GIS-Assisted Multi-Criteria Evaluation of Residential Site Suitability: Case Study of Homagama Divisional Secretariat, Sri Lanka

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Abstract

Rapid urbanization is a common phenomenon and it is hardly seen that effective measures were taken provocatively to establish planned cities in Sri Lanka. This has resulted the deterioration of living condition of the cities including loss of agricultural lands and recreation areas, improper planning of infrastructure facilities for residences, commercial and industries which eventually leading to many social and environmental challenges. This unprecedented growth in city population set tremendous pressure on both government and the people. Sri Lanka is no exception of the challenges coming ahead in the way forward for sustainable development with unhindered environment. Government has taken initiatives to develop Homagama as the model technological city incorporated with necessary educational intuitions, commercial ventures and amenities. Although different lands have been allocated for mixed development projects in the area, allotting and keep vacant areas for residential development are also

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essential. Detail research is needed to identify the socio-economic factors, available utilities, ground factors and environment factors in order to find the best locations for residential development. Hence this study attempts to conduct a land suitability analysis for residential suitability coupled with Analytic Hierarchy Process (AHP) and tools associated with Geographic Information Systems (GIS). The sample includes 19 experts and 125 potential residents of Homanagam who selected randomly for AHP analysis. The best suitable sites determined and mapped using the weighted overlay tool in the ArcGIS. The final suitability plots of GIS analysis showed that potential residents and experts preferred to developed peripheral areas of Godagama and Kahathuduwa town centers are highly suitable for residential development. Having aim to determine residential suitability areas in Homagama Divisional Secretariat (DS), this study identified residential locational suitability criteria, residential suitability GIS framework and developed guidelines for residential development for Homagama DS area.

Keywords: Analytic Hierarchy Process, Digital Elevation Model, Geographic Information System, Multi Criteria Decision Analysis, GIS-based Multi Criteria Decision Analysis

INTRODUCTION

The key aspect of urbanisation in the developing countries is the concentration of population in the urban periphery of the mega cities unevenly scattered manner and this individual competition for seeking suitable lands become more and more competitive as lands are shrinking at the urban domain.

Recent evidence reports that presently, over half of the global population accumulate in to the urban domain. The urban population was increasing at an alarming rate in developing countries as a result of push and pull factors influenced from third world urbanization. This issue is more intensified as these congested residential areas have no better access to basic infrastructure and facilities needed at an affordable rate for a better living. Therefore, urban planning requires serious attention on residential land

development. Although contribution of urbanisation is enormous in terms of economy, uncontrolled urbanisation would affect negatively in the long run to the physical, social and natural environment (Yaakup et al., 2005).

Sri Lanka in this century taking every effort in nation development having its attention in the subject of urban land use planning. Integrating all relevant and sensitive elements which includes socio economic factors, utilities, physical condition of the ground and the environment in to land use planning can help to make more sustainable urban planning in the future. Therefore, planning is an essential and effective tool which ensures that the growing cities as well as towns does not experience urban sprawl, poor waste management, environmental degradation, poor transportation management and poor living conditions of urban dwellers. Identification of suitable areas for residential development and allocating the same for future development projects during urban planning is highly essential. Dolapihilla (2000) argues that the disadvantages of unplanned settlements are twofold. Firstly, people lose commercially valued lands in settlements. On the other hand, best lands suitable for residential development would go to other mixed projects (Dolapihilla, 2000).

With the advancement of knowledge in the Geo-information Technology (GIT), decision making efficiency has increased in the field of urban planning and management due to the benefits associated with GIT (Yaakup et al., 2005). GIS along with Remote Sensing and Spatial Modelling have been used extensively in developed countries for urban planning and Sri Lanka also in the process of using GIS for urban planning activities. Suitability Analysis have been the common practice for site selection and the Analytic Hierarchy Process (AHP) can be used in selecting the suitable criteria and defining the weightages for selected criteria. Therefore, this study focused on selecting the appropriate residential lands as per the views of experts and potential residents in Homagama area using the suitability analysis assisted with AHP. With this backdrop the aim of the study is to identify locational suitability for residential development in Homagama Divisional Secretariat using GIS Multi Criteria Evaluation. This study uses increasingly available geo-referenced data to generate maps of residential

suitability at the local scale and follows the literature-based model integrated with properties to people's perception.

LITERATURE REVIEW

Urbanisation and Residence Planning

Urban planning of Sri Lanka started during British colonial period and transportation, shipping, business and administration activities have been centred on Capital Colombo. Workers in search of jobs particularly low income and middle-income populations moved to Colombo city suburbs resulting huge population with unplanned settlements. During this period, government lost many commercially valued lands due to unplanned settlement. To overcome these negative impacts, planning authorities of Sri Lanka introduced different guidance including Patrick Geddes Plan 1921, Abercrombie Plan 1946 and regulations such as Housing and Town Improvement Ordinance of No 19 of 1915. During the period of post-independence government introduced many proposals to curb the unplanned settlement yet some interrupted in between (Dolapihilla, 2000). With the liberalization of economy of Sri Lanka in 1977, then government established Urban Development Authority under the UDA Law of No 41 of 1978 with the objective of to promote integrated planning and implementation of economic, social and physical development of Sri Lanka.

Unplanned urban settlements are generally with poor quality and it is merely the poor attitudes, lack of management skills and behavioural patterns of the inhabitants. Along the path government implemented different policies to prevent occupation commercially valued lands for housing. At times government acquired commercially valued lands from occupants and offer them with suitable lands or housing facilities in alternative locations. Some areas with residential suitability were declared as housing development areas and situations created in order to force landowners to upgrade their simple single storied houses to multi storied apartments by using government subsidies. Housing schemes was another option introduce by the government with minimum infrastructure facilities (Dolapihilla, 2000).

