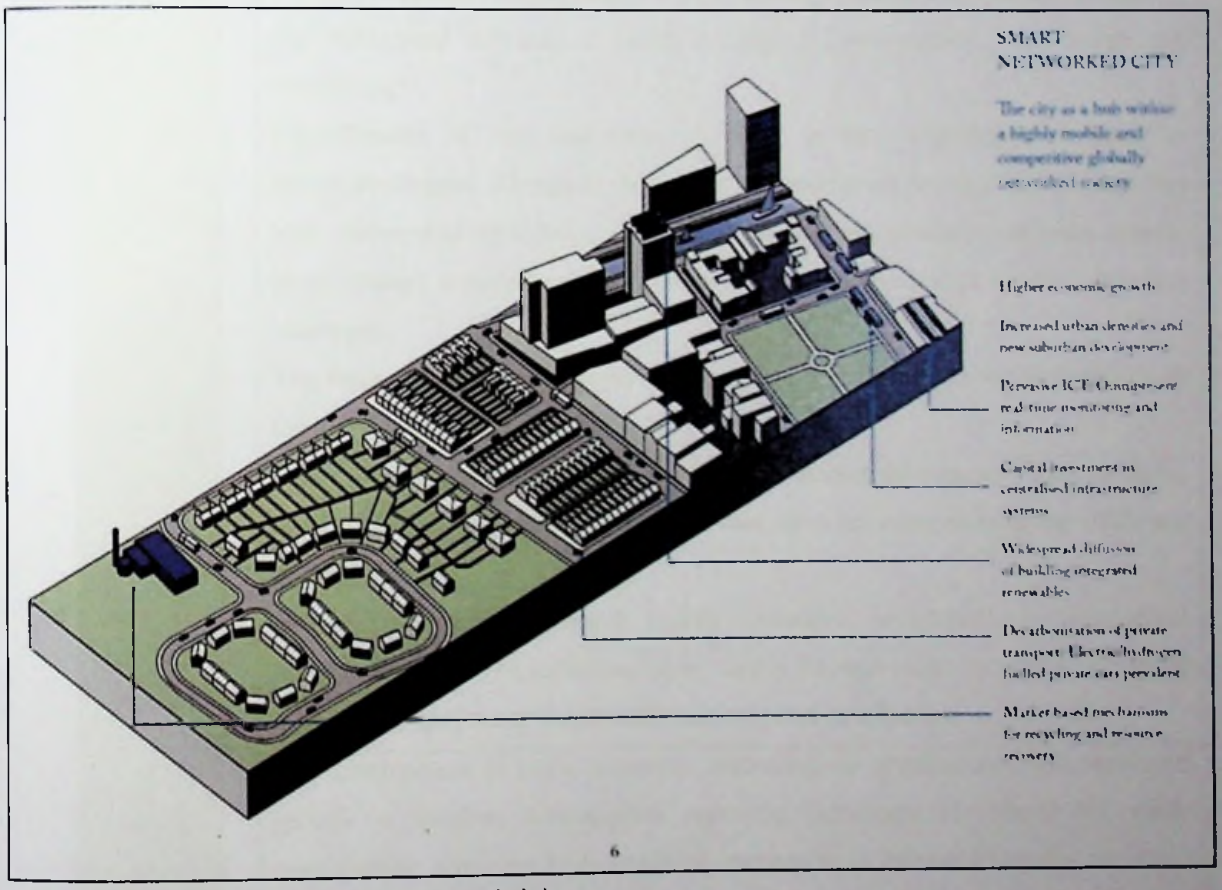


Figure 13: Overall concept of a smart networked city

Source: Retrofit city future (2013)

Basis	A growth oriented vision predicated on high levels of trade and private consumption. The private sector takes the lead in retrofitting new technologies, systems and infrastructure which are largely layered on existing infrastructure. E-mobility (battery electric and hydrogen fuel cell vehicles) enables the decarbonisation of private transport and persistence of current mobility patterns. The pervasive role of ICTs in mediating social and economic relations continues to facilitate new forms of governance and participation, but also new forms of exclusion and segregation. The natural environment is not a prominent feature of this vision but can be viewed as providing a recreational resource
Energy	This is an electric future. Despite significant improvements in end-use efficiency and widespread diffusion of building integrated renewables, total energy use remains high. Electrification of heat and transport result in very significant increases in electricity demand. Alongside the role out of smart grids and appliances, there has been widespread application of novel materials and products (vacuum panels, phase change materials, etc.) to improve the performance of existing building envelopes. The focus of deployment of micro-generation and renewable technologies, is at the individual building scale
Water	Smart metering and appliances coupled with market instruments, such as rising tariff structures and trading of water credits, drive improvements in the efficiency of water use. Industry supports continued capital intensive investment in centralised infrastructure systems including 'new' supply through water recycling (advanced treatment of grey water for portable use, etc) and desalination.
Waste and resource use	The development of novel materials, technological obsolescence and continued growth in absolute consumption represent significant challenges for waste management, requiring high levels of investment in infrastructure for recycling and resource recovery. As with energy and water, advances in ICT facilitate the development of market based mechanisms to enhance incentives for resource recovery and recycling.

Table 9: Further discussions of a smart networked city

Source: Retrofit city future (2013)

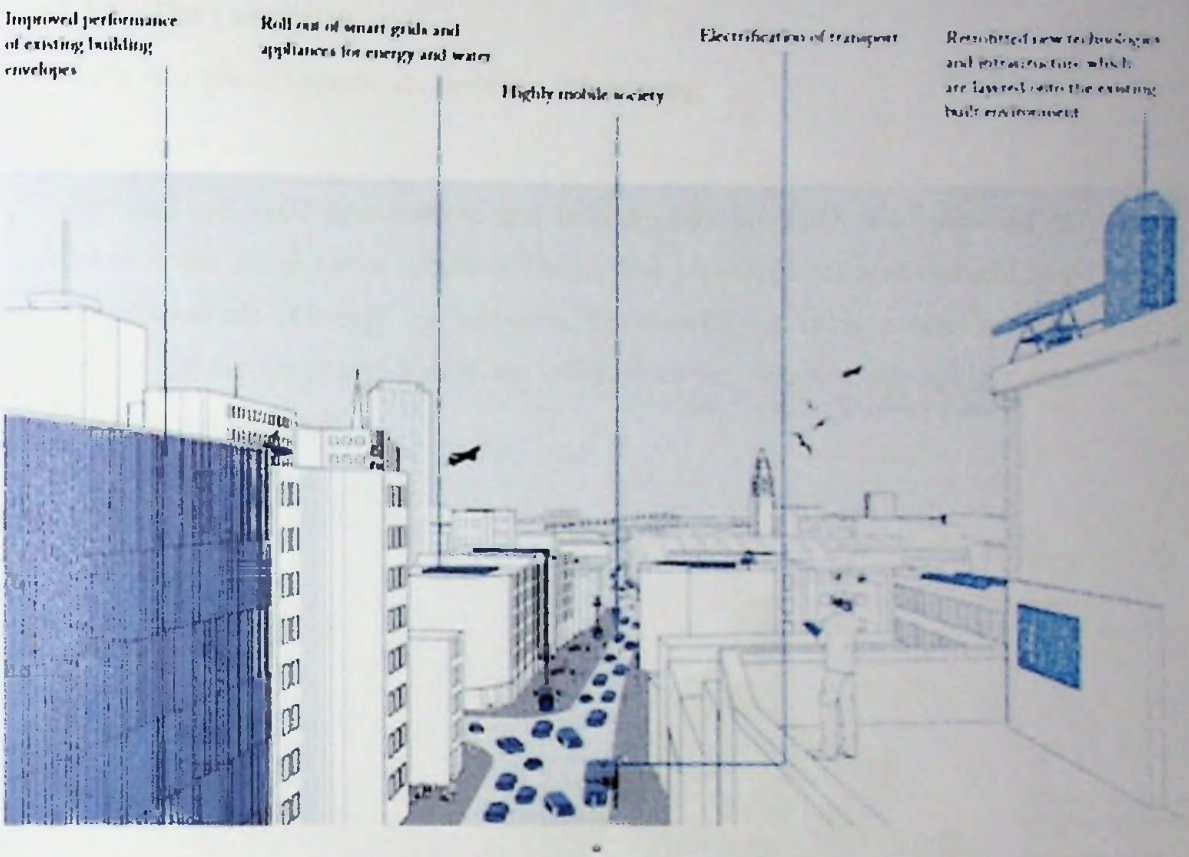


Figure 14: Applications within a smart networked city

Source: Retrofit cities 2050

The discussion above, of a smart networked city will be further analysed against that of Wellawatte in the chapters to follow.

4.7.1.2 The Compact City:

The city as a site of intensive and efficient urban living.

Urban land-use, buildings, services and infrastructure provision are optimised in order to create dense urban settlement forms that encourage reduced demand and more efficient use of energy and resources. Concentration in urban centres reduces pressures on the periphery. Significant efficiencies are obtained through systems integration and re-design.

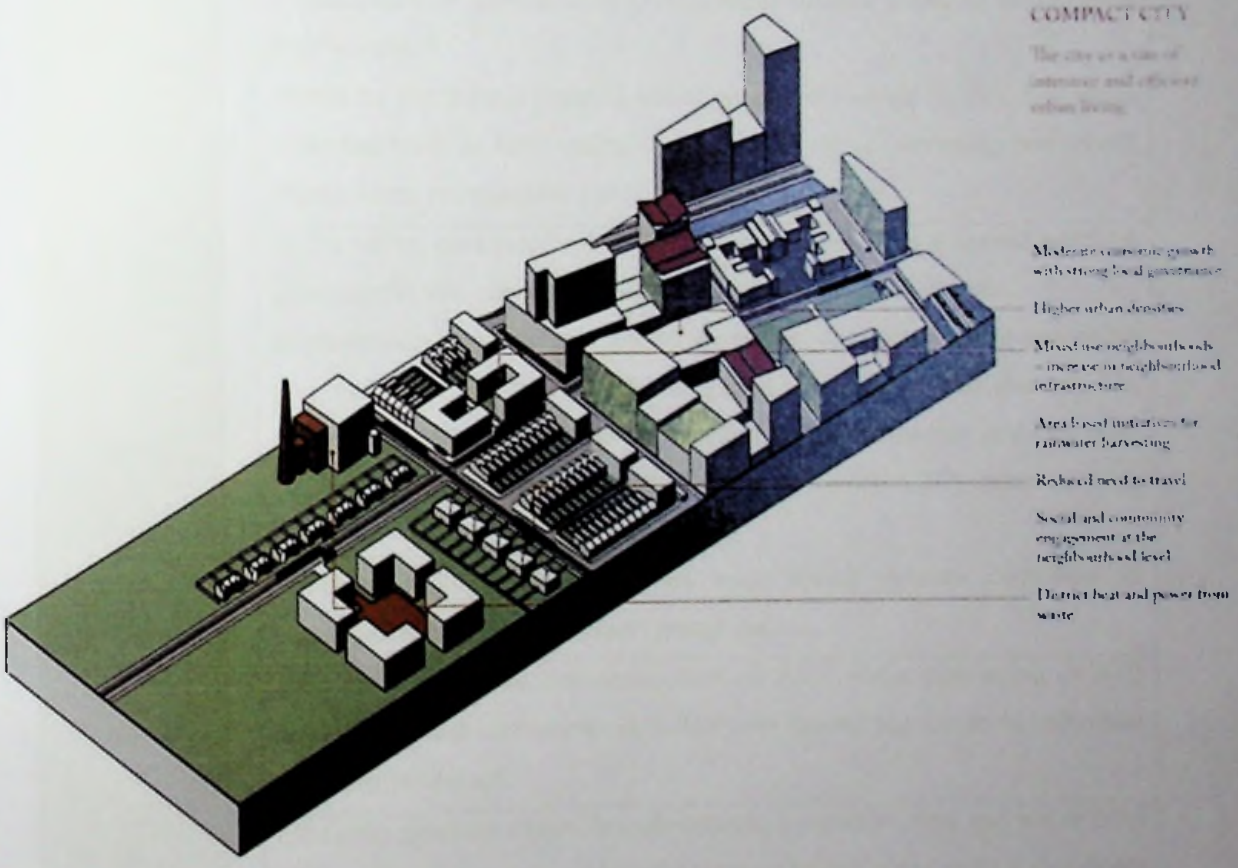


Figure 15: Overall concept of a Compact City

Basis	This is a moderate growth vision where regional economies are strongly coupled to investment in community infrastructure and local supply chains. Moderate growth in the UK's population and rural migration into the city are accommodated through increasing urban densities, entailing significant retrofitting of neighbourhood level infrastructure and built form. Mixed use neighbourhoods, coupled with developments in ICTs, reduce the need to travel; walking, cycling and public transport predominate. Regional government, local authorities and social housing providers play an active role engaging communities, regulating social behaviour, intervening in property markets and leading the development of local infrastructure projects. Concentration of population in urban centres reduces pressures on the rural environment. Within the city there is intensive use of green and blue space, including green roofs and walls to fulfil multiple functions (leisure, combating heat island effects, water management, food production, etc).
Energy	In this vision, area based solutions combine options from a limited portfolio of successful low carbon technologies which are deployed at scale. Improvements to individual building envelopes, distributed micro-generation (e.g. fuel cell CHP) and building integrated renewables (solar thermal, PV, heat pumps, etc), sit alongside the development of community and city scale heat and power networks (exploiting biogas & biomass CHP, industrial heat, etc). Walking, cycling and low carbon mass transit systems contribute to significant reductions in transport energy use.
Water	Area based initiatives link deployment of Rain Water Harvesting (RWH) technologies and investments in SUDS with stricter regulation of individual consumer behaviour.
Waste and resource use	Efficiency gains are sought through systems integration. Heat and power from advanced waste (including sewage) treatment technologies make a significant contribution at an urban scale

Table 10: Further discussions of a smart networked city

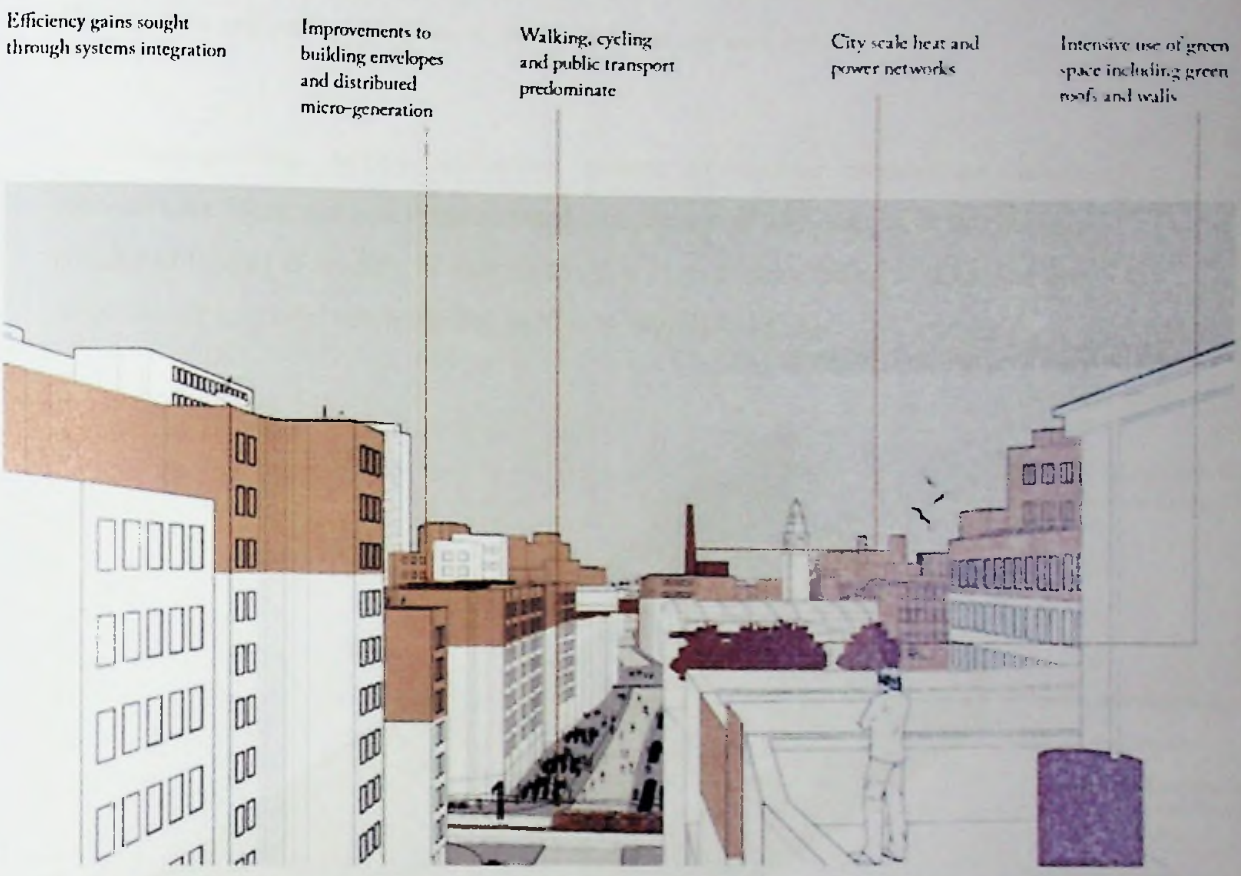


Figure 16: Applications within a compact city

The discussion above, of a compact city will be further analysed against that of Wellawatte in the chapters to follow.

4.7.1.3 The Self Reliant Green City:

The city as a self-reliant bio-region, living in harmony with nature.

A self-replenishing, largely self-reliant system of circular metabolism. where resources are local, demand is constrained and the inputs and outputs of the city are connected (cradle to cradle). In many ways this is an inward facing society, but one conscious of its global responsibility to 'live within its limits'.

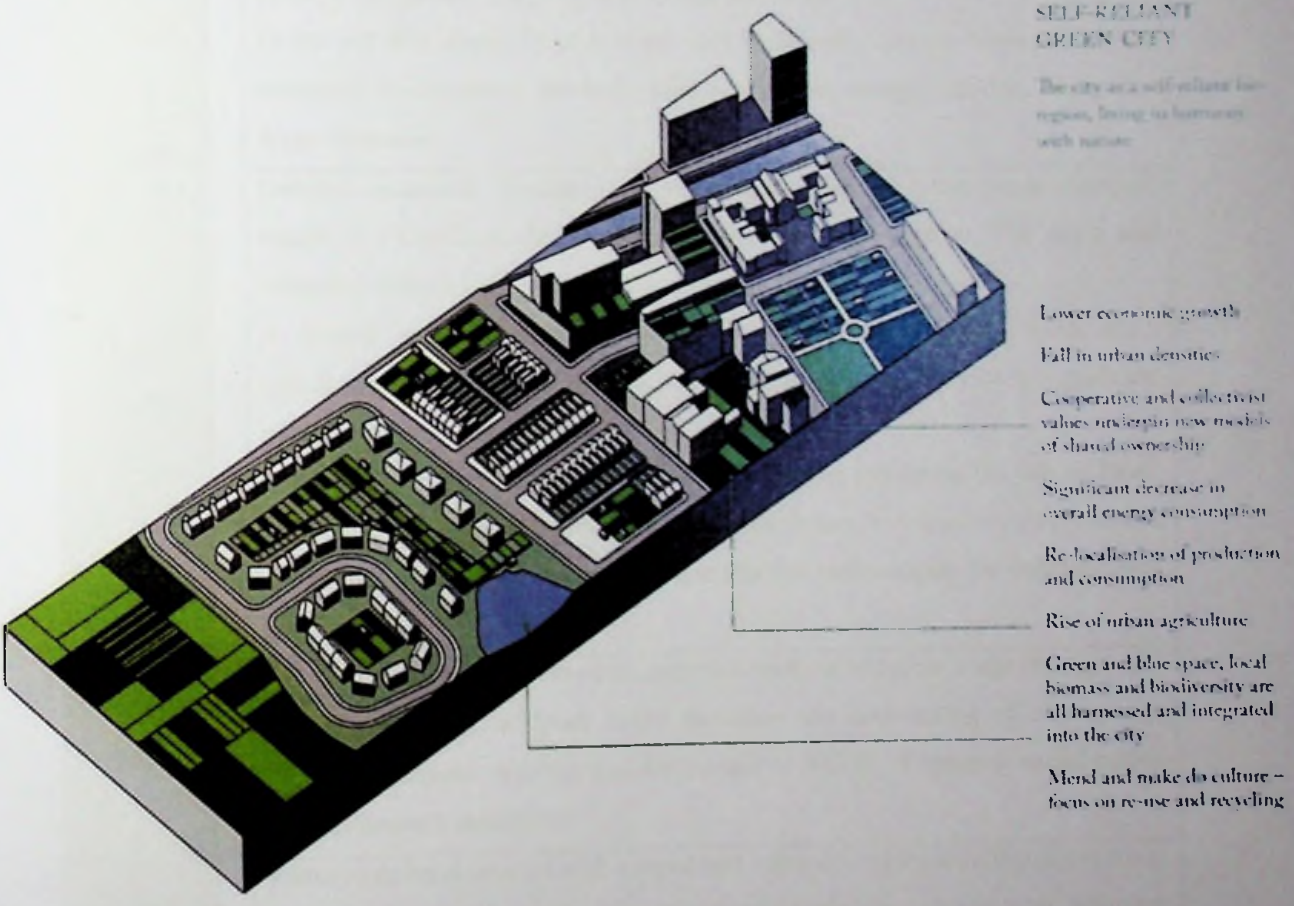


Figure 17: Overall concept of a Self-reliant green city

Basis	This is a low growth vision where systems of community ownership, trading and exchange focus on the creation and maintenance of local value, equity and sustainable wellbeing. Lower population growth is accompanied by outward migration from urban centres. 'Green fingers' replace the green belt as the extensification of urban living and rise of urban agriculture promotes the blurring of urban-rural boundaries. Despite falling urban densities, the transport intensity of economic activity declines significantly with the clustering and re-localisation of production and consumption. A high level of diversity and experimentation underpins the development of local solutions, exploiting the principles of urban metabolism through fragmented and piecemeal retrofit activities. Green and blue space, local biomass and biodiversity are all harnessed in the provision of ecosystem services (food production, energy, shelter, water and waste treatment).
Energy	Demand reduction, facilitated by significant universal behavioural changes, results in a significant decrease in overall energy consumption. The limits and rationing of energy use are widely accepted. A diverse range of distributed renewables (PV, micro hydro, wind, etc.), coordinated through local grids at the community level, provide a significant proportion of the energy mix. Insulation and improvements to building envelopes maximise the use of local, recycled and carbon neutral/negative materials (hemp, wool, straw, etc). There is extensive use of local biomass and solar thermal technologies for domestic heat and hot water.
Water	A more holistic and decentralised approach seeks to integrate water management into urban design, as lower urban densities and re-greening of city centres provides extensive opportunities for retrofit of SUDS. Changing social norms support demand reduction.
Waste and resource use	Reduced demand coupled with a mend and make do culture significantly reduces pressure on non-renewable resources. Small scale, low capital cost solutions (anaerobic digestion with bio-gas production, composting, etc.) are favoured for waste treatment, energy recovery and materials and nutrient recycling.

Table 11: Further discussions of a self-reliant green city

Figure 18: Applications within a self-reliant green city

The discussion above, of a compact city will be further analysed against that of Wellawatte in the chapters to follow.

CHAPTER 05: The Case Study: Wellawatte

Chapter five finally brings us to the crucial investigation – being that of the exploration of the town of Wellawatte in terms of assessing its potential for an urban renewal in terms of Green Urbanism. The study begins with an in-depth analysis of the Wellawatte town – its scope focused mainly from Bridge to bridge along the Galle road. This study further explores the concept of retrofitting green urbanism, looking into the means of transitioning Wellawatte into a sustainable future.

In order to analyse the research done against the existing situation in Wellawatte. an in-depth analysis was carried out, through means of interviews with local government bodies, citizens both short term and long term, investigations through available data from the National Archives, questionnaires and surveys of citizens as well as visitors to Wellawatte.

This Chapter therefore aims at analysing all the collected data in order to present a study that identifies the potentials of a green urban renewal in Wellawatte.

5.1 Introduction to Wellawatte

Wellawatte, a dynamic city in the western province of Sri Lanka, lies immediately south of Bambalapitiya, classified as zone 6 within the Colombo Municipal region and is bounded by the Old Dutch canal. Ideally, if not bridged, Wellawatte stands as an island in the middle of the Western Province.

The town begins at the Old Dutch canal just before the Savoy Cinema and extends all the way South to the same canal that spills into the sea just before the Hospital Road junction where Dehiwela begins.

It is bounded on the West by the waters of the Indian Ocean and extends to Pamankade where Havelock Road, forks and winds one of its ways to meet the Sri Saranankara Road Bridge that stretches over the waters of the Dutch canal extending towards Kohuwela-Hospital Road junction on Dutugemunu Street.

Figure 20: Location of Wellawatte

Figure 19: Wellawatte Boundaries

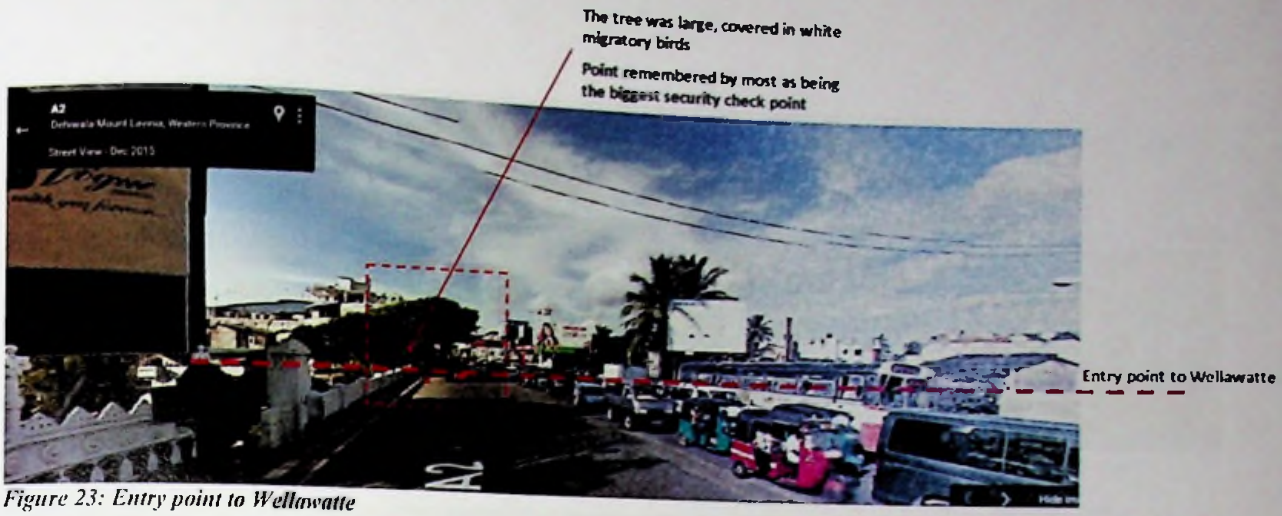


Figure 23: Entry point to Wellawatte

Figure 22: Exit point of Wellawatte

Figure 21: Midpoint at Wellawatte

Figure 24: Midpoint at Wellawatte

Figure 28: Entrance to Wellawatte at Marine drive

Figure 27: Exit at Marine Drive

Figure 26: Boundary at Havelock Road

Figure 25: Boundary at Veluwanarama Road

It is interesting to note that all the locations noted above, fig 21 – 25 were tightly secured as it was the main entrance points into Wellawatte.

Researching the archives and memories of its citizens, Wellawatte has indeed proven to be a city based on sustainability in the past. However, with development in its own area and in greater Colombo, Wellawatte has become a bypass with constant traffic jams as people move through the city to get to other destinations. **This passing through adds to the congestion on the streets and poses a threat to the character of Wellawatte.**

	School / Occupation	Visiting friends/Family	Shopping	Banking	Religious Observations	Healthcare/Selfcare	Simply passing through onto other destinations	Entertainment/Dining	Responses
All Data	9 (10%)	20 (22%)	35 (38%)	18 (20%)	4 (4%)	8 (9%)	63 (69%)	18 (20%)	91

Table 12: Reasons people enter Wellawatte

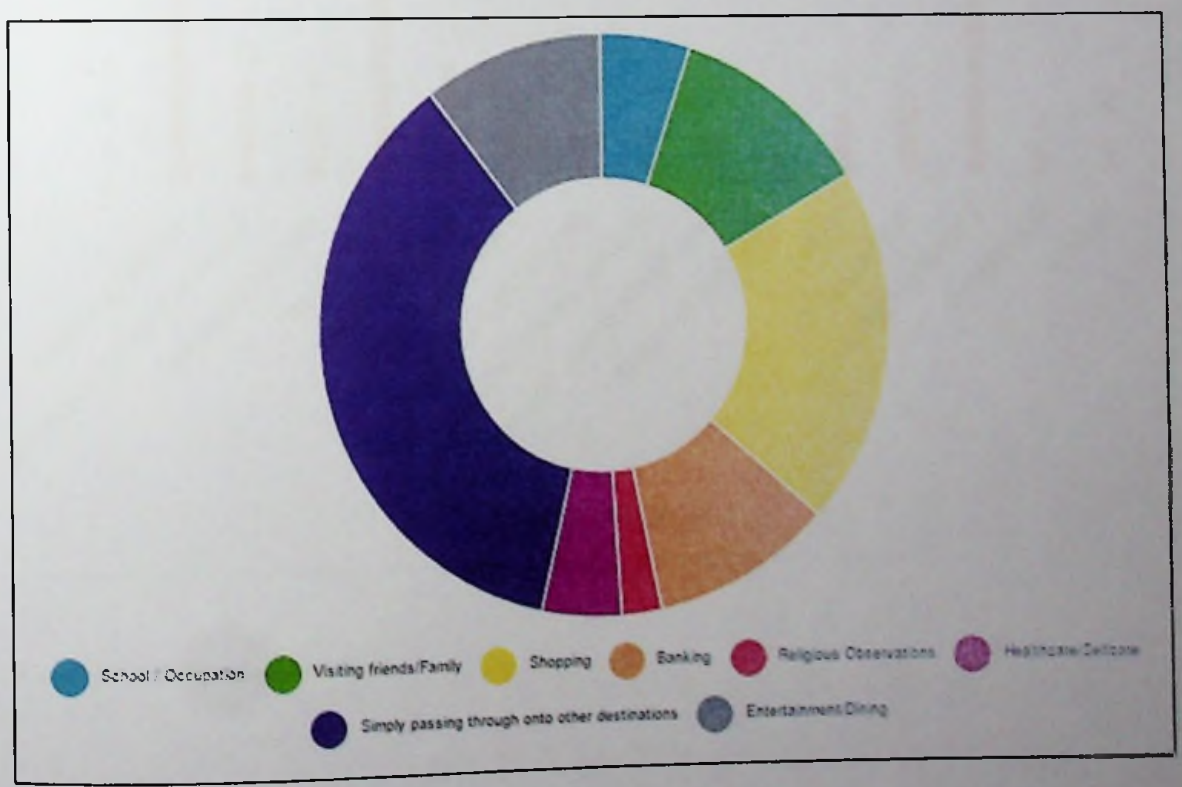


Figure 29: Reasons people enter Wellawatte

Results of the user survey done as part of this dissertation (Table 12, Fig 22) indicate the highest number of recipients, 69% experiencing Wellawatte simply by passing through it. As a result, it is experienced best by being a pedestrian in Wellawatte.

The main cause for Wellawatte losing its character are the roads and the association of the motor vehicle. The introduction of Marine drive and the expansion of Galle Road through Wellawatte impose a direct threat of safety to the large pedestrian population of Wellawatte as vehicles are in a hurry to get to locations out of Wellawatte.

Wellawatte from bridge to bridge covers everything one would need for daily life (Fig 23). From banks, shops, schools and places of religious worship, Wellawatte covers it all – hence the reason why Wellawatte sees the most amount of foot traffic when compared to other cities of similar size.

Figure 30: Activities along Galle Road

Figure 31: Road network Wellawatte - Bambalapitiya

Unfortunately the road network does not facilitate the pedestrian activity in Wellawatte.

As a result, vehicular flow is constantly interrupted for pedestrian crossings every 10m, which creates a bottleneck situation at Wellawatte.

