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Understanding the Challenges of Waste Management in Vientiane

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Abstract

Waste is a major global issue; thus, waste management(WM) is essential for promoting environmental sustainability, public health, and economic development. This study focuses on the issues of solid waste management (SWM) in Vientiane, Laos. While this study contains a review of the literature study on the issue, it focuses on the regulatory framework, present programs, and significant actors involved in waste management in Vientiane to draw attention to the fundamental problem and how successfully the stakeholders collaborate in SWM. Despite government efforts and international assistance based on the existing articles, Vientiane faces considerable obstacles including inadequate infrastructure, limited resources, poor governance, and low public awareness. In theoretical frameworks, policy implementation and governance theory are utilized for investigating societal aspects such as stakeholder participation, resource allocation, and citizen engagement. Four in-depth interviews were conducted with key stakeholders. In addition, thematic and in-depth analyses of existing research and report papers and interviews on WM policies, problems, and stakeholder collaboration were carried out. The research discovered that the issues arise from poor resource allocation, including financial, technical, and institutional capacities, a lack of knowledge among the public, and collaboration between stakeholders. Regardless of these limitations, the study indicates strong connections among major stakeholders in Vientiane's solid waste management sector. Sustainable waste management strategies can be improved by collaborating with public and private stakeholders to promote a cleaner, more sustainable future for Vientiane.

Abstrakt

Odpady jsou hlavním globálním problémem; odpadové hospodářství (WM) je tedy zásadní pro podporu udržitelnosti životního prostředí, veřejného zdraví a ekonomického

rozvoje. Tato studie se zaměřuje na problematiku nakládání s pevným odpadem (SWM) ve Vientiane v Laosu. I když tato studie obsahuje přehled literární studie o této problematice, zaměřuje se na regulační rámec, současné programy a významné aktéry zapojené do odpadového hospodářství ve Vientiane, aby upozornila na základní problém a na to, jak úspěšně spolupracují zainteresované strany v SWM. Navzdory vládnímu úsilí a mezinárodní pomoci založené na stávajících článcích čelí Vientiane značným překážkám, včetně nedostatečné infrastruktury, omezených zdrojů, špatné správy věcí veřejných a nízkého povědomí veřejnosti. V teoretických rámcích se pro zkoumání společenských aspektů, jako je účast stakeholderů, alokace zdrojů a zapojení občanů, využívá teorie implementace politiky a správy. Byly provedeny čtyři hloubkové rozhovory s klíčovými zainteresovanými stranami. Kromě toho byly provedeny tematické a hloubkové analýzy stávajících výzkumů a zpráv a rozhovory o zásadách WM, problémech a spolupráci zainteresovaných stran. Výzkum zjistil, že problémy vznikají v důsledku špatné alokace zdrojů, včetně finančních, technických a institucionálních kapacit, nedostatku znalostí veřejnosti a spolupráce mezi zúčastněnými stranami. Bez ohledu na tato omezení studie naznačuje silné propojení mezi hlavními zúčastněnými stranami v sektoru nakládání s pevným odpadem ve Vientiane. Strategie udržitelného nakládání s odpady mohou být zlepšeny spoluprací s veřejnými a soukromými zainteresovanými stranami na podporu čistší a udržitelnější budoucnosti Vientiane.

Keywords

Solid waste management, Governance, Stakeholder participation, Collaboration, Sustainable waste management, Vientiane.

Klíčová slova

Nakládání s pevným odpadem, správa, účast zainteresovaných stran, spolupráce, udržitelné nakládání s odpady, Vientiane.

Extent of thesis: 65,796

Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague **30.04.2024** **Subin Han** 

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Contents

1. Introduction

For decades, waste disposal has been a major concern in the eyes of governments and the global community. Waste is a compelling cause of pollution that adversely impacts the environment and all living organisms. The generation of municipal solid waste (MSW) is influenced by a country's economic status (Shekdar, 2009). Solid waste disposal differs significantly between industrialized and developing countries. Sustainable waste management systems are critical to control and treat MSW in a suitable manner that minimizes its negative effects on the ecosystem. However, they are expensive and difficult for developing countries to acquire (Marshall & Farahbakhsh, 2013). As a result, low and middle-income countries rely on unsustainable waste management systems such as landfills, open dumping, and incineration, which degrade air and water quality, have serious consequences for humans, and the broader environment. A well-maintained SWM system is critical for the country's economic development, health implications, and people's quality of life (Ferronato & Torretta, 2019).

