Green infrastructure policy for sustainable urban development

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Abstract: Green infrastructure refers to the network of natural and semi-natural areas, features and spaces in rural and urban areas, terrestrial, freshwater, coastal and marine areas. Green infrastructure can be strengthened through strategic and coordinated initiatives that focus on monitoring, restoring, improving and connecting existing areas and features as well as creating new uses and features. The principal issue that stimulates this work is to observe how planning policies could contribute towards achievement of sustainable urban development in Malaysian urban centres using GI attributes. The procedure involved for conducting this work was qualitative content analysis of planning policies that guides physical development of Peninsular Malaysia. The analysis conducted revealed the comprehensiveness of the GI. The policies give more emphasis on protection of natural areas, followed by conservation of Malaysian environment and provision of urban green spaces. The provision of urban trail was not provided anywhere in the policies analysed.

Keywords: green infrastructure; sustainable urban development; Malaysian planning policies; content analysis; protection of natural areas; provision of urban trail (green corridors); conservation; open space.

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1 Introduction

Green infrastructure (GI) refers to the network of natural and semi-natural areas, features and spaces in rural and urban, terrestrial, freshwater, coastal and marine areas. These together enhance ecosystem health and resilience, contribute to biodiversity conservation and benefit the human population through the maintenance and enhancement of ecosystem services. GI can be strengthened through strategic and coordinated initiatives that focus on monitoring, restoring, improving and connecting existing areas and features as well as creating new uses and features (Naumann et al., 2011). The definition has clearly demonstrated the need to achieve the desired services of the ecosystem through enhancing network of green spaces that can ensure efficient liveability, conservation of nature and promote the interaction of biodiversity which would in turn assist human community by providing ecosystem services. Thus, conscious effort is required in restoring and conserving existing ecosystem. To restore ecosystem services, proper network strategy must be employed to connect various existing patches of landscape and water bodies in such a manner as to establish integrated network of natural and semi natural features as advocated by GI concept. Sustainable urban development resolves the complex concept of quality of life, economic growth, social cohesion and environmental protection by promoting the idea of balance among economic development, social equity, efficiency and environmental conservation (Albu, 2013). The argument of sustainability is prevalent in only areas that are recognised as urban centres, because of substantial impact caused by physical development. Therefore, GI could be seen as the stimulant of sustainable urban development as both the two concepts promote conservation of environmental resources.

Environmental problems are inter-connected, for example, the problem of deforestation has effects on water quality (Dessie and Bredemeier, 2013) and air pollution (Cho et al., 2014). Once an area is selected for urban expansion which calls for massive clearance of forest reserve, the area in question if not properly designed would facilitate increases in surface run-off which would consequently accelerate the rate at which soil erosion is occurring and thereby causing siltation of rivers and lakes (Owens et al., 2005). Acidification of water bodies and soil composition play vital role in destruction of forest reserve. These links call for sustainable approach in the management of the environment. This indicates that if there is a concerted effort to face these challenges enumerated, the green open spaces would improve soil quality and thereby help in protection against flash flooding, erosion and other environmental issues that threaten the pleasant habitation of urban areas (United Nations, 1987).

GI is proven to provide urban communities with varieties of services and seeks to reduce the impact of physical development to achieve green growth (Hammer et al., 2011). Biodiversity is a component of GI which promotes the preservation of living creature such as plants and animals which are living in an interconnected web system. They assist in purifying water through purification and the hydrological cycle influences. They provide healthy food through adequate supply of soil nutrients. They serve as a carbon sunk through evapotranspiration, mitigation and adaptability to climate change impact through storing excess water and releasing them slowly to prevent soil erosion and absorption of pollutants (Lucas et al., 2011). GI adds tangible value to communities in economic, social, and environmental terms by creating places that are more resilient to climate change and distinct local character with scenic quality that people want to live, work, and visit; places that promote wellbeing, productivity, educational benefit, crime reduction; and places where communities can actively engage their local environment (The Wildlife Trusts, 2012). Thus, GI is a planning framework that facilitates sustainable urban development.

GI facilities promote social cohesion through recreational services (Hisyam et al., 2012), through the provision of pleasant green open spaces that can attract public users to visit and to recommend the site to family and friends, as well as a well maintained, clean and secured recreation centre within a walking distance which encourages patronage. Therefore, it promotes social wellbeing and community cohesion (Pasaogullari and Doratli, 2004). Green Park as an attribute of GI when designed with diverse facilities, promotes higher adult visits. Green open spaces are also part of GI attributes, and they can serve as a meeting point of urban population and place of recreation that enhance the health status of urban residents. Therefore, this work is designed to systematically analyse planning policies on GI for sustainable urban development.

