



## SUSTAINABLE LANDSCAPE DESIGN CONCEPTS FOR GREEN OPEN SPACE MANAGEMENT

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### Abstract

*To achieve the target of 30% of the total area's green space area, causing Jakarta and other big cities to make efforts to accelerate the provision of green space. Efforts to provide and manage it did not go as expected. The problem lies in the planning, implementation, utilization, and control relating to institutions, financing, and community participation. That causes the management of Green Open Space (GOS) is not running effectively and efficiently. The main problem is the unavailability of clear guidelines on implementing green space management and ineffective phasing related to the determination of terms of reference with budget constraints. Based on previous research, the concept of sustainable landscape design in harmony with sustainable development is the right way to solve this problem. This study aims to discuss how the concept of sustainable landscape design can be bundled by governance involved in managing green space using action research based on soft systems methodology. It will provide a conceptual model of packaging efforts so that it becomes a reference in various actions to provide and manage green space to achieve effective and efficient GOS management.*

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*Green Open Space;  
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### INTRODUCTION

The issuance of Law No. 26 of 2007 concerning Spatial Planning tells that green space from an urban area is required to have a minimum proportion of 30%. It is as a minimum measure for the balance of the city ecosystem balance of the hydrology system, microclimate system, and other ecological systems, which will further increase the availability of clean air for the community, and at the same time, can increase the aesthetic value of the city [1]. This consideration has driven the Jakarta City Government to accelerate the provision of green space. This effort made Jakarta increase the Green Open Space (GOS) area that has now shrunk to 9.98% [2]. However, the city's limited land area is more concerned with developing the industrial and trade sectors. It's because capable of absorbing a lot of workers and expensive land prices due. It's a conflict of interest in the phenomenon of urban development, is

which are considered the acceleration of green space procurement also becomes hampered.

Ministerial Regulation No.1 of 2007 concerning Urban GOS Arrangement states that urban GOS is part of the open space of an urban area filled with plants and plants to support ecological, social, cultural, economic, and aesthetic benefits. Urban GOS planning is the responsibility of the Regency/City Government. The utilization in managed by the Regional Government by involving stakeholders. Some regulatory components in the provision and management of GOS must consider and organize technical arrangements (the form, standard requirements, and GOS) [3]. The organization manages green space covering the stages of planning, implementation, utilization, and control, which need institutional, financing, and community participation. Besides, the availability of adequate funds to finance GOS is also urgent for

implementing green space provision and maintenance.

The available GOS funds are inadequate due to priorities in developing other public service sectors. The cause of ineffective and inefficient management of GOS, a stipulation of Terms of Reference for work carried out after budgeting (PUPR Regulation No. 8 of 2020, on Operational Guidelines for Implementing Special Allocation Funds for Public Works and Public Housing Infrastructure), the absence of clear implementation guidelines, maintenance of green space inconsistencies, and the choice of plant species are not by the ecological requirements for each location [4].

There are various problems, especially related to green space management and supporting the Green City Development Program (GCDP) promoted by the Ministry of Public Works and Public Housing in 2011. This research will use a sustainable landscape design concept approach. This concept is normative because it uses a sustainable landscape approach with different meanings for each person, depending on their beliefs, values, and preferences [5]. Decisions to make the built landscape more sustainable depended on the world view of the owner and user of the landscape and the resources they have.

Therefore, sustainability goals and solutions should be determined based on discussions and interactions between the owner (government) and the local community as users by considering the resources that owned and the interdependent environmental, social, and economic mechanisms [6]. A sustainable GOS must be able to overcome social, environmental, and economic problems so that [7] it has a design, construction, operation, and maintenance that meets current needs without reducing future generations' ability to meet their own needs. It also minimizes negative impacts on the environment and is mutually beneficial to the GOS and the people who use it. The concept of sustainable design places economic aspects into account the value of existing natural systems [8]. In other words, with the principles of sustainable landscape design, people receive benefits in the form of goods and services from healthy ecosystems. According to [9], in the concept of sustainable landscape design, the principles must be considered include:

1. High land-use efficiency, a principle that seeks to realize multifunctional landscape space on limited land, can be used effectively, positively impacting the human settlement environment and improving the quality of life.