Figure 32: Pedestrian crossings at Wellawatte

Similarly, with one way traffic towards Colombo beginning at the 2nd bridge near Savoy, Wellawatte is further congested as all traffic going towards Bambalapitiya tend to go through Wellawatte, adding more throughway traffic than traffic entering Wellawatte for specific needs.

The increase in traffic flow through Wellawatte as well as the increase in density experienced through development of apartment complexes is a constant threat as most apartments are accessed through very narrow streets.

Wellawatte today is moving further away from the sustainability it once had, and therefore this chapter challenges the current situation, whilst analysing principals of green urbanism, and its relationship with highlighting potentials for green urbanism renewing Wellawatte to be a sustainable city.

Based on the survey carried out among residents in Wellawatte, *(annexure 01)* 43% of the population walk in order to carry out activities within Wellawatte – further instilling that development of this city needs to pay additional attention to the needs of the pedestrian.

5.2 Wellawatte: Memories of the past

Wellawatte was once a town of character and colour. From small street shops to bustling religious festivals, Wellawatte was seen as an expression of culture.

Before the 1983 riots and the ethnic conflict that prevailed in Sri Lanka, Wellawatte was popoulated mostly by the Tamil community which added to the culture and flavour that the city is known for.

However, as a result of conflict, 75% of the Tamil community fled the country due to the fear that prevailed during the period. However, their return to Wellawatte, post conflict, has resulted in a population which is fused with borrowed culture of foreign lands. Today there exists a merging of cultures, with people from other ethnicities too living comfortably in Wellawatte along with a Tamil community whose lifestyles have greatly been influenced through mixing with other communities.

For example, their pattern of food consumption has also seen a drastic change. Tamil/Indian Restaurants (Saiver Kades) never served kottu and fried food items before. Hence, shops owners have now realized that the need to address such changes with different communities interacting in Wellawatte. *(Interview with Grama Sevaka)*

Eg: 'Dosai shops' (North Indian food shops) have completely changed the recipe of the famous 'Sambar' as it doesn't contain puhul, koththamalli seeds, murunga etc. anymore. All apartments, which were once small houses, are fully occupied now and are purchased even before the foundation stone has been laid. Shops have also vastly increased due to the demanding needs of the consumers.

Wellawatte, which is fondly known as 'Little India', has experienced drastic change in the past five years and is gradually rebuilding itself as a standalone city. The city, which is now abundant with restaurants, fashion outlets, hospitals, pharmacies and

supermarkets along with various modes and routes of transportation, shows great promise for a self-sustained city. (Grama Sevaka, 2016)

5.2.1 The Wellawatte Canal

The Wellawatte canal was not built by the Dutch despite the popular misconception. The canal was carved out in 1872 by the British as a flood outlet at Wellawatte. The road bridges of Wellawatte and Kirulapone span this cut. (Sameer. 2011)

The British Government Agent of the Western Province C.P. Layard, commissioned the undertaking, however the plan seemed to have not worked out, for when the rain came it was found that the that the canal bed was considerably higher than the flood area. The drainage did not occur much to the disturbance of some and the amusement of others who dubbed the canal Layard's Folly. (Muller, 1995)

Figure 33: Wellawatte Canal

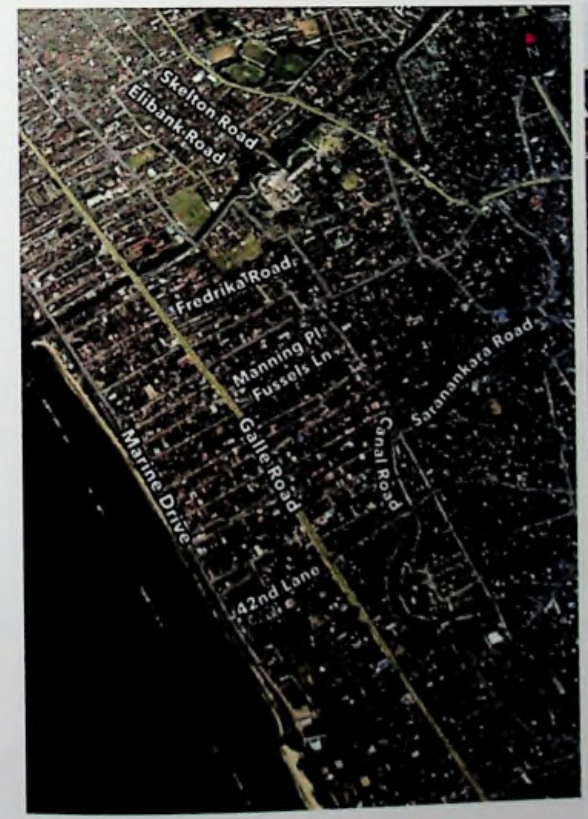


Figure 34: Satellite image of Dutch Canal

Subsequently, the canal bed was deepened and in the '70s converted into a rain water outlet which became filled with industrial wastes of the mills in the vicinity. It is related that in the very early 1950s, the canal was clean and boats used to come down from Piliyandala and beyond with vegetables and fruit to supply the Wellawatte and Dehiwela markets. (Sameer, 2011)

The canal itself was an adventurous place for kids from all walks of life to splash in, catch ornamental guppies and spend their leisure hours wallowing in its murky waters.

And it is after the rise of the shanty town that the canal became stagnant with waste of all kinds and almost disappeared. The edge of the canal was called ela-kandiya (canal bank). And those who lived there were referred to as folk from the ela-kandiya.

5.2.2 The streets and what they were remembered for

5.2.2.1 Charlemont Road

Figure 35: Entrance to Charlemont Road

It is related that all the land bordering Galle Road and the Railway tracks along the beach from the Savoy Cinema at the top of Charlemont Road to the Wellawatte Railway Station, was once owned by a Burgher gentleman named Gauder. His

children were named Charlemont (son), Alexandra (daughter) and Frances (daughter) after whom the successive streets have been named and stand that way to date. Not much information is available about the Gauder family. (Sameer, 2011)

Adjoining the Savoy, Charlemont Road, went straight down to the beach housing many a palatial residence and garden. The houses are remembered to be large and spacious with sprawling flora. Many of these residents were of Muslim Ethnicity – namely Bohra and Memons whose ancestors had arrived, long years ago, and settled as lucrative businessmen in Colombo. Their businesses were located mainly in Pettah where they indulged in oilman stores, groceries, condiments, spices and other similar produce. (Sameer, 2011)

One such family use to provide night prayer facilities at his residence during the Islamic month of fasting (Ramadhan) and a large gathering of believers from the locality used to patronize this service – **again evidence that Wellawatte used to be a very extroverted community unlike the introverted houses with high boundary walls you get today.**

5.2.2.2 Arethusa Lane & Hampden Lane

Figure 36: Arethusa Lane

Arethusa Lane was an example of multiculturalism – Sinhalese, Burghers, Muslims, Tamils, Indians (Southern and Northern) all co-habiting peacefully.

Interview: *"Even the 1958 riots didn't affect this little cul-de-sac because we looked out for each other. We shared each other's religious festivals and the associated food – the delicious Buriyani and Wattalappam at*

Ramazan, Kavum, Kokis and Kiribath at Sinhala New Year, Pongal Rice, Boondhi, Halva at Thai Pongal and Deepavali. Not forgetting the Christmas cake, Cream Crackers and Kraft Cheese washed down with Ginger Beer/Milk Wine during Christmas."

Interview: *"Baas' Kadé was the local café for the residents of the Alakandiya. I remember that my parents had a tab at the Kadé for their cigarettes. This was also the firewood depot for the neighbourhood. There were almost always disagreements about the actual weight and volume of the firewood as obviously wet timber was heavier than the dry. The house next to the kadé was where the Pollocks family lived and I remember the tock-tock of Joyce Pollocks' high-heel shoes as she walked up or down Arethusa Lane..." (Peiris, 2016)*

5.2.2.3 Sri Bodhirukkarama Mawatha (Vihara Lane)

Figure 37: Sri Bodhirukkarama Road

Formerly known as Vihara Lane, this very narrow street where only one single vehicle could pass at a time was later broadened to accommodate the massive traffic that plied between Galle Road and Sri Saranankara Road that bordered the Wellawatte Canal, inland. The massive Buddhist Temple located on the right side of the street gave rise to its new name of Sri Bodhirukkarama Mawatha.

Most homes down this street were owned and occupied by the Buddhist Fernando families who later sold out to other communities. In the past, this street was notorious for its gang warfare and crime which was a regular scenario within its domain. The street widening project reduced the crime rate although the gangs still continued to roam its locality. With the stagnant canal in that area and low visitor levels, this area is still known for this shanty neighbourhood.

Figure 38: Sri Bodhirukkara Temple

5.2.3 The Polytechnic Institute

Figure 39: The Polytechnic Institute

The Polytechnic or "Poly", as it was fondly referred to, is said to be the first private Business College in Sri Lanka. Established in 1901 by Lawrie Muthu Krishna who was a pioneer in encouraging the youth to learn business and media skills, it was the pioneer training centre in secretarial, typewriting, shorthand, book-keeping and other similar, basic, office management skills. Later on the institute added many other attractive courses

including, journalism, advertising, public relations etc. in order to cater to changing demands of society.

The resulting clutter of the heavy old Remington Standard typewriters in the Polytechnic, added to Wellawatte's charms, and was referred to as the Charlemont Road symphony. It was also one of the few, if not only, institutions at the time, providing co-education where men and women sat together in the same classroom.

5.2.4 The Kinross Swimming and Life Saving Club

On the Beach stood the Original KS & LSC – established in 1940. This great Club produced several Champions in Swimming & Aquatics. The Club produced several outstanding spear fishermen and introduced the sport of spear fishing to Ceylon. The Kinross bathing enclosure was situated opposite the site of the original KS&LSC. The enclosure was located in the sea. It consisted of two rafts and several orange barrels placed in a semi-circle, a relatively safe bathing area for both bathers and swimmers.

Figure 40: Kinross Swimming club

In 1955, the improved clubhouse was built on the beach just opposite the Station. The club was built on the proceeds from the carnival, sponsored by Mr. Thaha, which ran for about two months on vacant property owned by the William Pedris Family, free of Lease. The Club was moderately damaged by the recent Tsunami and the present committee of management is hoping to restore the Club and improve the facilities for its members. Unfortunately due to changing situations the Club is not in

the forefront of aquatics any more. The fierce competition and the 'Spirit of Kinross' for which the Club was renowned in the period 1941 – 75, sadly no longer exists. (Sameer, 2011)

However today, activities such as the 2km sea swim and lifesaving training still take place at Kinross. Sadly however, it is not as well-known as it was several years ago.

5.2.5 Ramakrishna Mission

The main centre of the Ramakrishna Mission is on Ramakrishna Road. Wellawatte. The concept of a Ramakrishna movement in Sri Lanka started with the arrival of Swami Vivekananda in January 1897 on his way back to India after his historic address in the parliament of Religions at Chicago. At the request of devotees he sent one of his brother disciples in July 1897 to Colombo to spread the message of Sri Ramakrishna.

The mission started its activities in the Island in 1924 with the management of a few schools. The Ashrama building has a shrine, meditation and prayer hall, and an administration section and book-sales department. A separate building houses the library, reading room and a lecture cum prayer hall. In addition, there is an auditorium named Swami Vivekananda Centenary Memorial Hall and an International Cultural Centre referred to as 'Guest House.'

5.2.6 Orchard Building

Figure 41: Orchard Building

The orchard building today is known for the best place to buy Indian sarees for a good rate – whilst the building also houses small offices and accommodation. its main focus has been the sarees and fabrics.

Today, its prominence has branched out further, with seamstresses and accessories also being readily available for purchase. As a result, the activities have spread along Sinsapa road and Dhammarama Road as well.

5.2.7 The Wellawatte Market

The Wellawatte market, as a single storied building with half walls, was remembered as the heart of the city with so much excitement and activity. However, following development and built environment changes in Wellawatte a new building was introduced to house the market, also including a multi-storey public car park. Being completely shut off from the road, the excitement of the market is not restricted behind closed walls with any activity shared with the public

Figure 42: Wellawatte Market building and public carpark

5.2.8 The Savoy Cinema

The Savoy Cinema, then owned and managed by C V de Silva, was an icon that no one could ever miss. The stature of the building itself combined with the many attractive movies that were shown there could never miss anyone's attention. Its location right next to the Dutch Canal on the seaside marks the beginning of the town. Several business outlets also occupied the ground floor stretch of the building, comprising a pharmacy and even a textile retail shop. The first floor also contained a Chinese Restaurant.

Today the entire building houses the two cinemas.

Figure 43: Savoy Building today

5.3 Demographics of Wellawatte

5.3.1 Population by Sex

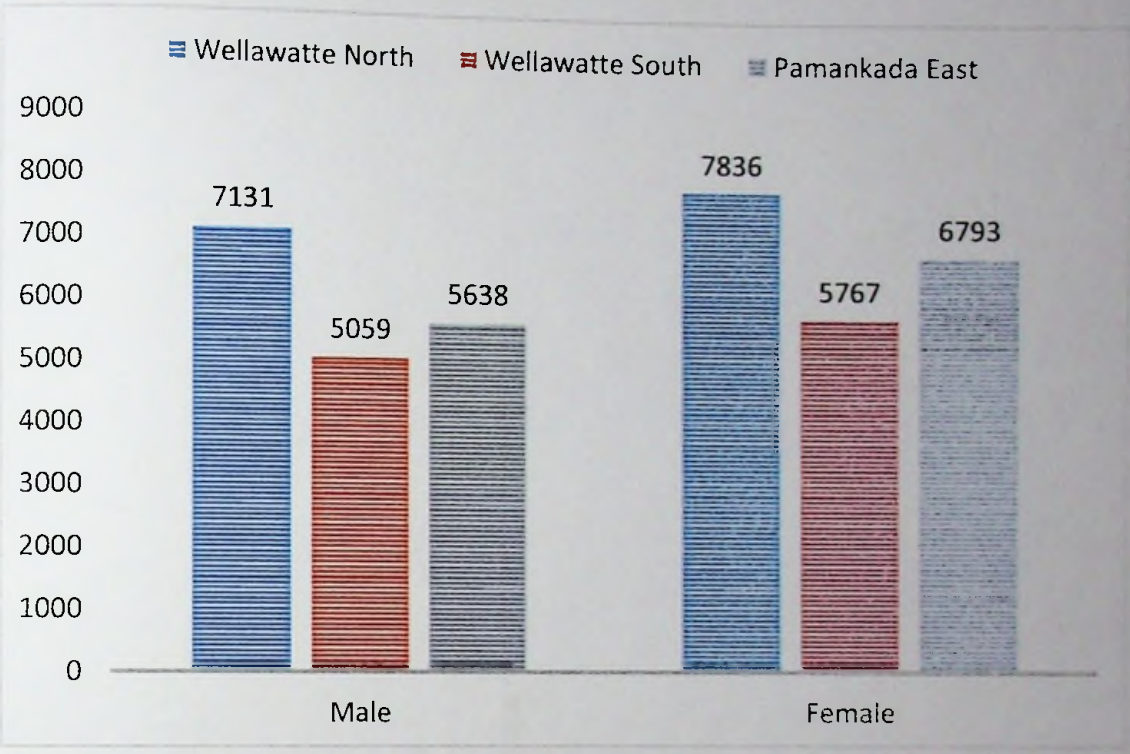


Table 13: Demographic Data for Wellawatte: Sex

Source: Dept of Demographics 2012

The above graph indicates the male: female ratio based on a census carried out in 2012. The above divides Wellawatte into its 03 Gramasevaka divisions and shows a higher ratio of Females residing in Wellawatte, a total of 53% as opposed to Males.

Although on first observation Wellawatte seems like a male dominated city, the demographic data shows otherwise indicating that the majority of women are housewives and do not come out into public areas much.

Considering the higher percentage of women in Wellawatte, (when measuring sustainability) security and safe walkability in the city needs to be of key importance.

Research based on empowering women within the city should be explored to further discuss means of achieving economic sustainability within Wellawatte.

5.3.2 Population by Economic Activity

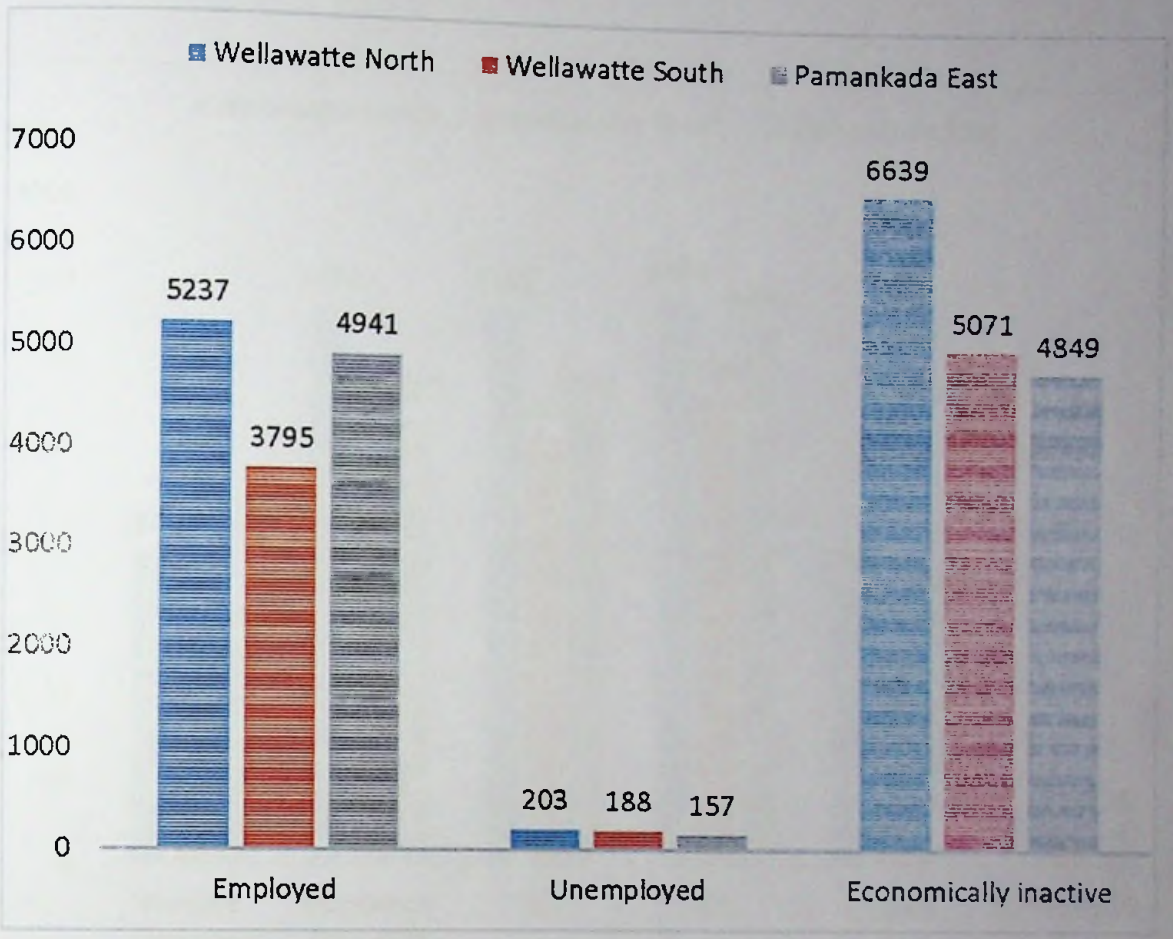


Figure 44: Demographic Data for Wellawatte: Employment

Source: Census and statistic, 2012

The above graph indicates a very high percentage of an economically inactive population which is defined as people who are not in employment or unemployed.

There are many reasons why an individual may be inactive, for example, they might be studying, looking after family or long-term sick. These individuals are not part of the supply of labour but are important as they are potential labour supply in the future when considering urban development in Wellawatte.

5.3.3 Population by Education Level

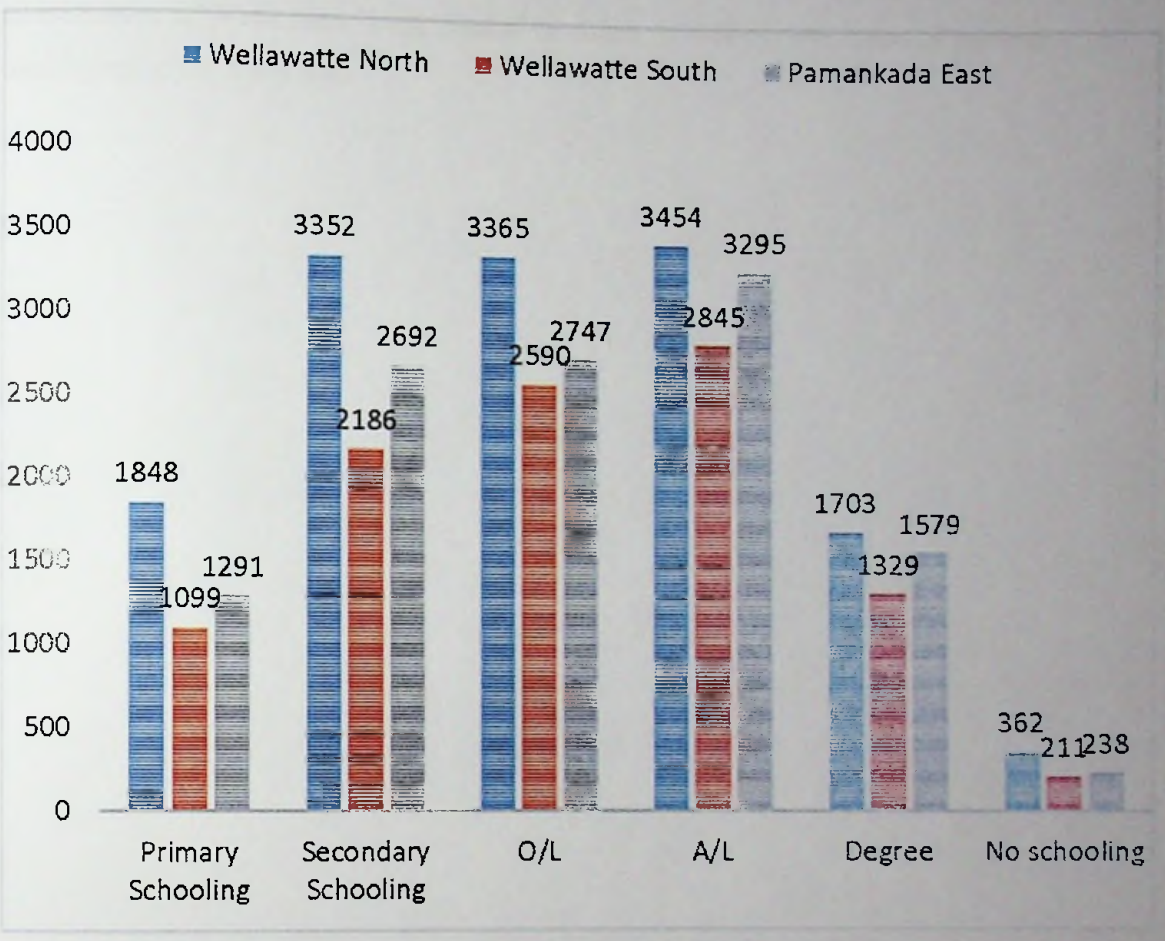


Figure 45: Demographic Data for Wellawatte: Employment

Dept of Statistics, 2012

The above graph indicates the education level that the citizens of Wellawatte have completed. This shows on average a lower indication of education when compared to the more developed areas of the country, with a higher percentage in total having completed only up to Grade07.

Wellawatte North sees a high percentage of A/L and degree holders, showing a relationship between economic levels and education levels – showing that poverty has a big influence on education in these areas.

The verdict on this data therefore is that in order to develop an educated citizenship in Wellawatte, who in turn will actively participate as involved stakeholders in the development of Wellawatte, steps should be taken to address the issue of poverty underlying in the study area.

5.4 The Study Area

Figure 46: Micro Study Area

The study area focuses on the Galle road in Wellawatte and is limited from bridge to bridge. As indicated in the figure above, the study area is a linear measurement of 1.9km, and is approximately a 5 minute drive and a 24 minute walk from bridge to bridge. Although this is the main area of study and an in-depth analysis is made in this area, the research widens out into Wellawatte as a whole, which supports the activities in this main spine.

The selected study area is considered the main artery or the spine. It is here that exists a diversity of activities, from residential to commercial to restaurant to places of worship. This diversity of activities are frequented by those in the area as well as those living in the outskirts, entering Wellawatte in order to complete specific tasks.

The above image depicts also a bypass route, through marine drive which is approximate 0.7km more than taking the straight path through Galle Road.

The intention of selecting this study area is to highlight that the main spine of Wellawatte, has the potential required to pull the economy into Wellawatte, and in turn with the support of the rest of Wellawatte, can be developed to transition in a Resilient Green City.

5.4.1 Land-use Patterns

5.4.1.1 Figure Ground Map

Figure 47: Figure Ground Map

Figure 47 shows the solid to void ration in Wellawatte which further indicates the high density of the built up space in comparison with the open areas.

5.4.1.2 Land use Map

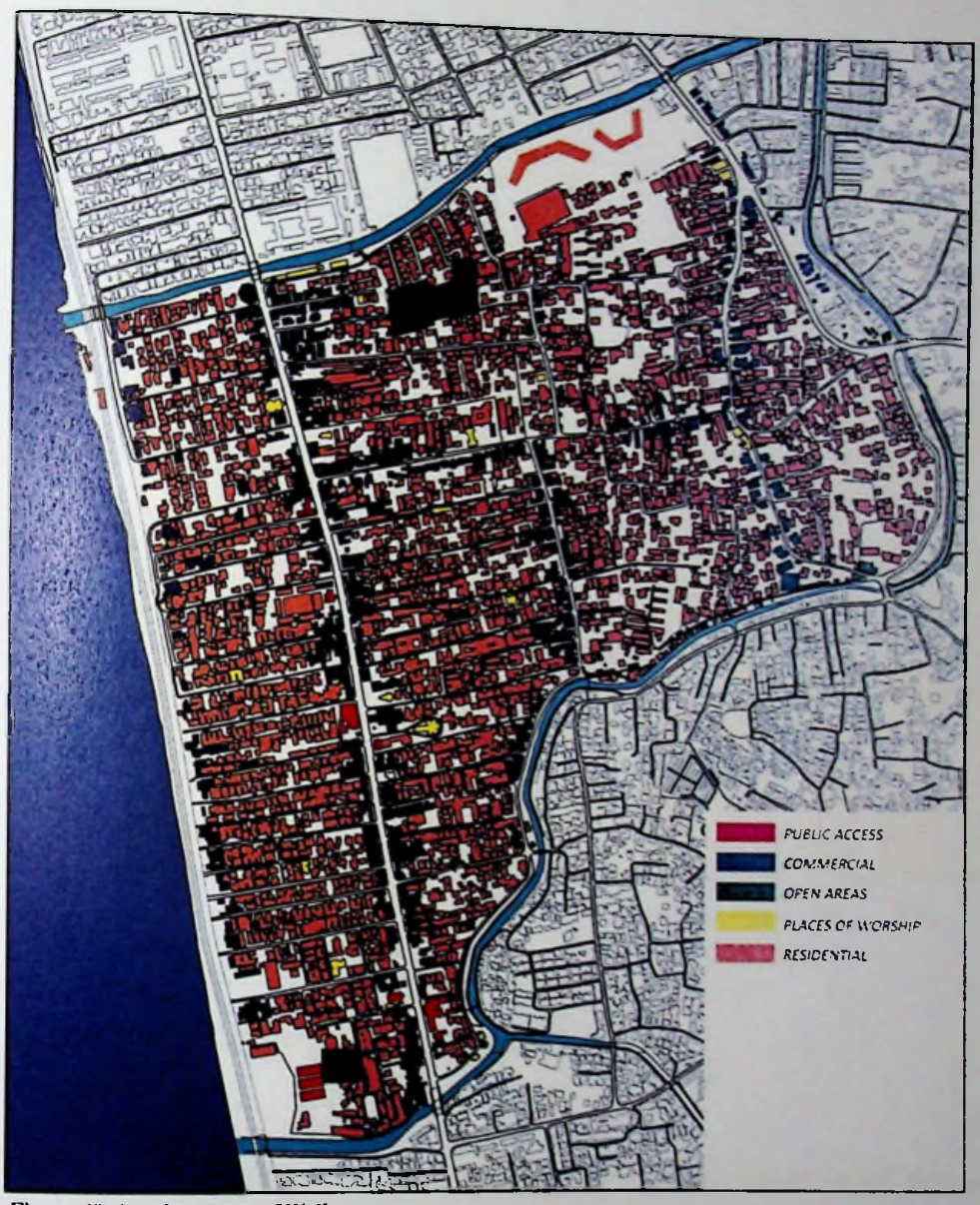


Figure 48: Land use map of Wellawatte

The land use pattern above sees a rhythm of commercial activities along the mainly used roads, evident that the current economic pattern in Wellawatte is mostly influenced by the vehicular transportation pattern in Wellawatte, as it is the main roads which are developing a commercial belt.

The highest density is represented by residential units, majority being multifamily/multi story units. The shows the importance of developing Wellawatte to be people friendly and interactive.

5.5 Using Green Urbanism principles to Evaluate Wellawatte

5.5.1 Wellawatte: Climate and Context

Temperature and Orientation:

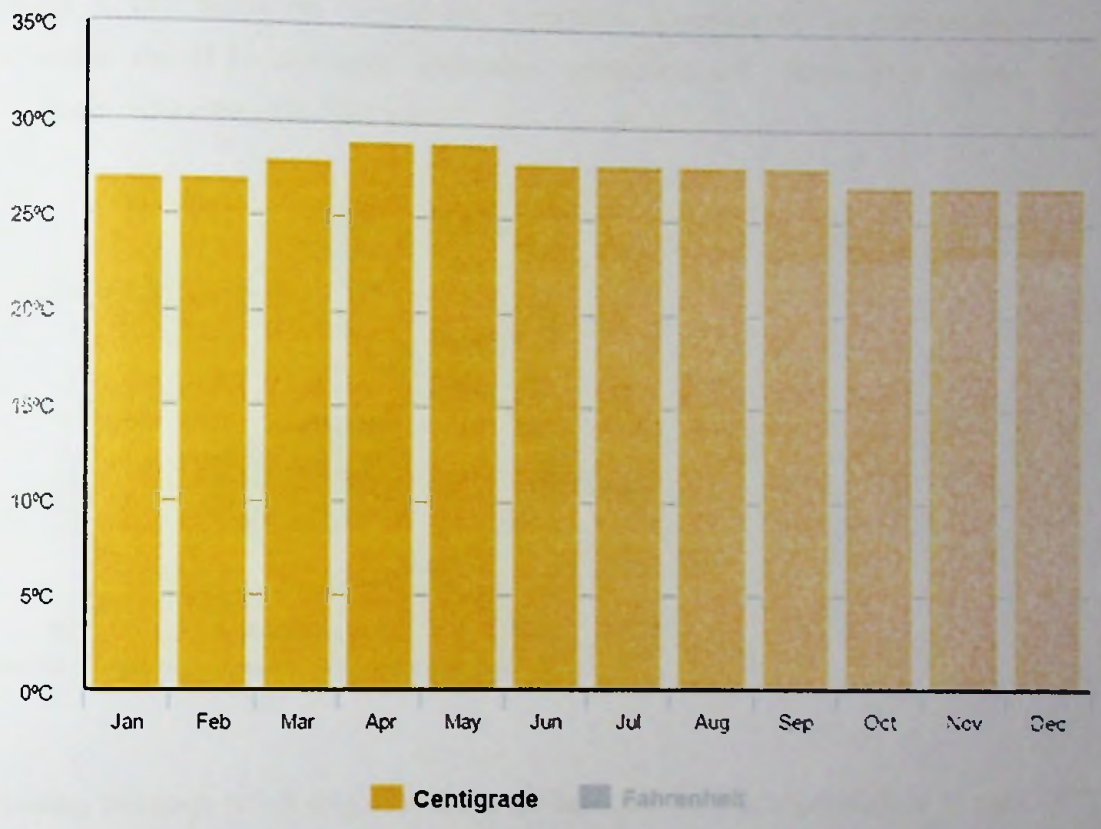


Figure 49: Wellawatte Average Monthly Temperature

With regards to principle 01 of Climate and context, the orientation of Wellawatte plays a big role in how to tackle the design challenge. Located on the western coast of Sri Lanka, Wellawatte gets direct afternoon sun with average temperature of 28deg C yearly. (Fig 48)

Above is indicative of temperatures higher than 24+/-2 degrees Celsius, which is considered as the comfort level of a human being to exist without any artificial temperature comfort. This indicates that temperatures experienced in Wellawatte are higher than the comfort levels and thus require artificial means of cooling the human

body. Principals of green urbanism calls for methods in which this high level of temperature should be mitigated, which in turn would prevent the need for artificial cooling.