Government being a facilitator focuses more on to the urban planning while encouraging public sector for housing development. The National Physical Planning Department is the government agency responsible to formulate national physical policies, plans and strategies and ensure that it's executed as planned. Kaiser and Godschalk, (2014) argues in his report that land use plan is the basic step in urban planning and it remains as the foundation for further planning activities. Therefore, further study is needed in addition to the National Physical Planning Policy and The Plan 2017 – 2050 in order to find the best residential areas in particular selected locality.

Residential Lands Attributes Quantification

There are different perspectives of different parts of the world when selecting locations for residences. However, studies suggest that future land use planning is about satisfying the residents and therefore, get them in the planning process (Godschalk, 2004; Hardekar et al., 2018). Taken together, these studies suggest the necessity of conducting a survey in order to get the opinion of different stakeholders including the opinion of local community when selecting housing locations. Studies identified following attributes are residential lands qualifications.

a) Land use and slope

Geometries and volumes of spatial objects, such as buildings, parcels, blocks, and connecting networks, constitute the built environment (both road and public transport networks) and land use. These things take up space; for instance, buildings host businesses and residences. These spatial objects can also be seen separately, such as the proportion of built-up area or the quantity of open space.

Different residential location models have looked at land-use mix, although the precise details are rarely included in most research. The detrimental effects of industrial land usage close to a residential area are frequently noted (Habib and Miller 2009; Weisbrod et al. 1980). Mixed land use excludes industrial land use with appropriate slope and solely distinguishes between residential and commercial (office and retail). In his analysis of Seattle, Waddell (2006) provides an indicator for mixed land use. His simulations demonstrate a benefit for young households. A favourable

approximation is also discovered by Guo and Bhat (2007) for families without a car. Additionally, they report a preference for mixed land use for the percentage of residential land use that is close to the residential location for a number of household types. The same research area, however, is the subject of a distinct impact reported by Pinjari et al. (2009), who also note that homogenous regions are preferred when utilizing land-use mix and commercial percentage as factors in their models for determining where residents should live. They do not distinguish between household types in their study, which predicts that families who choose urban regions, are young, or do not own cars enjoy mixed land use whereas other household types appear to prefer a more homogeneous neighbourhood. It has not yet been proven that homes with children may be further divided. The relationship between the built environment and decision behaviour in the research on residential site selection is still weak, at least in comparison to mode choice (Cervero and Kockelman 1997) and automobile ownership (Chu 2002).

b) Proximity to services

The discussion on locational proximity started with von Tunen (1826) in land-use modelling; he explained transport costs' effect on activity locations and land market function through a single market in an agriculturally based economy. The outcome of this discussion was bid-rent model. Later Alonso (1964) applies the concept of bid-rent to residential locations. In line with Alonso's model Lowry (1964) introduced the gravity model to determine the residential location.

Contemporary discussion on proximity to services focused on discrete choice framework. In this framework it is argued that decision maker relied on single alternative from a set of mutually exclusive alternatives where user trade-off utility of each alternative and select alternatives which provides highest level of utility. Close proximity to residential services regards as convenient for the people to live in. Studies on urban development, and urbanization confirmed that access to urban amenities is one of the most important factors when they select location for settlement (Allen, 2015, Schirmer et al, 2014). This convenience includes proximity to

urban centres, transport, schools, hospitals and recreational areas (Huang, 2019).

Schools and education facilities: This is one of the most common selection criteria for residential location where density of schools within the residential zone portrait positive relationship (Pinjari et al. 2009). Further another study of Axhausen et al. (2004) and Vyvere et al. (1998) confirmed a similar result where negative relationship noted in low density of school and preference on residential choice. However, there is no relationship found on tuition centres and residential location.

Recreation facilities: Studies on physical recreational centres such as gymnasium, and indoor sport centres and residential location choice confirmed the enhanced location utility (Pinjari et al. 2009, 2011). However, it is noted that there is minor influence on natural recreation centres. According to Pinjari et al. (2009) proximity to sport and recreation facilities to be generally positive, as long as noise is not a problem.

Transportation facilities: A study in Paris confirmed that households are not favourable on proximity of railways but preferred to located in areas to proximity for subways (de Palma et al., 2005). This is mainly due to noisy surrounding and multiple retail services around the train stations. Another study in Louvain-la-Neuve, of Belgium noted that residents preferred to settled close proximity bus stations (Vyvere et al. 1998). Individual car traffic and being close to highway exits are both considered positives by Habib and Miller (2009). Evidently, inhabitants benefit from living close to local public transportation stops (bus, tram, and subway), but only certain dependent groups of people prefer long-distance transportation services like railroad stations and highway exits. They would not be desirable if not for noise and pollution.

Urban Center: According to the Andrew and Meen (2006) location selection for residential place and proximity to urban centres varies with life cycles of the residents and show that households tend to move toward the city core when they are young and move away from the city later on. de Palma et al. (2005, 2007) show a significant negative value for a variable

representing the centre of Paris. Kim et al. (2005) includes a variable for city settlement in their stated preference survey of Oxfordshire. Their residential model shows a clear tendency to move out of the city as well. Belart (2011) and Bürgle (2006) define the central business district in Zurich as a spatial reference point and report a tendency for all households to move away from this spatial point. A considerable negative value for a variable denoting the centre of Paris is shown by de Palma et al. (2005, 2007). In their expressed preference survey of Oxfordshire, Kim et al. (2005) included a variable for city settlement. Their residential model clearly demonstrates a tendency to leave the city as well. Both Belart (2011) and Bürgle (2006) identify Zurich's central business area as a spatial reference point and note that all households have a propensity to emigrate from this location.

