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GREEN SPACE MANAGEMENT IN WORLD HERITAGE SITES UNDER THE 11TH SUSTAINABLE DEVELOPMENT GOAL: A CASE STUDY OF PHRA NAKHON SI AYUTTHAYA MUNICIPALITY, THAILAND

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ABSTRACT

The sustainable development goals (SDGs) are an important development framework for planning in all aspects of countries around the world. Therefore, the objectives of this research study were (1) to identify the types of green space, sizes, accessibility, safety, management, (2) to identify the people's needs for green space management, and (3) to analyse the consistency of SDG 11.7 that supports safe, complete, and fair access to green spaces and green space management in world heritage sites, such as Phra Nakhon Si Ayutthaya Municipality in Thailand. The data were collected by administering a questionnaire, conducting interviews, and performing field surveys. It was found that being a world heritage site caused the green space management to come under many organisations' responsibilities and laws, but the studied area had many types of green spaces in the historical sites and religious places. Consequently, the average ratio of the green spaces and the population was higher than that set in the national and international standards. However, most of the green spaces had access distances longer than 500 metres. Moreover, there were unsafe footpaths or bicycle lanes. Hence, the guidelines of the green space management leading to achieving the SDGs should not only increase the quantity of the green spaces, as well as maintain and develop the green spaces to be ready for use, but also provide knowledge and enhance people's awareness about the value of the green spaces and world heritage sites.

Keywords: Green space management; Phra Nakhon Si Ayutthaya Municipality; sustainable development goals; world heritage site

1. INTRODUCTION

The development in many countries has generally focused on economic growth, on the other hand, it turns out the social and environmental impacts such as the energy crises, pollution, and other effects in the current world situation (Klarin, 2018; Shi et al., 2019). Thus, the United Nations established the "World

Commission on Environment and Development", which is widely known as the "Brundtland Commission". This led to the presentation of the concept of "sustainable development" (Klarin, 2018; Lorenzo-Sáez et al., 2021; Xie et al., 2021). In 2000, the United Nations' conference in New York City, USA set mutual development goals to be pursued from September 2015 to August 2030, known as the "sustainable development goals" (SDGs). The SDGs consist of 17 goals, and the goal concerned with cities is Goal 11: Sustainable Cities and Communities (United Nations Department of Global Communications, 2023).

Goal 11 clearly specifies that the access to green spaces must be safe, complete, and fair, notably for women, children, the elderly, and physically disabled people, by 2030 (United Nations Department of Global Communications, 2023). Therefore, cities worldwide emphasized on the green space management in accordance with the mentioned goals, namely the municipal councils of Valencia in Spain had signed the agreement and cooperated with a mutual research centre in order to increase the green space as well as designate Valencia as a model of city management guidelines according to the SDG (Lorenzo-Sáez et al., 2021). In addition, the four important cities in Europe comprise Geneva, Barcelona, Goteborg, and Bristol have proceeded the green space management until increasing the ratio of green spaces in the cities up to 38% (Giuliani et al., 2021). Furthermore, many cities in South Africa have promoted increasing the number of green spaces in the form of green roofs, community parks, city parks and other approaches (Van Zyl et al., 2021).

For Thailand, the SDGs have been considered in order to determine the national development plans as included in the 20-Year National Strategy (2018–2037) and the 13th National Economic and Social Development Plan (National Strategy Secretariat Office & Office of the National Economic and Social Development Board, 2018; Phanthuwongpakdee et al., 2022). However, achieving the SDGs, especially Goal 11 regarding green space management at the city level, such as the world heritage site in Phra Nakhon Si Ayutthaya Municipality, has not been realised because the developments in Thailand, similar to other developing countries, have usually focused on the economy (Darkhani et al., 2019; Phanthuwongpakdee et al., 2022). Consequently, the developments in Phra Nakhon Si Ayutthaya Municipality have focused on economic growth and development of transport routes instead of green space (Ayutthaya Municipality, n.d.-a).