The Lao People's Democratic Republic (the Lao PDR) is one of Southeast Asia's fastest-growing economies, classified as a low middle-income country by the World Bank (World Bank, n.d.). Laos PDR aims to reduce poverty and enhance its economic standing by utilizing natural resources while also increasing the number of transportation and industrial facilities, which degrades the urban environment (Vientiane Capital, 2018). Rapid urbanization has resulted in an expansion of waste, as well as severe short and long-term health issues and other critical issues such as massive amounts of garbage that is improperly disposed of and managed. In 2018, the Lao government approved a National Green Growth Strategy 2030 to promote effective green strategies for the development of human and natural capital, as well as ensuring cleanliness and environmental friendliness and fostering economic growth. Some of the methods used to implement such strategies

include investing in government officials' education and training, encouraging investment in green technologies and infrastructure, encouraging participation by different stakeholders such as non-governmental organizations, communities, businesses, and international organizations, and establishing an effective monitoring system. (Vientiane Capital, 2018). Despite environmental policies aimed at improving SWM, in many rural and urban parts of Laos, landfills, burning, and open dumping are still prevalent methods of getting rid of solid waste, as is poor waste management (Kim et al., 2020, Vientiane Capital).

Research has highlighted the problems and opportunities in this sector, emphasizing the importance of collaboration among government institutions, private companies, non-governmental organizations, and local communities (Ahmed Ali 2004, Agustina 2023, Koontz 2005). However, no collaborative approach of pooling resources, sharing expertise, and forming partnerships was proposed to solve the complex difficulties facing waste management (WM) in Laos. The availability of government reports as well as data from municipal authorities and international organizations, provides significant insight into Vientiane's present WM procedures, infrastructure, and policies, shedding light on the difficulties.

The main aim of this thesis is to look at potential SWM difficulties in Vientiane, understand the core causes of the waste problem, and evaluate how well the government, non-governmental organizations (NGOs), and grassroots communities' relationships function in SWM.

1. Why does the capital of Laos face challenges in its system of waste management?
    - Are the problems the policies themselves, a lack of resources to support the policies, or other potential reasons?

2. How successfully do government agencies, NGOs, grassroots groups, and other organizations in Vientiane collaborate on waste management initiatives?

These questions endeavor to grasp a deep understanding of the complex reasons behind the WM challenges in Vientiane. Additionally, to scrutinize the dynamics of collaboration among different stakeholders in addressing these issues. The research holds importance as it can inform politicians, urban planners, and community leaders about the critical elements influencing WM practices in Laos.

In the upcoming literature chapter, I'll take a look closer at Laos' institutional and regulatory framework to understand who takes the lead in managing solid waste and to examine the policies currently in place.

2. Literature review

2.1 Laos regulatory framework on waste management system

At the central level MSW management oversees policies, laws and initiatives by the Ministry of Natural Resources and Environment (MONRE), as well as the Ministry of Public Works and Transportation (MPWT) (Global Green Growth Institute, 2020). Moving on to the provincial and city levels, the main issue of SWM is handled by urban development administrative authorities in collaboration with national ministries (Vientiane Capital, 2018). The Vientiane City Office for Management and Service (VCOMS) is in charge of SWM in Vientiane, for gathering, transferring, and eliminating it.

In 2016, Laos' government approved the National Green Growth Strategy (NGGS) 2030, which includes Vision 2030, a ten-year Strategy (2016-2025), and the 8th Five-Year National SocioEconomic Development Plan (2016-2020). The strategy aims to promote

green strategies for human and natural capital development, environmental friendliness, and economic growth (Vientiane Capital, 2018). In particular, the NGGS has focused on reducing Municipal Solid Waste (MSW) and greenhouse gas emissions to promote a clean and ecologically friendly environment.

As a result, Lao PDR has committed to raising awareness about the importance of recycling and avoiding the disorderly treatment of waste in an unsustainable way. Furthermore, more research is being conducted to improve and implement the reallocation of financial, waste management, and infrastructure mechanisms in metropolitan cities (Vientiane Capital, 2018). The federal government assists waste-related businesses in reusing waste or producing multiple products from it to create jobs and minimize the use of freshly mined materials.