Sustainable Urban renewal in Wellawatte in terms of Green Urbanism looks into forming a city based on its climatic conditions. Considering its orientation. Wellawatte should be developed optimising, orientation and compactness which would help reduce the cities heat gain.

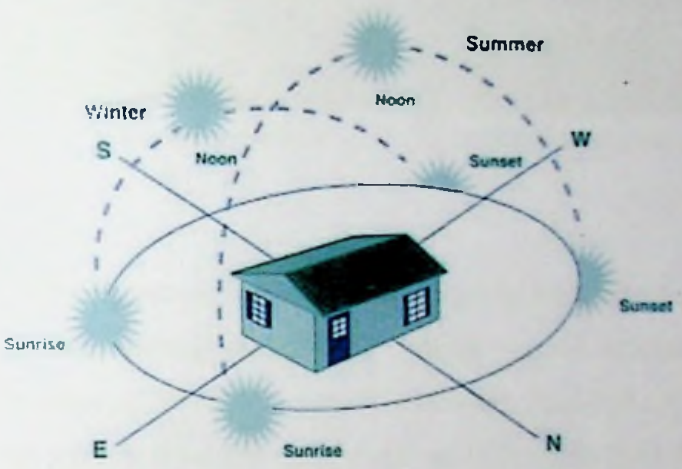


Figure 50: Considering orientation to minimize heat gain

Orienting buildings N – S (Fig 18) reduce the heat gain on the larger surface of the building, thereby limiting the area which heats up as a result of the sun. Steps should be taken to instil "sustainability" regulations which consider the overall heat gain of a building prior to local government approvals.

Additionally, a properly designed landscape can make the built environment significantly more energy efficient and reduce air pollution, including greenhouse gases. It can also cut heating bills by as much as 40 percent. (Vegetation to increase energy efficiency, 2001)

Figure 52: Masdar city Abudhabi

Figure 51: Brisbane shaded walkways

An energy-conserving landscape utilizes trees, shrubs, groundcovers, and vines to provide cooling shade. When shaded, ground temperatures were found to drop an average of 3°F–6°F in only five minutes. Studies have also shown that temperatures on a forest floor can be as much as 25°F cooler than those recorded at the tree tops. Shade can also drastically affect built environment comfort levels and energy costs. (FIG 20)

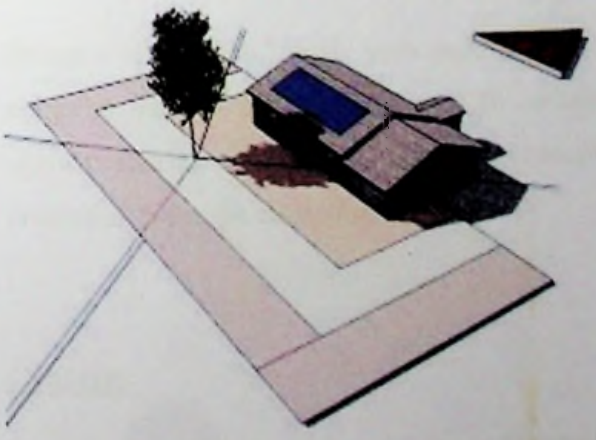


Figure 53: Trees provide a heat barrier

Rainfall:

The rainfall pattern in Wellawatte is constant with heavy rainfall being experienced in May and Oct – a.k.a the monsoon months of Sri Lanka. (Fig 20) is evidential that developing Wellawatte should also address the rainfall pattern, in turn preparing a city to function safely and hassle free during inclement weather at all times.

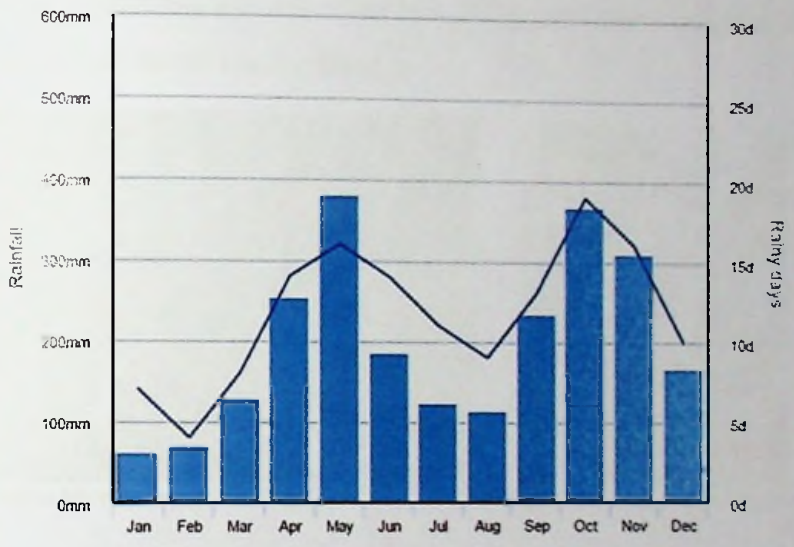


Figure 54: Average Rainfall in Wellawatte

Being a city which mostly sees pedestrian movement, it is clear that Wellawatte needs to address not only the need for shading but also the need for protection against sudden downpours. Extended canopies along the pavements facilitate protection from the elements.

Context:

The location of Wellawatte, with its undisturbed coastal belt and recently introduced Marine drive, has created a belt for commercial activities geared for tourism. This aspect of tourism is unlike that of the southern coast or the eastern coast, as it is more geared towards the city tourist, offering short term, city hotel accommodation as

opposed to the resort type accommodation. Therefore, tourism activities along the coastal belt of Wellawatte currently offer restaurants, spas etc.

Developing Wellawatte according to Green Urbanism principles explores the need to develop activities according to its context. AS a result – care should be exercised to prevent Wellawatte from becoming a tourism destination bearing characteristics similar to other coastal areas. Instead, tourism in Wellawatte should embrace its roots, celebrating its culture and stemming architecture and tourism concepts through the culture the context is placed in.

Figure 56: Vel Festival

Figure 55: Vel festival and community involvement

The above images depict a Vel festival in Wellawatte, a colourful cultural festival where the community as a whole celebrates. Chariot processions, coconuts being smashed, people decked in their brightest colours worshipping with camphor and flame, youngsters dancing the Kavadi dance and many other features of the Tamil Hindu community is displayed on the streets of Wellawatte, instead of behind their temple walls, as is usually the case. This is one of the most important Hindu festivals hosted in Colombo; the Adi Vel Festival, which has a unique history going back to 1874.

It is no doubt therefore that the tourism of Wellawatte can be developed to incorporate such culture- similarly the city being abundant with activity and services provided, the coastal belt can be developed to be public oriented, offering activities such as restaurants, coffee shops etc, developed to be a stop over from other cities and as breaks between busy shopping

Figure 58: Restaurants to serve traditional Tamil food

Figure 57:Sea side restaurants in La Jolla

Developing Wellawatte based on its context can branch out to its economy as well. Today Wellawatte is known for its Indian shopping, where users come to the city with a specific purpose of buying sarees, lehengas etc. This "niche market" is Wellawatte's potential and economically driving factor which should be exploited as it were to bring it more income into Wellawatte. Therefore Wellawatte should be further developed economically to capture its cultural essence – and make its culture its driving force – almost like a little India.

Figure 59: Little India concept neighbourhoods

5.5.2 Wellawatte: Renewable energy and Zero CO2 emissions

The main question explored under this principal is if Wellawatte can generate energy as well as be emission free in the most effective way. The best form of renewable energy is that through solar energy – a form of energy Wellawatte is abundant of, being a coastal city. A well balanced, combination of energy sources can sensibly secure future supply.

Figure 60: Solar panels generate electricity

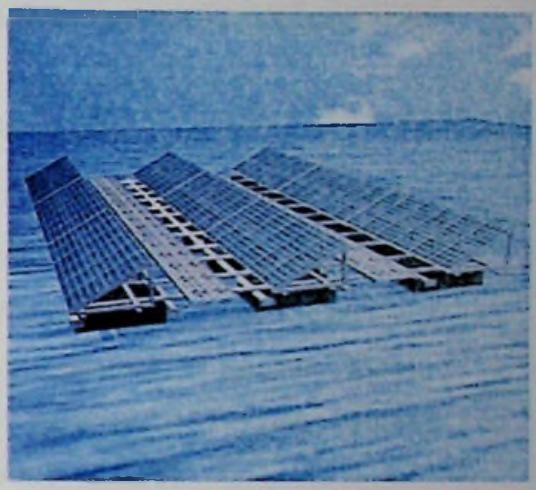


Figure 61: Solar panels in the sea

Fig 61/62 indicate the concept of solar generate electricity, a concept which is widely being explored globally as well as in Sri Lanka. This system allows the consumer, to generate their own electricity by way of solar panels mounted on their own buildings and in turn direct all unused electricity back into the grid.

Considering Wellawatte to be a sustainable city which generates energy on its own, it is best to look at larger scaled energy production which will generate electricity to Wellawatte independently without being dependant on the main supply grid.

A study by the Global Climate & Energy Project concluded that if current growth rates continue, by 2020 about 10 percent of the world's electricity could be produced by PV systems. A big part of the solar story is the steady growth of ground-mounted solar power, or "solar farms", where thousands of PV panels that often span miles of desert terrain, appear to symbolize the very future of alternative energy.

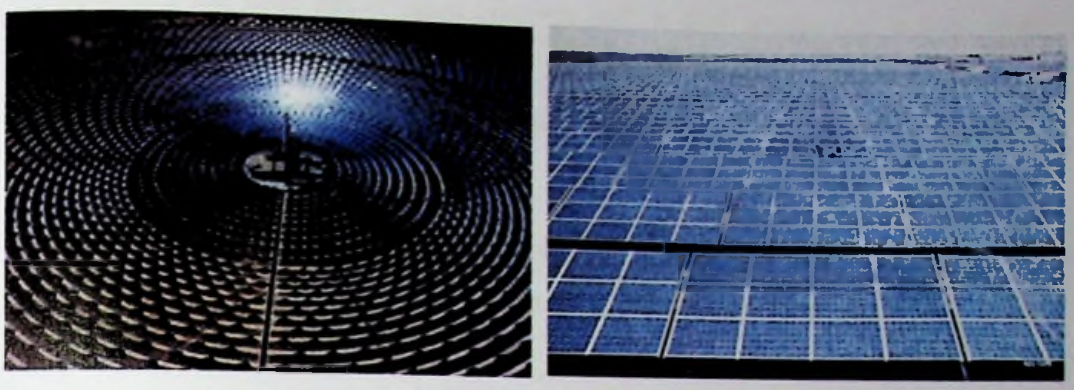


Figure 62: Sambhar Ultra Mega Green Solar Power Project, India

Sambhar Ultra Mega Green Solar Power Project, India (Fig 24) will sell power at a tariff of INR 5.50 per unit – probably close to the lowest tariff ever – therefore helping to bring the price of solar power down. It is expected to generate around 6000 million units of power annually with the power generated to be sold to various states through the National Grid. (evolution solar sunshine, 2014)

In Wellawatte too, using underutilized land close to the canals banks on the Western coast for such an endeavour maybe considered an option in considering solar generated power for the city.

Ocean thermal energy (OTE) is another form of energy coastal cities can be encouraged to generate.

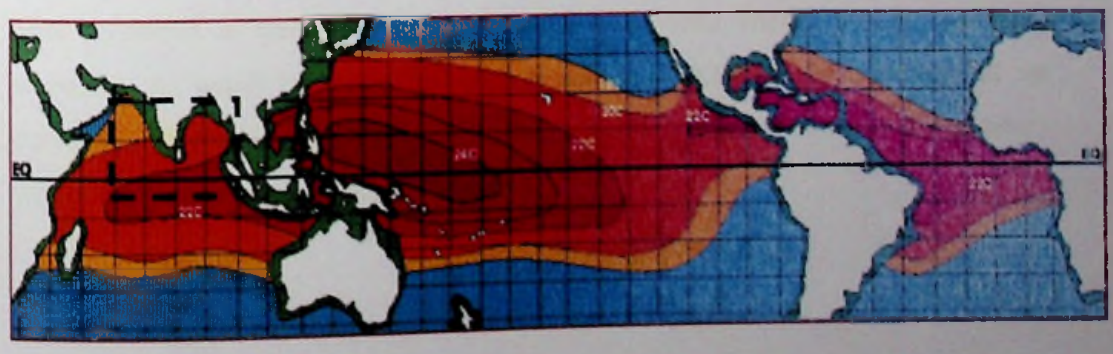


Figure 63: Ocean region applicable for OTE

To operate a sea solar power plant involves both a heat source and a heat sink. Therefore, the 80 degrees F surface water in the tropical oceans serves as the heat source and typically 3,000 feet below the surface is the heat sink or the cold bottom water, which is 40 degrees F.

This temperature difference or delta T is sufficient to operate vapour turbines, which drive generators and produces electricity and fresh water as a by-product. This is the OTE concept. (OTE technology , 2014)

Sea Solar Power uses the basic technology known as Ocean Thermal Energy (OTE), or sometimes Ocean Thermal Energy Conversion (OTEC), which was invented in 1881 by a French scientist years ahead of his time by the name of Jacque Arsene D'Arsonval. Before describing the mechanics of the system, let's first understand the natural resource and its potential.

Figure 64: Sea solar power generation

The ocean covers most of the earth's surface. More than 300 times what the world now consumes in electricity is available from the solar energy that is constantly stored in the upper layers of the tropical ocean. This takes place throughout the equatorial zone around the world or about 20 degrees north and south of the equator - where most of the world's population lives.

This area is also where the greatest increase in demand for new power exists, because population growth is greater in this region and where the standard of living has been rather low, and now more people with more wealth are demanding more electricity.

Figure 65: Identified location for alternate energy production in Wellawatte

This means of energy generation can be introduced to Wellawatte, in turn developing the coastal belt of Wellawatte into an energy generation strip – which would feed Wellawatte as a whole as well as supply the national grid with excess generated energy.

5.5.3 Wellawatte: A zero waste City

The third principal of Green Urbanism explores the question of how to avoid the creation of waste by changing consumer behaviour. The main focus of this principal is considering Wellawatte as a zero waste city with a circular closed loop eco system. It envisages Wellawatte managing its garbage problem by itself, without depending on the municipal waste disposal system.

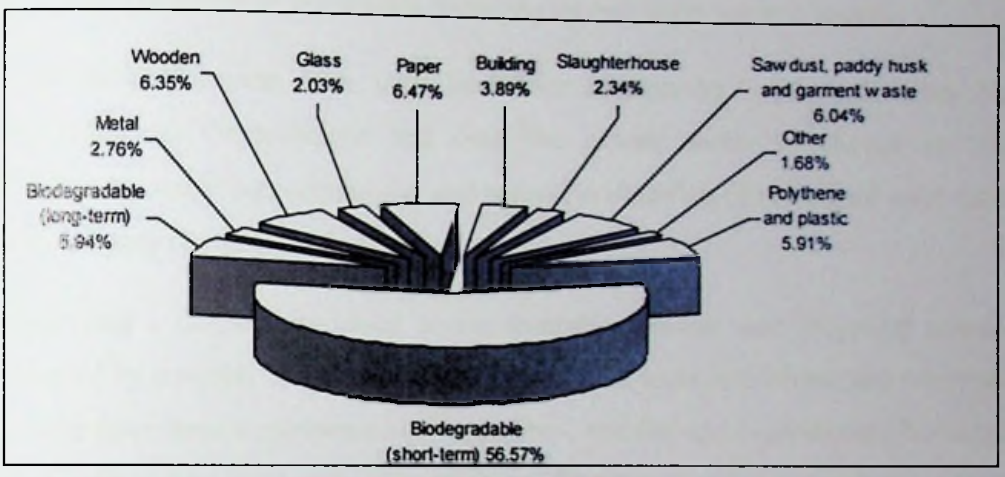


Figure 66: Composition of Municipal Waste Collection in Sri Lanka, 2005

"Worldwide, about 5.2 million tonnes of municipal waste is being produced a day and out of this, 3.8 million tonnes of solid waste is produced in developing countries. It has now been projected that by 2025, the global annual solid waste production would be around 2.2 billion tonnes, up from 1.3 billion tonnes in 2012. Of this, urban Asia will account for about 657 million tonnes of solid waste, about a third of solid waste in the whole globe by 2025. Hence, solid waste growth in Asia is inevitable and proper waste management solutions should be put in place right from now if Asia is to avoid a waste catastrophe" (Visvanathan, 2015)

Developing countries use land-filling as the main method of disposing solid waste produced by their growing urban populations. With the limitation of the available land for this purpose, it has become necessary for identifying other methods of solid waste disposal. Visvanathan notes that solid waste disposal options should necessarily change and these options are in fact fast changing worldwide. They have principally changed from land-filling to recycling, energy production and

composting. But, these are hampered by four types of constraints: lack of money, technology, proper policy and capacity. (Visvanathan, 2015)

Being a consumer oriented city with its main economy based on retail, the use of polythene in wellwatte is high. If steps are taken to make Wellawatte a polythene free zone, a high percentage of non biodegradable waste can be limited. Effective waste management in Wellawatte not only reduces the wasteissue as awhole, but it also looks at means of Wellawatte managing its own solid waste disposal.

Over the past decade or so, there have been attempts by Local Authorities, Non-Governmental Organisations and even the private sector to engage in waste processing, recycling, composting and anaerobic digestion of municipal solid wastes with varying degrees of success.

Recycling : Community-based source-separation, re-use and recycling schemes, initiated by a variety of stakeholders such as NGOs, local authorities, and community groups have been implemented amongst low-, middle- and high-income households in certain urban local authority precincts. Significant success has been achieved when these schemes were linked directly to livelihood improvement programmes for the poor; similar success was not achieved where schemes were stand-alone ventures.

If Wellawatte actively enforces the concept of recycling, setting up of recycling centres at the entrances to Wellawatte, perhaps by the main transport terminals, will encourage both citizens and visitors to bring in their recyclables in exchange for money or value added services. Initiatives can be carried out with restaurants, theatres etc, and giving discounts/value addition in exchange.

Currently there is one recycling centre in Wellawatte; however initiatives like this can lead the way to more centres which will in turn also promote additional job opportunities.

Figure 67: Sydney installs machines that offer bus tickets in exchange for recycling

Fig 68 indicates an initiative by Sydney which offers bus tickets in exchange for recyclables. The move is an attempt to encourage more people to recycle their cans and bottles, and is part of a broader plan to set up an Australia-wide cash-for-recycling scheme, like the one currently in action in South Australia. As at March 2016, three machines have been installed around Sydney's CBD, and they're offering two-for-one food truck vouchers, bus tickets, or a 10 cent donation to charity group "Clean up Australia" in exchange for rubbish.

Figure 69: vending machine that feeds stray dogs in exchange of recycle bottles, Istanbul

Figure 68: ecoATM: Phone Recycling Machine

Composting: Compost is organic matter that has been broken down to stable end-products for use as natural fertilizers and soil conditioners. At present, while there is significant potential for composting (because most of the solid waste generated in Sri

Lanka contains biodegradable waste), the commercial returns on the capital investment required are so insignificant as to make such endeavours financially unviable. (Foundation, 2007)

Figure 70: Introducing Composting at a large scale

In the case of composting, if the compostable waste is separated at the point of generation, processing becomes easier and less costly. This requires having separate waste bins for organic (such as kitchen waste) and for non-organic discards. Organic waste composting can be performed using 'bins', 'windrows or 'channels'. Bin-composting is where the waste is placed in a closed bin to maintain temperature and humidity at levels which promote composting.

If the concept of urban Farming (discussed later on in this dissertation) is introduced to Wellawatte, Compost can be sold to these urban farm lands or small-scale farmers and households to use as a soil conditioner/fertiliser. With increasing demand from consumers for organic foods, the demand for good quality compost will also grow in tandem. Furthermore, the high demand for compost in the Middle East presents a new export market opportunity as well.

5.5.4 Wellawatte: Water

The main question in the 4th principal of Green urbanism revolves around the status of potable water in the Wellawatte area. This principal also explores the various aspects of water consumption, efficient usage of water resources, ensuring good water quality and the protection of aquatic habitats.

Whilst all of Wellawatte is connected to the main water supply from the National Water Supply and drainage board, the main threat experienced by the consumers is the large majority of condominiums which tend to take up all of the supplied water. Underlining a problem the CMC faces is that although developers' putdown in their original proposals that they would have their own water supply, when they start building them conveniently connect the water supply to the main line thereby inconveniencing neighbours. (Nonis, 2005)

One of the major rivers of Sri Lanka flows in the northern border of Colombo City, the "Kalani Ganga". The main potable water supply for the Colombo City is from the National Water Supply & Drainage Board (NWS & DB), and their main source of water is from the surface water from Kalani Ganga River at Ambatale and the two impounding reservoirs, namely Kalatuwawa and Labugama. According to NWS & DB, they have provided an average water supply coverage of 81.6% (northeast Colombo City, 96.6%; and southwest Colombo City, 66.6%). About 94.95% of the households in the city use pipe-borne water as their main source of water. (Koralegedara, 2015)

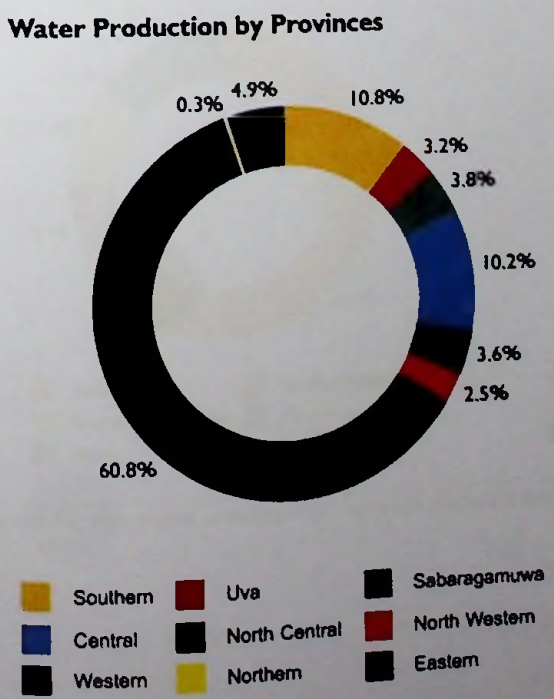


Figure 71: Water Production in Sri Lanka
Source: NWSDB

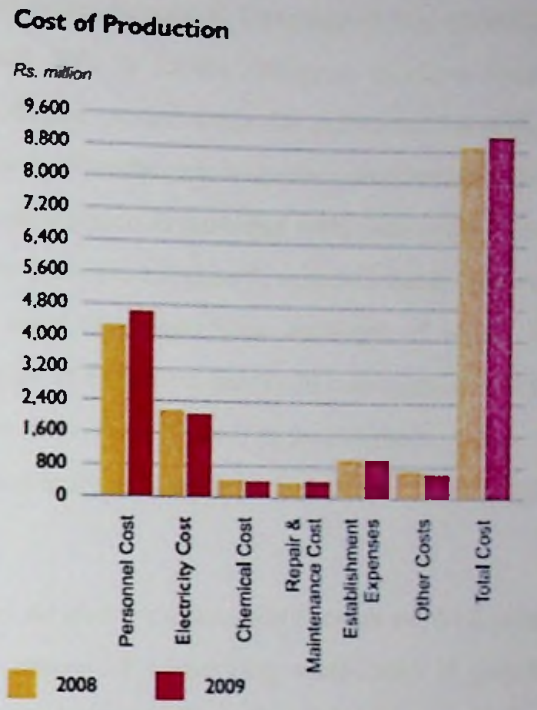


Figure 72: Cost of production 2009
Source: NWSDB

Discussing the above figures, the largest production is seen to be used by the western province, whilst the cost of producing potable water to be supplied is increasing yearly with the additional of new connections almost 4.2% yearly. (NWSDB, 2009)

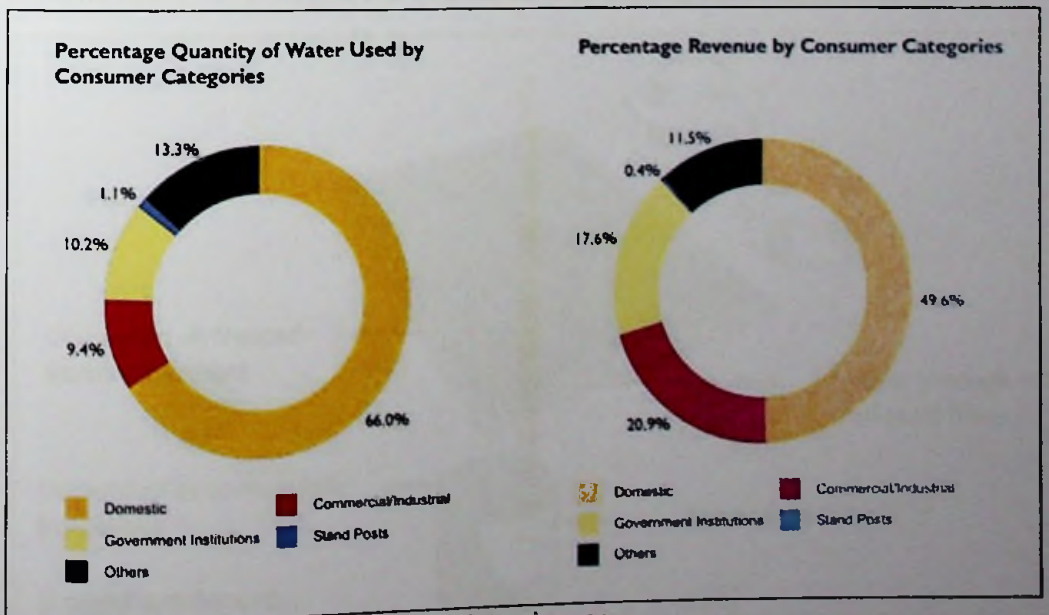


Figure 73: The largest consumption is through Domestic usage

In the City of Colombo, the National Water Supply & Drainage Board (NWSDB) serves 64,700 families out of which 50% is in the category of Low Income Settlements (LIS) and is provided with free treated water for consumption with no income to the NWSDB. In Wellawatte too, two large low income settlements inhabit the canal banks and fall into the category which is provided with free water. These settlements in Wellawatte alone have been provided with approximately 60 stand posts, 35 common bath taps and 89 toilet taps cause huge wastages of water. The total outflow of water from these outlets in Colombo, has been estimated as 27,000 m3 per day, which is 12% of the City Supply and approximately twice the requirement of these settlers if they had individual water connections. (Ranasinghe. 2006)

Based on the about factor, in order to achieve a sustainability status in Wellawatte. steps should be taken to look into means of conserving water and if possible generating its own potable water system without depending wholely on the main supply system.

Rainwater harvesting is one such option which can be incorporated in Wellawatte. Rainfall in Sri Lanka has multiple origins. Monsoonal. Convectional and expressional rain accounts for a major share of the annual rainfall. Whilst the mean annual rainfall varies from under 900mm in the driest parts (southeastern and northwestern), western areas in Colombo see rainfall of 3000mm to 5000mm.

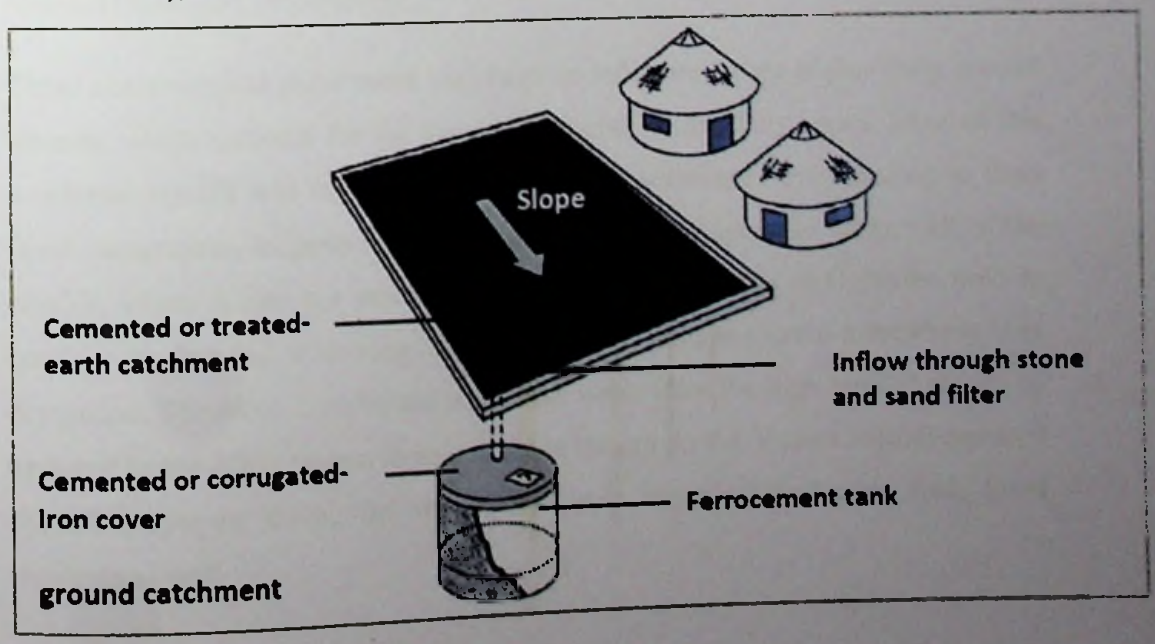


Figure 74: Rainwater harvesting system

Todays development regulations in the Colombo city insist on rainwater catchment and harvesting which would be connected to all outdoor taps and WC cysterns and in some cases. Encouraging the citizens to have their own rainwater harvesting plants, in turn reduces the water demand on the national suppy.

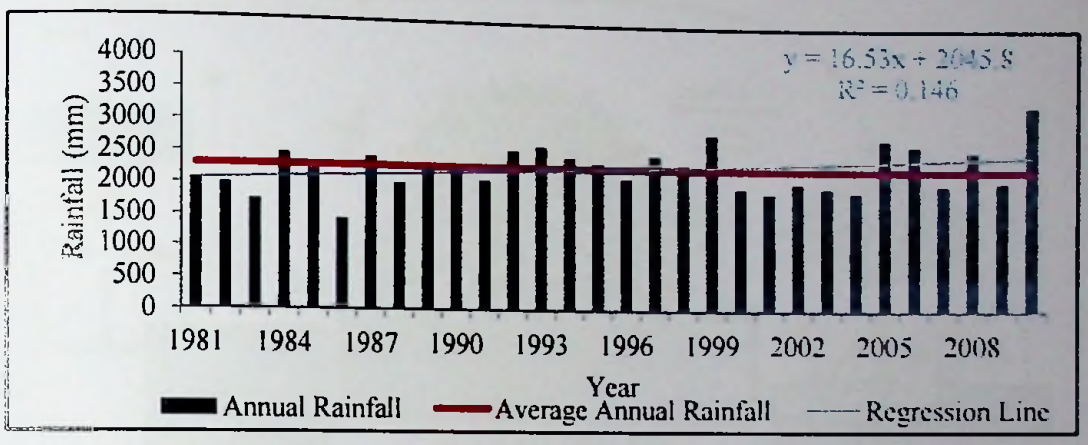


Figure 75: Average Annual Rainfall in Colombo 1981- 2010

Maximum daily rainfall records have a significant influence on the daily rainfall distribution in the study site. Especially April, June and November clearly show a large amount of contribution from the maximum rainfall records (Figure 4). In April, there are usually convective afternoon thunderstorms in Sri Lanka due to higher seasonal temperatures. June and November are within the southwest monsoon and northeast monsoon, respectively.

These climatological phenomena may have an influence on the higher daily rainfall amount, which accounts for the maximum rainfall of the daily series. Most of this maximum rainfall will result in excessive runoff, sometimes even leading to flash flood occurrences. In general, RWH systems are not designed to capture all of the rainfall, which is also not practical. However, RWH systems in Colombo need to consider the fact that, following these peak rainfall months there is a relatively long dry period. Therefore, a sufficient amount of water from the high rainfall should be captured by the RWH system to be utilized in the dry period. Excess rainfall captured by RWH systems during the wet periods may be able to alleviate flash flood incidents as well.