Based on the above information, this research study focused on identifying the consistency of the green space management in Phra Nakhon Si Ayutthaya Municipality relating to the SDGs, the people's needs, and the opinions of the organisations about green space management that could be beneficial for presenting the guidelines for green space management appropriate for world heritage sites and achieving Goal 11: Sustainable Cities and Communities.

2. BACKGROUND

Phra Nakhon Si Ayutthaya Municipality is situated in Phra Nakhon Si Ayutthaya district, Phra Nakhon Si Ayutthaya province, Thailand. (A municipality is a form of administration in Thailand, which is situated in a local area that is a large city with a population of 50,000 or more.) It covers an area of 14.84 square kilometres (Ayutthaya Municipality, n.d.-b). In 2021, the population was 48,679. The child population (0–14 years) was 8,817, the working age population (15–64 years) was 31,695, and the elderly population (64 years or older) was 8,167 (Department of Provincial Administration, 2023). The Municipality is on an island surrounded by three rivers consisting of the Chao Phraya, Pasak, and Lop Buri Rivers. This is where the former capital city of Thailand was situated from 1350–1767. Hence, Phra Nakhon Si Ayutthaya Municipality has a long history and many remaining historical sites, thus reflecting the cultures that were the identities of Thailand, such as Wihan Phra Mongkhon Bophit and Wat Mahathat. Accordingly, it was nominated and registered as a World Heritage Site in the 15th General Assembly of the World Heritage Convention in Tunisia on 13 December 1991 (UNESCO World Heritage Convention, n.d.) (Figure 1).

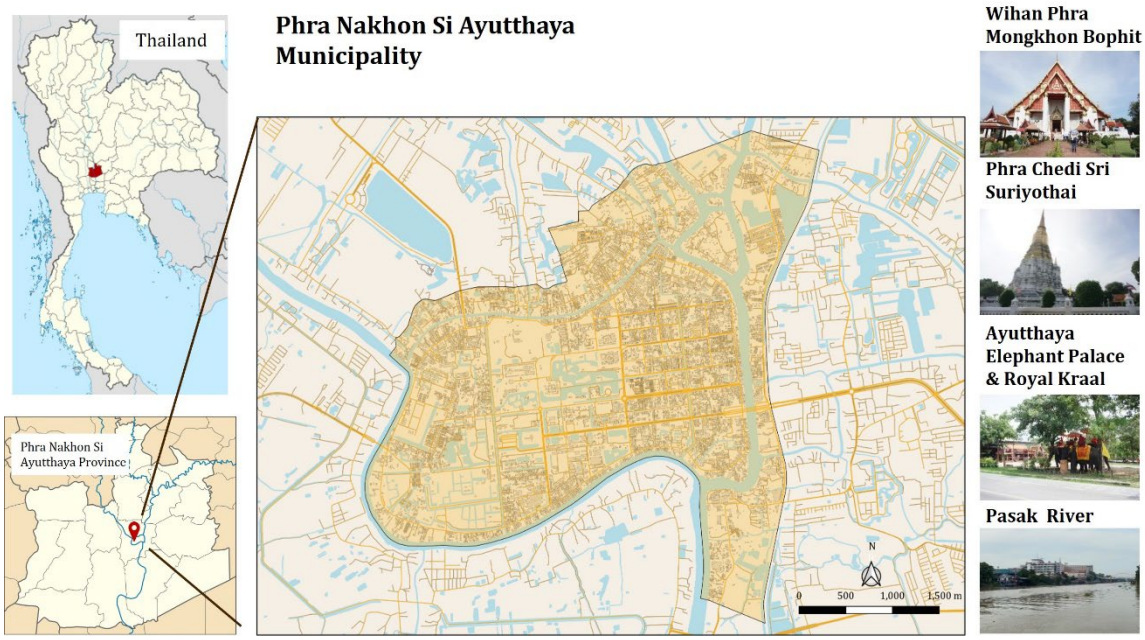

Figure 1: The Study Area

3. LITERATURE REVIEW

The related literature review in this research article is divided into 2 main points: studying sustainable development and SDGs, and studying on green space management. Sustainable development refers to development that meets the needs of the current generation without impairing the ability to meet the needs of future generations (Lorenzo-Sáez et al., 2021; Xie et al., 2021). Thus, sustainable development is development that does not cause any negative environmental effects and includes equal development in economic, social, and environmental aspects. Moreover, sustainable development is development that increases people's income and improves the quality of their lives (Klarin, 2018). The main tool for the success of sustainable development is the SDG related to cities, which is Goal 11: Sustainable Cities and Communities (Xie et al., 2021). This goal focuses on developing complete, safe, immunised, and sustainable cities and settlements of humans through targets, such as housing and basic service developments (Goal 11.1) and the access to green spaces (Goal 11.7).