WM in Laos was operated within the framework of laws and regulations which were set up to protect the environment, and public health and foster sustainable development. Environmental Protection Law (2012) categorized waste into general and hazardous types with the requirement of separate disposal methods and provides basic principles for waste handling and disposal. Chemicals Management Law was responsible for classifying chemical substances based on their potential harm and specifying the procedures for their safe Management and elimination in compliance with environmental standards (JICA, 2021). Moreover, legislation such as the Decree on Environmental Impact Assessment imposed comprehensive assessments on all development projects including those dealing with waste to manage environmental impacts effectively. These laws were complemented by ministerial instructions on pollution control and hazardous WM, which were the basis for the procedures to monitor and regulate the activities that emit pollutants and hazardous materials (JICA, 2021). Moreover, national policies such as the 8th National Socio-Economic Development Plan (2016-2020) and National Pollution Control Strategy and

Action Plan (2018-2025) proposed waste reduction, pollution prevention, and sustainable development initiatives at a strategic level to convey the country's commitment to environmentally friendly practiced without jeopardizing the well-being of its citizens and ecosystems (JICA, 2021).

The Environmental project approved World Bank financing, with an estimated implementation period of 2023 to 2029 and a budget of $45.08 million. The main goals of EWMP include strengthening environmental protection systems, improving MSW management in selected cities (Vientiane, Savannakhet, Pakse, Luang Prabang, and Vang Vieng), and ensuring an immediate and effective response to eligible crises or emergencies (Environment Protection Fund, 2022).

2.2 Vientiane background

Vientiane is Lao PDR's capital and the primary economic center in the region. It is the residence of the majority of the population, approximately 737,750, 10.4% of the country's population with an urban area of 3,920 km². Based on a 2015 Climate and Clean Air Coalition (CCAC) report, the understanding of solid waste was acknowledged from residential and commercial structures in 2015. Until then, there was no proper definition of solid waste (GGG1, 2020). Solid waste refers to waste produced in residential and commercial areas, including paper, food waste, and plastics (Williams, 2005). According to the report of an initial assessment and study on the SWM sector in Vientiane, only 30-50% of MSW is collected for disposal or recycling which can be interpreted as the rest being treated in an unsanitary manner in Vientiane (Global Growth Institute, 2020).

According to the Global Green Growth Institute (2020), the total household waste generation and other waste generated by other sources from the business sector and buildings were 711 tons and 970 tons per day, respectively in 2020. According to Figure

1, organic waste accounts for 27% of the MSW waste mix in Vientiane and is primarily found in landfills. After biological waste materials, plastic accounted for 12.1% of the waste generated (Kim et al., 2020). Additionally, due to changes in people's lives and the pandemic-related restrictions on dine-in restaurants, the amount of plastic waste surged (Bengtsso & Long, 2022). (The figures have been taken from Kim et al., 2020).

Figure1	**Waste composition of MSW in Vientiane (%)**
Organic waste	67%
Plastic	12.1%
Paper and cardboard	8.8%
Glass	3.3%
Can	0.7%
Textile	0.3%
Mental and Aluminum	0.1%
Others	7.8%

Figure 2	**Waste composition at the landfill in Vientiane (%)**
Organic waste	56%
Plastic	27%
Paper and cardboard	6%
Textile	3%
Glass	2%
Other waste	6%

Vientiane's WM was based on a "collect and dispose" approach, which ignored substantial chances in the absence of any policies or regulations to convert waste material into valuable resources that can be reused or transformed into new goods or energy sources. However, in 2017, they adopted a new paradigm in support of waste-to-resource initiatives, emphasizing reduction, reuse, and recycling (3R). Incinerators and other thermal treatment procedures are not well-known since they are economically unaffordable due to the state of Laos PDR. However, there is a small-scale incinerator in healthcare facilities. Given that organic waste is the majority of waste produced in Vientiane, composting may be the best method of waste removal. However, the majority of composting occurs in rural regions; it is still not prevalent in large cities, and there are restrictions on the usage of compost products in agriculture applications (GGGI, 2020).

Although there aren't any significant recycling enterprises in Laos, there are small and medium-sized companies besides unofficial waste pickers in Vientiane that process or handle recyclable materials. These waste pickers usually operate independently as members of informal networks or as employees of private enterprises (GGGI, 2020).

Overview of Vientiane's recyclable solid waste happens in the following stages (GGGI, 2020):

i. Waste is separated into two types: segregated and unsegregated.

ii. Waste is collected, transferred, and transported.

iii. The waste will undergo processing and treatment. Organic waste will undergo biological treatment, while inorganic waste will be recycled. Waste that does not go through these two processes will be treated in other ways, such as thermally, mechanically, or biologically.

iv. Waste will be disposed of at the end stage. Unsegregated waste will skip the third process and be disposed of directly. Throughout these stages, the informal sector (waste pickers) participates in the separation analysis.