Urban green space provides several benefits to urban population when managed and integrated in developmental plan. Pristine landscape provides more benefit than single value benefits provided by other grey infrastructures, for its ability to provide multifunctional services. Landscape that is well accessible is found to enhance cultural value in terms of provision of recreational service (De Groot et al., 2010). In order for recreational facilities to provide such services, the facilities in question must be well connected and accessible to various groups of urban population ranging from small children to senior citizens. They must have the essential facilities to attract urban population (Niemelä et al., 2010). The ecological preference lies in the diversity and the educational awareness of the people under study. The Malaysian people appreciate the value of GI toward the promotion of sustainable development as indicated by policies analysed in this study and other related literatures.

A green open space that is rich in various classes of plants, varieties of birds, and recreational facility with ancillary playing spaces and facilities that are well connected to residential land use attracts urban population to engage in physical exercises, and observe scenic beauty. It has great potentials especially in a country where people are employed in static and computerised places (James et al., 2009). The present modern society are living a substantial part of their life indoor; therefore, bringing urban green space close to their houses, and offices would encourage participation to do recreational activities during their leisure time. These would improve their psychological and mental health status.

Biodiversity influences human contact with nature thereby enhancing their well-being and recreational services, whilst promoting relaxation and community cohesion (Li et al.,

2005). It is proven that green view, influences job satisfaction and hence promotes productivity (Ambrey and Fleming, 2012). National park of Athens provides scenic beauty and provides the populace with cool and quiet place in a noisy city, which is a unique quality of green spaces in absorbing noise pollution (Brett-crowther, 2011). Therefore, incorporating GI in Malaysian urban areas would facilitate sustainability through enhancing the quality of urban areas and subsequent attraction of economic value of the landed properties and promote social cohesion, which are basic stimulant for sustainable urban development.

2 Comparison between urban green space provision in Kuala Lumpur and Putrajaya

Kuala Lumpur is the former capital city of Malaysia, with federal territory status while Putrajaya is the present administrative town of Malaysia, which also has federal territory status. Kuala Lumpur was developed as a mining city without a prior recognised master plan that would guide the physical development of the then town. However, on the achievement of federal capital territory, the city experienced substantial physical development, which prompted the city council to incorporate sustainable development attributes. The Kuala Lumpur City Council set as its target the enhancement of the well-being of its people by providing sufficient urban green spaces in an effort to have a green city. This responsive effort indicates the recognition of Kuala Lumpur's City Council of the GI's ability to promote sustainable urban development.

Despite the remarkable achievement of promoting the green city in Kuala Lumpur, the city is still in short supply of urban green spaces. The present supply of urban green spaces in Kuala Lumpur stands at 2,088.21 hectares (Town and Country Planning of Peninsula Malaysia, 2014), with a total policy requirement of 3,340. This indicates a deficit of about 1,251.79 hectares of green open spaces, accounting for more than 37%. Meanwhile, Putrajaya, the current seat of the Malaysian prime minister, is a city that was planned as a green garden city, which implied that the city was developing with considerable concern about the environment. Though Putrajaya is in its infant stage of development when compared with the highly urbanised Kuala Lumpur, the target populations that are conceived to be accommodated when fully developed extend to 350,000 residents and a floating population that will come to the capital city for work (Putra Perpadanan). The present population of Putrajaya is only 72,413 (Department of Statistics Malaysia, 2014), with lush provision of green open spaces that covers a total land area of about 37% of the total developed land in Putrajaya (Putra Perpadanan). Though Putrajaya does not have an existing natural forest within its enclaves, a conscious effort geared toward the creation of the garden city actualised the provision of the desired green open spaces in the city. This has helped the city managers to establish many pleasant green open spaces. The city, which is controlled by Putrajaya Corporation, has surrendered 1,603.01 hectares as urban open spaces. The actual requirement of Putrajaya is just 144.83 hectares. This signifies that Putrajaya has a surplus provision of green open spaces that amounts to about 1,158.18 hectares.