Goal 11.7 supports having safe and complete access to green spaces (especially for women, children, elderly people, and physically disabled people) by 2030. Its indicators are Indicator 11.7.1, the average ratio of the green areas in cities that are open for everyone is categorised according to gender, age, and disabilities; and Indicator 11.7.2, the ratio of the victims of physical or sexual harassment categorised according to gender, age, disability, and birthplace in the last 12 months (United Nations Department of Global Communications, 2023).

The developments according to the SDGs are generally at the national level (Han et al., 2021) because the cooperation of all relevant sectors is required. They should also provide various benefits, including standard infrastructure (Han et al., 2021), safe, resilient, and sustainable settlements (Berisha et al., 2022), and strengthen organisations at the national and international levels (Bogers et al., 2022).

There are research studies constantly being done on green space management. Kimpton (2017) stated that green spaces could help the people in cities relax. In green space management, increasing the size of the green spaces and having equal access to the spaces must be considered. Özbayraktar et al. (2017) suggested that managing the public areas, including green spaces, required the consideration of safety at night and the connections of roads to the areas. Girma et al. (2019) recommended that sustainable green space management must improve the existing green spaces, develop positive awareness about green space management, promote the participation of the people, provide budgets, and revise laws and plans so that they are clear. Vidal et al. (2020) defined the term 'green space' as an open space or a space that was partially or completely covered by grass or trees. In addition, green space management must not only consider the size of the spaces, but also the equality of the access to these spaces. Ayele et al. (2022) stated that green space management commonly focused on only increasing the number of trees. This led to a lack of consideration of the long-term green space management regarding the designs of ready-to-use spaces, recreational activities, and supportive budgets.

The Office of Natural Resources and Environmental Policy and Planning (ONEP) (2017) classified green spaces into five types: natural green spaces, such as forests; green spaces for services, such as parks;

special green spaces, such as green spaces in public organisations and academic institutes; wayside green spaces, such as traffic islands; and green spaces for communities' economic activities, such as agricultural areas. Moreover, it was specified that large urban communities and municipalities must have the standard average ratio of the green spaces to the population of 15 m^2 per person, a ratio of green spaces and urban land use of 15%, and the approximate walking distance for users of no more than 500 metres from their residences. The World Health Organization (WHO) specified that the standard average ratio of green spaces and the population was 9 m^2 per person, and the spaces should be appropriate for their uses, conveniently accessible, and safe (Maryanti et al., 2016).

The Department of Public Works and Town & Country Planning (DPT) (2006) specified the criteria of the sizes and service areas of urban parks. Neighbourhood parks should have a size between 40,000–80,000 m^2 and service areas of 300–500 metres. Community parks should have a size between 40,000–80,000 m^2 and service areas of 1–2.5 kilometres. District parks should have a size in the range of 48,000–120,000 m^2 and service areas of 3–6 kilometres. City parks should have a size of 160,000 m^2 or larger and service areas that public transport systems could access within an hour. Regional parks should have a size of 320,000 m^2 or larger and service areas that cars could access within an hour.

4. METHODOLOGY

The research methodology of this article can be divided into 5 important topics: Green space classification, calculation of green space size, green space convenience and safety analyses, green space management analysis, and people's needs analysis.

Green space classification comes under the green space standards in Thailand (DPT, 2006; ONEP, 2017). The green spaces used by the people and found in the study area can be divided into three types: 1) green spaces for services, such as 1,600–4,800 m^2 neighbourhood parks with 500 m service areas, 4,800–80,000 m^2 community parks with 3 km service areas, and 160,000 m^2 or larger city parks with service areas of 10 km; 2) special green spaces, such as green spaces in academic institutes, hospitals, public organisations, historical sites or religious places and private places; and 3) wayside green spaces, such as roadside green areas.