Waste water recycling by way of **desalination plants** is another such method if introduced to Wellawatte will aid in the principal of Wellawatte being non dependant of the national water supply systems.

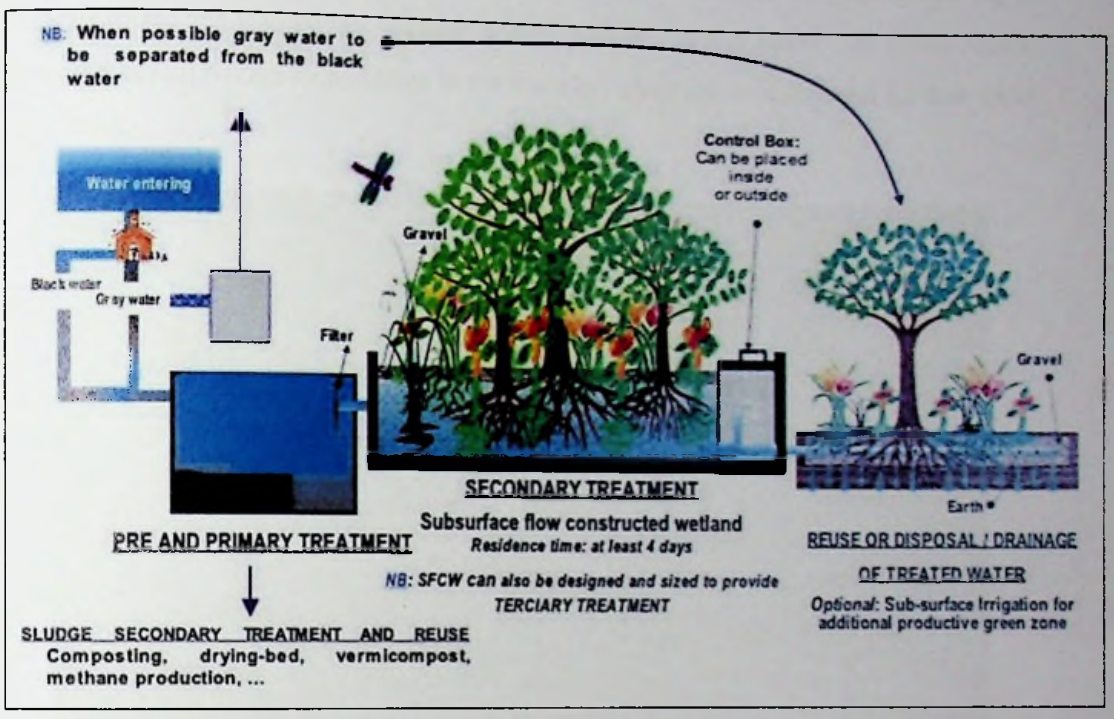


Figure 76: Waste Water purification system

The largest Waste water treatment plans were Madampitiya and Wellawatte; however were abandoned in 1956. In lieu of treatment, two long sea outfalls (In Mutwal and Wellawatte) were built in 1981-1983 with joint funding from the World Bank and Saudi Special Fund. Unfortunately today these two outfalls are the main cause of pollutants into the sea.

There is a proposal underway by the Asian Development Bank and the CMC, to introduce a waste water treatment plan in the same land as it once was; land belongs to the CMC and is not utilized as part of the fire brigade. A systematic water purification plant in Wellawatte will ensure all water is cleaned out for domestic use or prior to sending it out to the sea. This way the dependency on the national supply will reduce drastically and in return will work towards the transitioning of Wellawatte to a sustainable city.

Canals:

The network of canals in Greater Colombo were built in the Dutch period and were initially intended to transport people and goods. However, over the years with rapid urbanization, the waterways became highly polluted and a haven for mosquitoes, posing a health hazard to residents in the vicinity. Their use as a channel for transport dwindled.

Figure 79: Satellite Imagery of Canal Network in Wellawatte

Figure 78: Bambalapitiya Spill (B)

Figure 77: Wellawatte Spill (A)

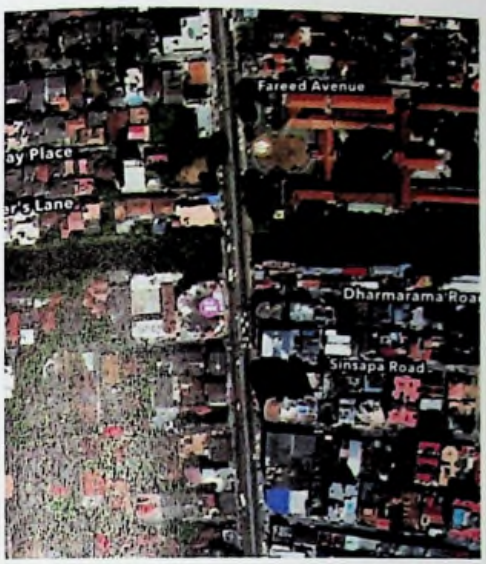


Figure 80: Bridge at Bambalapitiya

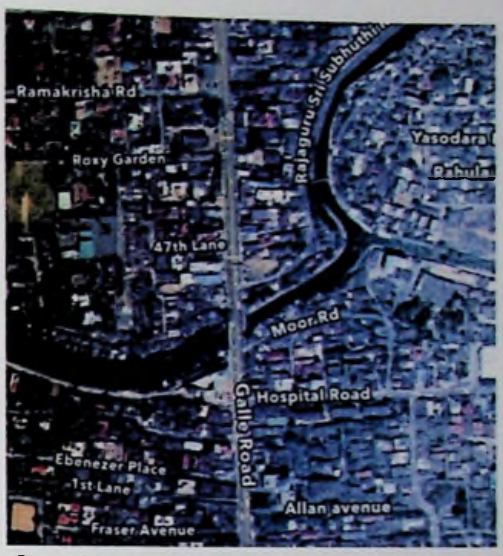


Figure 81: Bridge at Wellawatte

The Dutch canal, a.k.a the Kirulapone canal was initially dredged and cleared in 2010, as a flood control initiative but later a ferry service was initiated by the Navy. Sadly today the ferry service no longer exists.

Figure 82: Dredging work at the Kirulapone canal

5.5.5 Wellawatte: Landscapes, Gardens and Bio diversity

Based on the findings from the survey done in Wellawatte and interviews carried out, the unanimous complaint was that Wellawatte lacked "public" greenery. Figure 56/57 indicate the public opinion on the need for Trees and Open green space in Wellawatte.

Figure 84: Public opinion of the need for landscaping in Wellawatte
Source: User Survey

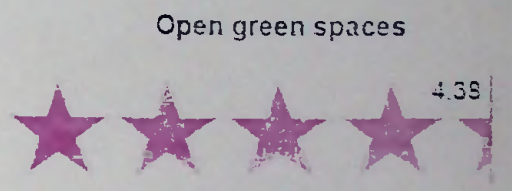


Figure 83:Public opinion on the need for Green open Spaces
Source: User Survey

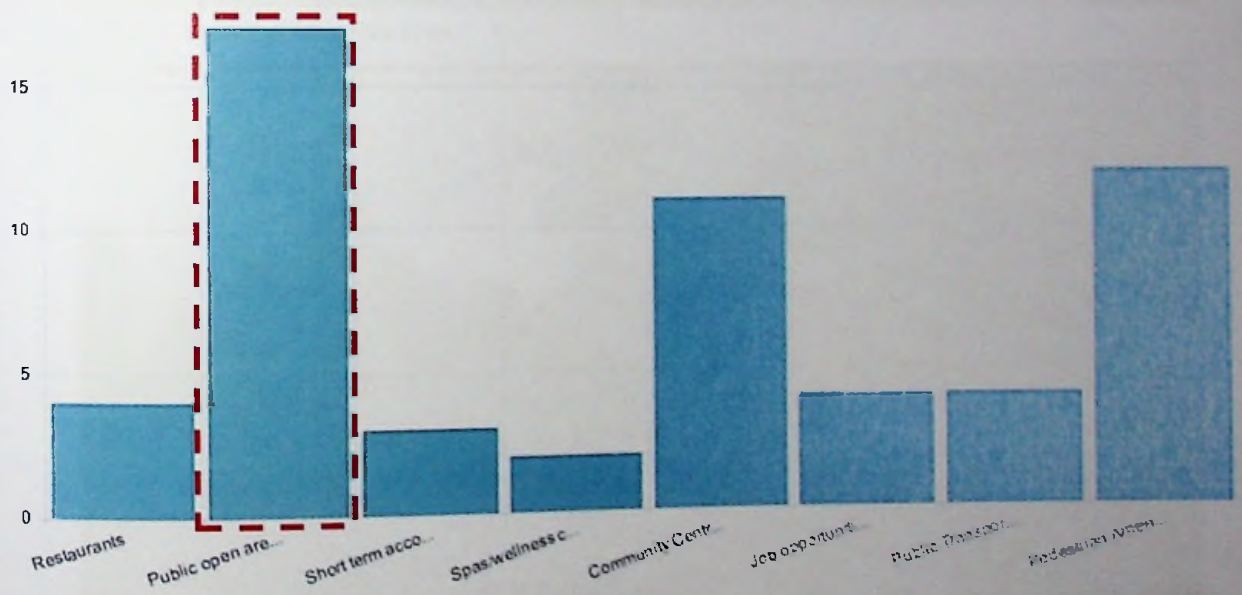


Figure 85: What citizens of Wellawatte felt they needed more of?
Source: Survey results: Wellawatte Users

The Green urbanism principal of Landscapes, Gardens and Bio diversity, revolves around creating a city which integrates urban gardens and green roofs etc. to maximize biodiversity. The one thing that is most missed by people in Wellawatte are the trees along the main road, the large white pelican migrant birds and the shaded roadways leading off the main road.

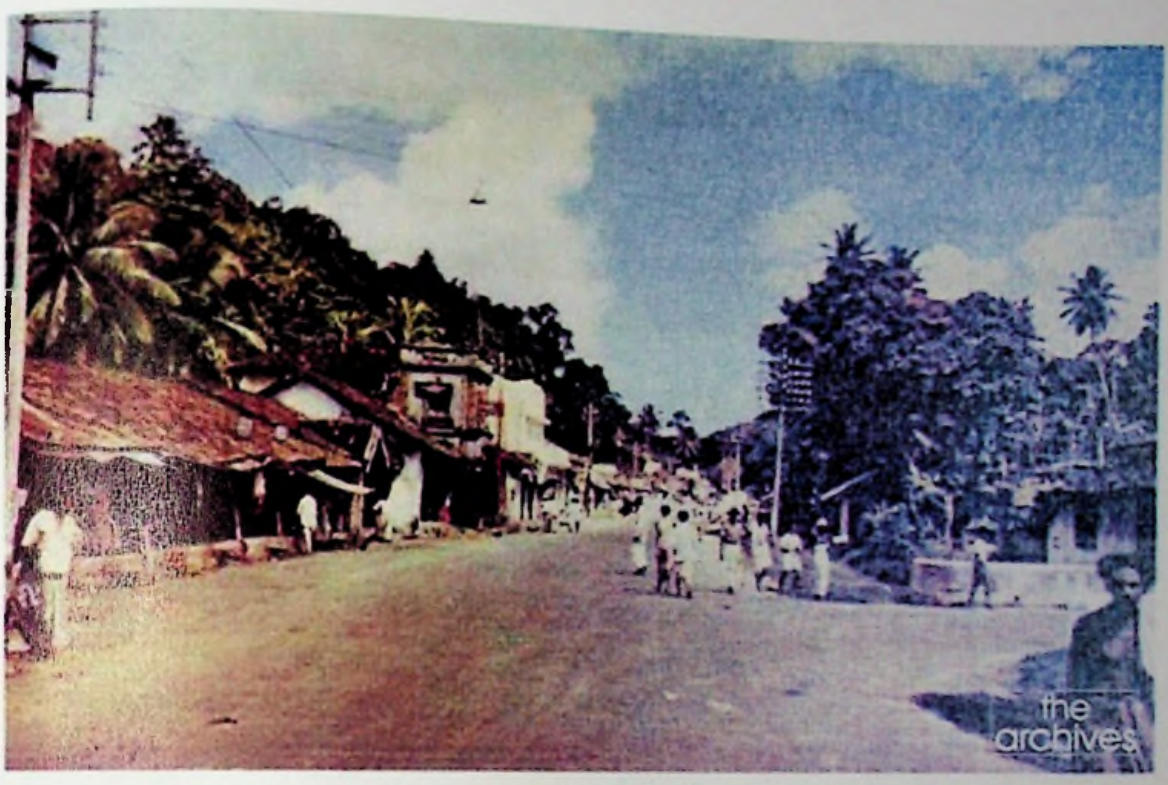


Figure 87: Galle Road in the late 1940s

Figure 86: Galle Road - Date unknown

Images 87 & 88 depict that greenery and development went hand in hand in the past.

Sadly today, deforestation makes way for development, with trees being cut down to make room for buildings and highways. It has come to a point where the present urban environments are heating up rapidly with threats of urban heat islands forming and temperature levels rising which are fast becoming detrimental to human life. Wellawatte with its high density and high people to build environment ratio, also boasts of a development which has taken place after cutting down on vegetation.

"***There was once a point where the entrance to Wellawatte from the south was announced by a large nuga tree covered in white migratory pelicans. . .***" *(Interview with residents)*

Today this tree is no more, along with many of the other trees remembered along Galle Road – it is this fact therefore that makes walking in Wellawatte uncomfortable with little or no shade along the pavements.

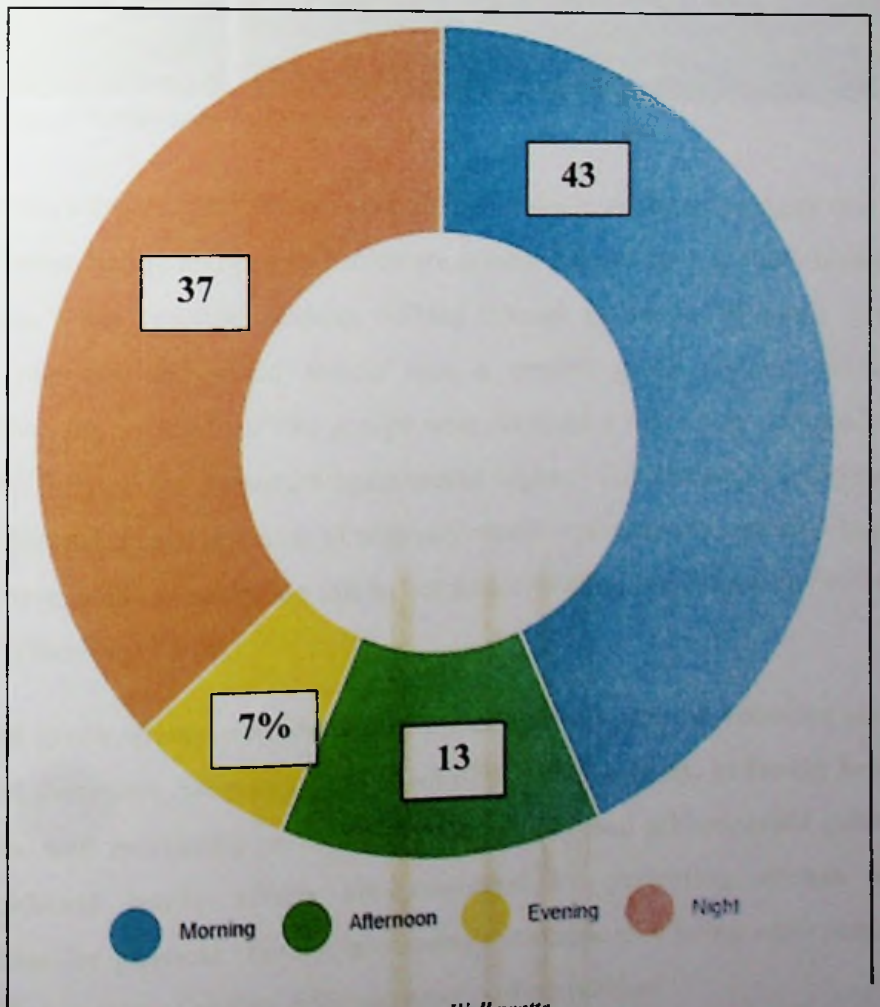


Figure 88: Preferred time for visitors to enter Wellawatte
Source: User survery (Annex 01)

The above graph indicates the preferred time users come into Wellawatte to carry out activities. The main reason for higher percentages during the morning or the night is the heat and the level of comfort the user experiences visiting at those times. The main reason for the heat in Wellawatte is due to its lack of greenery and shading. Pavements are open to the elements with no shading.

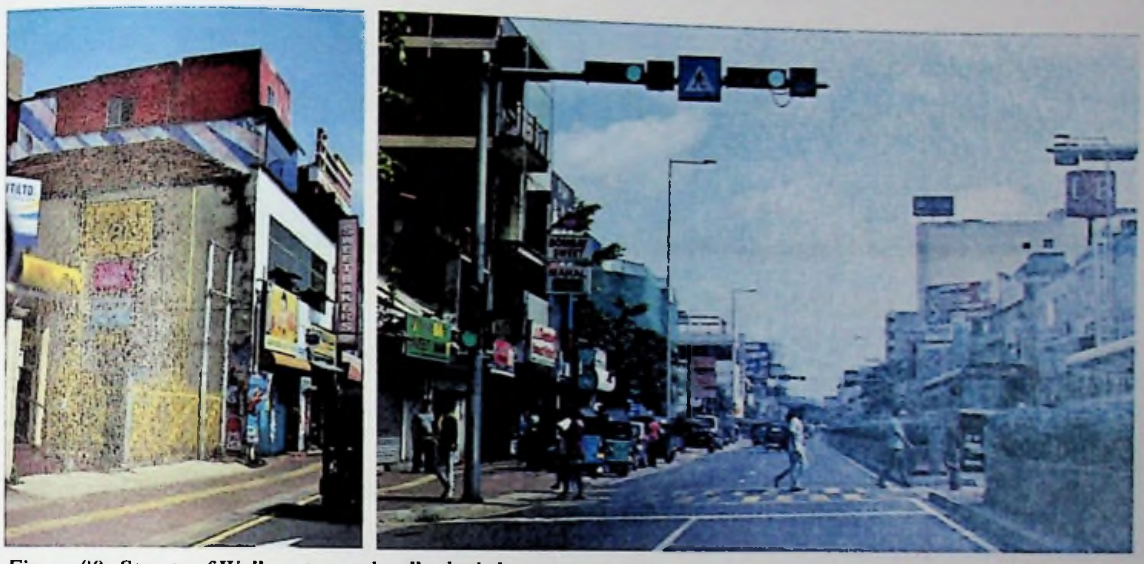


Figure 89: Streets of Wellawatte are hardly shaded

Apart from the simple aspect of tree canopies giving shade, research suggests that the science of urban nature and people habitat are greatly interwoven. At the University of Michigan, a test group of students walking through an urban arboretum scored better on memory and mood indicia than a control group walking on city streets. When the roles of the two groups were reversed a week later, the students who walked through the arboretum again scored higher. The researchers suggested that the additional mental demands of with city streets – particularly attention to cars – caused stress, while in nature we can let our minds wander, enabling us to "rest our attention." (Benfield, 2014)

Nature and green spaces contribute directly to public health by reducing stress and mental disorders, increasing the effect of physical activity, reducing health inequalities, and increasing perception of life quality and self-reported general health. Indirect health effects are conveyed by providing arenas and opportunities for physical activity, increasing satisfaction of living environment and social interactions, and by different modes of recreation.

Being an urban area which has the most amount of foot traffic, it is important that Wellawatte strives to mitigate the "urban Heat Island" using plants for purification and urban cooling. Similarly if Wellawatte preserves and maximizes its open spaces, natural landscapes and recreational opportunities it will in turn create a resilient city, which is healthy and dynamic.

Wellawatte unlike other urban areas in Sri Lanka is able to boast of natural landscapes, the sea and the canal, which can easily be developed and used for recreation as demanded for by its residents.

In spite of having large coastal frontage with recently developed with walking tracks, 90% of the citizens answered that Wellawatte still needed to have large open green areas and places for recreation.

Some of the reasons for their answers were:

- *"Beach tends to be unclean and unsafe"*
- *"Children needed safer areas to play in"*
- *"Unsafe railway crossing near the beach"*
- *"Greenery is needed. The beach too can be very hot"*

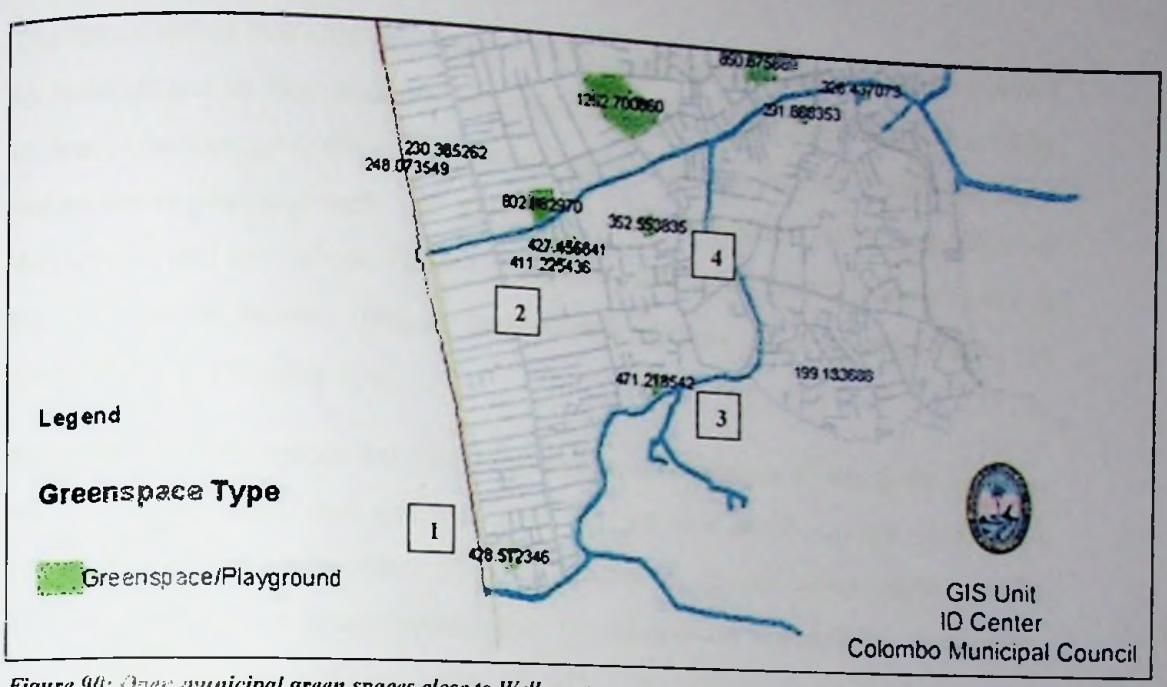


Figure 90: Open municipal green spaces close to Wellawatte
Source: Colombo Municipal Council

Figure 91 above is indicative of the open green areas currently available in the city of Wellawatte. The only available space is as follows:

1. **Rudra Grounds:** Rudra Play Ground is next to Dehiwala Canal and has a length of 0.35 kilometres, hidden behind military buildings, it is not clearly accessible to the public and is primarily used by the low income houses by the canal.

2. **Cooray Park**: Cooray Park is situated towards the north of Wellawatte, and is three acres in area with facilities for cricket/football and a children`s` park. Unfortunately as is the case with rudra grounds, it has been taken over by low income houses and squatters.

3. **Veluwanarama Temple Grounds:** similar to the above situation where the grounds are inaccessible and under maintained.

4. **Fonseka Road Grounds:** similar to the above situation where the grounds are inaccessible and under maintained.

The above shows that although there are 04 highlighted municipal recreational areas, its location and its inaccessibility have proved it to be isolated and underutilized by its main user category. Given the demand for such places, it is important that these places are regenerated with safe access to be utilized by the entire population of Wellawatte and its visitors. The main threat to such identified recreational areas is the low income houses, illegally situated around these areas and thus limits the accessibility to everyone else.

Similarly, if open spaces are identified and freed up closer to the Galle road, by means of alleyways and compact sites, recreational parks can be introduced; becoming lungs of a busy street. The high density due to apartment complexes in the area requires that a proportionate area be opened up for leisure, encouraging interaction between citizens. (Fig 67, 68, 69) perhaps some streets can be pedestrianized, with an overflow from restaurants etc giving the visitors to busy Galle road a place to break.

Figure 92: Green Alleyways in New Jersey

Figure 91: Narrow streets to be "greened"

Figure 93: Street side restaurants with tree canopies

When asked (through the questionnaire) "what one thing has changed in the last 10 years", along with answers that spoke of additional buildings, apartments, wider streets etc, 25% of the answers spoke of the greenery in Wellawatte, where citizens were concerned that the green Wellawatte they remembered from their youth, was no longer available.

A large contribution to the dynamism and the interaction people had with the "old" Wellawatte and the mind mapping of what they remembered always wove around the vegetation. Of the large trees, of vendors under trees, of plants exchanged with each other etc.

Considering the density of Wellawatte and its tight development, it seems almost impossible to introduce greenery. However, the concept of "retrofitting" urbanism and of creating a green resilient city brings different ideologies and development concepts to Wellawatte.

Recreation in the form of walking and cycling tracks can be introduced throughout the city, through busy commercial areas as well as neighbourhoods. This way, **the city as whole becomes responsible for recreation; streets become busy at all times, alert and in turn safe.** It also enhances interaction between citizens, bringing the "community" atmosphere back to Wellawatte.

Figure 94:Walking tracks introduced in the busy city
Source: Solano city, Mexico

The canal banks can be developed with walking and cycling tracks, opening out in into pocket parks within the city. Today whilst the main spill points are cleared out, the interior canals still house slums which add to the pollution of the canal. Relocating the slums to redevelop the canal banks for recreation adds to the landscape element Wellawatte needs. Figure 72 & 71 show the difference in canals. developed based on their location.

Figure 96: Slums along the canal banks

Figure 95: Cleared up canal bank closer to the spill

Whilst both images show the same canal, with both locations having low income housing on its banks, interestingly image 71, shows a higher level of discipline the houses have towards the canal as opposed to image 72. This shows that if public activities are introduced to the canal banks as a whole, all public may adapt to the redevelopment in turn keeping the canals clean. This community interaction too is needed in Wellawatte, upgrading the quality of life within the low income communities without necessarily relocating them.

Similarly the canal banks can be developed for Urban Farming. Urban agriculture or urban farming is the practice of cultivating, processing, and distributing food in or around a village, town, or city. Urban agriculture can also involve animal husbandry, aquaculture, agroforestry, urban beekeeping, and horticulture. This concept which can be developed in Wellawatte, will give citizens a chance to be stakeholders in an economic endeavour, whilst providing job opportunities within Wellawatte itself.

Figure 98: Urban Farming in Punjab, India

Figure 97: Stacked vertical farming

The introduction of green roofing, vertical gardening etc as means of domestic scaled landscaping brings in the additional dimension of landscape which will proportionately assist the "greening" of the city.

Green Roofs and cool roofs can save energy, reduce neighbourhood temperatures, and protect human health. They have a strong regulating effect on the temperature of underlying roof surfaces and building interiors, reducing the energy needed for building cooling and the effects of the urban heat island effect. (Garrison, 2012)

5.5.6 Wellawatte: Local Food and short supply chains

This principal stems around the concept of strategies implemented to grow food locally, as briefly analysed in the previous principal.

Wellawatte is rich in culture, with a Tamil community which is not strongly present in other urban areas as much as it is in Wellawatte. With a daily bus service to Jaffna. Wellawatte has direct ties with the Northern Province unlike other cities in Colombo.

This is Wellawatte's strength in terms of local food production as it stems from a unique character which can be promoted in order to draw people to experience Wellawatte.

Authentic Tamil dishes, from vadai to dhosais to simple drinks like nelli crush and Rio Icecream, Wellawatte has a strong streak of Tamil culture which needs to be developed in order to maintain sustainable characteristics in Wellawatte.

Figure 100: Urban Farming

Figure 99: Indoor urban farming Concepts

Urban Farming: The concept of urban farming which was briefly touched on previously is a local food production system which can be developed further transitioning Wellawatte into a self-sufficient city.

The strategy here is that plots of land is leased out primarily to the citizens and then to the general public to grow their own fruits and vegetables, giving all citizens equal chances of owning a plot. These plots can either be maintained by the lessee himself or can be left to be maintained by staff employed by the local government. In order to bridge the rural urban gap (between shanties and more developed Wellawatte) citizens from low income families can be given fulltime jobs to maintain these farms.

This concept of urban farming with time, once developed can be the main source of supply to the Wellawatte Market – reducing the need for petrol based transporting of fresh produce from out of Colombo. Similarly, the concept of urban farming reduces the demand on fertiliser and preservatives, resulting in fresh organic produce which is healthier for the community. It also gives rise to a barter system where food sharing can take place with a system of sharing compost in return for fresh vegetables. It becomes a cyclic production, where the city as a whole is able to be involved in the process of food production.

Urban farming is the practice of growing crops, vegetables, herbs and plants within and on the periphery of cities and, unlike rural farming, it can complement and be an integral part of a city and fit neatly into its ecological system. Such farming can use a city's solid waste that is compostable; it's treated effluent water that can be used for irrigation; provide self-sufficiency and, at a stretch, by integrating with local small retailers and transporters, even provide a viable small business model. Besides, it can make use of urban spaces that are commonly underutilised or unproductive in cities — think terraces and balconies of condominiums and other residential buildings; and rooftops of schools, office buildings and commercial complexes.

For Wellawatte's poor who live in its slums and where there are yawning gaps between dietary needs and what is affordable; Converting dumps near slums into community farms that organically produce vegetables, fruit and even crops can transform the lives of slum-dwellers.

Figure 101: Urban farming is common in Ghana and other sub-Saharan countries. *Photo by Nana Kofi Acquah/IMWI*

The concept of urban farming does not necessarily limit itself to the outdoors. Spaces at ground level of multi-storey houses can be developed as greenhouses which grow fresh produce indoors. (Fig 100)

Sustainable Wellawatte will strive to create a balance in the agriculture industry by supplying free electricity by means of renewable energy generated by flowing water in the canals and solar panels, ensuring that minimum cost is borne for the production of food in Wellawatte.

5.5.7 Wellawatte: Sustainable Transport and good public Space

The main statement addressed in this principal is developing Wellawatte to be a city of eco-mobility, with a good public space network and an efficient low impact public transport system.

The current public transport system is mainly through road transportation by way of personal vehicles, buses, three-wheelers and motorcycles.

Figure 102: Bus routes through Colombo
Source: Yamu.lk

The main public transport system the Bus system runs three routes along Galle Road at Wellawatte. (Fig 103)

Except for the 141 route which begins at Manning Place, Wellawatte, the other routes simply pass through ending beyond.

Considering Wellawatte is a busy city and majority of people come in, it is recommended that additional bus routes are introduced to begin and end in Wellawatte.

Data collected by way of the surveys indicate that 43% of the Citizens of Wellawatte walk in order to carry out their tasks in the city, whilst 29% use three wheelers and yet another 29% use their own vehicle. The statistics collected show 0% of citizens using a bus to travel around Wellawatte.

Similarly when the same survey was carried out with users who come into Wellawatte, 86% chose to come into Wellawatte by personal vehicles whilst the rest chose public transportation.

The main issue faced in Wellawatte in terms of roads transport is that the high encounters with pedestrians hamper a free flow of vehicles as the traffic lights are directly connected to the crossing button which makes it turn red any given time there is a pedestrian. As a result, vehicles are made to stop almost every 5m to give way for pedestrian movement. As a result, the interrelationship between pedestrians and vehicles along Galle road do not complement each other, and the situation is further complicated with the throbbing amount of pedestrians on the streets, which do not necessarily always use the crossings.

Figure 103: Underground Crossing at Havelock road

In summary, it can be said that the traffic network posts a very vulnerable situation in Wellawatte, as it does not complement the pedestrian and the driver.

Dealing with this situation, the crossing on Havelock road which also sees a large number of pedestrians (due to the Kovil), is underground, solving the problem of haphazard pedestrians who cross arbitrarily.