3 Methodology

3.1 Data collection

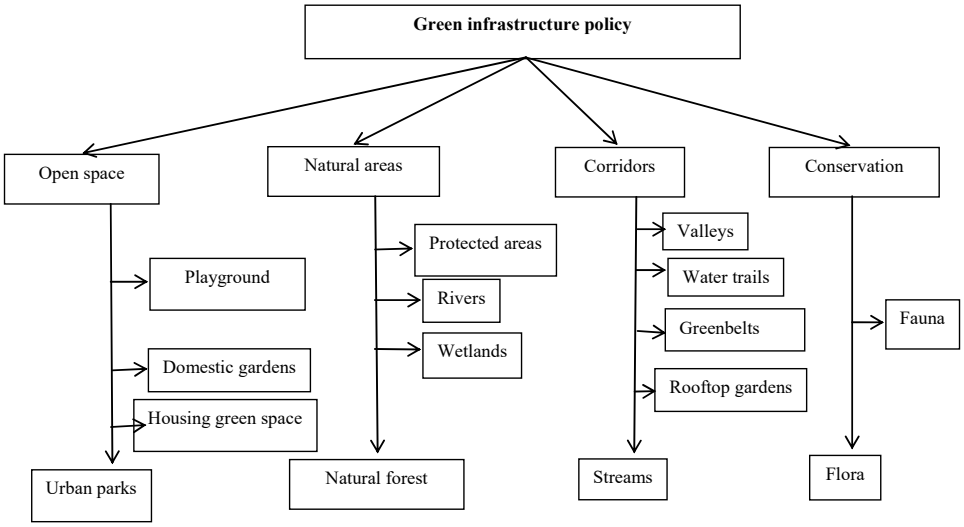
Data relevant for conducting qualitative content analysis were obtained from Malaysian policy documents that have direct influence on development and management of Peninsula Malaysia physical environment, which could specifically be regarded as planning policy for the purpose of this research. These documents include Federal Department of Town and Country Planning Act (FDTCP) (Act 172), National Urbanization Policy (NUP), National Physical Plan 2 (NPP 2), and Local Government Act (Act 171). All the four policy documents selected were downloaded from the website of FDTCP Peninsula Malaysia; with the exception of NPP 2 which was only available in Bahasa Melayu, but a copy of English version was later obtained from the staff of FDTCP, Peninsular Malaysia. Meanwhile, these policy documents were analysed qualitatively in order to provide clear picture of presence or otherwise of GI regulation aimed at enhancing Malaysian sustainability agenda.

3.2 Data analysis

The study used qualitative content analysis in ascertaining the comprehensiveness of planning policies with direct bearing to GI provision in Malaysia. To allow for robust qualitative document analysis, there is the need to categorise GI into various attributes that would give all the necessary ingredients needed for categorising the policy documents. The categories are open space, natural areas, corridors, and conservation; as generated from five scholarly articles published by Elsevier, and *Journal of Planning*, respectively; with specific titles on GI attributes (McMahon, 2000; Weber et al., 2006; Tzoulas et al., 2007; Wise, 2008; Hostetler et al., 2011). These attributes are regarded as building blocks for analysing the GI policy. Meanwhile, any of the four documents chosen for the purpose of this analysis in its own individual capacity is ranked equally. Any item of the GI attributes to be analysed in this work is weighted equally, with each scoring one to three points depending on the adequacy and sufficiency of the section that effectively dealt with the issue raised by the policy. Therefore, a document that contains the entire four mentioned GI attributes are considered to score maximum point of 12, policy document that contains three of the GI attributes scored nine and so forth, while the one that does not contain any of the attributes mention would be ranked as zero accordingly. The scoring is based on how the provided section is able to tackle the desired objective in the policy document. A ‘good’ score entails a score of three points; ‘okay or average’ is to score two, while ‘limited’ coverage of a given section would attract a score of one point respectively.

The emergent subcategories were analysed using inductive approach in which the themes and categories were generated from the policies related to GI attributes, and not deductive method that needed to be developed from previous theories (Patton and David, 1993). Content analysis is a research method for making replicable and valid inferences from data to their context, with the purpose of providing knowledge, new insights, a representation of facts and a practical guide to act. Meanwhile, content analysis is suitable for this research; as the research seeks to explore whether the four planning policy documents analysed have adequately provided provisions for GI attributes in order to actualise the vision of making Malaysia sustainable city by the year 2020.