The size of green spaces could be separated for each type with geographic information systems leading to the calculation of the average ratio of the green areas and the population. This enabled comparison to the average ratios of the green areas and the population with the WHO and ONEP standards (Maryanti et al., 2016; ONEP, 2017).

The green space convenience and safety analyses were performed to calculate the distances between the green spaces and the roads with geographic information systems in order to compare the results to the distances to the green spaces recommended by ONEP (2017). The service areas of the green spaces were also analysed in order to compare the results to the standards of DPT (2006). Moreover, the statistics and locations of areas with physical or sexual harassment in Phra Nakhon Si Ayutthaya Municipality that were obtained from the relevant research studies and organisations were also collected.

Green space management was studied by interviewing an expert with experience in environmental and urban planning. The person was a representative from a green space management organisation, a representative of the Phra Nakhon Si Ayutthaya Municipality Office, and a representative from the Ayutthaya Provincial Office of Public Works and Town & Country Planning. The interview topics focused on surveying opinions about the problems and obstacles of green space management, the future management guidelines under the sustainable development framework, and the main factors of SDG achievement.

The people's needs for green space management were studied by administering questionnaires to the participants in the study area. The non-probability sampling method, which is a quota sampling method, was used with the sample size of 200. After administering the questionnaires, the size of the sample was 205. This sample group was obtained with the accidental sampling method as the participants were ready and willing to provide their opinions.

According to the literature review and the above methodology, the present research framework was to study the green space types, sizes, accessibilities, safety and management as well as the people's needs for the green space management by administering a questionnaire, conducting interviews and performing field surveys that will lead to the green space management, considering the identities of the world heritage site and achieving Goal 11: Sustainable Cities and Communities for efficiently managing the green spaces (Figure 2).

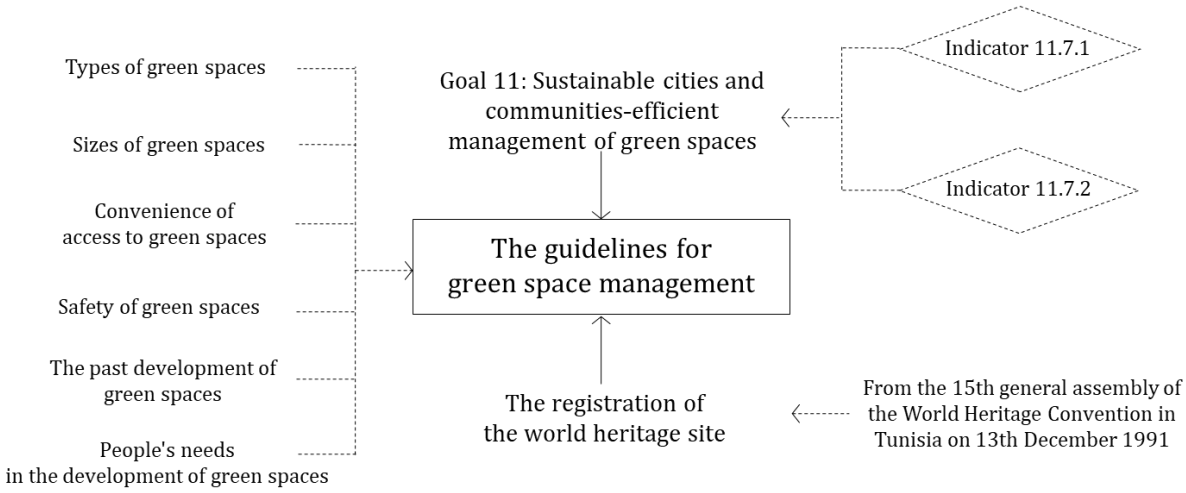

Figure 2: The Research Framework

5. RESULTS

5.1 Existing green spaces

The green spaces found in the study area included the green spaces for services, special green spaces, and wayside green spaces (Figure 3). There were three types of green spaces for services: 1) a neighbourhood park that is a municipal park covering an area of 3,257.47 m^2, 2) a community park that is a park next to the Pridi Bridge covering an area of 19,153.26 m^2, and 3) three city parks consisting of Srinagarindra Park with an area of 536,815.01 m^2, Sri Suriyothai Park with an area of 221,110.94 m^2, and Bueng Phra Ram Park with an area of 353,802.95 m^2.