Certain regions of Vientiane lack adequate road access, making it impossible to collect rubbish throughout the entire city. Solid waste produced in Vientiane is collected, transported, and disposed of under the supervision of the Vientiane City Office for Management and Service (VCOMS). Almost 31% of homes utilize it, while 14% are outside of the service region and the rest do not (Kim et al., 2020). In 2017, the cost of a weekly collection service increased from $3 to $5 per household; many households did not continue to use the service after the price increase (Vientiane Capital, 2018). This problem resulted in several families sharing a single litter pick-up service contract. As a result, a greater actual percentage of collection than 31% is reasonable to anticipate (Kim et al., 2020). In 2019, VCOMS and private enterprises that partner with VCOMS disposed of 400 tons of municipal waste per day in the landfill known as Km 32, which is 32 kilometers from the city (JICA, 2021). When trucks from VCOMS with incoming rubbish reach a transfer station 12–16 kilometers from the city to the midway landfill site, they

are loaded onto a larger vehicle. There is no compression or further sorting done at this point (GGGI, 2020). However, workers are permitted to gather any reusable waste which will eventually be sold to recycling companies that collect valuable materials from markets and restaurants. Additionally, VCOMS operates a private recycling center at the KM32 landfill that purchases resources from waste pickers (GGGI, 2020).

Informal workers (waste pickers) gather recyclables like plastic, paper, and metals from homes, public spaces, and landfill sites. According to the JICA 2016 survey, informal workers contributed 8.7% of Vientiane's recycling rate. Additionally, waste pickers are using door-to-door collection to purchase recyclables from homes, which they would then sell to recycling facilities for a profit. After that, the purchasing center would sell it for a higher price to additional intermediaries. Small and medium-sized businesses that process or handle recyclables sell their finished goods to recycling organizations so they can repurpose them or use them as fertilizer. Recyclable materials are typically shipped to China and Vietnam for ultimate handling and processing. Although there are no official methods for handling biodegradable organics, some research advises repurposing leftover food for animal feed. However, information and practices about waste processing methods and stakeholders are limited (GGGI, 2020).

The involvement of many stakeholders is necessary to put in place to create a comprehensive SWM. Table 1 displays the roles of significant players in Vientiane (GGGI, 2020).

Table 1. The role of stakeholders in Vientiane

Key stakeholders	Role and participation in MSW
Central government	The Ministry of Public Works and Transport (MPWT) is in charge of general waste management; The Ministry of Natural Resources and Environment (MONRE)

	(Both ministries are Responsible for developing policies and plans for environmental initiatives)
Municipal Authority	Urban Development Administration (UDAA) is the main body that handles solid waste management issues at the provincial level
Vientiane City Office for Management and Service	Solid garbage created in Vientiane is collected, transported, and disposed of under the supervision of VCOMS. Aims to enhance the overall management and service delivery within the city of Vientiane
Private Sector	Waste Collection Companies: entrusted with gathering and moving solid waste from homes, businesses, and industrial locations; either under contract with the government or operating independently. Recycling businesses: Organizations that recycle and process resources that can be recovered from solid waste streams.
Non-governmental Organization	Environmental NGOs: Dedicated to promoting solid waste management and environmental conservation through advocacy, awareness-raising, and capacity-building. Community-Based Organizations (CBOs): These groups strive to encourage community involvement in waste management initiatives such as recycling, composting, and trash segregation at the local level. Environment Conservation and Community Development Association" (ECCDA): conducted a few programs in Vientiane to improve the work and living conditions of waste pickers. ECCDA had helped waste pickers in a neighborhood of Vientiane to coordinate and organize their work, as well as offered basic training in waste segregation, medical treatment, and sanitation.
Informal Stakeholders	There are two types of waste pickers: The first group collects from door to door in public buildings, houses, or industries. The second group is employed by the recycling buying center at the landfill site, which is managed by VCOMS.
Households, and Businesses:	Businesses and individuals have a significant role as stakeholders in trash management. The way they generate, sort, and dispose of garbage has an immediate effect on how well the waste management system works.

(GGGI, 2020)

2.3 Main Challenges

In Vientiane, there are no recycling containers for segregated or unsegregated waste in public places. The municipal waste service gathers waste in bamboo containers or plastic

bags along sidewalks and roadsides. As a result, all of the waste gets mixed, making it more difficult to recover useful elements and increasing the probability that the waste will end up in landfills (GGGI, 2020). Also, one of the collection service truck barriers in various Vientiane streets is inaccessible due to the unpaved and poor road conditions. However, it was proposed to create a decentralized trash service using smaller dump trucks (GGGI, 2020).