The distances to Mittelzentrum and Oberzentrum are provided by Axhausen et al. (2004). The distance to a major centre (Oberzentrum), according to their concept, is important to local households. The usefulness of a residence is positively impacted by proximity to smaller centre structures (Mittelzentrum). According to Axhausen et al. (2004), local centre structures are prized in residential location decisions whereas dense metropolitan environments are often rejected. The impact of four urban characteristics (urban centres, urban neighbourhoods, local village centres, and local village green neighbourhoods) on the choice of residential location for various household types was investigated in a second study by Zondag and Pieters (2005) using a more differentiated approach. Although several of their models report significant urban characteristics, it is not possible to distinguish general tendencies, which might rely on the household classifications. Other studies lead to assume that urban characteristics have an effect on residential location, closely related to life cycles of households. Households tend to move away from the city core during this later phase. However, all these models lack urban characteristic variables. The extent and dimensions of the city core are not clearly defined, nor is the location of a single spatial reference point pinpointed. The definition of a point or zone as urban core thus seems less convincing as they are not reproducible or defined; this again makes studies difficult to

compare. Instead, it believes that models should investigate capturing these characteristics using other spatial variables, e.g., built density, density of services, and public transport density. Also, a further differentiation of household types should be attempted, as young households tend to favours urban areas. As a side note, not only does location choice behaviour differ, but also relocation probability changes over a life span and is additionally influenced by life-cycle events such as a change of marital status, a job change, or the birth of a child (Andrew and Meen, 2006; Beige 2008; Eluru et al. 2009; Kim et al. 2005). According to Madurika and Hemakumara (2017), people prefer to settled in primary residential zones rather live in mixed development zones. Adding to this, a study of Manatunge et al (2017) identified that surrounding area, infrastructure, distance to public offices are important criteria for selection of a residential site.

Health facilities: locating a hospital in an urban area has both advantages and disadvantages. Positive effects can include rising property values in the vicinity's peripheral and improving local inhabitants' access to healthcare. Therefore, a positive relationship noted on residential location and availability of health facilities. However, negative effects including environmental degradation and the appearance of new traffic waves on the district's transportation network are more significant. In fact, there is an influence on the nearby neighbourhood in the form of more traffic, more emergency vehicles being used in residential areas, etc. However, as living conditions and quality of life have improved, inhabitants have become more health concerned, which accounts for the rise in consumer demand for high-quality healthcare. Additionally, medical service authorities frequently work to strengthen organizational structure and urge hospitals to implement management strategies that will increase their competitiveness (Wu et al., 2007).

c) Population density

Population density shows the comfortability of living (Calhoun,1962). Studies confirmed that high population density negatively effect on psychological or pathological health of adults. These effects include psychological withdrawal (Regoeczi, 2008), stress (Valins et al, 1973),

aggression (Clark, et al, 2010), and loneliness (Wenz, 1984). Not only that overcrowding negatively impact on parent child relations (Evans et al 1998), less responsive parenting (Wenz,1984), and increased child behavioural problems at school (Evans et al, 2001). In this context it is argued that population density of residential areas is an important factor in urban residential land suitability analysis.

d) Land value

Sales price or rental charges are frequently included in the model specification because cost is such a key factor in deciding on a residential location. As observed in hedonic regression models (i.e., models like Löchl and Axhausen 2010), pricing captures a variety of location factors, but any models that incorporate property price emphasize its strong negative influence. While some research (Andrew and Meen 2006; Kim et al. 2005; Vyvere et al. 1998; Zolfaghari et al. 2012) use price as a non - proliferating variable, others incorporate a logarithmic price transformation (de Palmaet al. 2005, 2007; Habib and Miller 2009; Lee and Waddell 2010).

Numerous research examines how household income and pricing interact (Habib and Miller 2009; Zolfaghari et al. 2012). When limiting the choice set based on price, Zolfaghari et al. (2012) notices a positive price impact, showing that households select the best option available within a specific price range. When it is the only price-related variable in the model specification (Belart 2011; Bürgle 2006; Lee and Waddell 2010; Waddell 2006; Weisbrod et al. 1980), the ratio of price to family income is also significant.

The integration of the ratio and, eventually, the logarithmic transformation appear fair given Walker and Li's (2007) observation that price sensitivity declines with increasing wealth. As an alternative, price and income group interactions can enhance model estimates even more.

Both Srour et al. (2002) and Waddell (2006) investigate how improvements affect home value. Both studies find that all household types assessed regard this attribute favourably; this is not unexpected given that a highly valued building should guarantee a high degree of quality. Weisbrod et al. (1980)

surprisingly discovered no evidence of a substantial effect from this variable. Price endogeneity where the price of the unit is connected with the model's error term is a significant problem with the inclusion of price in residential models. This may be because factors that are correlated with price are excluded.

According above review, the scope of this study is formulated by considering following criteria (see Table 1: Criteria for Suitability Analysis) when selecting suitable areas for residential development. Degree of preferences will be collected through a survey from potential residents and Analytic Hierarchy Process will be utilised to calculate the weightages.