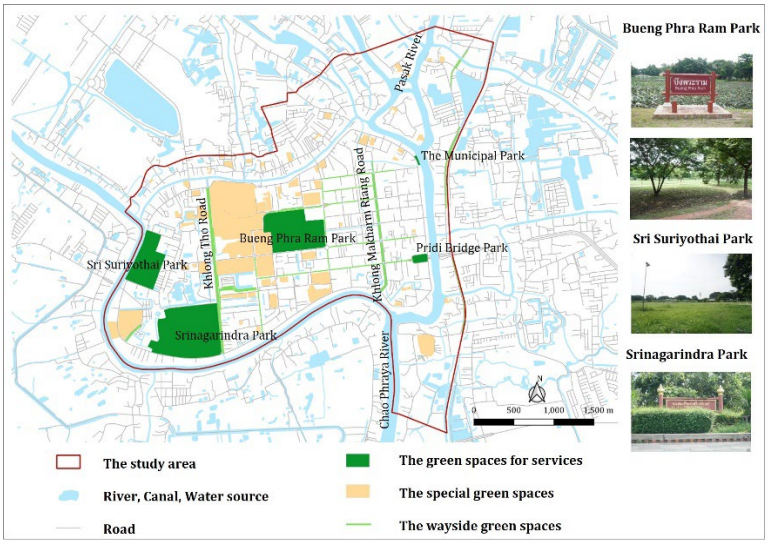

Figure 3: Types of Green Spaces in Phra Nakhon Si Ayutthaya Municipality

The wayside green spaces were traffic islands that were found along the nine main transport routes, such as Khlong Tho and Khlong Makham Riang Roads. The total area was 119,598.16 m^2. The special green spaces that were 1,600 m^2 or larger covered a total area of 1,252,122.27 m^2. There were 26 green spaces in the historical sites, such as public cemeteries and Wat Phra Si Sanphet. The total area was 602,092.02 m^2. These mentioned green spaces were mostly abandoned and not ready to be used. This was also according to the opinions from the interviews:

> There are green spaces in the historical sites, but the green spaces are not appropriate for use because of the grass growing there. Although the spaces are usable, the spaces are not safe from reptiles (Department of Public Works and Town & Country Planning, Phra Nakhon Si Ayutthaya province, personal communication, March 11, 2022).

All of the green spaces were under the responsibility of the Phra Nakhon Si Ayutthaya Municipality Office. Any action taken would be under the provincial and municipal development plans with the responsible organisations, such as the Phra Nakhon Si Ayutthaya Municipality Office, the Fine Arts Department, and the Treasury Department following the relevant laws. Though green space management in the study area was related to many agencies, the work integration had not yet been driven with full capacity. As a result, the recent green space management was in the form of the landscape improvement of the parks that could be generally found in cities (Ayele et al., 2022).

> Any spatial development needs permission from three organisations. The first organisation is the Phra Nakhon Si Ayutthaya Municipality Office. The second organisation is the 3rd Regional Office of the Fine Arts Department in Phra Nakhon Si Ayutthaya, which is the organisation responsible for building plans that must be consistent with the world heritage sites. The third organisation is the Treasury Office in Phra Nakhon Si Ayutthaya, which is the organisation concerned with most of the land ownership in the municipality (Phra Nakhon Si Ayutthaya Municipality, personal communication, March 24, 2022).

> The operations of the municipality office are planting new trees, improving the landscape, and building new gardens. In the last two or three years, Thanon Rojana Road has been improved with the cooperation of the Phra Nakhon Si Ayutthaya Provincial Office (Phra Nakhon Si Ayutthaya Municipality, personal communication, March 24, 2022).