Despite these challenges, there are no significant laws or regulations promoting waste-to-resource activity at the municipality level and national levels. Additionally, there are still no facilities that can sustainably process organic waste and plastic. Also, there is inadequate infrastructure for segregating and storing recyclables at scale. The challenges faced by waste pickers add another layer of complexity to the situation. The waste pickers have bad working conditions with no employment protection, particularly for those who work in landfills to gather recyclable materials. Waste pickers sell reusable waste to the buying center at a lower price, which the buying center then resells to recycling companies for a greater price. The market price fluctuates sharply, and there are no systems in place to safeguard them, which makes them an unsecured class (GGGI, 2020).

Vientiane's low household garbage collection rate of 31% indicates a lack of practice in waste segregation. This means that the majority of citizens are illegally dumping or burning their waste (Kim et al., 2020). Annually, VCOMS has a budget of 2 million dollars; the funding comes from the collection service fees. However, there is a budget deficit for VCOMS considering the fees from waste management services are not fully covered due to the shared contracts, with more than one household using one contract. (Kim et al., 2020).

I will examine societal elements such as public policies, stakeholder interactions, resource allocation, governance structures, and so on using policy implementation and governance

theory to provide important perspectives and frameworks to analyze the difficulties. Public policies have immediate effects on people's lives, changing their access to services, resources, and opportunities. Policies significantly impact societies, economies, and environments, with long-term consequences. These are developed in a multi-step process involving a variety of stakeholders, institutions, and decision-making mechanisms. The general process may include the following five stages. Agenda Setting, policy formulation, decision-making process, policy implementation, and policy evaluation stage (Wu et al. 2010).

Any shortcomings in waste management may be discovered during the implementation stage. Furthermore, poor governance can be a major issue, resulting in failed policy implementation in solid waste management systems in Low-income nations (Konteh, 2009).

I will focus on the implementation stage, which has the greatest effect on SWM (Trinh et al. 2021). Policy implementation is a process of putting a government policy or program into action. After the policy has been adopted, several actors begin to participate in the implementation process; unlike during the previous stages, bureaucrats are the primary actors in this phase. Different levels of bureaucratic agencies at the national, state, and local levels can exert influence over authority and responsibility within multi-governance processes. Multi-governance involves interactions and collaborations between various levels of government and stakeholders. (Bache & Flinders, 2004).

The continuation of funding for the programs is not guaranteed and may be temporary due to the high cost, necessitating ongoing discussion between the actors and institutions (Freeman 1997).

Furthermore, regulations play a vital factor in successful implementation as they can regulate how target groups of the policy behave, enforce compliance, and provide incentives to operate in a specific way. (Freeman, 1997).

All the shortcomings are evident in the policy implementation phase. For example, a lack of clear objectives might lead to poor operationalization. Inadequate funding of infrastructure can affect the effectiveness of a policy. If the policy is very complicated or poorly conceived, it may face some difficulties. Poor communication and collaboration among policymakers and stakeholders can also lead to confusion and hinder effective waste management efforts. (Wu et al. 2010).

Governance refers to the structure, processes, and institutions that enable decision-making, resource allocation, and accountability to stimulate the national economy, alleviate poverty, and successfully implement policy (Agustina, 2023). They are also crucial to promoting liability, openness, and public trust in the actions of the government (Agustina, 2023). By establishing clear procedures, accountability mechanisms, and oversight structures, policymakers can strengthen the legitimacy of their decisions and demonstrate their commitment to good governance, the protection of the public interest, and cross-cutting challenges such as public health crises.

Implementation and governance are important indicators in public policy when it comes to shaping the outcomes of government initiatives and programs. The formulation of laws and regulations, as well as their implementation and management, can determine the consequences of a policy. It translates policy objectives directly into tangible actions and outcomes. Strong governance frameworks and effective implementation strategies are needed to mobilize resources, coordinate actions, achieve collective goals, and reduce the risk of corruption.

2.4 Theoretical Framework

In the following subsections, I will look at the essential aspects of governance and their potential impact on WM such as the interaction between central and local governments, resource distribution, participation of all relevant parties, and citizen awareness of the necessity of recycling. I will employ implementation theories such as top-down and bottom-up approaches, as well as collaborative governance theory, to see how diverse stakeholders can interact to create transparency, accountability, and inclusivity. These approaches give frameworks to analyze governance structures influencing WM outcomes and to understand how diverse stakeholders interact together to develop sustainable SWM plans in Vientiane. Additionally, I will take a look at how effective governance structures can either support or hinder implementation efforts.