2. Sustainable use of energy by saving water, so it is necessary to use a water-saving irrigation system, planning, and designing a rainwater collection system to use water for the urban landscape and save and protect water resources at the same time.
3. Protect and build a perfect ecosystem is about applying landscape ecology principles to protect and build a sustainable ecological system, and considering cultural and social ecology.
4. Sustainability reflects the value of cultural heritage and the preservation of human history as a tribute to human social assets. It can cause environmental and spiritual interaction and improve people's lives, happiness, security, and happiness, providing a harmonious relationship between humans and nature.

Sustainability can also provide education to the community about environmental ethics and the use of public facilities. All this builds a sense of belonging and wants to maintain its sustainability. The use of post-maintenance landscape design elements should consider local environmental characteristics. It can save on maintenance costs.

These principles support the implementation of sustainable development that is being promoted by the whole world. Sustainable development concepts are the development that seeks to meet the needs of the present without compromising the right to carry out the needs of future generations [10]. Sustainable development concepts include three main aspects interrelated to realize sustainability, such as economic developments, social development, and environmental preservation [11]. In practice, sustainable principles encompass urban ecology, energy strategies, water, waste, materials, communities, strategic economic, cultural conservation, and operational management to support all three aspects of sustainable development [12].

The management of GOS with the concept of sustainable landscape design places the social and economic benefits of green space services built as a result of the community (local community) decision making regarding the balance of desired values [13]. Thus, be said that quality sustainable design emphasizes the search for design solutions that aim to produce an aesthetic, functional, sustainability, and cost-effective landscape suitable for a particular location or region [14]. Cost-effective, that is, by considering the maintenance costs that must be incurred for the green space. Because maintenance is an ongoing activity in open green space [15], the design of green space that refers

to sustainable landscape design principles can reduce maintenance costs.

One of the guidelines for measure a product that has to fulfil the principles of sustainability, especially in the field of Architecture, LEED (Leadership in Energy and Environmental Design) of the US Green Building Council 2013 establishes sustainable design principles that used as a reference are:

1. Low-impact material uses non-toxic materials and is produced in an environmentally friendly manner (does not harm the environment).
2. Energy efficiency, use, or making products that require less energy.
3. Quality and durability, use products that function well (have a long service life), thereby reducing maintenance or replacement.
4. Reuse and recycle, using product design by considering sustainable use, so that afterlife ends (afterlife) can recycle
5. Renew-ability, using materials originating from the local / nearest area, produced from renewable resources, and (if possible) can reprocess.
6. Healthy, which means the product is not harmful to users/occupants and the surrounding environment.

The application of sustainable design concepts can solve an area's problems, such as settlements related to community needs and the surrounding environment [16]. According to [17], the concept of sustainable design provides alternative solutions "Low Cost, Low Technology, Low Negative Impact Development" needed for developing countries, such as Indonesia, which are faced with economic problems. Sustainable design goals are to minimize the use of designs that require a lot of energy to anticipate the existing energy crisis issues [18].

Previous research has discussed a lot about the translation of the concept of sustainable development [10] [11], the principles in the concept of sustainable design [16], its application in solving problems in a residential area [16]. There is also research that discusses the concept of sustainable landscape design and the elaboration of its principles [7, 8, 11], the benefits if applied in the provision of green space [19]. This research will discuss how to make the principles of sustainable landscape design concepts as a guide can be applied in managing GOS so that it can produce efficient and effective green space management.