Table 1: Criteria for Suitability Analysis

Attribute	**Criteria for Evaluation**	**Source of Information**
Development potential	Lands free from conservation & water bodies and within the developable lands/gardens	Land use map
Suitable slope	Existing government policies	Digital Elevation Model (DEM)
Proximity to urban centres	Distance from existing urban centres	Land use map
Proximity to transport	Distance from existing roads	Land use map
Proximity to schools	Distance from existing schools	
Proximity to hospitals	Distance from existing hospitals	Land use map
Proximity to recreational areas	Distance from existing recreational areas	Land use map
Land value	Reasonable and preferred land values	Land value map
Population	Preferred population density	Population density map

Source: developed by authors based on the literature review

Application of GIS in Urban Planning

Popularity of the GIS in urban planning grows as decision makers often needed the visual representation of spatial data on maps based on the specific criteria defined (Witlox, 2005). GIS involves in urban planning as a tool for managing and analysing spatial data. It embraces different application during different stages and functions of planning. Most importantly the integration of GIS with world wide web has enhanced its capacity to reach the public and to get them participate in planning process (Yeh, 1999).

Identification of potential sites (suitability analysis) is the main use of GIS in urban planning (Javadian, et al, 2011). Recent literature suggests that GIS have been used extensively for site selection and suitability analysis remains the most widely used spatial analysis method in GIS while multi-criteria decision analysis (MCDA) tools being the widely used land suitability analysis tools available in GIS for site selection projects (El Sayed, 2018; Malczewski, 2004; Munasinghe et al., 2017).

Integration of GIS and AHP for Suitability Analysis

The AHP is a widely used tool in MCDA since AHP is used to rank criteria and determine weightages for each defined criteria through pair-wise comparison (Chandio et al., 2013; Duc, 2006; Jankowski, 1995; Saaty, 1987; Saaty, 2008). Saaty (1987) introduced the AHP tool which can be used in decision making to select best out of many competing choices and to rank them accordingly. Findings of many contemporary researches confirms the advantages associated with the integration between the GIS and AHP for land suitability analysis (Chandio et al., 2013; Duc, 2006; Javadian et al., 2011; Malczewski, 2004; Mohit and Ali, 2006; Munasinghe et al., 2017).

Literature survey of the Chandio et al., (2013) shows GIS and AHP integration has been widely used for geo-spatial problem solving particularly in the field of land use suitability for decades. Integration between AHP and GIS not only contribute for developing short term

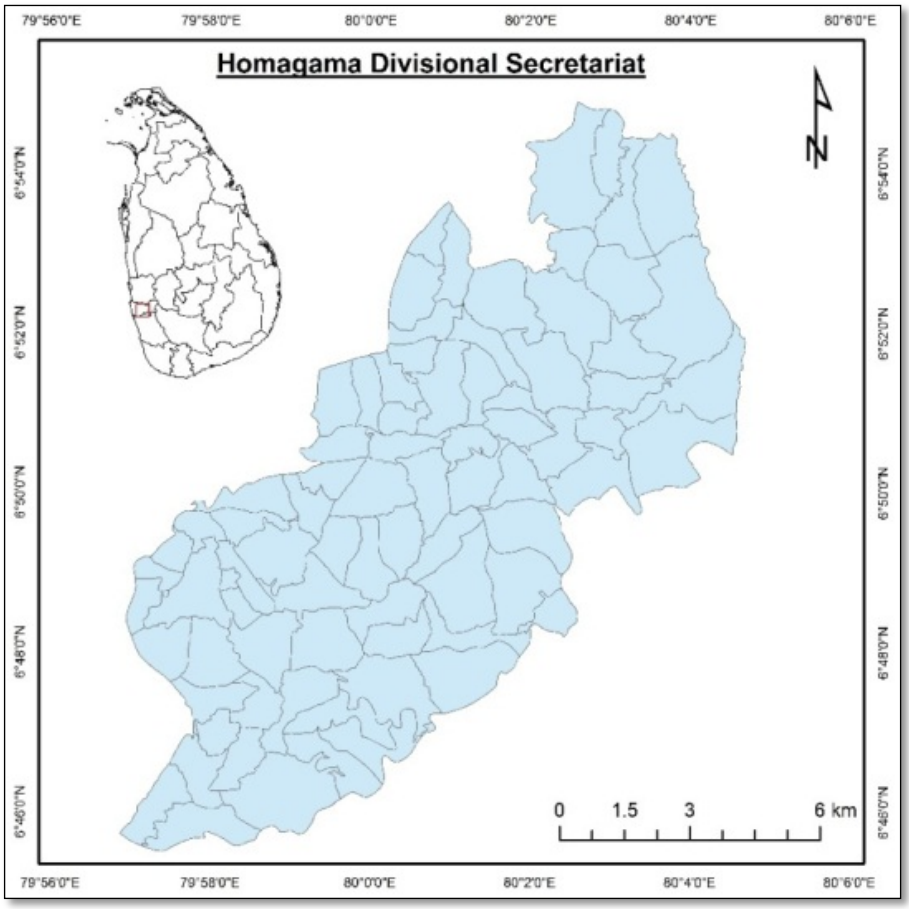
planning tasks but also for developing long term strategic policies (Mohit & Ali, 2006).