The free flow of vehicles, with no means of traffic calming will simply cause vehicles to whizz past Wellawatte without stopping. In order to regenerate the economy and the sustainability of Wellawatte, a situation needs to be created where "stopping" or "pausing" is encouraged.

Wellawatte needs to be developed to be public friendly, allowing people to walk around, mingle, interact and spend time in Wellawatte. The question therefore is, are the vehicles getting in the way? If so, what steps should be taken to reduce the vehicles "passing through" Wellawatte?

One solution that can be proposed is the bypassing of Wellawatte completely for those who are on continuous journey outside of Wellawatte.

Figure 104: Alternate routes to travel beyond Wellawatte

For example, if a traveller is travelling from Dehiwela to Kollupitiya, by passing Wellawatte completely by travelling on Marine drive (which is wider that Galle road and has less pedestrian movement) it may take 0.5km extra, but the travelling will be nonstop, which will save time as opposed to stopping at every traffic light and crossing on Galle road.

Similarly, traffic that is moving towards Colombo 05 or further east too can bypass Wellawatte by travelling through Saranankara Road in Dehiwela, rather than entering Wellawatte.

By improving the transportation network to incorporate such changes with the bus also travelling around Wellawatte rather than through it, it immensely brings down the vehicular congestion experienced; which would proportionately bring down the high carbon emissions due to traffic congestion.

Developing the 2km stretch on Galle road, Wellawatte to be pedestrian and public friendly, would mean incorporating strategies of traffic calming methods, which would be safe for pedestrian movement. Eg: Narrower roads, more trees, sculptures, activity etc.

Keeping in tune with the need for shading and introduction of landscaping in Wellawatte discussed previously, steps can be taken to widen the existing pavements (Fig 106); along with a green belt which would give shading as well as create a safety buffer from vehicles and pollution. This large pavement will in turn encourage interaction, where activities from the shops can spill out in the outside.

Figure 105: Inconsistent pavements in Wellawatte

Larger pavements will in turn not only facilitate pedestrian walking, but will also encourage activity on the street such as street dramas etc as well as give way to street sculpture, galleries etc. It brings in the valuable character which once was part of Wellawatte.

Figure 107: Wider pavements encourage more activities

Figure 106: Green barrier between vehicle and pedestrians

Difficulty in parking along the streets was another main complaint the users had with regards to coming in to Wellawatte. Dedicated parking areas which bring visitors into Wellawatte by way of shuttle is a welcome change in Wellawatte. Similarly on street parking too can be designed (FIG 108) to act as a safety barrier to a dedicated bike lane in Wellawatte.

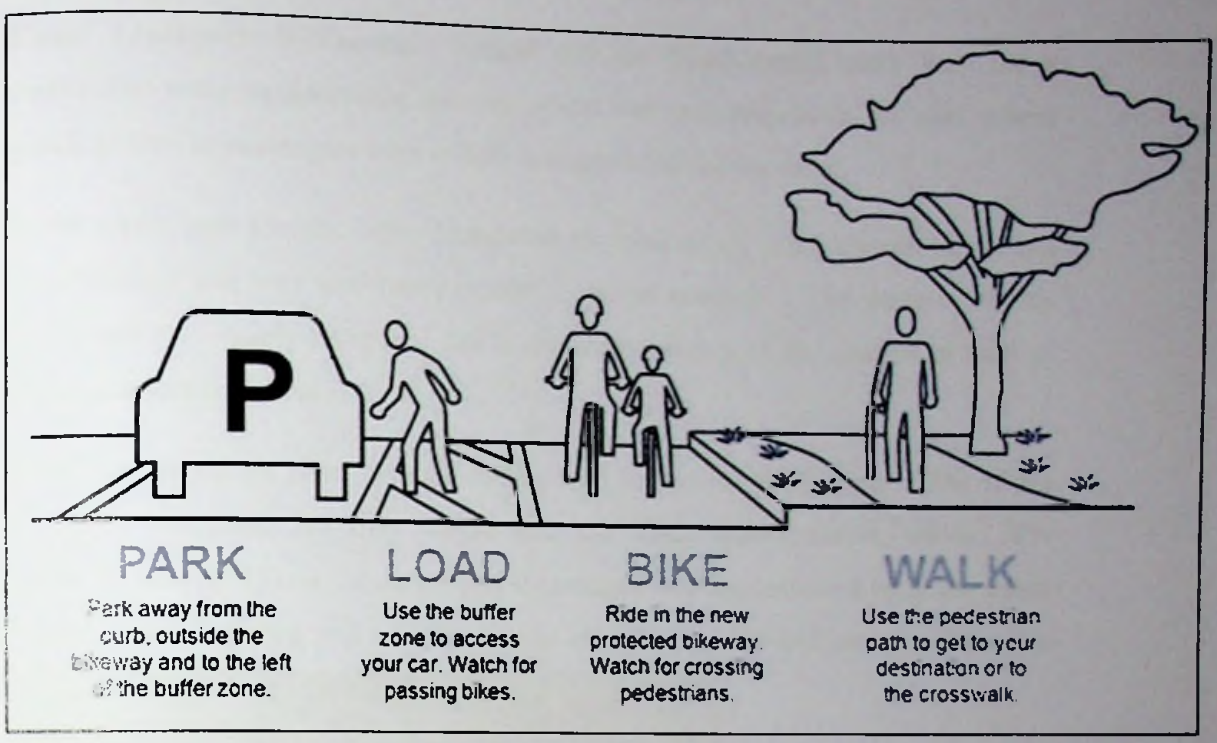


Figure 108: On street parking acts as a safety barrier to the bike lane

Source: Reserta Boulevard

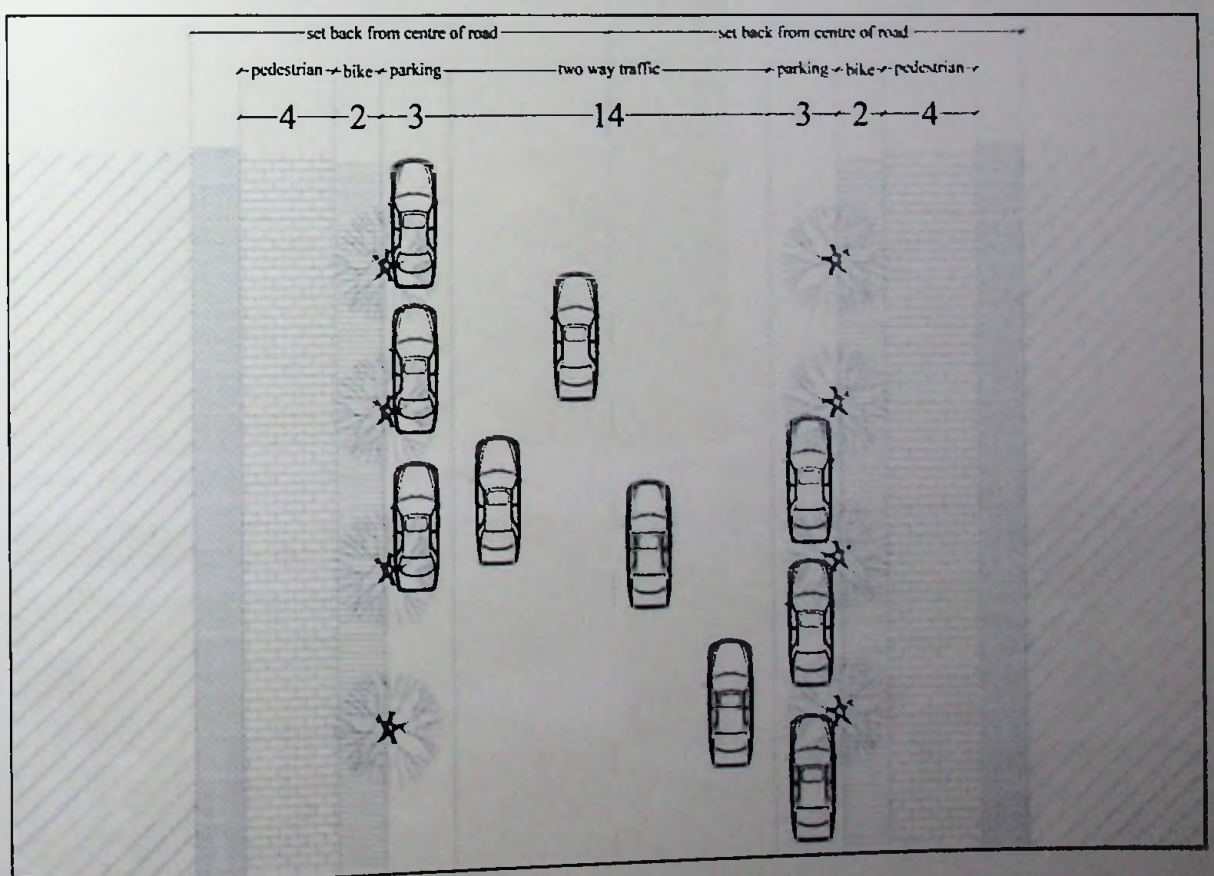


Figure 109: A proposal for street design: Wellawatte

Canal Transport: Wellawatte's context and the Dutch canal make way for a sustainable water transportation network which was once popular in the past, where goods as well as passengers were widely transported along the canal.

In the recent past too, the Navy introduced the concept of canal transportation but unfortunately this was terminated before it started properly. The success of this endeavour was mainly hampered due to the inconsistency of the system as well as the poor awareness created for it.

Based on the survey done of both citizens and visitors to Wellawatte, 57% of the recipients answered that they would take the water transportation, whilst 38% answered maybe. This is indicative that if managed and implemented well, the water transportation network will ease the traffic into Wellawatte and prove to be more

Figure 110: Old house boat on Wellawatte Canal

Figure 111: Navy Boat service along the canal (2012)

Figure 112: The Canal Network in Colombo

The Canal network in the Colombo Area (Fig 112) shows the connections between the canal networks; indicative that a water transportation system is indeed viable.

A Water transport system is proven to be sustainable as it is low cost, have lower or none emissions in comparison to road transportation. It is also low cost, as the overheads are minimum and carries a larger capacity of passengers in comparison.

By making the water transportation into Wellawatte prominent, will serve Wellawatte in numerous ways.

1. The entrances to Wellawatte are bounded by the canal – therefore "themed" entry points can be highlighted through the use of Wellawatte.
2. The water transport terminals ideally located at Wasala road and Dhammarama Road, give rise to additional activities around these nodes. (Fig 113)

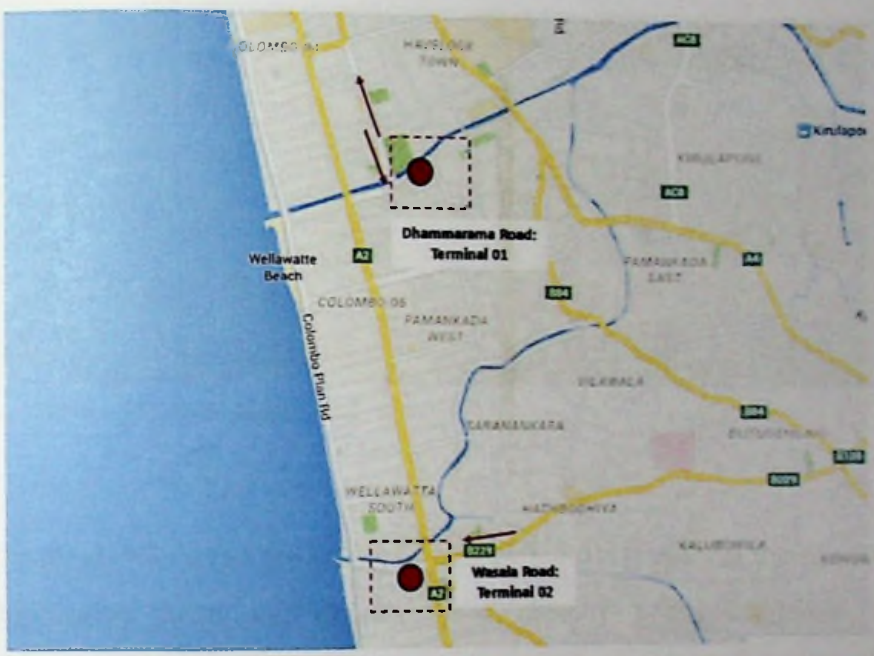


Figure 113: Identified locations for Water Terminals

For example, these terminals can be developed to be the main hubs – main community centres, recreation activities etc, developing the canal banks to be the heart of Wellawatte, abundant with activity.

Figure 115: Terminal 02: Wasala Road

Figure 114: Terminal 01: Dhammarama Road

The above two nodes are ideally located as it will also connect transportation through Duplication Road and Hospital Road, thereby giving additional avenues for sustainable development. Similarly, by creating dedicated transportation which comes directly into Wellawatte as well as moves out of it, additional business opportunities are created through the new tasks identified.

Enhancing additional job opportunities and Sustainable transportation is directly proportional to compact communities where a citizen would both live and work within short commuting distance. This way the need for constant travel out of the city is limited, with citizens been able to stay within their city boundaries. This way those coming into Wellawatte are task oriented, bringing in additional income, discussed further in the next principal.

Railway Transportation:

The railway transportation network is well used, with the Wellawatte station being constantly crowded. This transportation method has been used throughout the years and its functionality still remains. The only reason why one would not use the train would be due to congestion as the crowds build up by the time the train reaches Wellawatte.

Figure 116: Wellawatte Station, year unknown
Source: National Archives

Figure 117: Wellawatte Railway station (2016)

Figure 118: Approach to Wellawatte Station

The location of the railway station and its support to Green Transit oriented Development is discussed in the analysis of the next principal: Density and retrofitting existing cities.

5.5.8 Wellawatte: Density and retrofitting of Existing cities

The main question here explores opportunities to motivate people to move back to the city closer to workplaces in the city centre itself. Currently, a majority of the citizens of Wellawatte work for organisations located out of Wellawatte, mostly in the greater Colombo areas of Colombo 01/02 & 03. As a result the daily traffic build up is also due to the many citizens moving away from the city for work, school or recreation.

Whilst this principal has varied aspects, one such aspect is the densification through mixed urban landfill. The best of its examples is that of the high density of apartment complexes in Wellawatte. These complexes are primarily residential, with no interaction with no residents. By introducing varied activities at least to the ground floor of the complexes, it brings in a public element which responds to the street and to the citizens. Ground floor activities may include restaurants, gyms, coffee shops, activity centres etc which draws visitors in, adding to the dynamism at street level. **The introduction of such activities directly facilitate additional job opportunities within the city which reduce the need for citizens to move out for work.**

Figure 119: Closed up apartment complexes with no response to the street or public

By bringing in development policies that instate that the ground floors of all multifamily living buildings should incorporate public activities with easy access, it not only adds value to the building but also creates safer environments which are vigilant 24/7 with public activity.

Narrow streets which lead off Galle Road will be lit up through ground floor activity and walking along will still be safe.

Figure 120: Apartment complexes which respond to the street at road level
Source: Design stack conceptual imagery for apartments in Rotterdam

Green Transit Oriented Development: Transit-oriented development is an approach to development that focuses land uses around a transit station or within a transit corridor. (NLOC, 2013)

Typically, it is characterized by:

- A mix of uses, Moderate to high density
- Pedestrian orientation/connectivity
- Transportation choices
- Reduced parking

By developing more "urban-scale" buildings with reduced parking ratios and ready access to transit, TOD improves air quality and reduces auto traffic congestion. Studies indicate that TOD can reduce traffic congestion and air pollution by up to 25% to 50% compared to typical suburban development.

Transit-oriented development is a response to current conditions:

- Rising energy prices
- Road congestion
- Climate change
- Shrinking household sizes
- Increasing demand for urban living
- Interest in green building and walkable neighbourhoods

Currently whilst three bus routes run through the city, only one begins at Wellawatte – the 141 route which starts at Manning Place, Wellawatte. (Fig 91)

Figure 121: Start point of the 141 bus route

The main reason for this location to be selected for the starting point was the large market which used to be here. This market is still there, except today has been relocated within a building as opposed to the dynamic busy street market it used to be. In the past, the market was a "pola" with traders selling their wares out of make shift kiosks. The special characteristics were dynamic and exciting with loud haggling and promoting of items adding to the colour and excitement the market projected.

Figure 123: Old Wellawatte Market

Figure 122: Wellawatte Market today

Today the market is behind closed walls, with no excitement seen to the outside needed to draw people to it.

Transit oriented development, calls for activity and excitement around main transit hubs, with mixed development nodes swelling and expanding sustainably.

Figure 124: TOD analysis

Figure 124 is an analysis of the current transportation network in Wellawatte overlaid with a probable transportation analysis based on green transit oriented design. Here, based on the location of activities, and the analysis of passenger flow, the main Junction at WA silva mawatha seems to be the most suited for transit oriented development.

This node, is the meeting point of all passenger flow. (Fig 125)

Figure 125: Intersection between Station Road and WA Silva Mawatha

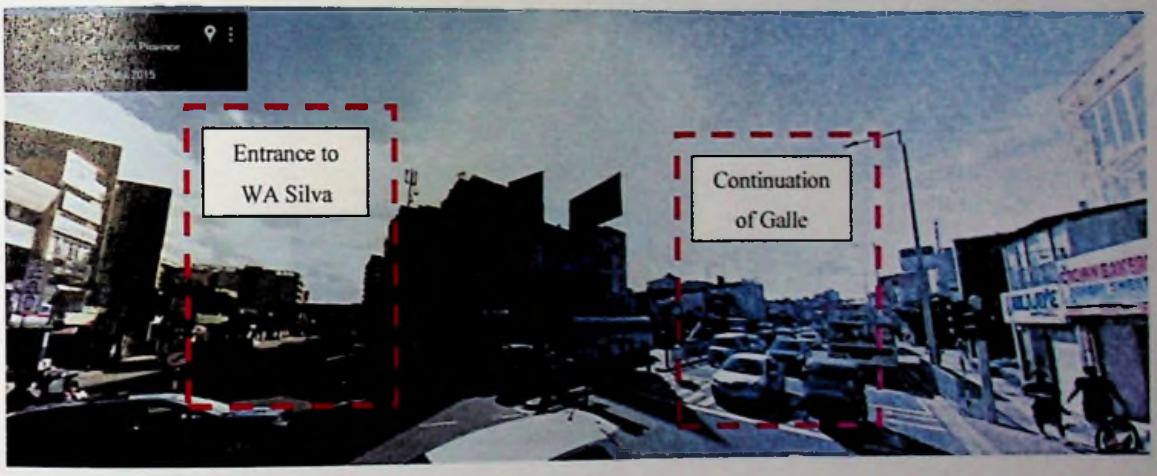


Figure 126: Intersection between Station Road and WA Silva Mawatha

Figure 127: Intersection between Station Road and WA Silva Mawatha

Based on the convergence of all transport activities, this node is best developed to be transit oriented. As discussed previously, if additionally public transportation is to be introduced to specifically begin at Wellawatte, this location serves as the most sustainable as it links all forms of transportation.

Linking this area with multi storey housing options and stores, markets, service providers etc, bring in additional job opportunities whilst developing a compact neighbourhood close to the transit hub, limiting the need to travel far, which would result in less dependency on private motor vehicles.

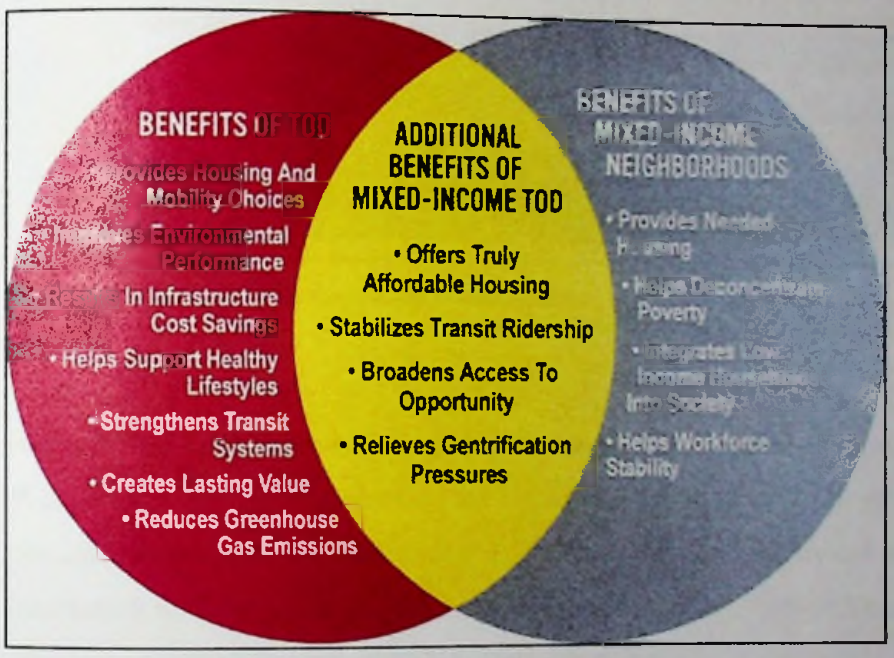


Figure 128: The benefits of Transit oriented Development in Wellawatte

This optimization of the relationship between urban planning and transport systems is the first step towards sustainable development.

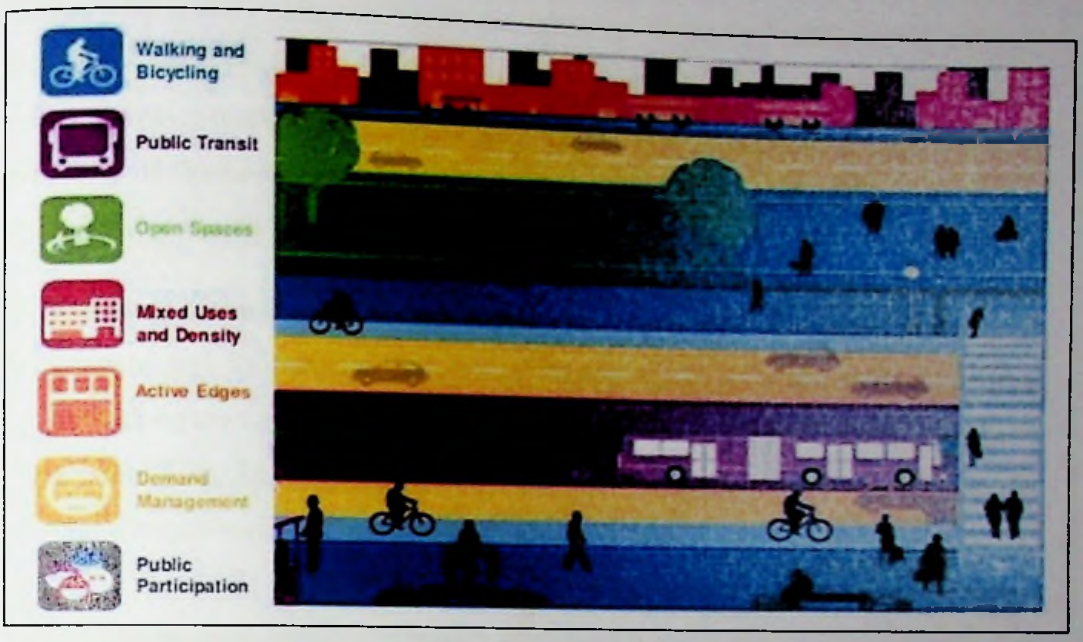


Figure 129: Principals of Transport Oriented development

Retrofitting inefficient building stock is another key aspect of green urbanism. Wellawatte with its high density, and rapid development of multi-storey housing options, has resulted in apartment complexes that are inefficient in terms of interaction with the street and other buildings, maintenance, ventilation, etc which is slowly indirectly increasing the cities carbon footprint.

In order to consciously reduce the city's carbon footprint, dilapidated buildings should be revisited, renovated to be more sustainable or its use changed through adaptive reuse making it more efficient.

Building efficiency is key to cutting energy consumption. In 2007, 878 million metric tonnes of greenhouse gases were attributed to commercial buildings worldwide. Buildings account for 16 percent of world energy consumption, with a higher share in developed economies While roughly two percent of commercial floor space is newly constructed each year, and a comparable amount renovated, the

majority of opportunities to improve efficiency over the next several decades will be in existing building stock, most of which are constrained by old equipment, aging infrastructure, and inadequate operations resources. Improved efficiency of existing buildings—through building retrofitting and other measures—represents a high-volume, low-cost approach to reducing energy use and greenhouse gas emissions. **A majority of Wellawatte's buildings are older than 20 years, meaning times have changed drastically and they do not perform as expected.**

Low income communities/Shanty areas: The biggest threat to the development of Wellawatte and its transition towards a "Green City" is its shanty communities location along the canals. Although the low income squatters along Wasala road have been cleaned up, Rajaguru sri Subuthu Road and Veluwanarama Road still has low income communities inhabiting prime developable land by the Canals.

Figure 130: Veluwanarama low income housing

Figure 131: Low income families along Rajaguru sri Subuthu Road

Figure 132: "Lak Muthu Sevana" Mayura Place, Wellawatte

The low income families currently take up prime land as well as hamper any development which could be implemented by the canal banks. Although the "Lak muthu Sevana" housing scheme for low income families was vested with the public in Oct 2014, in order to relocate these slum dwellers, majority of them still occupy these two roads.(Fig 130,131)

Sadly this area has great potential to be developed as a recreation belt, water transportation network, urban farming, leisure activities etc, but due to such low income communities' development cannot take place.

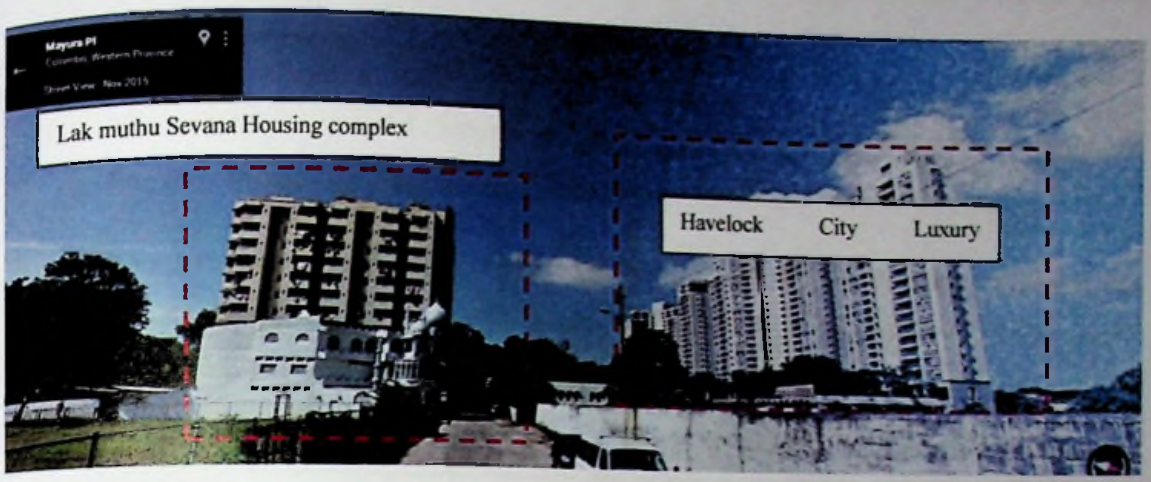


Figure 133: Luxury apartments besides government low income housing

5.5.9 Wellawatte: Liveability, Healthy Communities and Mixed used programs

The statement explored through this principal is the special concern for affordable housing, mixed use programs and means of maintaining a healthy community.

The previous principals have already established the importance of mixed use developments in Wellawatte, and the fact that it will deliver more social sustainability and social inclusion, helping to repopulate the city centre.

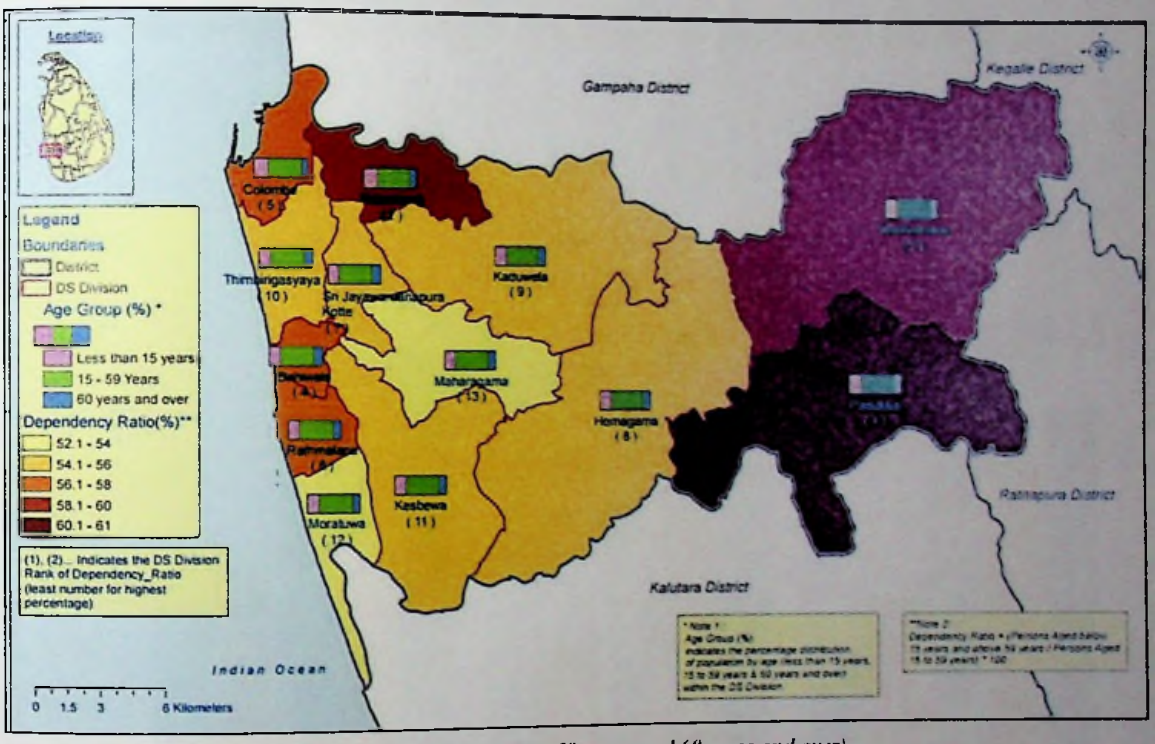


Figure 134: Population by Age (Less than 15 years, 15 to 59 years, and 60 years and over)
Source: National Census and Statistics Dept, 2012

Figure 134 is indicative of the age groups and dependency ratios based on the DS Divisions of the Western Province. Wellawatte, belonging to the DS of Thimbirigasyaya, as at 2012 shows a large percentage of citizens between the ages of 15 – 59. Similarly the dependency ration of the area is 54.1% - 56% meaning that more than half the population is dependent on the younger generation to take care of them.

One of the key factors to be considered in this principal is that of demographic changes – mainly age. The statistics above indicates that in the next 10 – 20 years, the number of citizens who would be dependent will increase substantially. Therefore, it is an aging population which will remain in Wellawatte.