## METHOD

This study uses Soft System Methodology (SSM) to study the determination of sustainable landscape design in the stages of managing green space in Jakarta. This system approach begins with complex and uncertain situations. SSM is an appropriate method for conducting social studies at the group's level or situational of organizational [20]. The systems approach examines the relationship between problematic situations and the real world [21]. An SSM can provide significant problem solving because the activities built in a conceptual model can help understand problems in the field and provide steps for solving them [22].

Table 1 explains the research framework used that is divided into two areas: methods for research interest and problem-solving [23]. This study will describe in six stages [20, 24, 25, 26], known as SSM based actions, as listed in Table 2. There is the identification of problems unstructured, problem identification, formulated of root definitions associated with relevant systems of activities, formulating conceptual models, comparing concept models with the real world, and developing desirable interventions systematically and culturally appropriate.

## RESULTS AND DISCUSSION

### Unstructured Problems: Reality of GOS Management in Jakarta

In the SSM-based action, the research presents an overview of the management of GOS based on Ministerial Regulation of Public Works No. 5/PRT/M/2008, combined with several views considered about the success of the project [27] and achievement from stakeholders' expectation of the quality of the GOS [28]. In the discussion related to the application of the concept of sustainable landscape design in the management of green space, the actors involved were the government, in this case, the Ministry of Public Works and Public Housing at the organizational level and the City Forest and Forest Service Office at the operational level.

At this stage, social analysis carries out to identify elements, such as the roles, norms, and values of actors [20] [29]. At the organizational level, the Minister of Public Works and Public Housing must improve ministerial regulations. Furthermore, political analysis carries out to identify the hopes and needs of all stakeholders, related to the application of sustainable design concepts. At the operational level, organizational units must implement ministerial regulations with goods governance structures and procedures.

Table 1. Research Framework [19] [25]

Information	Process Phase	Previous Research and Regulations as a Reference
<i>Theoretical framework (F)</i>	<i>Theoretical framework</i>	There are 4 (four) factors that must consider o achieve the effectiveness of GOS management are natural factors, social factors, design considerations, and maintenance [28]. Sustainable landscape design concepts are in line with Sustainable Design concepts. It provides "Low Cost, Low Technology, Low Negative Impact Development" [17]. It must describe in 2 process design stages are the PSS design process (outlining the specifications of product usability) and PSS design expectations (requirements that a product must have) in the Product-Service System (PSS) [29].
<i>Methodology for research interest (MR)</i>	<i>Methodology for research interest (MR)</i>	Action Research Based on Soft System Methodology (SSM) with enrichment.
<i>Problematic situation (P)</i>	<i>Real-world problematic situation</i>	According to it was started as a research question. In short, interventions considered to be systematic and culturally appropriate in the effectiveness and efficiency of GOS management summarized in Table 5. Ministerial Regulation of Public Works No. 5/PRT/M/2008 concerning Guidelines for Provision and Utilization of GOS, the management of GOS consists of the planning, land acquisition stage, engineering design; implementation of GOS development; and the use and maintenance of those not yet implementing the Sustainable Landscape Design concept.
<i>Methodology for problem-solving (MPs)</i>	<i>Methodology for problem-solving</i>	Action Research Based on Soft System Methodology (SSM)
<i>Area (A)</i>	<i>The specific area in research</i>	Determination of the specifications of the product's use in the PSS design process and description requirements and design expectations of a product, and provide an effective Product-Service System (PSS) [30]. It can be considered design as one of the variables which influence the effectiveness (quality) of a GOS and maintenance efficiency [28].