2.4.1 Relationship between central and local government

The dynamics between federal and provincial governments in waste management policy implementation are one of the most important factors in allocating resources efficiently and ensuring consistency in policy enforcement (Freeman, 1997). In policy implementation literature, there are two main types of perspectives for studying the implementation process: the top-down approach and the bottom-up approach (Wu et al. 2010). The former perspective is focused on the viewpoint of policymakers, has a legal framework, and clearly defined goals and policy tools aimed at achieving goals, but undervalues the role of strategic activities by frontline bureaucrats or target groups. Policymakers are assumed to know the capacities of the people or institutions implementing policy, such as resources, legal authority, autonomy, understanding of policy implementation, and so on. They are also assumed to understand the level of implementers' commitment or desire to behave according to the policy's objectives and goals (Birkland, 2001). Policy makers' leadership also becomes the crucial requirement

for the effective implementation in this perspective. In contrast, the bottom-up perspective sees policy implementation to rely on street-level bureaucrats such as local civil servants, law enforcement authorities, and public service providers. This perspective faces obstacles including policy ambiguity, limited resources, and time pressure to implement a policy (Wu et al, 2010). Wu et al. (2010) emphasize the importance of addressing "resource gaps" in the institutional environment where street-level bureaucrats work, as well as their understanding of their roles in dealing with such challenges. In addition, Birkland (2001) stated that without allowing local implementers to adjust to local conditions, programs are more likely to fail. The key to the success in this perspective on policy implementation is to give appropriate flexibility to local bureaucrats and tools to increase the knowledge and competence of front-line bureaucratic officers, which are the most important factors in addressing the implementation accomplishment (Sabatier, 1986). In understanding implementation of SWM, it is recommended to involve various stakeholders and numerous levels of governments (Joseph et al., 2007, Sabatier, 1986). Furthermore, most countries have decentralized WMS; managing solid waste involves a variety of stakeholders from the public as well as the private sectors. In the case of decentralization, responsibility is delegated to provincial and municipal governments (Joseph et al., 2007, Marshall & Farahbakhsh, 2013). Decentralized mechanisms are seen not only to strengthen local communities but also encourage community participation (Marshall & Farahbakhsh, 2013).

2.4.2 Resource Allocation

Management shortcomings stem from a lack of institutional capacity and expertise. Inadequate organizational capacity in local waste management legitimacy, such as leadership and expertise, can contribute to management failures (Chung and Lo 2008). Based on some research, in many Asian countries, local authorities have insufficient technical knowledge and skills to manage the MSW sector, and external factors such as

sociocultural issues by influencing waste generation patterns and community behaviors. These factors impact the success of municipal governments' obligations in developing nations in Asia which makes it more difficult to handle sophisticated tasks (Zurbrugg, 2002).

Resource availability is critical to the effectiveness of SWM implementation because it is challenging to adopt a practice with limited resources (Zurbrugg, 2002). Management is responsible for marshaling resources during the execution phase to ensure proper implementation. Capital allocation must be properly dispersed to boost implementation strategies. Other challenges may include a lack of technology which may impede effective implementation in developing nations.

According to Gonzalez-Torre and Adenso-Diaz's study in 2005, pro-environmental behavior toward recycling is more linked to more recycling at home, and shorter distances to these recycling bins increase the possibility of recycling rate; on the other hand, the insufficient supply of recycling bins and the further it is, the people are more likely to dispose of waste in open areas. Regulation can motivate citizens to recycle (Pokhrel and Viraraghavan, 2005). Additionally, The lack of regulation may prevent the fulfillment of policy goals, and there are no means to ensure enforcement (James, 2000). The government is responsible for improving the SWM system while supporting financially, boosting professionalism, and providing strict regulations so that recycling companies, other businesses, and citizens have a positive attitude toward recycling (Minghua et al.)

2.4.3 Collaboration of all parties

Stakeholder engagement is critical to deliver efficient MSW management and overcome the challenges (Bhuiyan, 2010). Collaborative approaches lead to more effective

decisions by ensuring a diverse range of perspectives and encouraging participatory decision-making processes in which stakeholders contribute their expertise, local knowledge, and insight. Collaborative governance can be defined using basic terms like partnership and collaboration, in which both public and private Organizations like government, NGOs, and civil society perform collective action (Ansel & Gash, 2007). When stakeholders are involved in the planning and implementation process, they are more likely to support and actively participate in waste management programs. Collaboration also promotes transparency and accountability in MSW management processes when resources are shared, as well as the ability to build trust and legitimacy by including every voice in the input (Bhuiyan, 2010).