Figure 1 Showing GI attributes



4 Results

The documents analysed in this work are planning policies that drive the development activities in Peninsular Malaysia with sustainability as their guiding principle. The FDTCP is the agency responsible for leading development activities in Peninsular Malaysia; the policy instrument used by the department is the 'Town and Country Planning Act 1978' (Act 172).

Section 2A of Act 172 provides for the establishment of a 'National Physical Plan Committee', with responsibility for promoting physical development and environmental conservation within the framework of the Malaysian national policy, and the use of Act 172 for the achievement of sustainable urban development in Peninsular Malaysia. The council is also responsible for advising state governments on matters related to physical development. The instrument used for guiding the activities of the council is the National Physical Plan, as provided for, in Section 6A(1) of the Act, which is designed and reviewed every five years in tandem with the five-year national development plan of Peninsular Malaysia.

Section 12(vi) and Section 12(vii) of Act 172 provide for the planting and maintenance of trees and open space in the area of their local jurisdiction. Therefore, Act 172, as a principle policy for this analysis, empowers local authorities to prepare their plan for proper development of the local area with the aim of enhancing the physical planning in Peninsular Malaysia. To this effect, the Local Government Act 1976 (Act 171) is considered for the purpose of analysing planning policy in Peninsular Malaysia.

Table 1 GI policies in Malaysia

	Green space attributes	*Act 172*	*National Urbanization Policy (NUP)*	*National Physical Plan (NPP2)*	*Local Government Act (Act 171)*	*National Landscape Policy (NLP)*
1	Open space, urban parks, playgrounds, housing green space, and domestic gardens.	1	3	0	3	3
2	Natural areas, protected areas, natural forest, rivers, wetlands, and native plants.	3	3	3	0	3
3	Corridors, streams, ridges, valleys, upland forests, water trails, greenbelt, rooftop gardens.	0	0	2	0	3
4	Conservation of flora and fauna.	0	3	3		3

Furthermore, Section 6(B)(3) of Act 172 provides for the preparation of a NUP to guide the physical development of Malaysian urban centres to meet the growing demand of population growth, which is expected to reach 75% by the year 2020, the year in which Malaysia plans to attain developed nation status. This has led to the NUP incorporating sustainability features and thus, designed cities to face the challenges of population growth in a more efficient and conducive living and working environment.

4.1 Town and Country Planning Act 1978 (Act 172)

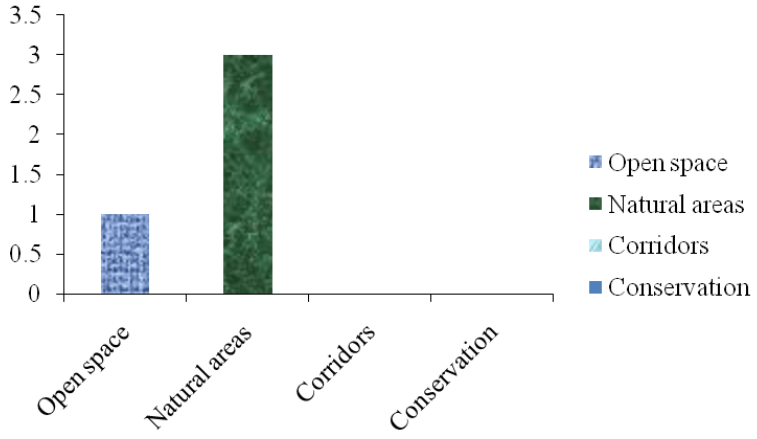
Act 172 makes provision for GI attributes as indicated in the subsequent sections. Section 3(a) and Section 33A of Act 172 allow for the provision of open spaces, which would help to enhance the quality of the built environment, and the protection of the Malaysian natural environment through protecting its landscape and natural topography. The Act also promotes the planting of trees in order to replace the forest areas lost as a result of urban expansion and logging activities for commercial purposes. Section 33A provides for the preservation of trees or group of trees that are considered by the Act to possess certain aesthetic values and the provision of amenities to implement a tree preservation order in respect of that tree or group of trees that are regarded as providing amenities.

Section 3(a)(iii) provides for the protection and improvement of the physical environment while making any development activities on land, as included in Section 3(a)(i)(ii) of the same Act. Its subsequent provision, as contained in Section 3(a)(iii)(iv), also covers the protection of the Malaysian landscape and topography to ensure harmonious growth and development that would facilitate the promotion of sustainable development in Peninsular Malaysia. These provisions are further strengthened by Section 33A, which provides for tree preservation orders that prescribe sanctions and penalties to persons or groups of persons who violate them with a term of imprisonment or a fine or both, as the local authority determines. Act 172 has elaborately expatiated on the preservation of the natural environment within the policies

analysed in this work. Thereby, the section on preservation could be regarded as good, hence scoring three points.