Table 2. Stages of research based on the Soft System Methodology [19] [25]

Stages in the system	Picture	Collecting data method
First Stage: Identification unstructured problem	Gather various information relating to problematic situations through primary and secondary data. The results of the gathering and interpretation provide an overview of problem situations in the research context.	Literature study and initial interview
Second Stage: Structuring the problem	Compile ideas related to problematic situations systematically based on data and information obtained. Researchers uncover the problem through Rich Picture so that it becomes a structured illustration of the problem.	Literature study, formal and informal discussion, and in-depth interviews
Third Stage: Formulating Root Definition/RD	Regulate Broot's metaphors of problems that can solve and explain systems in a research context. RD describes what, how, and why systems used to enrich questions about problematic situations.	Formal and informal discussion
Fourth Stage: Formulating Conceptual Model	Model RD guidelines based on QPR, CATWOE, and controlled analysis with effective and efficient criteria.	Formal and informal discussion
Fifth Stage: The conceptual model compared to the real world	Compare research results with the real world, with comparative tables that facilitate the comparison process. The results of the comparison are used as a basis for researchers in designing changes that will improve the problematic situation.	Formal and informal discussion
Sixth Stage: Systematic development with appropriate cultural interventions	Analyze and interpret problematic situations based on comparisons that have made. The results of the analysis form the basis for determining change for problematic situations.	Formal and informal discussion

### Arranging Identified Problems Identified: Rich Picture

The second stage of SSM-based action research is to organize problems into a structured and easier-to-understand [29]. Figure 1 is a Rich Picture depicting the problems identified. As seen in the Rich Picture, in the management of GOS, researchers explore governance that is applied at the operational level based on the Minister of

Public Works Regulation No. 5/PRT/M/2008. Problem situations were identified at the organizational and operational levels. At the organizational level, the Guidelines for the Provision and Utilization of Urban GOS describes that the management of GOS consists of the

planning, the land acquisition, engineering, design; implementation of GOS development; utilization and maintenance, do not have a detail description. It is a problematic situation resulting in less effective and efficient implementation at the operational level.

The application of management phases in the Ministry of Public Works and Public Housing is another problematic situation.