Partnership refers to a cooperation between public and private networks, often formalized through legal agreement. In a partnership between the central and local government, the central government contributes to finances, regulations, and laws, while local governments increase involvement and access to private sector resources within their communities. They can jointly deliver a public service or infrastructure project (Edgar et al., 2006).

Civil society has become increasingly aware of and committed to local problems and issues, promoting a community-based self-help mindset (Edgar et al., 2006). The coalition of organizations working on a particular issue has the chance to draw on indigenous expertise and increase the implementation of programs that will increase citizen accountability. This could be a chance to showcase how democracy works by including a diversity of views and a coalition representing civil society that promotes transparency. Reaching consensus among varied groups can be difficult; nonetheless, variety is essential to the thriving of civil society; when civil society participates in public

issues, it has a deeper effect on both the administration and the public (Edgar et al., 2006, Tukahirwa et al., 2010).

To achieve sustainable SWM it is important to encompass a governance dimension, to consider implementation strategies, and to monitor the institutional system (Agrawal 2001). In low- and middle-income countries, building integrated partnerships (PPP) with organizations in the private and civic realm such as community-based organizations (CBO), non-governmental organizations (NGOs), waste pickers, small and large recycling enterprises, and waste purchasers, and citizens is critical to solving SWM problems when resources and capacity are limited (Ahmed & Ali, 2004 & 2006). According to Ahmed and Ali, Bangladesh, a developing country in South Asia with weak finances and a dysfunctional waste management system, has started to improve with the help of private sector participation. The local government provided CBOs and NGOs with training in the process of managing primary collection. The CBOs and NGOs were responsible for door-to-door waste collection and the management of this service contract with citizens. In addition, the partnership between the public and private sectors was promoted by the municipal authorities by creating a joint forum for citizens and service providers to increase opportunities for collaboration, innovation, and efficiency in WM.

Furthermore, Collaborations are voluntary arrangements between private entities and civil society to mitigate the impact of public policy challenges. The government often plays a facilitating or regulatory role rather than a direct participant (Casady et al., 2019). It is a new paradigm of governance that establishes cooperative efforts between various stakeholders, as opposed to top-down management systems that allow for inclusive decision-making and collaborations (Casady et al., 2019). However, it may also have weaknesses. The private sector is often more concerned with profit than with ideas of

equality and justice. Thus, some impoverished populations may be excluded from the services they provide.

2.4.4 Citizen awareness and participation

Active participation by government, NGOs, and citizens, influences community awareness and improves SWM operation efficiency (Moghadam et al., 2009). One notable transition in industrialized democratic countries, such as the United States and throughout the entire EU have been the involvement of multiple stakeholders to promote inclusivity and engagement in environmental policy. This tendency has not only resulted in decentralization of authority between the national and local governments as well as in an increase in power devolution to local governments and citizen stakeholders in many countries (Koontz, 2005).

The integrated SWM approach is a new concept in WM strategies. It focuses on synergy and collaboration among numerous stakeholders. Also, it promotes citizen engagement by understanding the concerns and preferences of citizens to achieve the most effective performance in reducing household waste while educating and encouraging citizens to reduce and recycle waste (De Feo and De Gisi, 2010). It has been shown that citizen participation strongly influences the success of SWM programs. (Keramitsoglou and Tsagarakis, 2013). Also, it can take numerous forms and is critical in creating local waste policies and practices, as well as sharing innovative ideas to raise awareness among the next generation. They can also advocate for environmentally beneficial methods for handling waste (Valera, 2020).

A significant amount of solid waste originates in the home (Keramitsoglou and Tsagarakis, 2013), hence having an adequate collection service is imperative. Unproductive garbage collection services are frequently seen in developing nations

(Ahmed and Ali, 2006). Citizens have a vital function in waste management since they generate, segregate, collect, recycle, and dispose. Some research demonstrates that lack of understanding and engagement in SWM practice is a concern, particularly in countries with limited resources. (Nasrabadi et al., 2008). Human activity can lessen environmental impacts because humans are the primary source of waste. (Vlek et al., 2007). In terms of pro-environmental behaviors, both governmental and private institutions have increasingly been encouraging citizens to act responsibly. For example, in Thailand, the Bangkok Metropolitan Administration (BMA) provides three separate waste-sorting containers at various locations. Furthermore, the BMA promotes community-based SWM based on the three R's (reduce, reuse, and recycle) through a variety of programs, while also educating and empowering individuals to create awareness about the impact of SWM (Environment Department Bangkok, 2016).