STUDY AREA

It is significant to notice that many contemporary planning has identified Homagama as a potential city for development. It has been declared as an urban development area under the Gazette Notification, No 4/1 dated 30 September 1978 having identified its potential and feasibility. Homagama Divisional Secretariat Division (DSD) is situated in the Colombo district and is 21 km away from the city of Colombo. Land is spanned across 133 sq.km. and estimated population is 236,201 based on the 2012 census (Jayaweera, 2014). Further, it is comprising of 81 Grama Niladari Divisions (GND)

Homagama DSD is also becoming the centre of attraction due to developments associated with the concept of Green Expert City focusing Homagama. Hence there is a high demand for residential uses focusing the advantages associated with governmental development programmes. Competition in progress in seeking land slots suitable for commercial, industrial and service development versus residential development. However, finding suitable land slots for residential development is a tedious task as it needs several sensitive elements to be accomplished. Therefore, detail study is required to identify the availability of suitable land slots for residential development in Homagama Divisional Secretariat before best lands are allotted for other development projects. Refer figure 1 for study area map.

Figure 1. Study Area – Homagama Divisional Secretariat



METHODOLOGY

This research incorporates three major steps in selecting the suitable sites for residential development. This includes (a) Identification of factors for consideration, (b) Weighting of identified factors and (c) Mapping the suitable areas.

Identification of factors is developed through the literature review while weighting is based on the inputs of professionals, customers, policy makers and entrepreneurs through the primary data collection Criteria for the suitability analysis were selected based on the literature review and weightages for each criterion and sub criterion were given based on the

preferences of prospective residents and experts who have experience in the urban development projects and urban planning. Total of 19 experts and 125 potential residents of Homagama participate for this analysis who were selected using convince sampling method. Individual expert 's experience was utilised to estimate the relative importance of each criterion through pairwise comparison. Finally Analytic Hierarchy Process was used to calculate the weightages for each criterion tested. Meanwhile the best suitable sites will be determined and mapped using the weighted overlay tool in the ArcGIS.

ANALYSIS OF RESULTS AND DISCUSSIONS

Calculation of Criterion Weights and Criterion Maps

Opinions received from experts were purely used to weigh the main criteria while the opinions of prospective residents were used to weigh the sub criteria. Value categories for sub criterion were derived at the literature review based on previous studies and also due to imposed restriction from local authorities. Weightages obtained after analytical hierarchy process and pairwise comparison are summarised as tabulated in the following matrix (see Table 2).

Table 2: Weight and Scale Matrix for Criteria and Sub Criteria

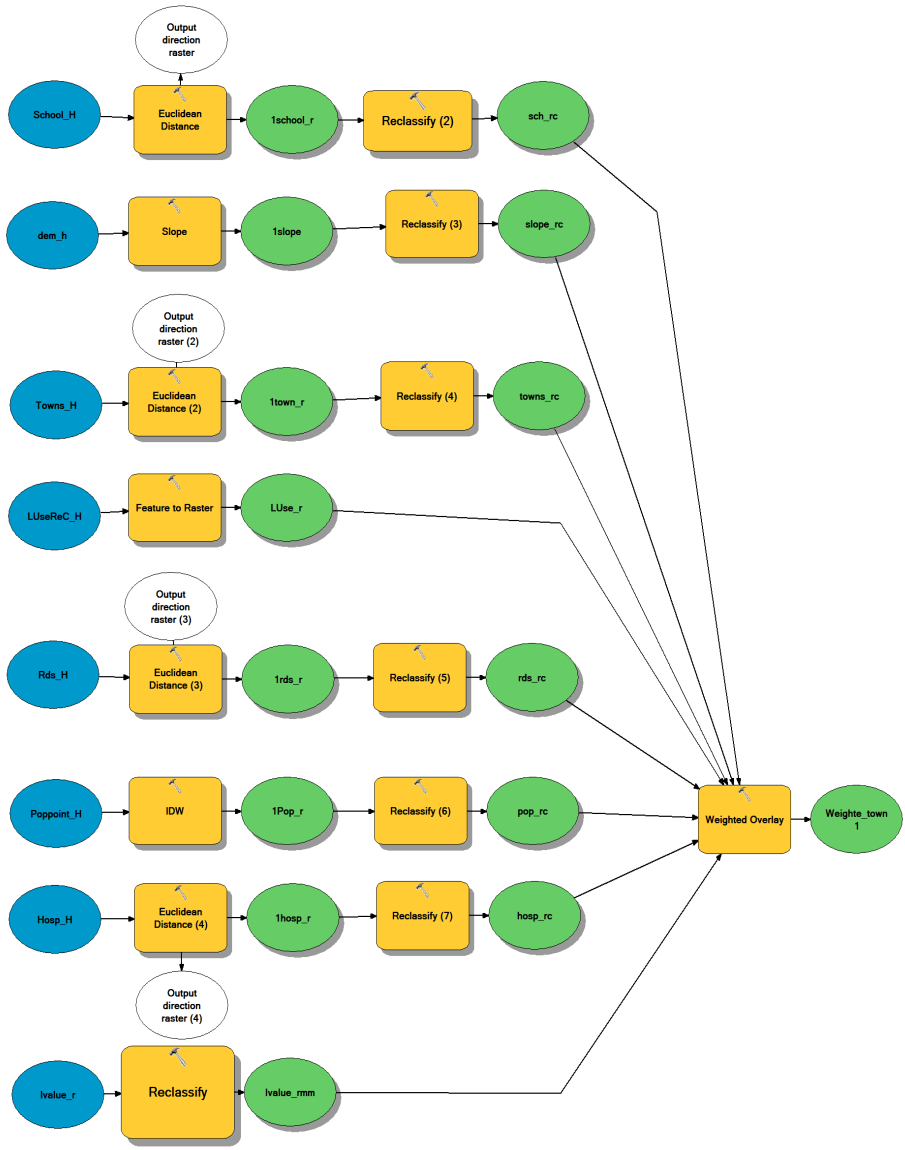
No	Criteria	Weight for Criteria	Percentage	Sub Criteria	Weight for Sub Criteria	Scale Value
1	Proximity to schools	0.26	26	1Km >	0.4753	9
				1Km – 2Km	0.3067	6
				2Km – 3Km	0.1624	3
				3Km <	0.0556	1
2	Land Slope	0.14	14	11^0 >	0.7014	9
				11^0 - 31^0	0.2392	3
				31^0 <	0.0594	1
3	Proximity to urban centres	0.15	15	1Km >	0.4224	9
				1Km – 2Km	0.3404	7
				2Km – 3Km	0.1763	4
				3Km <	0.0609	1
4	Land use	0.11	11	Residential	0.5841	9
				Commercial	0.2174	3
				Vegetation	0.1422	2
				Paddy	0.0563	1
5		0.16	16	400m >	0.5206	9