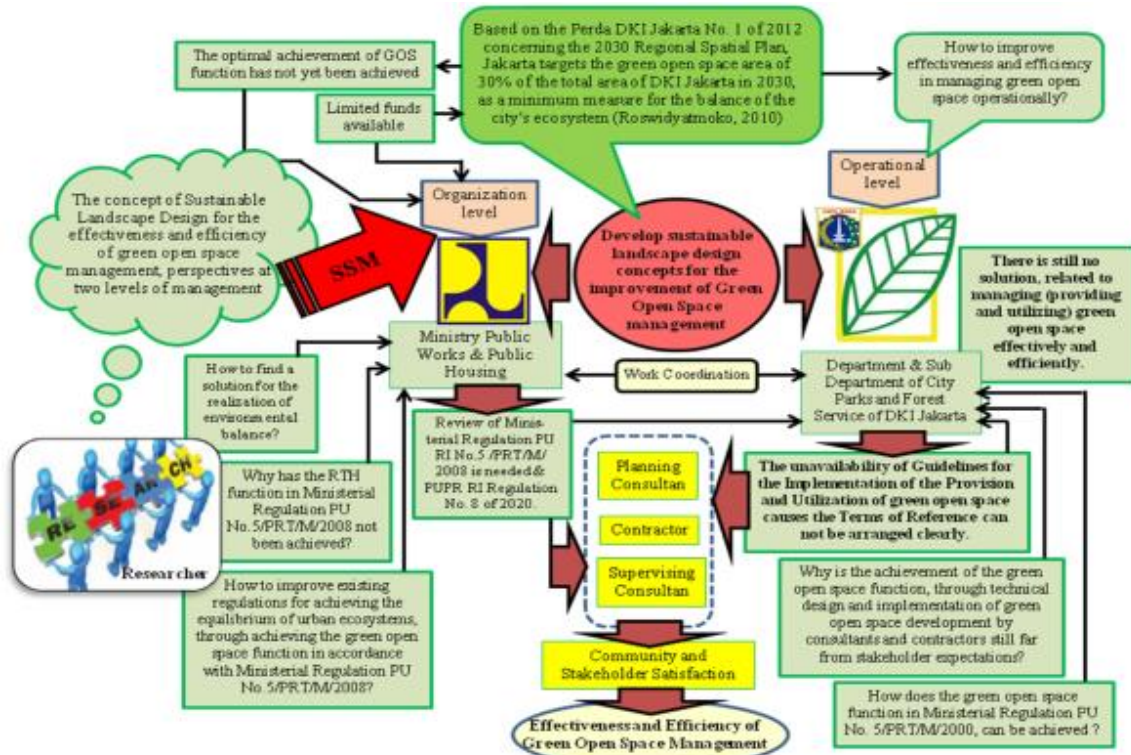


Figure 1. Rich Picture of Problems in the Management of GOS (Adopted from [19, 28, 31, 32])

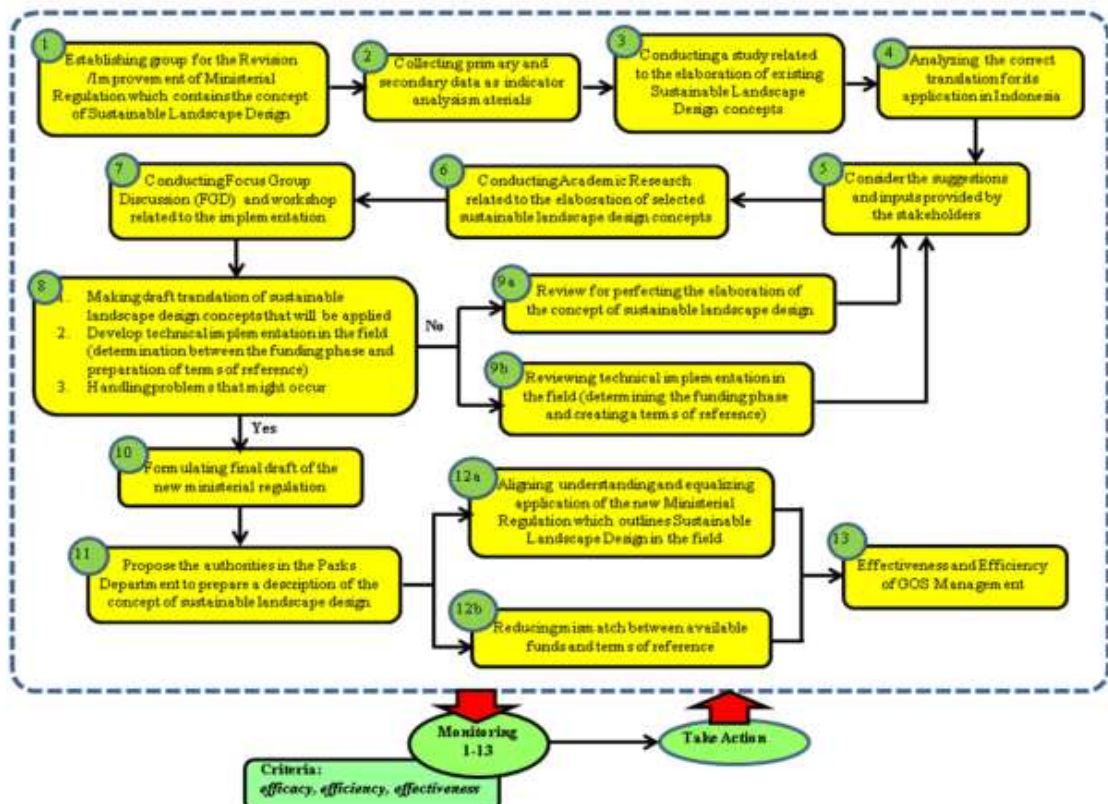


Figure 2. Conceptual Model for Explaining the Concept of Sustainable Landscape Design in the GOS Management (Adopted from [19, 31, 32])

Finally, at the operational level, structured and clear Terms of Reference cannot be arranged optimally. This situation creates problems during the implementation of the design and construction of green space.