Meanwhile, the provision of open space as contained in Section 3(a) (vii) could be seen as limited, therefore scoring only one point. Act 172 scores four points, as shown in Figure 2; the points scored by the Act are secured through Section 3(a) and Section 33A, as explained above.

Figure 2 Presence of GI attributes in the town and country planning law (see online version for colours)

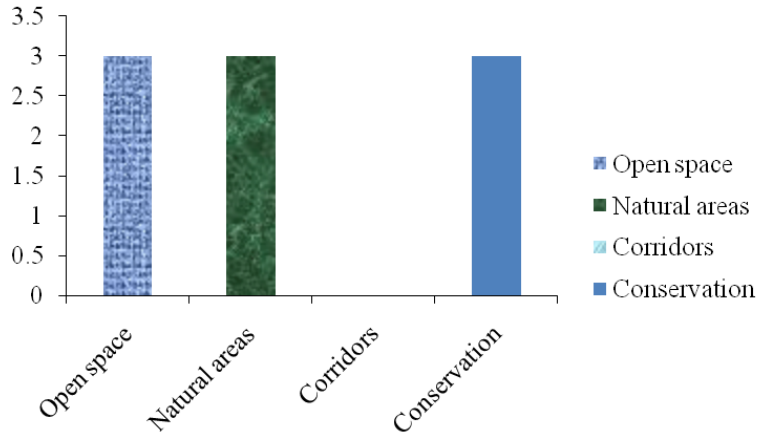


4.2 National Urbanization Policy

Another important planning policy document that provides for the provision of GI attributes is NUP, as provided in its subsequent relevant sections. Section 9 of the National Urbanization Policy (NUP9) provides for adequate provision of open space and recreational facilities in such ways that the spaces provided are sufficient to meet the population's requirement in Peninsular Malaysia. This section serves as a platform to integrate the NUP9 into land use planning for the promotion of sustainable development. The provision of NUP5 requires balanced land use planning in urban development. Conversion of arable land into built environment remains the obstacle of many developing countries as indicated in Liu et al. (2014). In order to achieve balanced urban land use, there is the need to create and integrate the living environment, working places, and playing facilities harmoniously; and to conserve arable land for ensuring food security. To achieve the provision of NUP5, conscious effort is required to group complementary land uses in a systematic order and to separate non-complementary land uses with buffer areas; buffers are to be designed to assist in reducing the effect of detrimental land use. The buffers are to be provided using the GI as an efficient environmental management strategy, which could be provided with less cost and in a more environmentally friendly manner. This section could be regarded as encompassing and comprehensive in not only providing the urban residents with green spaces, but extending to recognise the need for urban population growth. Furthermore, NUP5 strengthens the provision of NUP9 and therefore is considered to have good policy provision, scoring three points.

NUP8 provides for the protection of the urban form in order to avoid the occurrence of sprawling in Malaysian cities, which is recognised as a negative urban development with over-reliance on personal transportation, influencing the consumption of fossil fuel. The NUP advocates compact development to curb the impact of sprawling on the environmental quality of Peninsular Malaysia. In recognition of the effect of sprawling on the urban form which is having effect on transportation and fossil fuel consumption (Zhao, 2010). NUP8 provides for the protection and conservation of environmentally sensitive areas and prime agricultural land to ensure the continued supply of qualitative agricultural land. This section of the policy could be regarded as having a good and elaborate description not only of the protection of the natural environment but also extending the protection of agricultural land to ensure food security and sustainable urban development in Malaysia. Therefore, this section of the policy scores three points.