Nonetheless, green space management usually faced lack of funding because the budget allocation in the province is normally used for other types of development. Hence, Phra Nakhon Si Ayutthaya Municipality Office had to wait for the next budget allocation or find funding from other sources. This was also according to the opinions expressed in the interviews:

> The local organisations will face problems with budget and must ask for funds from the provincial office. The provincial office will provide funding for many activities, but the budgets may not be sufficient. The local organisations then have to wait for the next budget allocation (Department of Public Works and Town & Country Planning, Phra Nakhon Si Ayutthaya province, personal communication, March 11, 2022).

> Among the 30 municipalities across the country, our income is ranked 29th rank. The city has the historical park, but its income is very low. The municipality office solved this problem by asking for the funding from the main organisations and other business sectors in order to conduct the development projects. In other words, these are donations. In the last three or four years, we have coordinated with the Department of Corrections to ask for the use of the old prison and Toyota Company in order to develop the green spaces (Phra Nakhon Si Ayutthaya Municipality, personal communication, March 24, 2022).

Problem relating to budgets is a situation that occurs in many countries (Fongar et al., 2019). Urban development and green space management previously disregarded the value of world heritage sites and only focused on developing the infrastructure. Moreover, the developments were independent. As a result, the developments were not sustainable. This was also according to the opinions expressed in the interviews:

> The municipal areas of Phra Nakhon Si Ayutthaya Municipality possess the identities of a world heritage site, but these are not included in the urban development. These valuable assets are not considered and the things to be preserved are not identified. For any development, these things must not be lost (R. Khunanake, personal communication, August 2, 2022).

> To be an area with outstanding universal values, those things must be identified. Then, the objects must be preserved because these things are not owned by the local people but are owned by everyone in the country. It is a world heritage site (R. Khunanake, personal communication, August 2, 2022).

> The improvement of Rojana Road initially had a problem. That is, the provincial office had to ask for the cooperation with the private sector to design it, and an architect from the private sector designed it. However, the Fine Arts Department ordered it to be stopped during the quotation in order to select the trees for this area, which wasted the time and budget during that period (Phra Nakhon Si Ayutthaya Municipality, personal communication, March 24, 2022).

5.2 The people's needs for green space management

There were 205 participants in the sample group who answered the questionnaire, showing 51.20% was female and 48.80% was male. The largest age group was 55–64 years (35.60%). Their highest education

level was mostly primary education (29.30%), while most were mainly self-employed (66.30%). In addition, a vast majority had lived in the studied area for longer than 10 years (92.20%).

The respondents' need for increasing the number of green spaces that would be complete, safe, and conveniently accessible were at the low level (mean = 3.45). By analysing the relationships between the ages, residency periods, and need for increasing the number of green spaces that would be complete, safe, and conveniently accessible, it was conversely found that the ages and residency periods had significant relationships with the need for increasing the number of required green spaces (p-value < 0.05). The respondents with residency periods of 5–10 years and longer than 10 years demanded an increase in the number of required green spaces at the highest level, which was higher than that of those with the other residency periods (20.50% and 79.50%, respectively).

The respondents who were 25–34 years, 55–64 years, and 35–44 years had the need for increasing the number of green spaces that would be complete, safe, and conveniently accessible at the highest level, which was higher than that of those of the other age groups (29.50%, 22.70%, and 18.20%, respectively). These findings were consistent with the study of Ode Sang et al. (2020), who stated that the different ages of the service users of the green spaces affected their behaviour.

5.3 Future green space management guidelines

The main factor of green space management achieving the SDGs was the people's participation because any project which the people did not provide their opinions on or objections would not be conducted. This was also in accordance to the opinions in the interviews:

> The people's participation is the main factor driving a project. Although a project may be good, there will be objections if the people do not participate in it. In many cases, participation was too low. It was like they were only informed but did not provide their opinions (Department of Public Works and Town & Country Planning, Phra Nakhon Si Ayutthaya province, personal communication, March 11, 2022).

> The cities are not important. The people are important. The people indicate the directions, developments, and appearance of the cities. These depend on the people. If we educate them to have awareness, then these will be significant (R. Khunanake, personal communication, August 2, 2022).