As described in the previous research [28], input into design considerations, in the form of clarity of requirements and design expectations on a product from stakeholders, provides a practical design model [31], which can affect the effectiveness (quality) of green space and efficiency in its maintenance. The planning and land acquisition stage is carried out based on the prediction of meeting the land requirements for GOS. After the location of the land is determined, requirements should be formulated to realise the green space function, stakeholder expectations of green space, and the results of other studies related to natural and social factors in the form of Terms of Reference (CAC). However, in reality, the GOS that was built seemed to follow the trend and uniform shape, for example, the development of "RPTRA" (Child-Friendly Integrated Public Space) throughout the DKI Jakarta area, which in the end also experienced difficulties in its maintenance. Another problem that was revealed based on in-depth discussions and interviews with supervisory consultants was the mismatch between the amount of the budget and stakeholder expectations for green space, resulting in various design adjustments, which affected the quality of green space.

#### Formulation Root Defining: Application of Sustainable Landscape Design Concepts in Managing GOS

In the third stage of the SSM Based Action Research, Root Definition at the organizational level focuses on improving regulations and proposing the preparation of implementation guidelines related to applying sustainable landscape design concepts in managing GOS. The concepts which refer to the principle of "Low Cost, Low Technology, Low Negative Impact Development" [17], are expected to help accelerate the provision of decent and quality green space. By SSM-based action research methods, Root Definition examined for accuracy through CATWOE Analysis as shown in Table 3, which consists of Customers, Actors, Transformation Process, World View, Owner, and Environmental Constraint.

Table 3. CATWOE Analysis [20]

Customer	Community, consultants, and contractors
Actor	Government (Ministry of Public Works and Housing, Municipal Parks and Forest Service, and Urban Parks and Forest Service Department).
Transformation	Ineffective and in-efficient GOS management system toward an efficient and effective GOS management system.
Welt (Worldview)	The application of sustainable landscape design concepts outlined in the technical guidelines for GOS management implementation will result in effective and efficient management.
Owner	Government (Ministry of Public Works and Housing, Municipal Parks and Forest Service, and Urban Parks and Forest Service Department).
Environment	Regulations, funds, time, sustainable landscape design principles, stakeholder needs, and environment.

#### Formulating a Conceptual Model

The four-stage of this study formulated a conceptual model built by the researchers, as shown in Figure 2. The concept model developed in this study produced technical guidance on the implementation of urban GOS management related to the application of sustainable landscape design concepts in urban GOS management. It was built based on the root definition formulated in the previous stage and strengthened by in-depth interviews with the Department of Parks and Urban Forests and the GOS development supervisory consultant.

The depiction of the conceptual model preceded by a description of the series of activities needed to prepare technical guidelines for the implementation of GOS management. Through activities series, they are expected to produce an ideal form of technical implementation guidelines to refer to the concept of sustainable landscape design. This guide's availability hopes to improve the performance of urban GOS management to be effective and efficient. For this reason, goods coordination needed to produce technical implementation guidelines related to the provision and utilization of urban GOS. Figure 2 provides an overview of the conceptual model that connects each activity, the relationship of activity with supervision and control of the implementation of activities.

There are 5 (five) performance criteria for conceptual testing models: efficacy, efficiency, effectiveness, elegance, and ethicality [24]. However, in this study, only three performance criteria were used: efficacy, efficiency, and effectiveness. An explanation of the reason for using criteria is in Table 4.

**Table 4. Testing Criteria with 3E [26, 29, 32]**

Efficacy	the existence of formal law underlies the improvement of GOS management.
Efficiency	minimum use of resources, especially funds.
Effective	The success of the model is determined by the accuracy of the implementation sustainable landscape design concept and the consistent implementation of the proposed refinement of stages in the management of GOS.