	Proximity to Road network			400m - 800m	0.2878	5
				800m - 1200m	0.1426	2
				1200m <	0.0489	1
6	Population density	0.06	6	2500 >	0.6030	9
				2500 - 6000	0.3161	5
				6000 <	0.0808	1
7	Proximity to Hospitals	0.05	5	1Km >	0.5757	9
				1Km – 2Km	0.3334	5
				2Km <	0.0909	1
8	Land value	0.07	7	Rs. 0.5M >	0.6503	9
				Rs. 0.5M - 1M	0.2737	4
				Rs. 1M <	0.0760	1

Having analysed the opinion of prospective residents and professionals, it was found that the proximity to schools (26%) have the highest preference of the prospective residents when selecting residences in Homagama DS while proximity to hospitals (5%) have the least preference. It was also interested to notice that population density and land value were also least bothered by the residents having less than 10% of preference.

Tools associated with ArcMap were used to create a geospatial data base to store raster and vector data required to analyse eight criteria. Complete model was developed to prepare criterion maps for each criterion and accordingly eight basic maps were developed.

Figure 2: Model for Residence Suitability in Homagama Divisional Secretariat

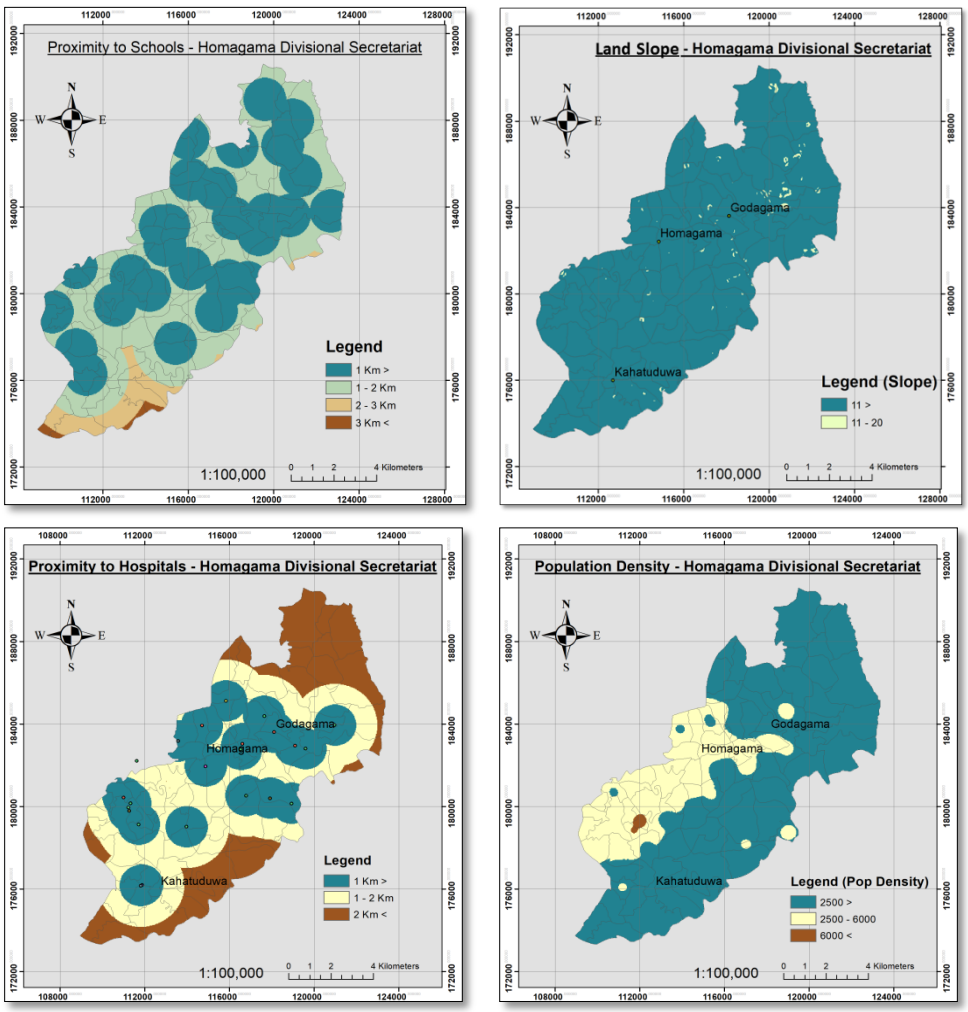


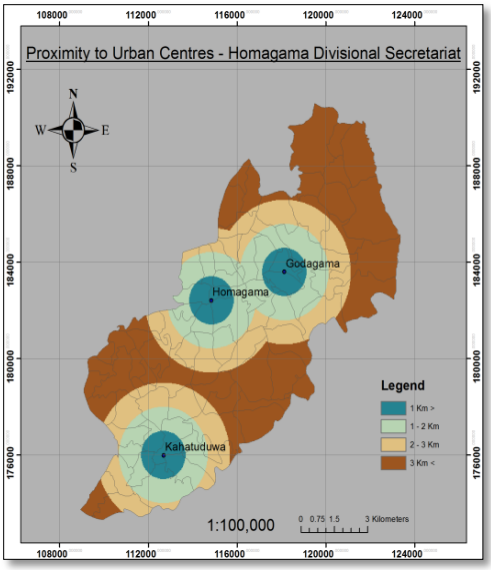