Figure 3 Presence of GI attributes in the NUP (see online version for colours)



NUP26 provides for the adoption of sustainable and environmentally friendly development, which is considered to be the basis of conservation and hence influences the improvement of environmental quality. By implication, it recognises the effect of the GI as a guiding principle to promote sustainable development. The urban environment which has been recognised as the engine of growth of the Malaysian economy would have adverse negative impacts on the environment, if it is not efficiently designed. The concentration of economic growth in urban areas is observed in European cities by Bosma and Sternberg (2014). Therefore, the GI would assist in reducing the impact of the grey infrastructure (physical structures), which has significant negative impact on the environment. Integration of GI attributes would enhance the urban quality thereby promoting sustainable development. This section is equally good, thereby achieving a score of three points. Meanwhile, the NUP scores nine, as indicated in Figure 3. This indicated the presence of three attributes of GI in the policy document. The Malaysian NUP has a huge contribution as envisaged in its provision discussed above in championing the sustainable agenda of the country. However, NUP has failed to recognise the potential of green corridors in ensuring better inter-connection of fragmented GI as envisioned by Fredric Law Olmsted.

4.3 National Physical Plan 2

Similarly, the NPP2 has some policies that promote creation of GI attributes. For instance Section 22 and section 26 of the National Physical Plan 2 (NPP22 and NPP26) provide for the integration of environmentally sensitive areas into the planning and management of land uses for the conservation of natural resources and the conservation of ground and surface water bodies in promoting sustainable urban life. NPP22, though, bears some similarity to the provisions of NUP5 and NUP8; it is more general, with a broader horizon in terms of its emphasis on integrating environmentally sensitive areas into the general planning and management of land uses and conservation of natural resources. Shepherd and Ortolano (1996) highlight the importance of strategic environmental assessment (SEA) into development plan to ensure sustainable urban development. They argued that environmental impact assessment (EIA) only looks into a specific project without relating it to the general sustainability of the area. To this effect, the conservation of sensitive areas is to be planned and integrated in local area plan from the initial stage of the needs to develop the area up to the completion stage to ensure sustainable urban development. The score for this policy is good, which carries three marks, as the section is comprehensive enough to tackle the conservation need from the inception of developmental projects to their completion.

NPP23 provides for the establishment of a central forest spine in order to reconnect the various fragmented forest areas and environmentally sensitive areas. The establishment of forest corridors is of the utmost importance in conserving the biodiversity and hence promotes the ecological service in Peninsular Malaysia. Corridors assist in promoting the services provided by urban green spaces, as opined by Frederic Law Olmstead. Similarly, creation of green corridors is recognised as panacea to counteract the impact of green space fragmentation. Thus, helps in creating integrated open spaces, preserving natural green areas, providing space for passive recreation activities, and supporting migration of both animal and plant species (Shapira and Shoshany, 2013). Frischenbruder and Pellegrino (2006) elucidated that greenways planning is having recognition in Brazil as a policy tool for improving urban quality of live. Therefore, NPP23 provision is also acceptable, which scores two points, as it acknowledges the importance of the creation of corridors to reconnect fragmented forests. However, the policy does not recognise the contribution of urban street trees and other forms of urban trails that help to create urban corridors. The development of various urban infrastructures influences the creation of the fragmented forest resources thereby establishing urban corridors which would assist in reducing the impact of urban-induced fragmentation of forests.

NPP24 provides for the protection of the marine ecosystem in an efficient and sustainable manner, as well as promotes the protection of the sensitive coastal environment to avoid premature extinction of the marine habitat. This policy transcends to provide not only how to conserve terrestrial habitat, but provide for the conservation of marine habitat which are used by urban population for their sustainable cohabitation. NPP25 provides for strict development control of highland areas to be maintained only as synergies for aesthetic quality and hence promotes the protection of human safety to avoid any untoward incidents. Preservation of highlands as potential heritage landscape would, apart from enhancing the quality of the built environment, serve as tourist destination; hence, promote the economic potentials of the sites. NPP24 and NPP25 also score three, which is good. The NPP2 policy document, as shown in Figure 4, indicates

the presence of three attributes of GI in the policy document, achieving a total score of eight marks.

Figure 4 Presence of GI attributes in the National Physical Plan 2 (see online version for colours)