Green space management does not only mean increasing the number of green spaces or enlarging the size of the green spaces, but it must also consider maintaining the green spaces and making the green spaces ready for use. This was also in accordance to the opinions expressed in the interviews:

> If we have many green spaces, it does not mean that there will be many of them forever. The guarantees for their sustainability are important for the existing green spaces. So, we must have measures for maintaining these spaces. Municipal laws may be enacted in order to control and maintain the green spaces. Surely, these deprive the people of their rights. However, resolutions will be made in the communities" (R. Khunanake, personal communication, August 2, 2022).

> Moreover, there may be unpleasant and abandoned green spaces. There must be the measures for using these spaces as parks, business areas, or local and rare plant conservation areas (R. Khunanake, personal communication, August 2, 2022).

The suggestions for future green space management from these interviews were consistent with the results of Girma et al. (2019) and Ayele et al. (2022), who stated that sustainable green space management must improve and make the existing green spaces ready for use, develop managerial awareness, promote people participation, provide budgets, enact laws, and make clear management plans.

6. DISCUSSION

The SDGs focused on three issues related to green space management: size, accessibility, and service safety (United Nations Department of Global Communications, 2023). By considering the issues regarding the size of the green space, it could be seen that the studied areas covering the green spaces totalled 2,505,860.06 m^2, or 16.89% of the municipal area. This was higher than the green space ratio standards of ONEP. By analysing the ratio of the green spaces and the population, it was also found that Phra Nakhon Si Ayutthaya Municipality had a ratio of green space to population that was higher than the standards set by the WHO and ONEP (Maryanti et al., 2016; ONEP, 2017) for any type of green space or green space for services. Accordingly, the ratio of green spaces to the total population was approximately 51.48 m^2 per capita, along with 284.21 m^2 per capita to the child population, 79.06 m^2 per capita to the working age population, and 306.83 m^2 per capita to the elderly

population. Concurrently, the ratio of green spaces for services to the total population was approximately 23.30 m^2 per capita, including 128.63 m^2 per capita to the child population, 35.78 m^2 per capita to the working age population, and 138.87 m^2 per capita to the elderly population.

By considering the service safety of the green spaces from the published information of the Phra Nakhon Si Ayutthaya Provincial Police (2021) and Phra Nakhon Si Ayutthaya Statistical Office (2022), it was found that the crimes in Phra Nakhon Si Ayutthaya's municipal areas involving murder, physical harm, sexual violence, property, special crimes, and public victims were usually unrelated to the green spaces. By considering the accessibility of the green spaces, it was found that the green spaces for services and all parks had the service areas that met the standards of the DPT (Figure 4). However, most of the green spaces were on the streets or secondary roads that were 500 m away from the main roads, especially the green spaces in the historical sites or religious places. Additionally, most of the routes to all types of green spaces did not have footpaths or bicycle lanes that were considered safe and environmentally friendly.