Eight layers relevant to the study area were used in this model to select the best areas for residential development. Yet this model can be applied to any part of the Sri Lanka since the local opinion and regulations were considered during the study. Additional criteria could be integrated in to this model for consideration with similar datum transformations and similar cell size raster files. As an example, if the crime intensity is needed to consider when

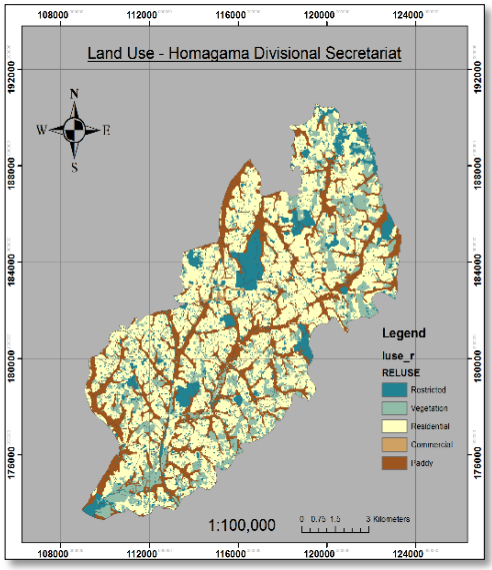
finding areas for residential development, crime sub model with associated tools could be integrated in to the weighted overlay model for analysis.

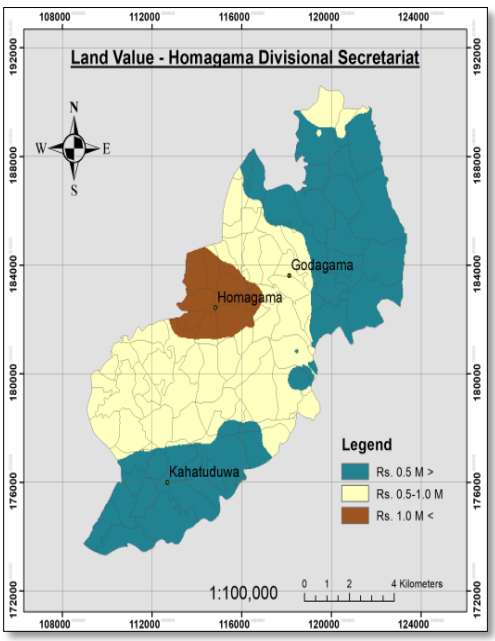
However, it's important to note that if any additional layer is added to the model for analysis, it is essential to conduct the questionnaire survey for the main criteria and for the newly added sub criteria from the beginning since pairwise comparison is needed among all main criteria to assign weightages.

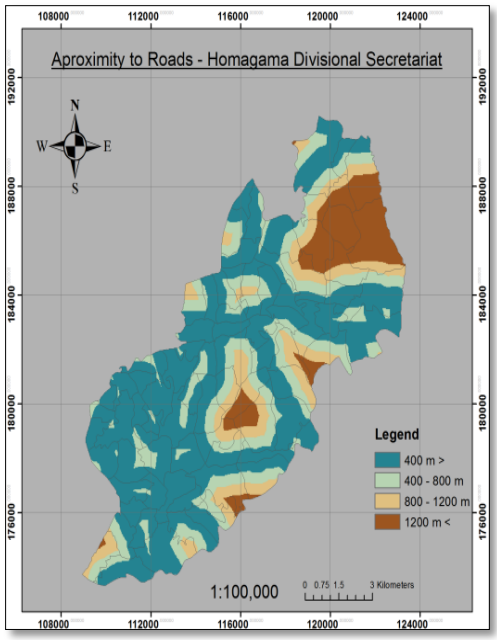
Map 3: Criterion Maps




Proximity to Urban Centres - Homagama Divisional Secretariat
N
W
E
S
Godagama
Homagama
Kahatuduwa
Legend
1 Km >
1 - 2 Km
2 - 3 Km
3 Km <
1:100,000
0 0.75 1.5 3 Kilometers


Land Use - Homagama Divisional Secretariat
N
W
E
S
Legend
luse_r
RELUSE
Restricted
Vegetation
Residential
Commercial
Paddy
1:100,000
0 0.75 1.5 3 Kilometers