In this conceptual model, the proposed organizational level, improvement of the Regulation of the Minister of Public Works of the Republic of Indonesia No.5/PRT/M/2008 carried out as a basis for applying sustainable landscape design concepts in managing urban GOS. Improvements made by providing a description related to the scope of work that has not described at several stages of managing urban GOS are:

1. The planning stage, considering the principles that must complete with the application of sustainable landscape design concepts and the stakeholder expectations, will be useful as input for the preparation of technical implementation guidelines for managing urban GOS at the operational level (Department of Parks and Urban Forests)
2. The Land acquisition stage includes matters relating to consideration of the stakeholder's expectation
3. The technical design stage includes matters that require the parties in terms of reference
4. The implementation stage of GOS construction include matters needed for the smooth construction
5. The utilization stage and maintenance, the description is quite clear and will depend on the four previous stages.

The Republic of Indonesia Minister of Public Works and Housing Regulation No. 8 of 2020 concerning Operational Instructions for the Implementation of Special Allocation Funds for Public Works and Public Housing Infrastructure also needs to improve this conceptual model. It related to changes in the right stage to prepare the Terms of Reference for Work carried out before prepared the budget.

At the operational level, the proposed conceptual model relates to the preparation of technical guidelines for implementing RTH management that encompasses the principles of applying sustainable development by the City Parks and Forests Service. This implementation guide will be a reference in preparing the Terms of Reference that will be made by each Urban Forest and Forest Service Office in each of the City Administration Areas in Jakarta. Figure 3 shows the structure of the implementation of urban GOS

management based on sustainable landscape design.

#### Comparing Conceptual Models with the Real World

The five-stage of SSM-based action research is conducting discussions to compare conceptual models with perceived reality. Researchers formulate change efforts or action steps that need to take to resolve the problem at this stage. Based on philosophical aspects, several points must consider applying sustainable landscape design concepts in GOS management:

1. Accelerating the improvement of the Regulation of the Minister of Public Works of the Republic of Indonesia No.5/PRT/M/2008 concerning Guidelines for Provision and Utilization of GOS and the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia No. 8 of 2020 concerning Operational Instructions for Organizing Special Allocation Funds for Public Works and Public Housing Infrastructure.
2. Accelerate the preparation of Guidelines for the Implementation of Green Open Management by the City Parks and Forest Service Agency to become guidelines for the preparation Terms of Reference for providing/providing GOS at the City Administration Level.
3. Improve coordination with stakeholders regarding the preparation of Guidelines for Managing GOS Management and the preparation of Terms of Reference.

#### The keys element of recommendations that has an impact on effective and efficient GOS management

The sixth stage of SSM-based action research is to formulate recommendations for action changes needed to resolve the problem. These recommendations usually describe as systematically and culturally desirable to support the desired change from the problem situation started as a research question, in short, interventions considered to be systematic and culturally appropriate in the effectiveness and efficiency of GOS management summarized in Table 5.