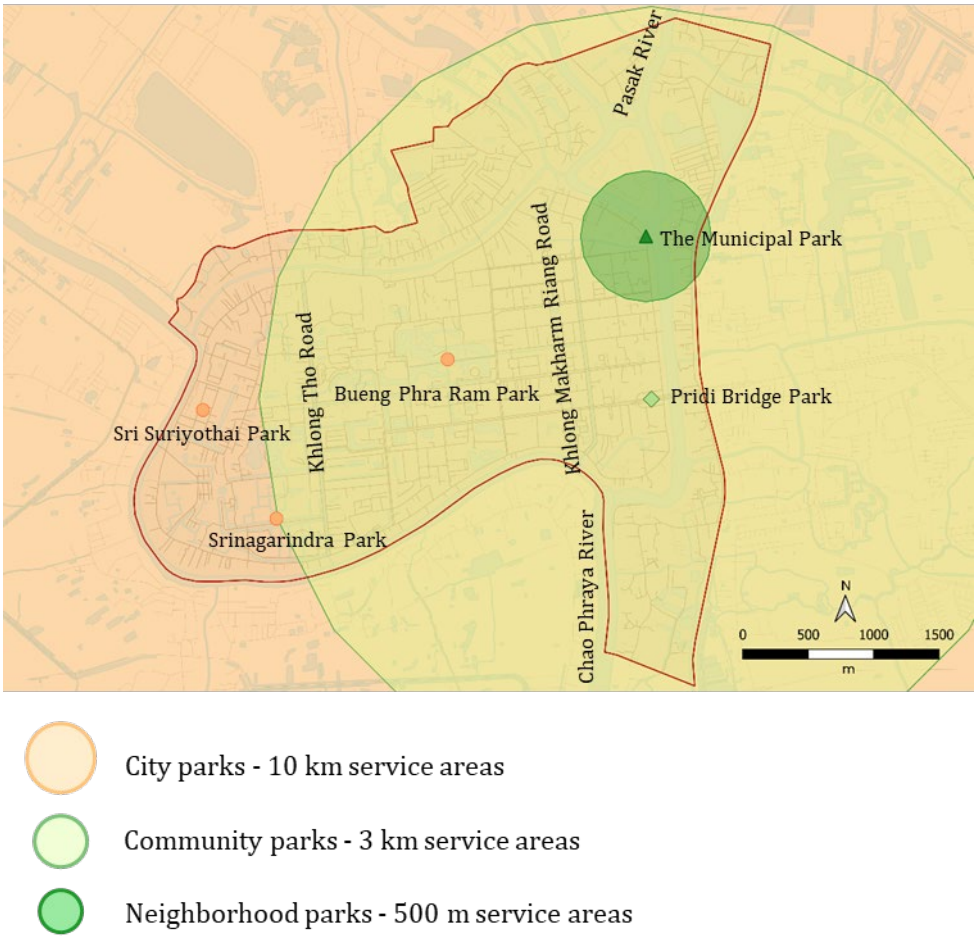

Figure 4: The Service Area of the Green Spaces

7. CONCLUSIONS

The registration of the world heritage site of Phra Nakhon Si Ayutthaya Municipality caused the green space management to come under many organisations' responsibilities and laws. Furthermore, the limited budgets, the lack of the awareness of the identities of the world heritage site, and the lack of the cooperation of all sectors resulted in green space management that only increased the number of trees, improved the landscapes, and increased the number of gardens. These were identified as the general problems and characteristics of green space management (Ayele et al., 2022). Nonetheless, being a world heritage site was the reason that Phra Nakhon Si Ayutthaya Municipality had many green spaces in the historical sites and religious places, as well as an average ratio of the green spaces to population that was higher than the national and international standards (Figure 5).

Figure 5: Advantages and Disadvantages of Existing Green Space Management

In addition, the green spaces of Phra Nakhon Si Ayutthaya Municipality were not sources of danger causing deaths or affecting property. Moreover, the green spaces and parks had service areas covering all the studied areas that met the national park management standards. Nonetheless, the other types of green spaces were over 500 metres away from the primary or secondary roads, and the routes to most of these green spaces did not have safe footpaths or bicycle lanes (Figure 5).

Though the use of green space involved other factors, such as socio-cultural factors and public sensibility, the factors or issues were determined by the SDGs to manage different levels of green space worldwide, and appropriately assess the green space management in special areas, like the world heritage site of Phra Nakhon Si Ayutthaya Municipality. Additionally, the recent green space management of Phra Nakhon Si Ayutthaya Municipality did not meet Indicators 11.7.1 or 11.7.2 of the SDGs. Nevertheless, green space management could be achieved according to the SDGs by 2030. This can be done by stimulating the work integration between academics and the public and private agencies to increase the number of various green spaces, such as rooftop gardens and vertical gardens; maintaining the green spaces with tools and measures, such as master plans and laws of green space management; and ensuring the readiness of the green spaces. It would be essential to encourage public participation by providing knowledge and developing awareness of the value of green spaces, as well as the status of world heritage sites that are significantly directed towards the sustainability of green space management (Girma et al., 2019; Kimpton, 2017; Özbayraktar et al., 2017; Vidal et al., 2020).

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