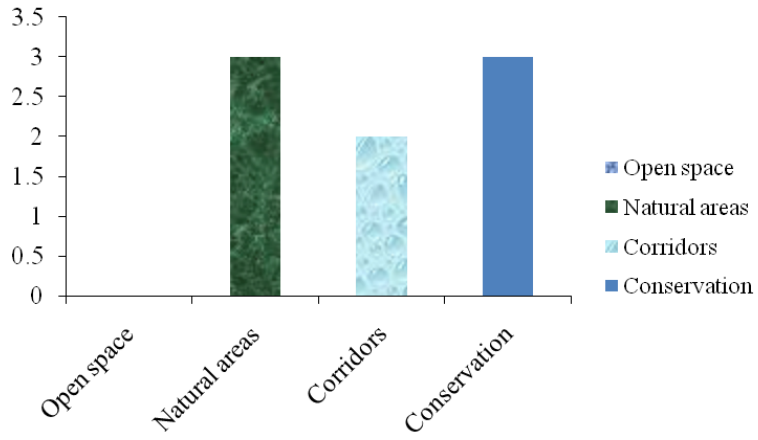
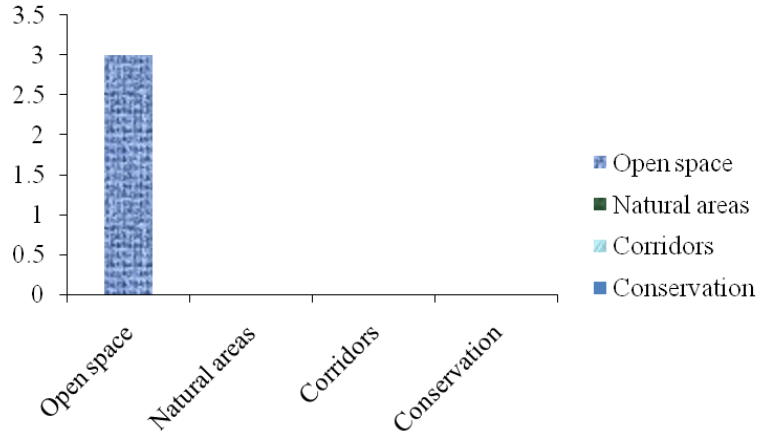


Figure 5 Presence of GI attributes in the Local Government Act (see online version for colours)



4.4 Local Government Act (Act 171)

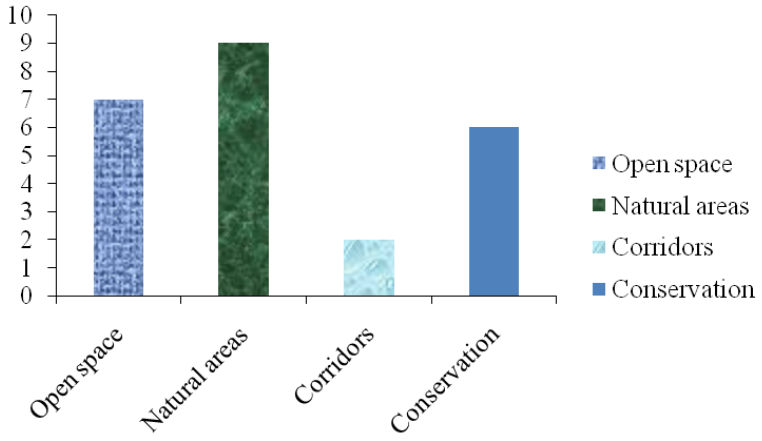
More so, The Local Government Act (Act 171) also covers the provision of open space for the aesthetic quality of the built environment in Peninsular Malaysia and the promotion of efficient urban life. Sections 101(b) and (c) concern the maintenance of open space provided by local authorities and also support other agencies in the provision of open spaces in their respective area of jurisdictions. Act 171 scores the fewest points, as shown in Figure 5; only one of the attributes of the GI is present in the policy document.

5 Discussion

The qualitative document analysis reveals that of the four policies analysed, three policy documents provide support for the provision of open space. These are Act 172, the NUP, and Act 171. These policies provide for the protection of natural and sensitive areas in Peninsular Malaysia. Of the four policies analysed, only the local government policy is silent on the protection of the natural environment, which is beyond the scope of local authorities. The local authorities are only empowered to make laws on regulating the physical development within their local jurisdiction. Meanwhile, the protection of the natural environment within the Malaysian context remains the sole interest and responsibility of the Malaysian State Governments, which are empowered by the Federal Constitution of Malaysia. Therefore, the protection of natural areas is considered as a paramount priority in Malaysia in order to protect the rich biodiversity on the peninsula of Malaysia. This finding has supported the findings of Jusoff (2013), where he shows the importance attached to conservation of mangrove forest which he asserts as the most important forest type.