- Migration of younger citizens are increasing leaving older citizens to fend for themselves.
- Older citizens who fled the country during the riots and the War have returned, making their home in Wellawatte
- Extended families that live together – grandparents
- Older citizens living on their own in apartments after giving up their larger houses

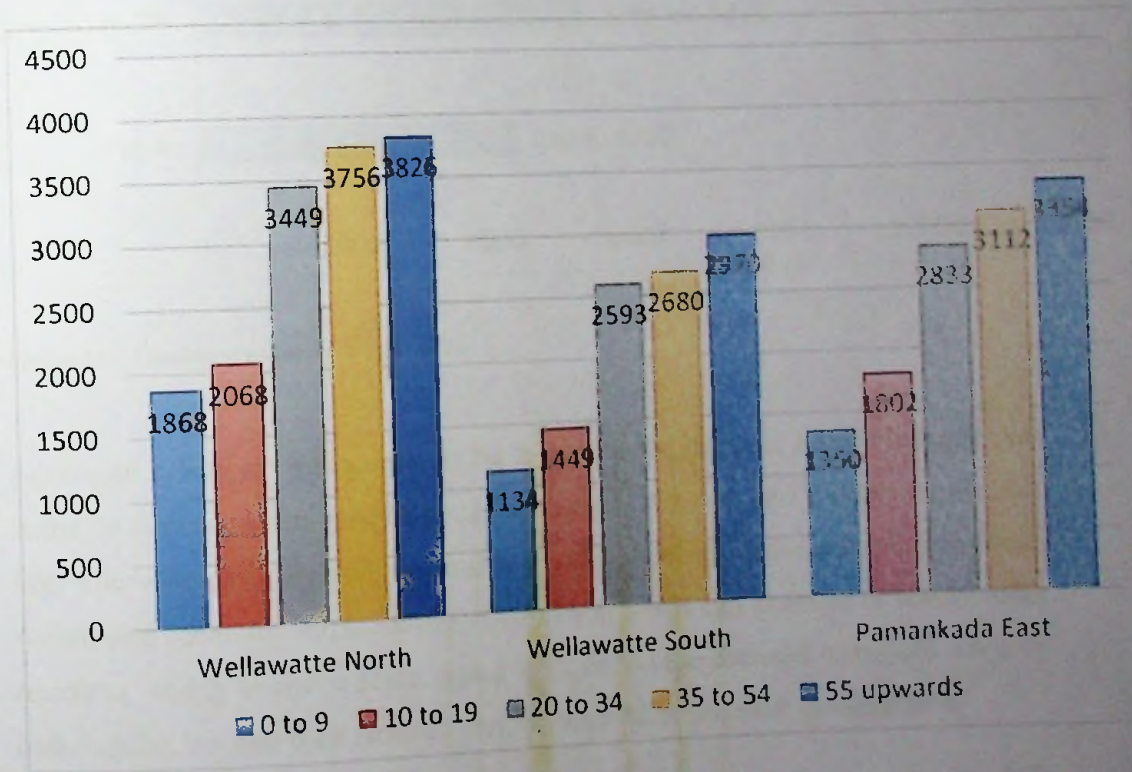


Figure 135: Population by Age 2012

Based on the above data, Sustainable development in Wellawatte needs to address the needs of an aging community. Developing environments responsive to the aspirations and needs of older people has become a major concern for social and public policy.

Figure 136: Population according to Age - 2012

Ageing in urban environments: Aging in place is the ability to remain in one's own home or community in spite of potential changes in health and functioning in later life. The concept of liveable communities calls attention to the ways the physical, social, and economic infrastructure of cities and towns can promote or hinder older residents' ability to age in place. Aging in place has the potential to benefit not only older adults, but also their families, their communities, and their governments.

Sustainable aging in place involves helping older residents remain in their community while also addressing the long-term economic, social, and environmental health of both current and future generations at every age.

- A liveable community offers a variety of accessible, affordable, and visit able housing options so that older adults have a place to live.
- A liveable community has features that promote access to the community, including: – Safe and walkable neighbourhoods – Transportation options – Safe driving conditions – Emergency preparedness
- A liveable community provides a wide range of supports and services, and opportunities to participate in community life: – Health care – Supportive services – General retail and services – Healthy food – Social integration

Thus based on the above, security and safety are one of the key requirements development of Wellawatte needs to look into. Traffic calming methods are the most important as streets need to be geared to allow for slower citizens, sometimes even disabled to move around easily. Street Lighting levels take on a big role, making Wellawatte safe and liveable even after dark. Community awareness programs, such as senior citizen emergency help options needs to be integrated with the development of a strategy.

Data collected from the questionnaire indicated that 52% of the citizens felt that Wellawatte was ready to handle an ageing community however a high 29% disagreed that Wellawatte was not ready to handle an ageing population.

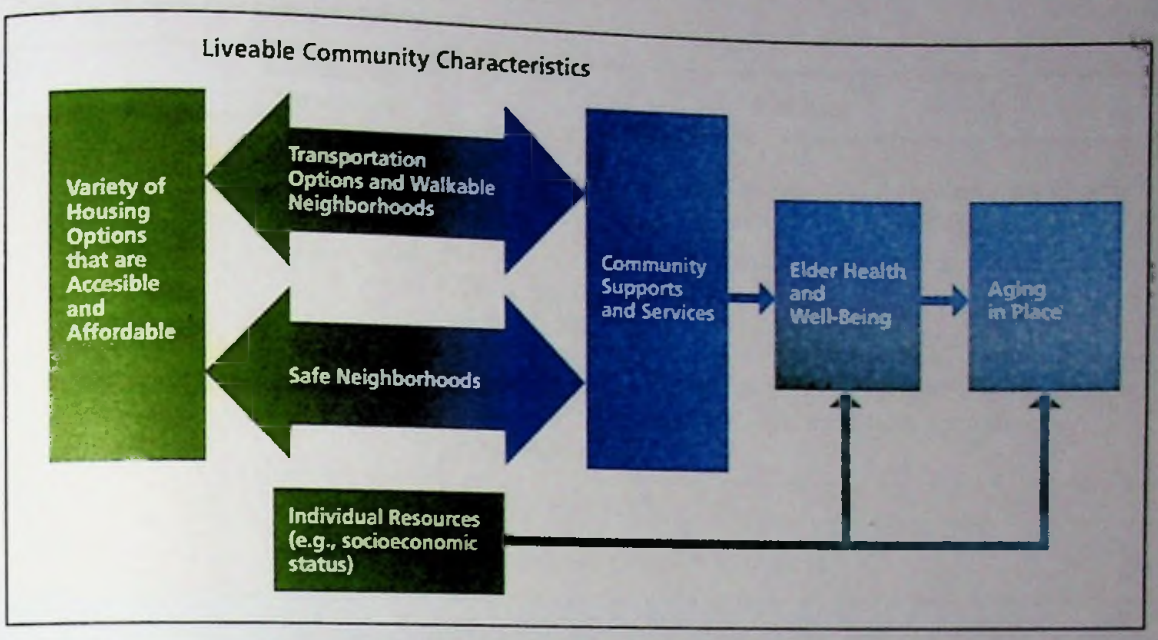


Figure 137: Liveable communities and ageing in place

Based on research carried out on ageing populations, Community characteristics that promote aging in place have the potential to lead to positive outcomes for the entire population. This includes improving the health and well-being of older adults, and benefiting other residents, businesses, organizations, and local governments by, for example, fostering the economic and environmental health of the community. (Lehning, 2013)

Table 14: Designing for Older populations

	Community Characteristic	Indicator
Accessible visitable housing	Accessible housing	Building regulations should state special characteristics needed for families with ageing population : eg: Handrails, ramps etc
	Housing Options	Dedicated housing for older citizens, similar to an elders home concept within a city
		Flexible housing arrangements - percentage of each apartment complex by regulation will need to address the ageing population
	Affordable housing	Flexible payment options
		Tax concessions for citizens above 65+
Transportation Options	Transportation options	Presence of easily accessible public transportation
		Option of senior transportation - dedicated tuk tuks, dedicated vans with wheel chair capabilities etc
	Walkable Neighbourhoods	Sidewalks in good conditions, bicycle lanes, safe crossings
		Existence of parks and recreational areas
	safe driving conditions	Infrastructure to improve visibility - larger font, clearer sign boards
Neighbourhood Safety	Safety	Crime rate to be minimized
	emergency preparedness	Linked with a hospital which would provide care on demand
Support Services	Support Services	Home and community based services
		Care giver services-short term and long term
Social Integration	Social Integration	Community events of older citizens - eg: senior friends, senior citizens programs
		Activities which promotes intergenerational contact
Community Life	Participation in Community Life	Presence of places of worship, community centres, libraries, museums, colleges/uni
		Volunteer opportunities

"Relationships" need to be strengthed in order to create lively neighbourhoods. Too many neighbourhoods today suddenly see retired people just getting to know the person they grew up next to only once the rush of life came to a standstill.

Positive features of a neighbourhood, are enhanced by general 'friendliness' and the presence of 'good neighbours', along with benefiting from the proximity of family and friends. A study of 100 municipalities in Belgium demonstrated that older people living in inner-city Brussels were strongly attached to their locality. Although problems such as 'fear of crime' and 'degradation of the area' were reported more frequently in comparison with other areas, the extent to which older people felt involved with their neighbourhood was significantly higher compared with other communities beyond Brussels (Buffel et al., 2011).

A qualitative study on experiences of place among Turkish older migrants living in Brussels also showed the importance attached to neighbours, which was often described by using the Turkish expression 'find your neighbour, choose your house', suggesting that trustful and supportive neighbours are the most important criterion for determining the choice of a home (Buffel et al., 2011). At a more general level, rather than providing limited social support, urban environments may allow people to draw from a wider range of networks as compared with rural areas. Friendship networks, for instance, appear to be especially robust in urban communities and may provide an important support mechanism for those who are single or widowed (Phillipson et al., 2000).

Therefore the need to create interactive neighbourhoods today is the key feature of preparing for aged population tomorrow.

Wellawatte needs come back to being a "community", boundary walls needs to come down, a support system needs to be enhanced to what it was 45 to 50 years ago, where it was still safe for children to play on the roads, for youth to have options to grow up to volunteer together or relax together and for adults to have activities that help them meet other adults, share parenting stories with each other rather than the internet, and most of all for families to grow together, encouraging extended families

and closer family units, all foundations today which will serve to create a sustainable future tomorrow.

Whilst Wellawatte has homes for the ages which are well accommodated, the future needs to be geared for a more independent aged community.

Cities that do not sleep: A city that is constantly active is iconic for a living city. Different sectors of the city need to take on different roles over a 24 hour cycle in order to maximize the diversity of its users. Being a city which has a varied age group, this factor is easily achieved in Wellawatte.

The Galle road Wellawatte from bridge to bridge, is the most active spine of Wellawatte. Its mixed development ranges from housing to medical to commercial to institutional to multi religious activities give Wellawatte the vibrancy it boasts of today. However, Wellawatte, except for a few "saivar" food centres, everything else tends to shut down by 8pm the latest. Excitement is still seen in the small barber shops and in the small street food shops yet this level of activity is not enough for Wellawatte to be characterised as a living city.

Figure 138: Street cafes, Croatia

Figure 139: Living streets, France

Based on the questionnaire and interviews (Annexture 01&02) Wellawatte is craving for more restaurants and more relaxing coffee shops open later into the night which gives bursts of activity throughout Wellawatte, not only along Marine drive. These spaces need to open out into the streets, where passer-by's see people and are encouraged to stop. Through this with time even shops will start staying open longer as long as people patronise them.

Figure 140: Wangfujing Street, Beijing

The market may turn into a night bazaar, where citizens and visitors can do their marketing in the cool climates of the evening, where visiting carnivals take place and most importantly activities which put Wellawatte back on the map in terms of tourism, where visitors come into Wellawatte mainly for its night time activity. (Eg: wang fujing street, Beijing)

The opportunities are endless, portraying that Wellawatte indeed has potential to be rejuvenated.

Affordable and liveable housing – the concept of housing is another aspect which measures the sustainability of a city. Wellawatte has mixed typologies for inner city living. From the single storied old houses of Wellawatte to multi story personal housing to multifamily apartment complexes the housing types are varied.

What needs to be worked on is the flexibility and affordability of these houses, where permanence is not encouraged – more so where families move to bigger houses based on their family size. Apartments with varied types – i.e studio, two bedroom, three bedroom to penthouse etc, gives way to flexibility and affordability without compromising on the living condition.

Regardless of social status, whether rich or poor, young or old, whatever walks of life, varied housing present's sustainable living with healthy communities which learn to live with each other and learn from each other.

5.5.10 Wellawatte: Cultural Heritage, Identity and sense of Place

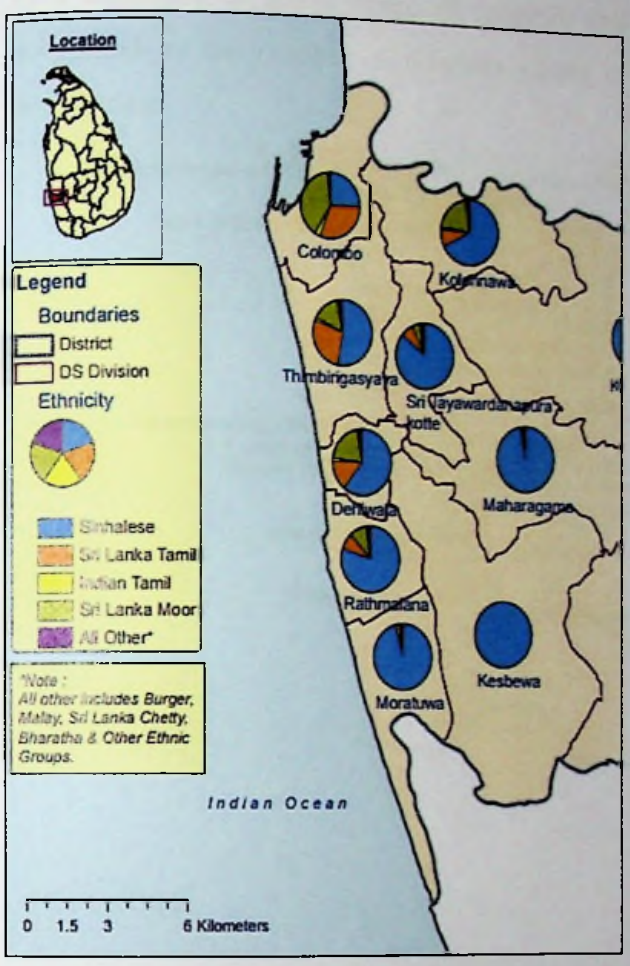


Figure 141: Population by Ethnicity and DS Division - Colombo District, 2012

Sustainable cities strive to protect cultural heritage, without side-lining to become global sustainable cities that have no difference from each other.

Fig 141 is descriptive of the Colombo district which shows the Thimbirigasyaya DS which covers Wellawatte – whilst the Sinhalese community is significantly larger, the Sri Lankan Tamil percentage is larger than its neighbouring counterparts.

The high percentage of Sinhalese is also due to the Fact that the Thimbirigasyaya DS includes areas such as Kollupitiya, Bambalapitiya which are predominantly Sinhalese as opposed to Wellawatte.

Designing cities to be sustainable, needs to ensure that a region's identity and unique character and valued urban heritage is maintained, by avoiding interchangeable characteristics which make all cities look the same. This is mind, Wellawatte needs to be developed to be rich in character. Whilst it has a large percentage of Sri Lanka Tamils, its culture needs to be celebrated through festivals, through food, through customs.

Similarly what makes Wellawatte unique is not only its Tamil background. It stands as a testimony of unity, where all religions and ethnicities are welcome; further confirmed by the number of religious places of worship within its geographical boundaries.

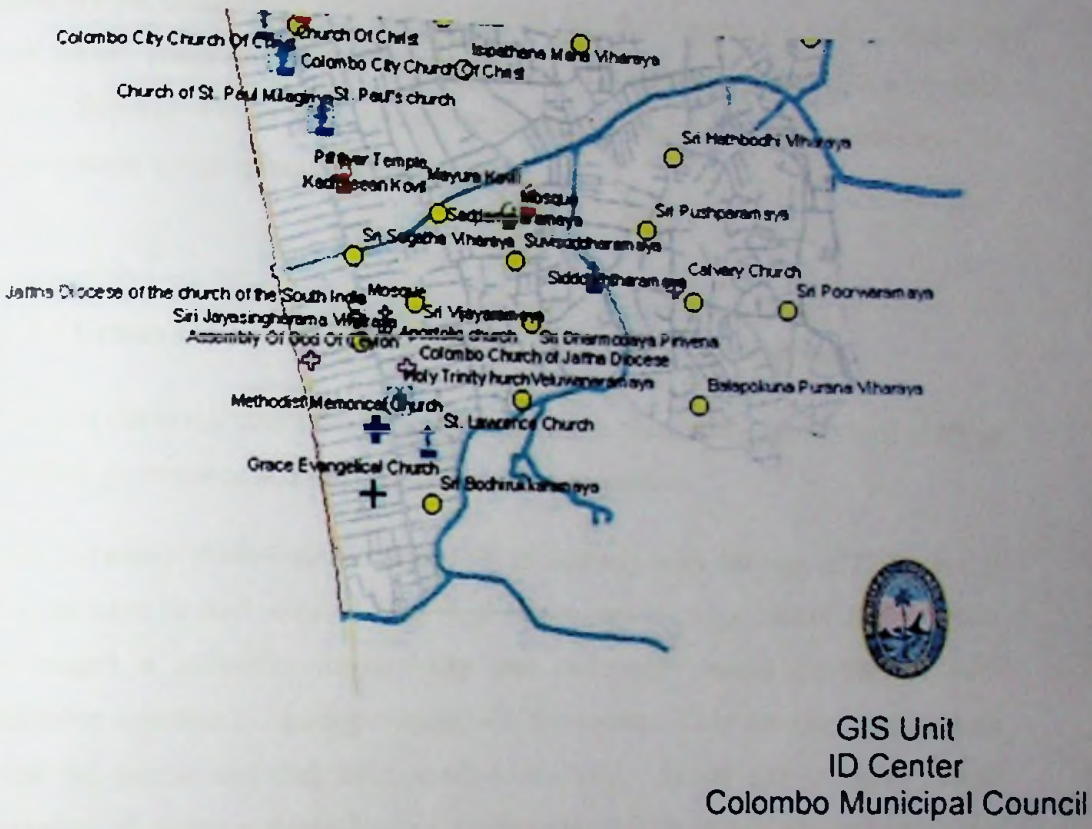


Figure 142: Religious Places of Worship Wellawatte

Wellawatte is warm, colourful and vibrant. The sense of place felt within its boundaries should form the concept Wellawatte has for itself. The essence of the place is captured through the memories discussed previously- of its communities with no boundaries, friendly people and welcoming spirit. The maintenance of its cultural identity is must, promoting locally owned businesses, giving rise to a bazaar atmosphere where wares brought down from Jaffna or India are freely welcomed.

Where festivals are celebrated and welcomed, instead of causing traffic jams, becoming a menace to people who are just "passing through". Developing Wellawatte under this light would mean the city celebrates with festivals, with

singing and dancing on the streets- where tourism is given a direct channel to experience this, where city hotels promote the religious festivals as part of their "pull factor".

Based on the discussions and surveys carried out, the one thing people missed the most about Wellawatte is the interaction and relationships people had with each other. Striving to achieve social sustainability, lies in creating passages to development which enhances this interaction.

5.5.11 Urban Governance, Leadership and Knowledge sharing

The main challenge under this principal is to ensure Wellawatte applies best practice for urban governance and sustainable procurement methods.

Today however Wellawatte is spoken for collectively with the rest of Colombo. It does not have its own voice, and therefore cannot project its need individually. Cities are indeed a collective responsibility and authorities should be formed with leadership sensitive to creating a sustainable Wellawatte. They need to be passionate about the people and their relationship to the city. Strong city councils should comprise of citizens themselves as Wellawatte strives to be self-sufficient and sustainable.

The city needs to produce citizens who will be good leaders, hence discussions and workshops in schools in the area and youth community development programs are required.

Image 2: Student Workshops

Image 1: Youth Workshops

As far as its best practice and governance is concerned, the following needs to be taken into consideration.

- Building codes and regulations – considering the need for landscapes and greenery within each individual plot, the importance of rainwater harvesting regulations, FAR, boundary wall heights, street access, Ground floor public access on apartments etc

- Database of citizens and their professions/free-lance work – creating a community that is responsible for each other, where residents do not have to go far to get work done. People are all knowledgeable of the vision for Wellawatte and therefore are able to work towards achieving it

- Active raising of public awareness- the need to be sustainable, encouraging green urbanism principals to be passed on to other cities. Sri Lanka has so much potential to be carbon neutral, it just takes one place to begin.

- Tax exemptions of sustainable projects that foster green jobs – of supplying free renewable energy to urban farm lands and green water purification techniques which use canal for irrigation

- Eliminating fossil fuel subsidies, encouraging electric vehicles for transport within Wellawatte

- The above is just a few ways of creating good leadership who would successfully carry out Wellawatte's mission.

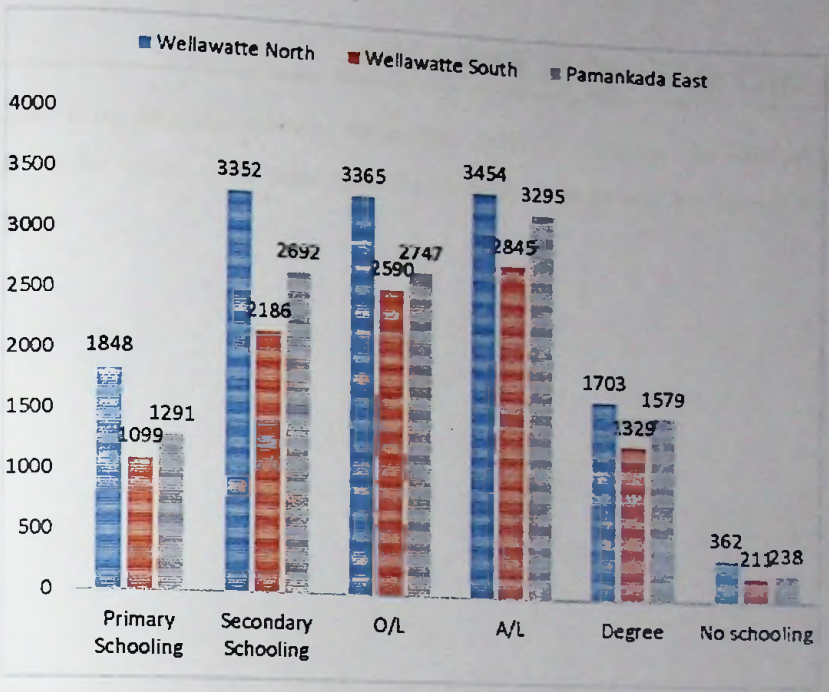


Figure 143: Educational Level of citizens

The above (FIG 142) indicated the level of education the citizens have acquired. This shows a high percentage of educated individuals in Wellawatte north as opposed to Wellawatte south. This principal looks into creating a city which education training for all in sustainable development. It looks at ways in which awareness on sustainability can be introduced in order to change behavioural patterns.

Institutions such as galleries, libraries museums etc need to be introduced to Wellawatte, which not only educates the citizens but also the large public component the regenerated city hopes to bring it. This in mind, the way of life in sustainable Wellawatte will aim to act as an "educator" on sustainable development.

In conclusion of this chapter therefore, it can be projected that Wellawatte is indeed ready for sustainable development as it shows potential in being developed to be an energy efficient, zero carbon, and sustainable city. The need for the people to be actively involved in the sustainable development of Wellawatte is important as the stakeholders are the prime users of Wellawatte.

CHAPTER 06: The Discussion

This chapter is the final discussion of the analysis of all the chapters which led up to the case study and is the review of the dissertation as a whole, confirming if it achieved its intension.

*"**The happiest country on Earth, in danger.** Bhutan is a country of 700,000 people in the Himalayas, sandwiched between two of the most populated countries on Earth. China and India. But Bhutan is a little different", says Prime Minister Tshering Tobgay. "For Bhutan, Gross National Happiness is more important than gross national product," he says.*

Education and healthcare are free, and the environment is a priority: Bhutan was the first country to go carbon neutral, forest protection is written into its constitution, and it exports hydropower. "Today, the clean energy we export offsets six million tons of co2," he says, and by 2020, that number will increase to 17 million tons. But Bhutan is a mountainous country of glacier lakes, and as they melt, the effects are devastating. "My people have done nothing to contribute to global warming, but we are already bearing the brunt of its consequences," he says. Tobgay sees hope in the recent Paris Agreement. But still, his government is thinking proactively on how to keep leading the charge. They have set up Bhutan For Life, a Kickstarter-like campaign to fund environmental protection and the nation's system of parks. He asks: what if this campaign went global? (Ted talks, 2016)

If a country as small as Bhutan at 38,394 km² could achieve so much, why can't Sri Lanka at 65,610 km²?

Today we live in a world where climate change occurs faster than it should, with temperature currently 2 degrees higher than what is meant to be and is still on the rise. Being a developing country, does it mean that we stand back and wait for the more developed countries to take the initiative towards climate change?

Although most of the countries are all in 'discussion', the time has come to step out of it and start working towards achieving climate change and saving our planet before it is too late. Research shows that the United States of America can be powered through renewable solar energy generation only by the rooftops in Texas. The question lies on whether there is anything being done about it?

If Sri Lanka takes Bhutan into consideration by stepping forward to make a change and takes on the challenge to be carbon neutral, we need to be ready with the research and findings in order to support the challenge.

It is always easy to introduce sustainability into a new city or city which has underutilized land; however the challenge lies on doing so in congested busy cities without invasive changes which could be economically viable. Thus the reasoning behind this dissertation.

The dissertation intends to study sustainability in all its angles by exploring economic, environmental and social sustainability while discussing all its principals. From thereon, the research continues with the study of the concepts of Green Urbanism and principals which could be followed to formulate a list of guidelines for sustainable green urban development.

The main reason behind choosing the city of Wellawatte was to challenge this dissertation to reach a level which would result in it being a comprehensive study on how an existing city could be manipulated to be sustainable, whilst maintaining its character and importance. Furthermore, it needed to be least intrusive, with minimal physical change, based purely on the high density and least availability of open space in this town.

Choosing Wellawatte as the case study also ensures that the principals of green urbanism were not reviewed and implemented as a whole; instead it was further analysed based on an in-depth research of Wellawatte, ensuring that the character of Wellawatte was not lost whilst seeking its potentials to be made into a sustainable city. It is easy to introduce green building systems and sustainable initiatives to any city alike, but its main challenge should be in retaining its character whilst doing so.

The principals of Green urbanism discussed in accordance with the analysis of Wellawatte, intends to project the potential Wellawatte has in order to be regenerated in terms of sustainability.

It takes every principal and draws parallels to Wellawatte whilst identifying its potential for development. This analysis and research therefore intends to pave the

way for additional research in making Wellawatte a completely self-sufficient sustainable city.

Unlike its counterparts such as Bambalapitiya or Mount Lavinia, Wellawatte is rich in culture, context, and bio-diversity and in economy. Wellawatte is indeed a difficult city to develop with change in mind based on its culture and way of life. However, uncovering green potentials which can be carried out in such a complex city like Wellawatte, only shows that it can easily be carried out in other cities as well.

The concept of retrofitting sustainability plays an important role in the development of Wellawatte as a green city; as it achieves positive change through minimal intrusion. It challenges cities to make small changes which have bigger impact. This dissertation also explores the importance of stakeholders in any project, understanding that the main user has an impact in the development of sustainability.

The 12 principles of Green Urbanism explored through Chapter 05 of this dissertation, dissects Wellawatte as a whole, exploring the different principles and the possible changes that can be made to make Wellawatte sustainably viable. The concepts studied have been directly applied to the different segments of Wellawatte, thereby showing great potential that this City can be manipulated to be an example of a self-sufficient green city.

Being self-sufficient, the city is able to function on its own, opening up opportunities for development and income generation which prove to be the least dangerous to its citizens. The dissertation explores the importance of applying the city's context, be it its population or its culture to its potential, focusing on the importance of making Wellawatte unique in its own way.

The conclusion of this study therefore is the statement that Urban Regeneration in indeed possible regardless of the density or complexity of a given city. It succeeds in presenting a case study for future research, presenting the potentials existing cities have in being re-vitalised to be green cities in the future; whilst being examples for further regeneration.

Based on the analysis and exploration of Wellawatte's opportunities, it is evident that the city is ready for Green Urbanism. This is turn, would transform Wellawatte into a sustainable city.

In conclusion therefore, if Wellawatte, a city as socially, environmentally and economically complexed, can find potentials to meet with sustainability goals and avenues to develop a resilient green city, there is no doubt that Sri Lanka can take up the challenge to be carbon neural.

ANNEXURES

6.1 Annexure 01: Questionnaire for Users: Residents of Wellawatte
6.2 Annexure 02: Report on Annexure 01
6.3 Annexure 03: Questionnaire for Users: Visitors to Wellawatte
6.4 Annexure 04: Report on Annexure 02

Reassessing Urban Sustainability in Wellawatte

kwiksurveys

Thesis Research
Masters in Urban Design,
University of Moratuwa
2016

1) Age:	
under 18	
18 - 30	
30 - 45	
45 - 59	
60+	

2) Gender	
Male	
Female	

3) Highest level of education completed	
Ordinary Level	
Advanced Level	
Bachelors Degree	
Postgraduate Degree	
Doctorate	

4) Which of the following matches your current occupation status?	
Not employed	
Self employed	
Working for an organisation	

5) How many People, **by age**, currently live in your household?	
under 5	
5 - 12	
13 - 18	
19 - 30	
31-45	
46 - 59	
60 and above	

6) Current location of residence?	
Within Wellawatte	
Bambalapitiya / Dehiwela / Mount Lavinia	
Other - Greater Colombo region	
Other - Within Western Province	
Other - Out of the Western Province	

7) If you live in Wellawatte, indicate status of housing	
Own house/own land	
On rent in a house	
Own house in Apartment	
On rent in an Apartment	
Temporary stay in Wellawatte	

8) On average, how often do you travel into Wellawatte Town to carry out personal activities?	
I live in Wellawatte	
Daily	
Weekly	
Monthly	
Fortnightly	
Occasionally	

9) Which of the following activities would bring you into Wellawatte?	
School / Occupation	
Visiting friends/Family	
Shopping	
Banking	
Religious Observations	
Healthcare/Selfcare	
Simply passing through onto other destinations	
Entertainment/Dining	

10) What mode of Transport would you use to enter Wellawatte?	
Personal Vehicle	
Public transport	
Walk	

11) Based on your personal experience with the city of Wellawatte, how would you rate the following?

1 being the least satisfactory
5 being the most satisfactory

Sense of safety					
Walkability within the city					
Access to the city					
Physical comfort whilst being in the area					
Psychological comfort while being in the area					
Access to services					
Friendliness of people					
Air Quality					
Pollution - in terms of litter					
Shade					
Fresh Air movement					
Cultural Balance					
Greenery					
Transportation Transit (bus stands)					

12) If given a choice, what time would you prefer to come in to Wellawatte to carry out personal tasks?

Morning	
Afternoon	
Evening	
Night	

13) Please elaborate as to why you would choose the above time

14) Which time of day do you feel Wellawatte is most energetic?

Morning	
Afternoon	
Evening	
Night	

15) What is the first thing that comes into your mind when you think of Wellawatte and the following?

Shopping	
Health Care	
Roads	
Walking	
People	
Religious activities	
Culture	
Nighttime	
Entertainment	

16) **In your experience, what do you feel Wellawatte needs more of?**

1 being least
5 being most

restaurants					
Short term accomodation					
Luxury City hotels					
Spas / Wellness Centres					
Community Centres - pool/gyms					
Open green spaces					
Pedestrian amenities					
Public Transport					
Shopping					
Educational Institutions					
Trees/Landscaping					
Job opportunities					
Vehicular parking					

17) How familiar are you with following concepts?

Sustainabilty					
Green Energy / Solar, wind, etc					
Cycling as a daily mode of transportation					
Urban Farming					
Large scale recycling					
Pedestrian only streets					
24/7 cities					

18) If city transport/street conditions were improved, do you see yourself using the following transportation options into Wellawatte?