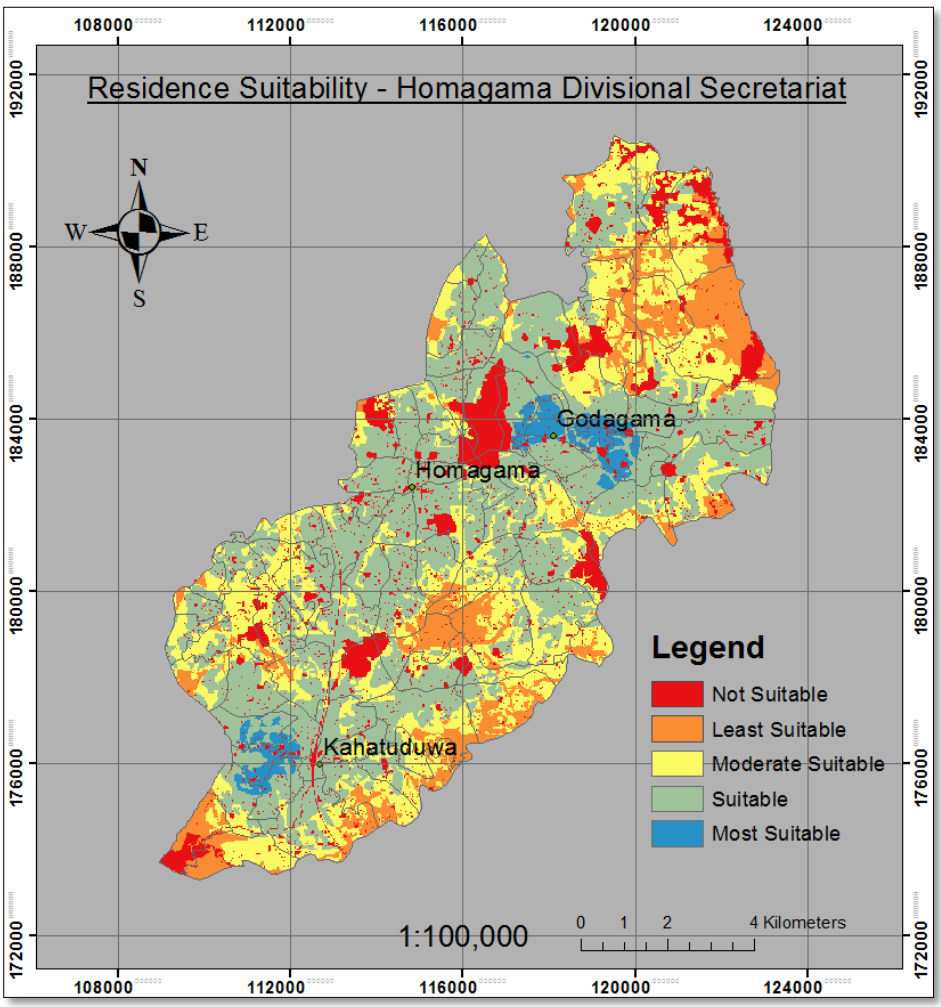

Land Value - Homagama Divisional Secretariat
N
W
E
S
Godagama
Homagama
Kahatuduwa
Legend
Rs. 0.5 M >
Rs. 0.5-1.0 M
Rs. 1.0 M <
1:100,000
0 1 2 4 Kilometers


Aproximity to Roads - Homagama Divisional Secretariat
N
W
E
S
Legend
400 m >
400 - 800 m
800 - 1200 m
1200 m <
1:100,000
0 0.75 1.5 3 Kilometers

Final Suitability Map: Residence Suitability Map

Weighted Overlay was the tool being used to determine the influence of each criterion when selecting the most suitable areas. Each raster map created based on the sub criterion categories and all raster maps were finally analysed to create a single suitability map.

Figure 3: Residence Suitability Map – Homagama



The Residence Suitability Map of Homagama (Figure 4) reveals the complete residence suitability layout in Homagama Divisional Secretariat having considered the prospective residents and the experts' opinion. There are five suitability categories were determined to describe the study area

i.e., not suitable, least suitable, moderate suitable, suitable and most suitable.

As tabulated in Table 3 only 2.97 % (3.531 sq.km.) is most suitable for residential development while over 73% either suitable or moderately suitable for residences. These findings together reconfirm the residential potentiality in Homagama DSD. Despite its potential, it is significant to notice that over 11% area is restricted for development projects in Homagama. Considerably more area is being restricted due to the existence of defense and industrial facilities.

As can be seen from the Figure 4, although Homagama city has basic services needed for social needs of the residents, most suitable areas are focused in and around of Godagama and West of Kahathuduwa. Possible explanation for these results may be the high land value to the proximity of Homagama City as clearly shown in the Figure 3: Land Value Map, although only 7% weightage preference is found for land value main criteria. Evidence from this study suggests that, although other criteria are met to develop residential area, land value has a great bearing on the customer preference.

Table 3: Summary of Residential Suitability – Area and Percentage

Suitability Category	Area Sq.Km.	Percentage (%)
Most Suitable	3.531	2.97
Suitable	54.607	45.94
Moderately Suitable	32.995	27.76
Least Suitable	14.646	12.32
Not Suitable	13.09	11.01

CONCLUSION

This research collected the preference from consumers, entrepreneurs, professionals in the construction field and policy makers in the governmental regulation authorities. Hence, best weightages were obtained having identified the factors essential for consideration through AHP. AHP found that, proximity to schools (26%) have the highest preference while proximity to hospitals (5%) has the least out of eight main criterions. Having

summarised the findings of the research, it can be concluded that over 76% of lands available in Homagama DSD has potential for residential development.

Findings of this research is beneficial not only the prospective residents but also to many stakeholders who involves in property development and commercial activities. Urban development authority, Homagama divisional secretariat, Road Development Authority, property developers and miscellaneous service providers such as water supply, electricity, garbage collection, disaster management, and environmentalists are few beneficial parties among many.

This study revealed that GIS analysis and output model of this research could be used for spatially related applications for suitability analysis and to speed up the cohesion among all relevant stakeholders for sustainable development.

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