The development of corridors is least recognised by the policies analysed because only the NPP provides for the establishment of a central forest spine in its effort to restore the connection of the fragmented forest areas in Peninsular Malaysia. Therefore, there is the need for the Malaysian planning policy makers to focus on provision of urban green corridors. Urban green corridors as the life wire for restoring the vitality and efficiency of urban green space provide the essential services to urban community (Sandström et al., 2006).

Figure 6 Presence of GI attribute's in the four documents analysed in this study (see online version for colours)



Moreover, the NPP and NUP provide for the conservation of natural resources. The NPP provides for the protection and conservation of both the marine and the terrestrial environment for sustainable and harmonious living, while the NUP regulates the development activities that could exert adverse negative impacts on the quality and productivity of the Malaysian environment. To achieve sustainable development, there is the need to integrate development objectives with conservation efforts. Figure 6 shows

the presence or otherwise of GI attributes, revealing the coverage of all the attributes of the GI. Though the policy places more concern on some of the attributes than others, on general consideration, the policy analysed makes adequate provision for GI attributes in Peninsular Malaysia.

Though the policies analysed are regarded as comprehensive in terms of provision of GI attributes yet, the GI provision is quite below the policy requirement in Malaysia. Green open spaces are inadequately provided to serve the growing population of Peninsular Malaysia. As indicated by JPBD 2000, the available open space in Malaysia at 1.19 hectares of open space per 1,000 persons as at December 2009, which indicates a deficiency of 0.81 hectares to achieve the requirement of the target by NPPC No. 5/2005. The National Physical Plan Council (NPPC) is the body recognised to control the implementation of all development activities provided by Act 172.

The NUP provides for sufficient open spaces in Peninsular Malaysia to meet the needs of the growing population for efficient and sustainable development. Similarly, the FDTCP make provision of 10% open space for any intended development to commence in Peninsular Malaysia (JBPD 7/2000). This policy requirement could be seen as a comprehensive requirement irrespective of the types of the intended physical development project. A developer with a total land area of more than two hectares is expected to surrender 10% of his total land area to the local planning authority, which is responsible for the design, implementation, and management of public open spaces. However, most of the prospective developers perceive this policy as an additional liability that adds to the total cost of their development project. It then results into piecemeal development of less than 2 hectares by estate developers, which does not condone surrendering 10% of land for open space provision as required by the policy.

The GI is multifunctional in its service provision; therefore, its implementation requires interagency collaboration to achieve the benefits of GI facilities. The implementation of the GI in the Malaysian context could be achieved without much difficulty. The National Physical Planning Council is the supreme planning body responsible for the overall development activities in Peninsular Malaysia.

Therefore, the council should make it mandatory for every planning authority to comply with the national standard of providing 10% open space for any development activities irrespective of the area or size of the development. This would ensure uniformity of the policy on the peninsula and thereby facilitate the actualisation of the projected two hectares of public open space for each one thousand urban population in Peninsular Malaysia, as required by the policy and some other developed nations. To implement the GI policy in Malaysia, the machinery could be put in place more easily considering the fact that the service providers are unskilled workers who attract little remuneration. However, the service must be monitored by experts, either landscape architects or botanists who specialise in selecting suitable local plant species that would improve the scenic quality of the urban areas and the environmental conservation of the area.

6 Conclusions

The qualitative document analysis conducted in four of the planning policy in Malaysia revealed the comprehensiveness of the policies in term of scope and coverage. However, the policies were found to neglect important attributes that ensured continuous survival of

GI facilities which is the creation of urban corridors in connecting fragmented urban green spaces resulting from urban development. Achievement of sustainable urban development is largely connected with proper management of land resources. The policies analysed have indicated commitment of Malaysian Government in attainment of developed nation status comes 2020 and to integrate sustainability agenda in all its developmental strategies. Therefore, it can be concluded that the area that needs to be strengthen in the existing planning policies is the provision of urban corridors to facilitate efficient functioning of the provided GI attributes in Malaysian urban areas.

More so, as indicated by the statistics of the present deficit of open spaces as at December 2009, about 0.81 hectare is required to meet the policy requirement of providing two hectares of open space to each 1,000 urban residents. This policy was not mandatory for local authorities to comply with; therefore, such opportunity given to Malaysian local authorities is the contributing factor towards the inability of the nation to achieve the policy requirement. Meanwhile, GI facilities show promising contribution in facilitating sustainable urban development as it helps in conservation of environment, in promotion of social cohesion, and in increasing the aesthetic quality of the built environment; hence enhances the economic value of urban housing.

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