1 being least likely to
5 being very likely to

Buses					
Boats (by way of Canal)					
Train					
Cycling					
Walking					

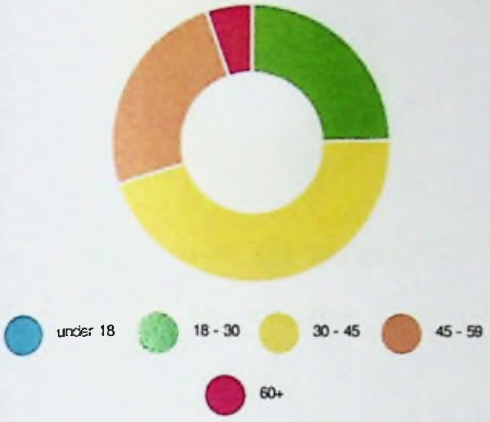
19) Comment on the following Statements, based on your personal experiences in Wellawatte.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	prefer not to comment
Statistics indicate that 70% of the population in Wellawatte is Tamil. As a result today Wellawatte is predominantly biased to the Tamil ethnicity.						
Wellawatte should be regenerated to be socially sustainable with no cultural bias. I.e all ethnicities should feel at home						
Wellawatte has great potential to be made into a self sufficient "sustainable city" I.e made greener, more inviting, comfortable						
Night time activities such as outdoor restaurants, cafe's, community centres are needed to bring in more "life" into Wellawatte						
With optional access roads through Marine drive and Havelock road, Wellawatte Town (along Galle road) has potential to be made pedestrian only, making the city people friendly and active						
Wellawatte can be made into an additional income generating hub through growing of organic vegetables, large scale recycling and other specific technologies built to generate income.						
Unauthorized housing (slums) along the canal banks, which pose a threat to the development of Wellawatte should be removed						
"Urban farming" can be defined as growing fruits and vegetables in small areas within cities, a process that is accompanied by many other complementary activities such as processing and distributing food, collecting and reusing food waste and rainwater, and educating, organizing, and employing local residents. Do you feel you would want to be a stakeholder in this venture within Wellawatte.						

ser Study - visitors to Wellawatte

Age:

	under 18	18 - 30	30 - 45	45 - 59	60+	Standard Deviation	Responses
ll Data	0 (0%)	23 (24%)	43 (46%)	23 (24%)	5 (5%)	15.26	94

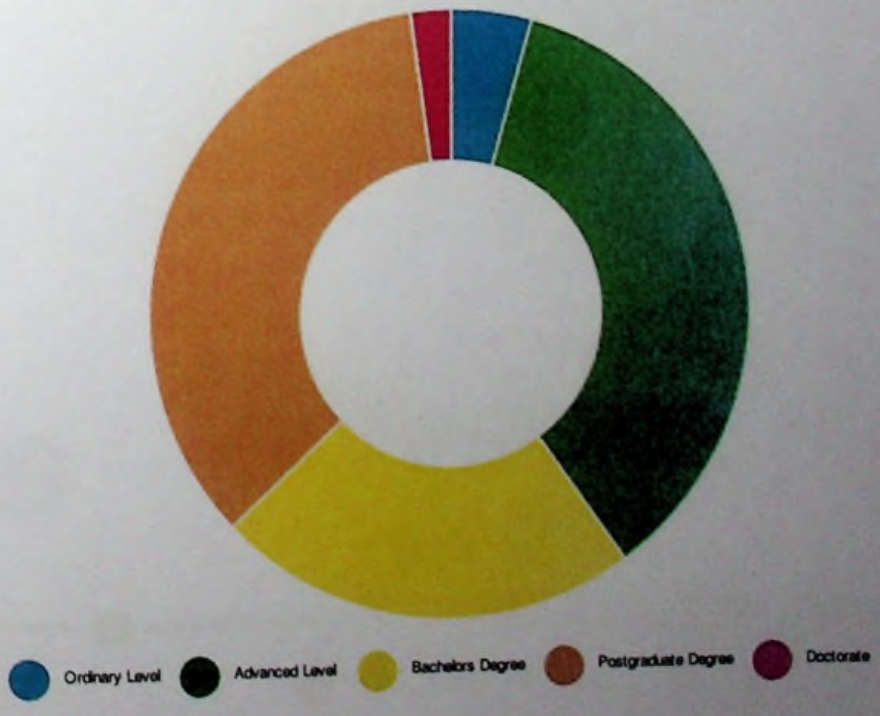


Gender

	Male	Female	Standard Deviation	Responses
All Data	32 (35%)	60 (65%)	14	92

Highest level of education completed

	Ordinary Level	Advanced Level	Bachelors Degree	Postgraduate Degree	Doctorate	Standard Deviation	Responses
ll Data	4 (4%)	33 (36%)	21 (23%)	32 (35%)	2 (2%)	13.28	92

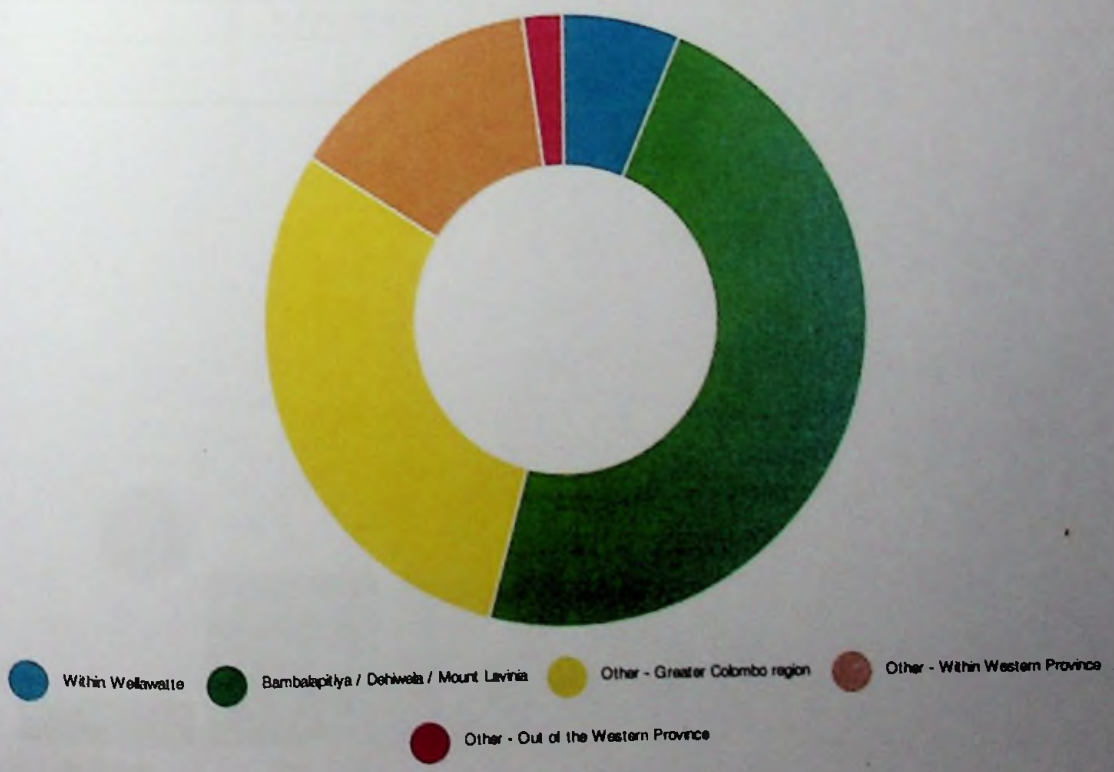


Which of the following matches your current occupation status?

	Not employed	Self employed	Working for an organisation	Standard Deviation	Responses
All Data	21 (22%)	22 (23%)	51 (54%)	13.91	94

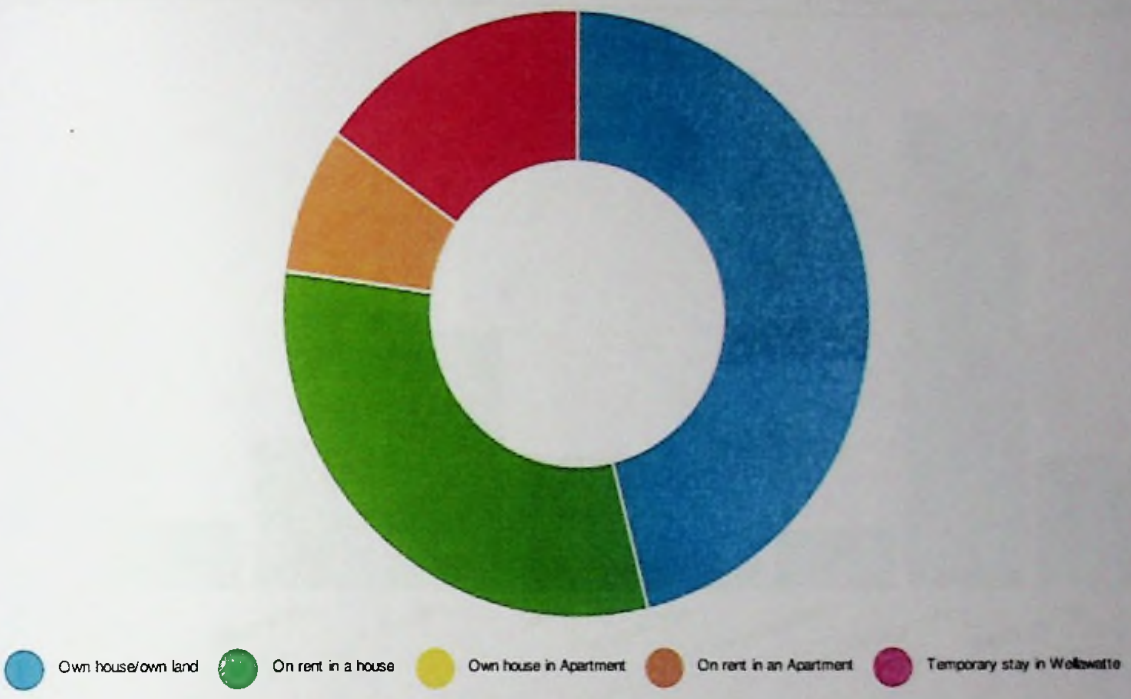
Current location of residence?

	Within Wellawatte	Bambalapitiya / Dehiwela / Mount Lavinia	Other - Greater Colombo region	Other - Within Western Province	Other - Out of the Western Province	Standard Deviation	Responses
All Data	6 (6%)	45 (48%)	28 (30%)	13 (14%)	2 (2%)	15.82	94



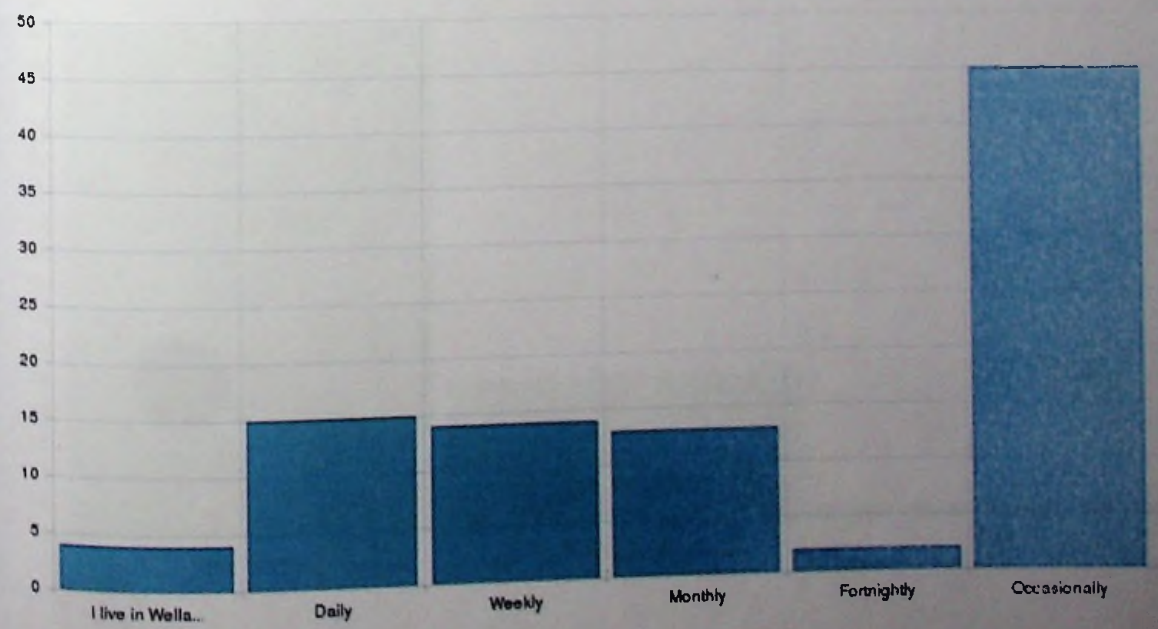
If you live in Wellawatte, indicate status of housing

	Own house/own land	On rent in a house	Own house in Apartment	On rent in an Apartment	Temporary stay in Wellawatte	Standard Deviation	Responses
Data	6 (46%)	4 (31%)	0 (0%)	1 (8%)	2 (15%)	2.15	13



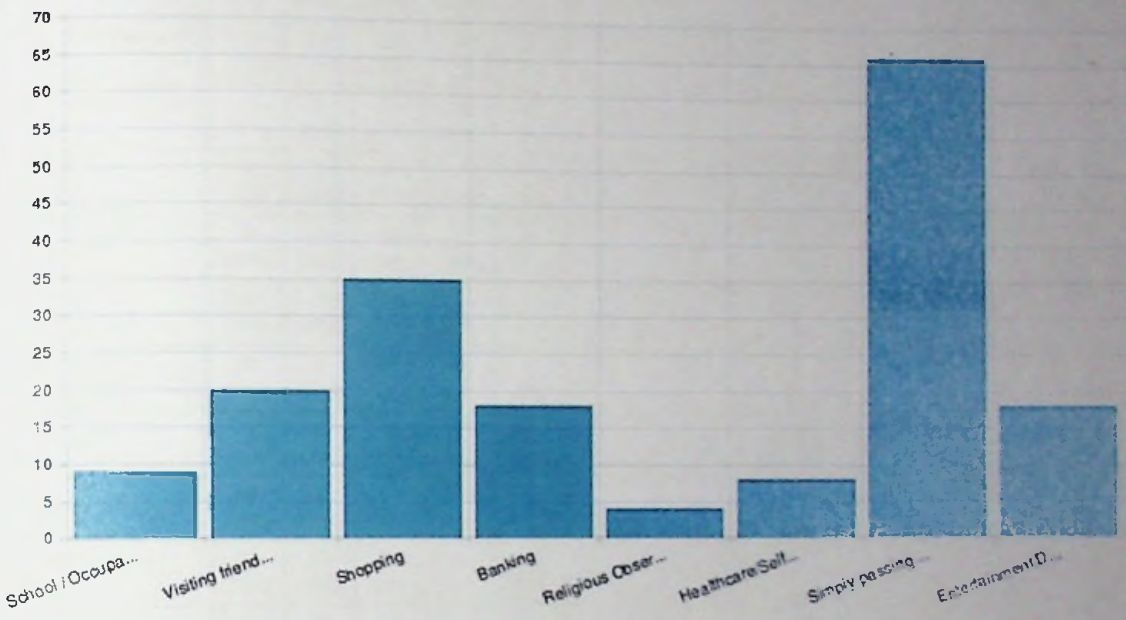
On average, how often do you travel into Wellawatte Town to carry out personal activities?

	I live in Wellawatte	Daily	Weekly	Monthly	Fortnightly	Occasionally	Responses
Data	4 (4%)	15 (16%)	14 (15%)	13 (14%)	2 (2%)	45 (49%)	91



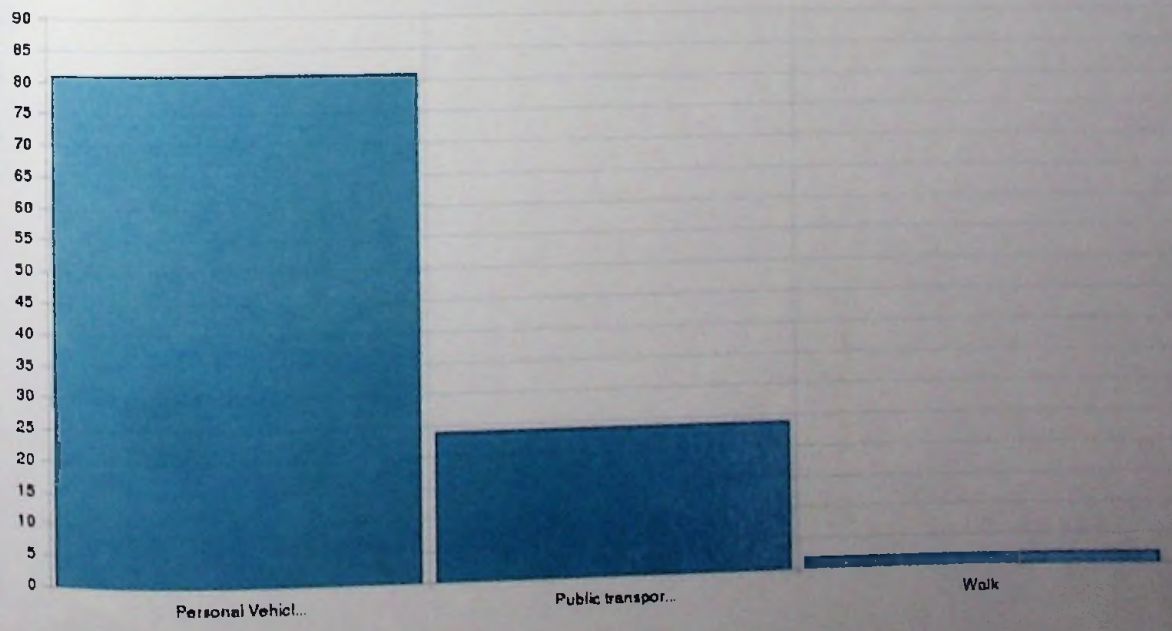
Which of the following activities would bring you into Wellawatte?

	School / Occupation	Visiting friends/Family	Shopping	Banking	Religious Observations	Healthcare/Selfcare	Simply passing through onto other destinations	Entertainment/Dining	Responses
l Data	9 (10%)	20 (21%)	35 (37%)	18 (19%)	4 (4%)	8 (9%)	66 (70%)	18 (19%)	94



What mode of Transport would you use to enter Wellawatte?

	Personal Vehicle	Public transport	Walk	Responses
ll Data	81 (86%)	24 (26%)	2 (2%)	94



Based on your personal experience with the city of Wellawatte, how would you rate the following?1 being the least satisfactory5 being the most satisfactory

	1	2	3	4	5	Standard Deviation	Responses	Weighted Average
Sense of safety	2 (2%)	24 (27%)	35 (39%)	23 (26%)	5 (6%)	12.45	89	3.06 / 5
Walkability within the city	14 (16%)	25 (28%)	25 (28%)	18 (20%)	7 (8%)	6.85	89	2.76 / 5
Access to the city	4 (5%)	13 (15%)	31 (36%)	25 (29%)	14 (16%)	9.52	87	3.37 / 5
Physical comfort whilst being in e area	14 (16%)	29 (33%)	33 (38%)	9 (10%)	2 (2%)	11.81	87	2.49 / 5
Psychological comfort while ing in the area	15 (17%)	33 (37%)	26 (29%)	13 (14%)	3 (3%)	10.47	90	2.51 / 5
Access to services	2 (2%)	16 (18%)	26 (29%)	31 (35%)	14 (16%)	10.09	89	3.44 / 5
Friendliness of people	9 (10%)	21 (24%)	34 (38%)	20 (22%)	5 (6%)	10.19	89	2.9 / 5
Air Quality	29 (33%)	33 (37%)	22 (25%)	4 (4%)	1 (1%)	13.01	89	2.04 / 5
Pollution - in terms of litter	32 (36%)	21 (24%)	26 (29%)	6 (7%)	4 (4%)	11.03	89	2.2 / 5
Shade	42 (47%)	34 (38%)	12 (13%)	1 (1%)	0 (0%)	17.21	89	1.69 / 5
Fresh Air movement	40 (45%)	28 (31%)	20 (22%)	1 (1%)	0 (0%)	15.5	89	1.8 / 5
Cultural Balance	22 (25%)	31 (35%)	23 (26%)	11 (12%)	2 (2%)	10.15	89	2.33 / 5
Greenery	38 (43%)	39 (44%)	12 (13%)	0 (0%)	0 (0%)	17.46	89	1.71 / 5
Transportation Transit (bus tands)	14 (16%)	15 (17%)	27 (30%)	27 (30%)	6 (7%)	8.13	89	2.96 / 5
								2.52 / 5

Access to the city

Psychological comfort while being in the area

Friendliness of people

Pollution - in terms of litter

Fresh Air movement

Greenery

Walkability within the city

Physical comfort whilst being in the area

Access to services

Air Quality

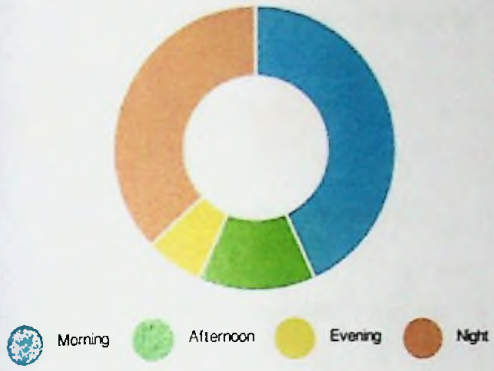
Shade

Cultural Balance

Transportation Transit (bus stands)

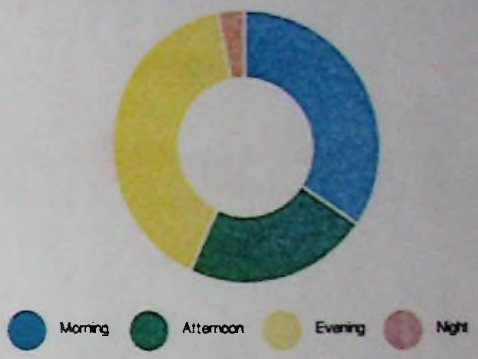
If given a choice, what time would you prefer to come in to Wellawatte to carry out personal tasks?

	Morning	Afternoon	Evening	Night	Standard Deviation	Responses
	39 (43%)	12 (13%)	6 (7%)	33 (37%)	13.83	90



Which time of day do you feel Wellawatte is most energetic?

	Morning	Afternoon	Evening	Night	Standard Deviation	Responses
All Data	32 (34%)	21 (23%)	37 (40%)	3 (3%)	13.05	93



In your experience, what do you feel Wellawatte needs more of? 1 being least5 being most

	1	2	3	4	5	Standard Deviation	Responses	Weighted Average
restaurants	14 (16%)	23 (27%)	25 (29%)	16 (19%)	8 (9%)	6.18	86	2.78 / 5
Short term accomodation	28 (35%)	26 (32%)	15 (19%)	5 (6%)	7 (9%)	9.45	81	2.22 / 5
Luxury City hotels	29 (35%)	23 (28%)	22 (27%)	5 (6%)	3 (4%)	10.42	82	2.15 / 5
Spas / Wellness Centres	24 (30%)	22 (27%)	20 (25%)	10 (12%)	5 (6%)	7.39	81	2.38 / 5
Community Centres - pool/gyms	10 (12%)	14 (17%)	26 (32%)	21 (26%)	10 (12%)	6.34	81	3.09 / 5
Open green spaces	1 (1%)	3 (3%)	8 (9%)	24 (28%)	51 (59%)	18.64	87	4.39 / 5
Pedestrian amenities	2 (2%)	7 (8%)	10 (12%)	24 (28%)	42 (49%)	14.48	85	4.14 / 5
Public Transport	9 (11%)	14 (17%)	25 (30%)	18 (21%)	18 (21%)	5.27	84	3.26 / 5
Shopping	13 (16%)	10 (12%)	29 (35%)	19 (23%)	12 (14%)	6.89	83	3.08 / 5
Educational Institutions	14 (17%)	24 (29%)	27 (33%)	7 (9%)	10 (12%)	7.81	82	2.7 / 5
Trees/Landscaping	2 (2%)	3 (3%)	9 (10%)	22 (25%)	53 (60%)	18.99	89	4.36 / 5
Job opportunities	18 (22%)	14 (17%)	25 (31%)	15 (19%)	9 (11%)	5.27	81	2.79 / 5
Vehicular parking	2 (2%)	3 (3%)	4 (4%)	15 (17%)	65 (73%)	24.06	89	4.55 / 5
								3.25 / 5

Luxury City hotels

Community Centres - pool/gyms

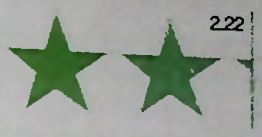
Pedestrian amenities

Shopping

Trees/Landscaping

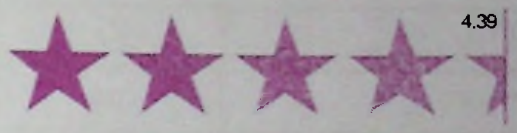
Vehicular parking

Short term accomodation

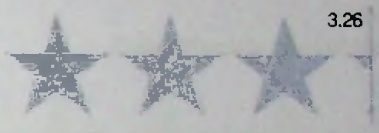


Spas / Wellness Centres

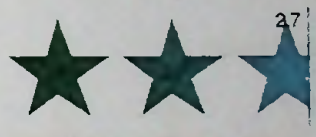
Open green spaces



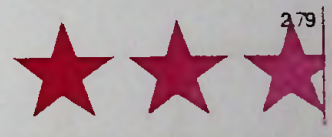
Public Transport



Educational Institutions



Job opportunities



How familiar are you with following concepts?

	1	2	3	4	5	Standard Deviation	Responses	Weighted Average
Sustainabilty	2 (2%)	10 (11%)	21 (24%)	24 (28%)	30 (34%)	10.07	87	3.8 / 5
Green Energy / Solar, wind, etc	1 (1%)	7 (8%)	22 (25%)	23 (26%)	35 (40%)	12.16	88	3.95 / 5
Cycling as a daily mode of transportation	10 (11%)	13 (15%)	18 (21%)	17 (20%)	29 (33%)	6.47	87	3.48 / 5
Urban Farming	19 (23%)	24 (29%)	22 (26%)	8 (10%)	11 (13%)	6.24	84	2.62 / 5
Large scale recycling	9 (11%)	11 (13%)	25 (29%)	10 (12%)	30 (35%)	8.74	85	3.48 / 5
Pedestrian only streets	17 (20%)	10 (12%)	23 (27%)	14 (16%)	21 (25%)	4.69	85	3.14 / 5
24/7 cities	8 (10%)	14 (17%)	18 (21%)	19 (23%)	25 (30%)	5.64	84	3.46 / 5
								3.43 / 5

Sustainabilty

Green Energy / Solar, wind, etc

Cycling as a daily mode of transportation

Urban Farming

Large scale recycling

Pedestrian only streets

24/7 cities

If city transport/street conditions were improved, do you see yourself using the following transportation options into Wellawatte? 1 being least likely to 5 being very likely to

	1	2	3	4	5	Standard Deviation	Responses	Weighted Average
Buses	14 (16%)	7 (8%)	24 (28%)	14 (16%)	27 (31%)	7.3	86	3.38 / 5
Boats (by way of Canal)	24 (32%)	18 (24%)	11 (14%)	10 (13%)	13 (17%)	5.19	76	2.61 / 5
Train	17 (20%)	15 (18%)	14 (17%)	14 (17%)	23 (28%)	3.38	83	3.13 / 5
Cycling	24 (33%)	18 (25%)	13 (18%)	11 (15%)	7 (10%)	5.89	73	2.44 / 5
Walking	18 (23%)	15 (19%)	11 (14%)	12 (15%)	22 (28%)	4.03	78	3.06 / 5
								2.94 / 5

Buses

Boats (by way of Canal)

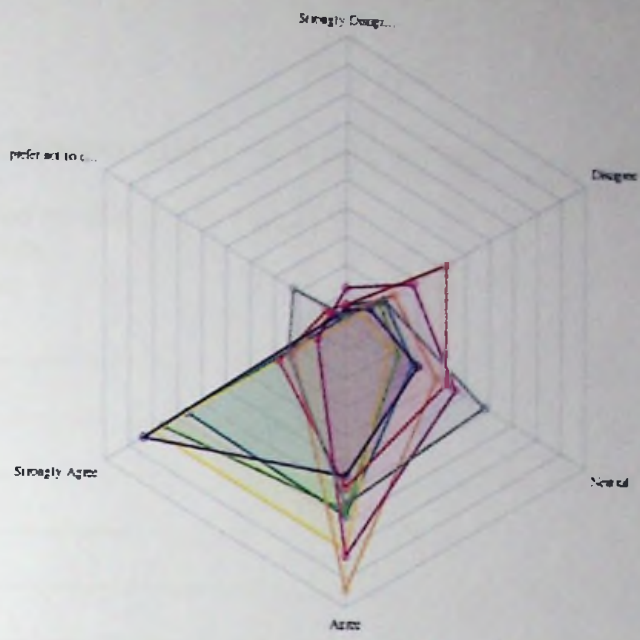
Train

Cycling

Walking

Comment on the following Statements, based on your personal experiences in Wellawatte.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	prefer not to comment	Standard Deviation	Responses	Weighted Average
Statistics indicate that 70% f the population in Wellawatte Tamil. As a result today ellawatte is predominantly ased to the Tamil ethnicity.	3 (3%)	8 (9%)	14 (15%)	**34 (37%)**	33 (35%)	1 (1%)	13.38	93	3.96 / 6
Wellawatte should be enerated to be socially stainable with no cultural as. I.e all ethnicities should el at home	2 (2%)	7 (8%)	11 (12%)	33 (35%)	**38 (41%)**	2 (2%)	14.55	93	4.12 / 6
Wellawatte has great tential to be made into a self fficient "sustainable city" I.e ade greener, more inviting, mfortable	1 (1%)	3 (3%)	9 (10%)	**40 (43%)**	40 (43%)	0 (0%)	17.56	93	4.24 / 6
Night time activities such as tdoor restaurants, cafe's, mmunity centres are needed bring in more "life" into ellawatte	2 (2%)	10 (11%)	19 (21%)	**47 (51%)**	11 (12%)	3 (3%)	15.24	92	3.7 / 6
With optional access roads rough Marine drive and avelock road, Wellawatte Town long Galle road) has potential be made pedestrian only, aking the city people friendly nd active	3 (3%)	21 (23%)	21 (23%)	**29 (32%)**	14 (15%)	4 (4%)	9.43	92	3.46 / 6
Wellawatte can be made into additional income generating b through growing of organic egetables, large scale cycling and other specific chnologies built to generate come.	6 (6%)	14 (15%)	23 (25%)	**41 (44%)**	6 (6%)	3 (3%)	13.2	93	3.39 / 6
Unauthorized housing lums) along the canal banks, hich pose a threat to the evelopment of Wellawatte hould be removed	2 (2%)	5 (5%)	15 (16%)	27 (29%)	**42 (45%)**	2 (2%)	14.77	93	4.16 / 6
"Urban farming" can be efined as growing fruits and egetables in small areas within ities, a process that is ccompanied by many other omplementary activities such a processing and distributing ood, collecting and reusing food aste and rainwater, and ducating, organizing, and mploying local residents. Do ou feel you would want to be a akeholder in this venture ithin Wellawatte.	1 (1%)	8 (9%)	29 (31%)	**32 (34%)**	12 (13%)	11 (12%)	11.21	93	3.85 / 6
									3.86 / 6



Statistics indicate that 70% of the population in Wellawatte is Tamil. As a result today Wellawatte is predominantly biased to the Tamil ethnicity.

Wellawatte should be regenerated to be socially sustainable with no cultural bias. I.e all ethnicities should feel at home

Wellawatte has great potential to be made into a self sufficient "sustainable city" I.e made greener, more inviting, comfortable

Night time activities such as outdoor restaurants, cafe's, community centres are needed to bring in more "life" into Wellawatte

With optional access roads through Marine drive and Havelock road, Wellawatte Town (along Galle road) has potential to be made pedestrian only, making the city people friendly and active

Wellawatte can be made into an additional income generating hub through growing of organic vegetables, large scale recycling and other specific technologies built to generate income.

Unauthorized housing (slums) along the canal banks, which pose a threat to the development of Wellawatte should be removed

"Urban farming" can be defined as growing fruits and vegetables in small areas within cities, a process that is accompanied by many other complementary activities such as processing and distributing food, collecting and reusing food waste and rainwater, and educating, organizing, and employing local residents. Do you feel you would want to be a stakeholder in this venture within Wellawatte.

Reassessing Urban Sustainability - Key user category kwiksurveys

a thesis research based on the above subject
Masters in Urban Design
University of Moratuwa

1) Age	
under 18	
19 - 35	
36-45	
46-59	
above 60	

2) Gender	
Male	
Female	

3) How would you describe your current accomodation?	
Own house - own land	
Own house - Apartment	
On rent - House	
On rent - Apartment	

4) How long have you been living in Wellawatte?	
less than 5 years	
5 - 10 years	
10 - 15 years	
15 - 25 years	
over 25 years	

5) Where is your residence located?	
Along Galle Road	
Road on the Sea Side	
Road on the Land side	
Enter the answer option	

6) What activities have you travelling **out of Wellawatte** on **a daily basis?**	
Work	
Education	
Daily shopping	
Religious Observations	
Other (Please Specify)	

7) When travelling **within** Wellawatte, what mode of transportation do you frequently use?	
Walk	
Bus	
Three Wheeler	
Own Vehicle	

8) What mode of transportation do you use when travelling **out** of Wellawatte?	
Walking	
Bus	
Three wheeler	
Own vehicle	

9) For what reasons do you come to the the Galle Road?	
Shopping - retail	
Grocery Shopping	
Utilities (Gas, Petrol,bill payments etc)	
Banking	
Religious Activities	
Restaurants - Dine in	
Restaurants - Take Away	
Medical/Health care	
Entertainment	
Transport out of the city	
Education	
Occupation	

10) Based on your **personal experience** with the living in Wellawatte, how would you rate the following?