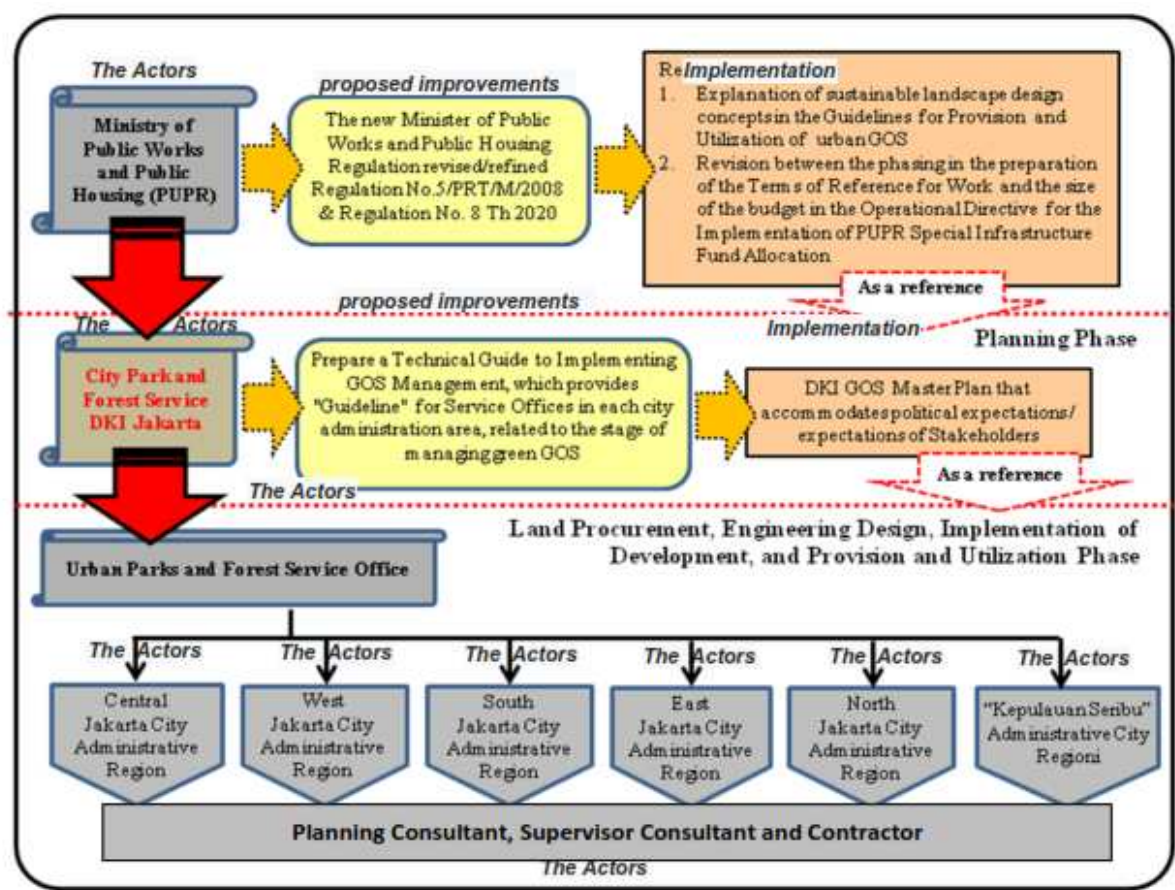


Figure 3. Role of the Department of Park and Urban Forests in Managing Urban GOS

Table 5. Key Elements of Recommendations (Adopted from [25, 28, 31,32])

Root Definition	Systematically desirable	Culturally feasible	Recommendation
Defining Sustainable Landscape Design Concepts in Managing GOS	Yes, the elaboration of sustainable landscape design concepts in managing urban GOS is needed to provide a reference that can simplify and facilitate government relations with consultants and contractors in managing GOS (provide and maintenance) to run efficiently and effectively. In the implementation, it needs to be strengthened by the Government regulations as a legal basis.	Yes, no detailed guideline guides the stakeholders involved in managing GOS (provide and maintain).	The review of the management of urban GOS by the City Parks and Forest Service Department and its tribes carried out in connection with the ongoing application of sustainable landscape design concepts in GOS management. It needed to support the efficiency and effectiveness of managing GOS, particularly to the acceleration of GOS provision/development that the government is promoting.

### CONCLUSION

In this paper, elaborating on the sustainable landscape design concepts illustrated describes the source of ineffective and efficient GOS management, which is the unavailability of technical guidelines for managing GOS that refers to the sustainable landscape design concepts. If the sustainable landscape design principle of sustainability is not considered in the planning and design of green space, it will burden maintenance cost. This research hopes that by exploring the importance of these technical guidelines at the organizational level, sustainable landscape design

concepts in the management will apply in the proposed GOS.

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