1 being the least satisfactory
5 being the most satisfactory

Sense of safety/security					
Walkability within the city					
Friendliness of people					
Air Quality					
Cultural Balance					
Shade/Landscape/Greenery					
Public transportation					

11) As a citizen, what do you feel Wellawatte needs more of?	
Restaurants	
Public open areas - parks/walking tracks etc	
Short term accomodation	
Spas/wellness centres	
Community Centres - Gyms/Pools	
Job opportunities within Wellawatte	
Public Transportation	
Pedestrian Amenities	

12) Comment on the following statements

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	prefer not to comment
Statistics indicate that 70% of the population in Wellawatte is Tamil. As a result today Wellawatte is predominantly biased to the Tamil ethnicity.						
Wellawatte should be regenerated to be socially sustainable with no cultural bias. I.e all ethnicities should feel at home						
Wellawatte has great potential to be made into a self sufficient "sustainable city" I.e made greener, more inviting, comfortable						
Night time activities such as outdoor restaurants, cafe's, community centres are needed to bring in more "life" into Wellawatte						
Wellawatte can be made into an additional income generating hub through growing of organic vegetables, large scale recycling and other specific technologies built to generate income.						
Unauthorized housing (slums) along the canal banks, which pose a threat to the development of Wellawatte should be removed						
"Urban farming" can be defined as growing fruits and vegetables in small areas within cities, a process that is accompanied by many other complementary activities such as processing and distributing food, collecting and reusing food waste and rainwater, and educating, organizing, and employing local residents. Do you feel you would want to be a stakeholder in this venture within Wellawatte by having the chance to own						
Galle Road should be made "one way" similar to Galle road from Bambalapitiya to Kollupiitya in order to the traffic.						
Pavements should be made wider, encouraging more pedestrian interaction rather than vehicular movement						

13) If a well organized **"Water Transportation"** system by way of the canals allowed you to travel by boat to areas outside of Wellawatte will you be willing to use it?	
Yes	
Maybe	
No	

14) How often do you go to shops/services **along Galle Road**, Wellawatte(from bridge to bridge) to carry out personal tasks?	
Daily	
Weekly	
Monthly	
Occasionally	

15) Citizens of Wellawatte should have a strong committee willing to partner with private sectors and the Government in city development projects

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Prefer not to comment
Wellawatte is able to handle an aging population - in terms of accessibility, safety and security for older people to move around the city						
In terms of Housing and environmental health, houses in Wellawatte are well maintained and safe						
Well being, happiness and quality of life in Wellawatte is satisfactory						
The mix of culture has helped me learn more about different ethnicities and be able to mix freely						
The houses are situated in a manner which promotes neighbourhoods and interaction between citizens						
Wellawatte is child friendly and has a great environment for young families to settle down in						
Wellawatte should be developed with more activities and services to bring in more people into the city						
Bringing in people who would spend longer hours in the city partaking in varied activities pose a threat to the character and culture of Wellawatte						

16) With the Beach so close by, do you think Wellawatte needs large open green community spaces like parks?	
Yes	
No	

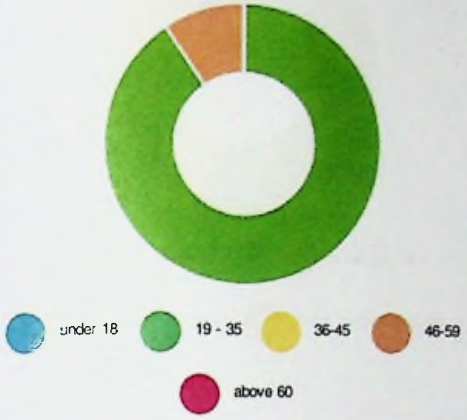
17) Please elaborate your reason for the above answer

18) Appreciate your answers on the following	
What do you feel wellawatte has that no other city in Colombo has?	
What has changed the most in Wellawatte in the last 10 years?	
What is your earliest memory of Wellawatte which is not available today	
Which location would you feel is the "heart" of Wellawatte?	

esidents of Wellawatte

Age

	under 18	19 - 35	36-45	46-59	above 60	Standard Deviation	Responses
ll Data	0 (0%)	19 (90%)	0 (0%)	2 (10%)	0 (0%)	7.44	21

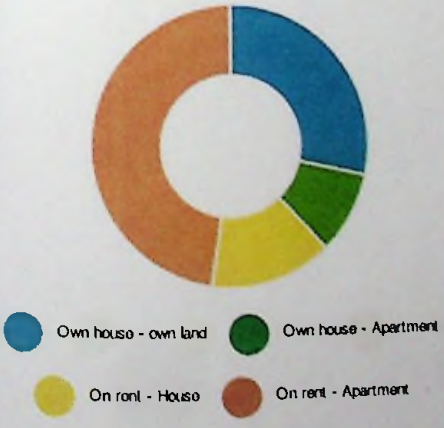


Gender

	Male	Female	Standard Deviation	Responses
All Data	7 (33%)	14 (67%)	3.5	21

How would you describe your current accomodation?

	Own house - own land	Own house - Apartment	On rent - House	On rent - Apartment	Standard Deviation	Responses
All Data	6 (29%)	2 (10%)	3 (14%)	10 (48%)	3.11	21



How long have you been living in Wellawatte?

	less than 5 years	5 - 10 years	10 - 15 years	15 - 25 years	over 25 years	Standard Deviation	Responses
All Data	5 (24%)	4 (19%)	1 (5%)	5 (24%)	6 (29%)	1.72	21

Where is your residence located?

	Along Galle Road	Road on the Sea Side	Road on the Land side	Enter the answer option	Standard Deviation	Responses
All Data	0 (0%)	11 (55%)	7 (35%)	2 (10%)	4.3	20

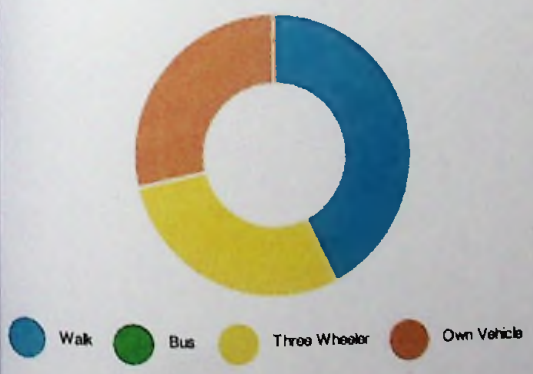
What activities have you travelling out of Wellawatte on a daily basis?

	Work	Education	Daily shopping	Religious Observations	Other (Please Specify)	Standard Deviation	Respo
All Data	13 (62%)	5 (24%)	2 (10%)	1 (5%)	0 (0%)	4.71	21

Text Responses

When travelling within Wellawatte, what mode of transportation do you frequently use?

	Walk	Bus	Three Wheeler	Own Vehicle	Standard Deviation	Responses
All Data	9 (43%)	0 (0%)	6 (29%)	6 (29%)	3.27	21

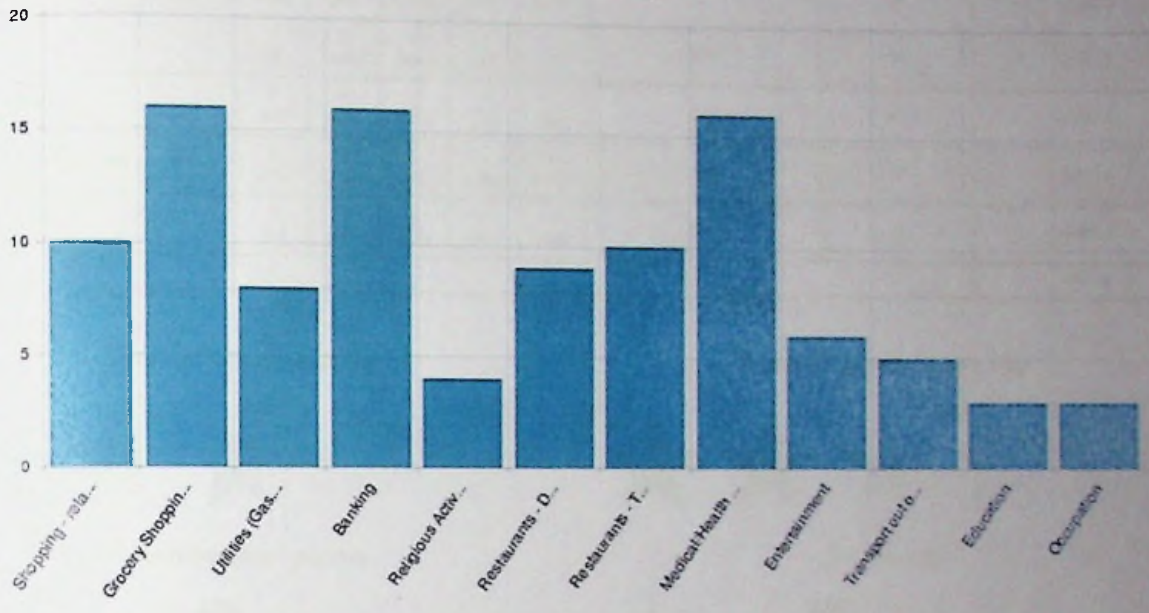


What mode of transportation do you use when travelling out of Wellawatte?

	Walking	Bus	Three wheeler	Own vehicle	Standard Deviation	Responses
All Data	0 (0%)	4 (19%)	4 (19%)	13 (62%)	4.76	21

For what reasons do you come to the the Galle Road?

	Shopping - retail	Grocery Shopping	Utilities (Gas, Petrol,bill payments etc)	Banking	Religious Activities	Restaurants - Dine In	Restaurants - Take Away	Medical/Health care	Entertainment	Transport out of the city	Education	Occupation	Responses
All Data	10 (48%)	16 (76%)	8 (38%)	16 (76%)	4 (19%)	9 (43%)	10 (48%)	16 (76%)	6 (29%)	5 (24%)	3 (14%)	3 (14%)	21



Based on your personal experience with the living in Wellawatte, how would you rate the following?1 being the least satisfactory5 being the most satisfactory

	1	2	3	4	5	Standard Deviation	Responses	Weighted Average
Sense of safety/security	3 (14%)	3 (14%)	9 (43%)	5 (24%)	1 (5%)	2.71	21	2.9 / 5
Walkability within the city	0 (0%)	6 (29%)	4 (19%)	9 (43%)	2 (10%)	3.12	21	3.33 / 5
Friendliness of people	4 (19%)	8 (38%)	5 (24%)	2 (10%)	2 (10%)	2.23	21	2.52 / 5
Air Quality	6 (29%)	6 (29%)	7 (33%)	2 (10%)	0 (0%)	2.71	21	2.24 / 5
Cultural Balance	6 (29%)	7 (33%)	5 (24%)	1 (5%)	2 (10%)	2.32	21	2.33 / 5
Shade/Landscape/Greenery	14 (67%)	5 (24%)	0 (0%)	2 (10%)	0 (0%)	5.23	21	1.52 / 5
Public transportation	1 (5%)	3 (14%)	6 (29%)	8 (38%)	3 (14%)	2.48	21	3.43 / 5
								2.61 / 5

Sense of safety/security

Walkability within the city

Friendliness of people

Air Quality

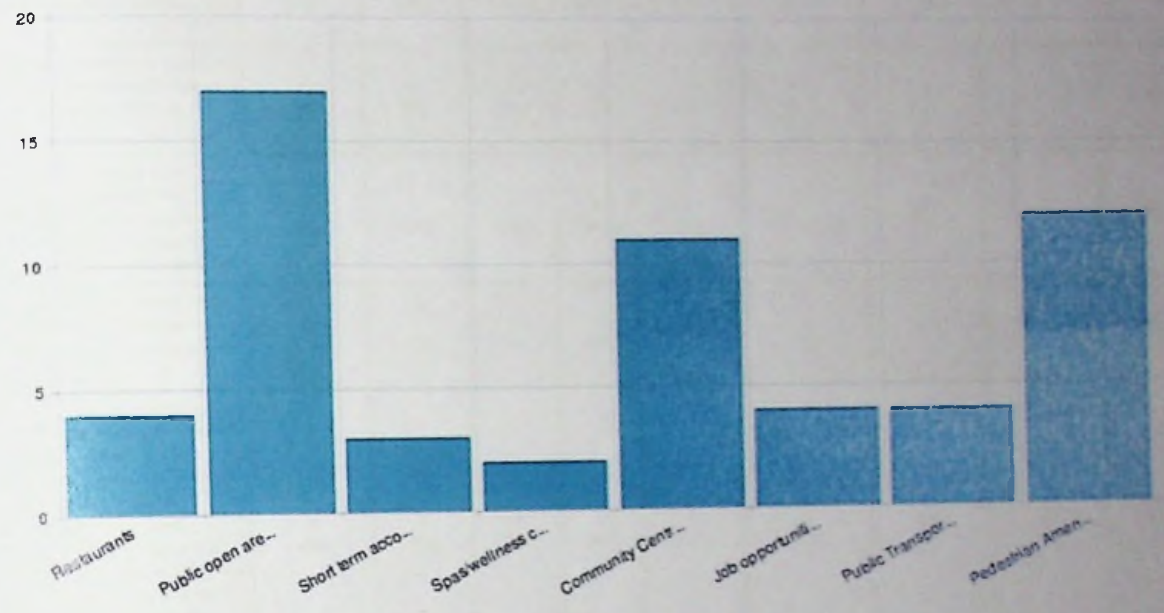
Cultural Balance

Shade/Landscape/Greenery

Public transportation

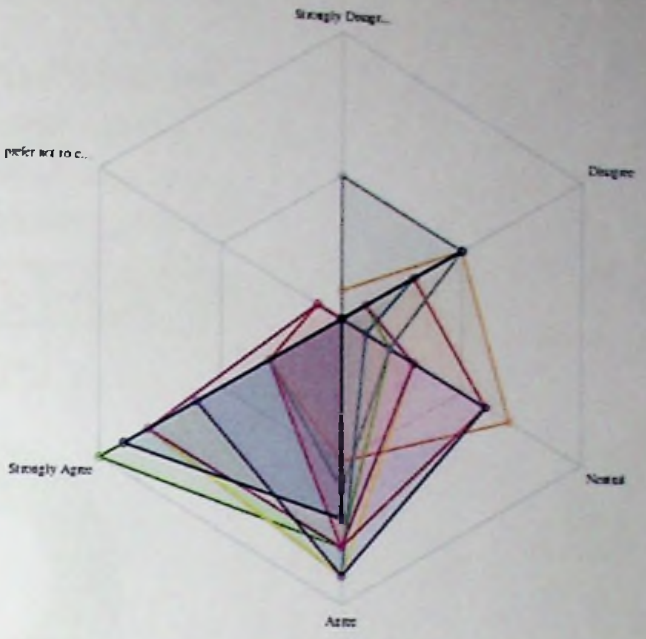
As a citizen, what do you feel Wellawatte needs more of?

	Restaurants	Public open areas - parks/walking tracks etc	Short term accomodation	Spas/wellness centres	Community Centres - Gyms/Pools	Job opportunities within Wellawatte	Public Transportation	Pedestrian Amenities	Responses
All Data	4 (19%)	17 (81%)	3 (14%)	2 (10%)	11 (52%)	4 (19%)	4 (19%)	12 (57%)	21



Comment on the following statements

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	prefer not to comment	Standard Deviation	Responses	Weighted Average
Statistics indicate that 70% of the population in Wellawatte is Tamil. As a result today Wellawatte is predominantly biased to the Tamil ethnicity.	0 (0%)	3 (14%)	1 (5%)	9 (43%)	8 (38%)	0 (0%)	3.69	21	4.05 / 6
Wellawatte should be regenerated to be socially sustainable with no cultural bias. I.e all ethnicities should feel at home	0 (0%)	1 (5%)	2 (10%)	8 (38%)	10 (48%)	0 (0%)	3.99	21	4.29 / 6
Wellawatte has great potential to be made into a self sufficient "sustainable city" I.e made greener, more inviting, comfortable	0 (0%)	0 (0%)	3 (14%)	9 (43%)	8 (38%)	1 (5%)	3.69	21	4.33 / 6
Night time activities such as outdoor restaurants, cafe's, community centres are needed to bring in more "life" into Wellawatte	1 (5%)	5 (24%)	7 (33%)	5 (24%)	3 (14%)	0 (0%)	2.43	21	3.19 / 6
Wellawatte can be made into an additional income generating hub through growing of organic vegetables, large scale recycling and other specific technologies built to generate income.	0 (0%)	3 (14%)	6 (29%)	8 (38%)	3 (14%)	1 (5%)	2.75	21	3.67 / 6
Unauthorized housing (slums) along the canal banks, which pose a threat to the development of Wellawatte should be removed	0 (0%)	1 (5%)	3 (14%)	8 (38%)	8 (38%)	1 (5%)	3.3	21	4.24 / 6
"Urban farming" can be defined as growing fruits and vegetables in small areas within cities, a process that is accompanied by many other complementary activities such as processing and distributing food, collecting and reusing food waste and rainwater, and educating, organizing, and employing local residents. Do you feel you would want to be a stakeholder in this venture within Wellawatte by having the chance to own	0 (0%)	0 (0%)	6 (29%)	9 (43%)	6 (29%)	0 (0%)	3.64	21	4 / 6
Galle Road should be made "one way" similar to Galle road from Bambalapitiya to Kollupitiya in order to ease the traffic.	5 (24%)	5 (24%)	2 (10%)	6 (29%)	3 (14%)	0 (0%)	2.06	21	2.86 / 6
Pavements should be made wider, encouraging more pedestrian interaction rather than vehicular movement	0 (0%)	5 (24%)	0 (0%)	7 (33%)	9 (43%)	0 (0%)	3.69	21	3.95 / 6
									3.84 / 6



Statistics indicate that 70% of the population in Wellawatte is Tamil. As a result today Wellawatte is predominantly biased to the Tamil ethnicity.

Wellawatte should be regenerated to be socially sustainable with no cultural bias. I.e all ethnicities should feel at home

Wellawatte has great potential to be made into a self sufficient "sustainable city" I.e made greener, more inviting, comfortable

Night time activities such as outdoor restaurants, cafe's, community centres are needed to bring in more "life" into Wellawatte

Wellawatte can be made into an additional income generating hub through growing of organic vegetables, large scale recycling and other specific technologies built to generate income.

Unauthorized housing (slums) along the canal banks, which pose a threat to the development of Wellawatte should be removed

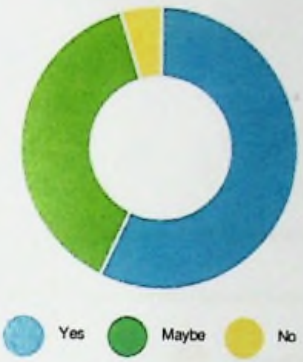
"Urban farming" can be defined as growing fruits and vegetables in small areas within cities, a process that is accompanied by many other complementary activities such as processing and distributing food, collecting and reusing food waste and rainwater, and educating, organizing, and employing local residents. Do you feel you would want to be a stakeholder in this venture within Wellawatte by having the chance to own

Galle Road should be made "one way" similar to Galle road from Bambalapitiya to Kollupitiya in order to the traffic.

Pavements should be made wider, encouraging more pedestrian interaction rather than vehicular movement

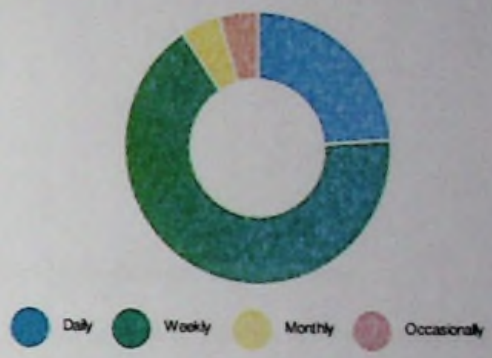
If a well organized "Water Transportation" system by way of the canals allowed you to travel by boat to areas outside of Wellawatte will you be willing to use it?

	Yes	Maybe	No	Standard Deviation	Responses
All Data	12 (57%)	8 (38%)	1 (5%)	4.55	21



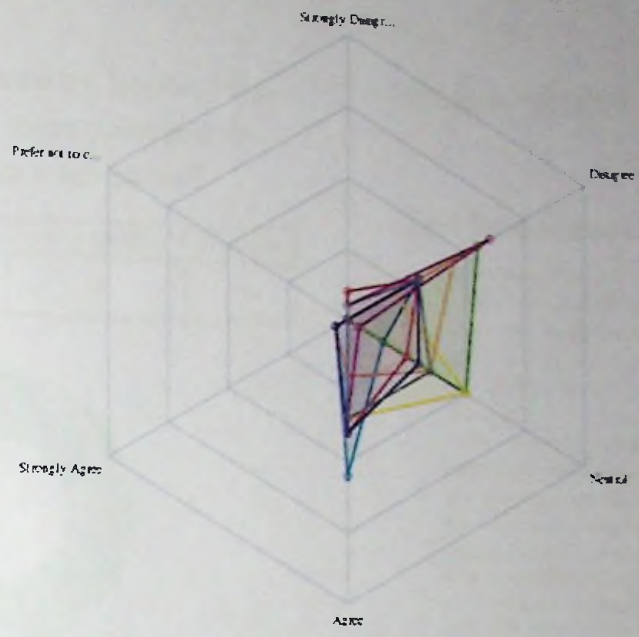
How often do you go to shops/services along Galle Road, Wellawatte(from bridge to bridge) to carry out personal tasks?

	Daily	Weekly	Monthly	Occasionally	Standard Deviation	Responses
All Data	5 (24%)	14 (67%)	1 (5%)	1 (5%)	5.31	21



Citizens of Wellawatte should have a strong committee willing to partner with private sectors and the Government in city development projects

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Prefer not to comment	Standard Deviation	Responses	Weighted Average
Wellawatte is able to handle an aging population - in terms of accessibility, safety and security for older people to move around the city	0 (0%)	6 (29%)	3 (14%)	11 (52%)	1 (5%)	0 (0%)	3.95	21	3.33 / 6
In terms of Housing and environmental health, houses in Wellawatte are well maintained and safe	0 (0%)	11 (52%)	10 (48%)	0 (0%)	0 (0%)	0 (0%)	4.96	21	2.48 / 6
Well being, happiness and quality of life in Wellawatte is satisfactory	0 (0%)	4 (19%)	10 (48%)	7 (33%)	0 (0%)	0 (0%)	3.91	21	3.14 / 6
The mix of culture has helped me learn more about different ethnicities and be able to mix freely	0 (0%)	9 (43%)	7 (33%)	4 (19%)	1 (5%)	0 (0%)	3.5	21	2.86 / 6
The houses are situated in a manner which promotes neighbourhoods and interaction between citizens	2 (10%)	6 (29%)	5 (24%)	8 (38%)	0 (0%)	0 (0%)	3.04	21	2.9 / 6
Wellawatte is child friendly and has a good environment for young families to settle down in	1 (5%)	12 (57%)	1 (5%)	7 (33%)	0 (0%)	0 (0%)	4.5	21	2.67 / 6
Wellawatte should be developed with more activities and services to bring in more people into the city	0 (0%)	6 (29%)	6 (29%)	8 (38%)	1 (5%)	0 (0%)	3.25	21	3.19 / 6
Bringing in people who would spend longer hours in the city partaking in varied activities pose a threat to the character and culture of Wellawatte	1 (5%)	6 (29%)	7 (33%)	7 (33%)	0 (0%)	0 (0%)	3.2	21	2.95 / 6
									2.94 / 6



Wellawatte is able to handle an aging population - in terms of accessibility, safety and security for older people to move around the city

In terms of Housing and environmental health, houses in Wellawatte are well maintained and safe

Well being, happiness and quality of life in Wellawatte is satisfactory

The mix of culture has helped me learn more about different ethnicities and be able to mix freely

The houses are situated in a manner which promotes neighbourhoods and interaction between citizens

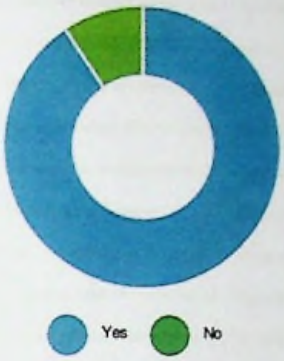
Wellawatte is child friendly and has a great environment for young families to settle down in

Wellawatte should be developed with more activities and services to bring in more people into the city

Bringing in people who would spend longer hours in the city partaking in varied activities pose a threat to the character and culture of Wellawatte

With the Beach so close by, do you think Wellawatte needs large open green community spaces like parks?

	Yes	No	Standard Deviation	Responses
All Data	19 (90%)	2 (10%)	8.5	21



Please elaborate your reason for the above answer

Text Responses

We have walking tracks now

apart from beach we should have some green park also.

Beach is unclean and unsafe, need more relaxed places

Need more open spaces

beach isnt clean anymore

To hang more

Activities on the beach and parks are different - so need to cater both

Beaches arent clean, can also get very crowded.

because children can't always go to the beach and need an area to play in safety.

Beach ONLY cannot fulfill the need of a park

Although beach is of easy access, it possess a threat to kids and adults because of the unsafe railway crossing.

Although beach is of easy access, it possess a threat to kids and adults because of the unsafe railway crossing.

.

Because right now the beach is not safe for normal people.

The beach isn't appealing anymore

For the need of more greenery

- Limitations to accommodate recreational activities in beaches
- sfety, beach vs park

Cause people can spend time leisurely

Because there are way too many buildings

The beach is almost walking distance for many, and I doubt there will be space for parks in Wella. Wellawatte has one grounds but it is situated in the middle of the slums and therefore not sure how many feel safe to use it. I mysell have never been there.

Greenery is always good, even if there is sea breeze.

Appreciate your answers on the following

Text Responses

What do you feel wellawatte has that no other city in Colombo has?	strong religious culture
What has changed the most in Wellawatte in the last 10 years?	its greenery
What is your earliest memory of Wellawatte which is not available today	less noise and commotion
Which location would you feel is the "heart" of Wellawatte?	kingross veach area
What do you feel wellawatte has that no other city in Colombo has?	transport, market, bank, beach
What has changed the most in Wellawatte in the last 10 years?	bank facilities, raod developmnt
What is your earliest memory of Wellawatte which is not available today	NA
Which location would you feel is the "heart" of Wellawatte?	Near market area
What do you feel wellawatte has that no other city in Colombo has?	alot of banks
What has changed the most in Wellawatte in the last 10 years?	so many apartment complexes
What is your earliest memory of Wellawatte which is not available today	quality of the eateries
Which location would you feel is the "heart" of Wellawatte?	rio
What do you feel wellawatte has that no other city in Colombo has?	stations of public transport being conviniently located
What has changed the most in Wellawatte in the last 10 years?	so much buildings
What is your earliest memory of Wellawatte which is not available today	friendly people during morning walks
Which location would you feel is the "heart" of Wellawatte?	Rio
What do you feel wellawatte has that no other city in Colombo has?	Alot of people of the same ethnicity
What has changed the most in Wellawatte in the last 10 years?	the beauty of it
What is your earliest memory of Wellawatte which is not available today	the beautiful view and network signals
Which location would you feel is the "heart" of Wellawatte?	Rio Ice cream parlour
What do you feel wellawatte has that no other city in Colombo has?	alot of people from Jaffna
What has changed the most in Wellawatte in the last 10	unnecessary apartments, completely spoiling the view

years?	
What is your earliest memory of Wellawatte which is not available today	The peace, serenity and view
Which location would you feel is the "heart" of Wellawatte?	The area near arpico
What do you feel wellawatte has that no other city in Colombo has?	Convenience and access
What has changed the most in Wellawatte in the last 10 years?	The rise of apartments
What is your earliest memory of Wellawatte which is not available today	The wellawatte overhead bridge
Which location would you feel is the "heart" of Wellawatte?	Marine drive \ beach or wellawatte market stretch
What do you feel wellawatte has that no other city in Colombo has?	a lot of saivar kades and beach accessibility
What has changed the most in Wellawatte in the last 10 years?	the increase in number of high rise apartment complexes
What is your earliest memory of Wellawatte which is not available today	more gardens and houses along lanes
Which location would you feel is the "heart" of Wellawatte?	market area to savoy
What do you feel wellawatte has that no other city in Colombo has?	Availability of almost everything
What has changed the most in Wellawatte in the last 10 years?	Number of Population
What is your earliest memory of Wellawatte which is not available today	Single houses
Which location would you feel is the "heart" of Wellawatte?	Surrounding thE Wellawatte market
What do you feel wellawatte has that no other city in Colombo has?	It has the access to all the essential commodities
What has changed the most in Wellawatte in the last 10 years?	Too many apartments how crowded the city.
What is your earliest memory of Wellawatte which is not available today	Walking along the by lanes and enjoying the gardens of different households
Which location would you feel is the "heart" of Wellawatte?	The wellawatte market
What do you feel wellawatte has that no other city in Colombo has?	It has the access to all the essential commodities
What has changed the most in Wellawatte in the last 10 years?	Too many apartments how crowded the city.
What is your earliest memory of Wellawatte which is not available today	Walking along the by lanes and enjoying the gardens of different housenolds
Which location would you feel is the "heart" of Wellawatte?	The wellawatte market
What do you feel wellawatte has that no other city in Colombo has?	.
What has changed the most in Wellawatte in the last 10 years?	.
What is your earliest memory of Wellawatte which is not available today	.
Which location would you feel is the "heart" of Wellawatte?	.
What do you feel wellawatte has that no other city in Colombo has?	Predominantly Tamil population
What has changed the most in Wellawatte in the last 10 years?	The number of apartment and housing units
What is your earliest memory of Wellawatte which is not available today	Less crowded walkways
Which location would you feel is the "heart" of Wellawatte?	The police station bus stand
What do you feel wellawatte has that no other city in Colombo has?	ice cream parlour
What has changed the most in Wellawatte in the last 10 years?	the freedom of playing sports along by-roads
What is your earliest memory of Wellawatte which is not available today	breadman
Which location would you feel is the "heart" of Wellawatte?	Rio ice cream
What do you feel wellawatte has that no other city in Colombo has?	Shopping convenience
What has changed the most in Wellawatte in the last 10 years?	Roads/ traffic
What is your earliest memory of Wellawatte which is not available today	Less traffic
Which location would you feel is the "heart" of Wellawatte?	High street junction
What do you feel wellawatte has that no other city in Colombo has?	24/7 access to Anything and everything at Anytime
What has changed the most in Wellawatte in the last 10 years?	Condominiums
What is your earliest memory of Wellawatte which is not available today	Unpoluted Canals & its banks
Which location would you feel is the "heart" of Wellawatte?	Junction
What do you feel wellawatte has that no other city in Colombo has?	Appartments
What has changed the most in Wellawatte in the last 10 years?	Lifestyle of people
What is your earliest memory of Wellawatte which is not available today	Not relavent
Which location would you feel is the "heart" of Wellawatte?	Boswell place
What do you feel wellawatte has that no other city in Colombo has?	nothing comes to mind
What has changed the most in Wellawatte in the last 10 years?	houses being turned into apartments
What is your earliest memory of Wellawatte which is not available today	trees and houses with gardens
Which location would you feel is the "heart" of Wellawatte?	the market
What do you feel wellawatte has that no other city in	[illegible]

[illegible] Colombo has?	everything you need at walking distance
What has changed the most in Wellawatte in the last 10 years?	more apartments complexes and bigger shopping complexes
What is your earliest memory of Wellawatte which is not available today	a quieter pavement for nice long family walks. I suppose it was less busy back then.
Which location would you feel is the "heart" of Wellawatte?	the wellawatte market junction with the 141 bus stand and station road etc.
What do you feel wellawatte has that no other city in Colombo has?	Shops
What has changed the most in Wellawatte in the last 10 years?	I don't know. I left a while ago
What is your earliest memory of Wellawatte which is not available today	Don't remember
Which location would you feel is the "heart" of Wellawatte?	Not sure
What has changed the most in Wellawatte in the last 10 years?	Population
Which location would you feel is the "heart" of Wellawatte?	Wellawate junction

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