Decentralized SWM systems help local organizations take control of their waste management processes, leading to greater community participation. Local governments can conduct public meetings or consultations where citizens can provide feedback on waste management issues, such as developing recycling programs or forming citizen advisory committees (Valera, 2020). It is more beneficial to establish programs that meet the needs of the local community, as they can better adapt to unique conditions and socioeconomic circumstances, leading to more sustainable waste management practices (Marshall & Farahbakhsh, 2013). In addition, community-led initiatives, such as community-based solutions, can provide tailored approaches that align with local priorities and values while engaging residents and promoting environmentally friendly behaviors.

Building capacity and empowering communities through community-based solutions is essential for sustainable development. Community-based solutions entail actively

involving and empowering local communities to increase their local knowledge, participation, and collaboration while implementing community recycling and composting programs, clean-up campaigns, waste reduction and reuse initiatives, and collaborating with local organizations. Providing residents with knowledge and skills can help them become self-sufficient and beneficial in the long term (Babei et al., 2015). A study discovered that a lack of recycling knowledge causes environmental concerns in most developing nations, implying that environmental sustainability education should begin at a young age in schools (Debrah, Vidal, & Dinis, 2021).

3. Methodology

3.1 Research aims and questions

The goal of this study is to investigate the key difficulties of SWM in Vientiane to discover the constraints that affect WM practices and allow stakeholders to address them more efficiently. Building upon the understanding of the effective SWM requires cooperation between diverse stakeholders. This investigation seeks to understand collaboration dynamics and can shed light on power dynamics, issues, and the overall sustainability of SWM efforts.

The research question seeks to delve thoroughly into Vientiane's SWM to identify the main problems, whether they are caused by policy deficiencies, resource limits, or other contributing variables. Another question seeks to analyze the level of coordination among various stakeholders, including government agencies, NGOs, grassroots organizations, and other entities involved in WM activities.

3.2 Data collection

The interview aimed to collect data on WM practices and issues, as well as to investigate the interaction between key players and their level of collaboration. Four online interviews were conducted using WhatsApp to collect the data. One interview was conducted with a representative of the Ministry of Natural Resources and Environment (MONRE) to assess government perspectives. In addition, interviews were conducted with an NGO (Zero Waste Laos), an advocacy group (Green Vientiane), and a grassroots group (Recycle for Upcycle) to shed light on the challenges and highlight the relationships between stakeholders in the field of SWM.

Background material on the SWM in Vientiane was collected, including literature, reports, and policy documents. By evaluating available sources, I obtained thorough information about the regulatory framework, major stakeholders, and problems of SWM initiatives in Vientiane.

3.3 Data analysis

In-depth interviews were done to determine the root cause of SWM difficulties in Vientiane and to explore the relationship between public and private actors (Government, NGO, grassroots community). The interviews with actors involved in SWM were semi-structured and audio-recorded. The file was automatically converted to Word format using Beey.io software, a few spelling mistakes were corrected using Word software, and then reviewed with Targuette, a text analysis software.

The interviews were analyzed using thematic analysis, which looked for recurring themes. This level was completed step by step (Braun & Clarke, 2006). First, the interviews were transcribed, and all responses were carefully reviewed. Second, initial codes were inductively developed to answer the research questions based on the collaborative

governance theory. Third, codes with similar themes were grouped to organize the data. Fourth, themes were reviewed to ensure that codes were assigned to the correct theme or separated to improve coherence. Fifth, a thematic map was created, and the themes that effectively describe the idea were redefined. Lastly, once the themes and sub-themes were established, the data set was ready for discussion (Braun & Clarke, 2006). The data was successfully analyzed thematically and conceptually to uncover patterns. This technique involves examining the data to achieve the research objectives (Riger & Sigurvinsdottir, 2016). In addition, a thorough examination of the current literature on SWM of Vientiane took place. Combining knowledge from diverse sources, provided a foundation for discovering gaps and trends to help identify the key difficulties in determining the success of SWM in Vientiane.

3.4 Ethical considerations

In advance, each interviewee was informed of the topics for which she or he would be interviewed. The interview began with a few minutes of light conversation to establish intimacy. Also, an individual was assured that the interview would be kept confidential and that it would be recorded so that the information could be properly analyzed. In addition, the interviewees were told they could answer only questions that they felt comfortable with. The interview format was chosen to the interviewee's preferences, including choices for a survey form or online interview via WhatsApp. The interview questions were standardized and given equal priority to eliminate unconscious biases and to allow fair understanding.

3.5 Limitation

Time restrictions limit the breadth and depth of data collection and analysis. As a result, the sample size was limited to four interviews, which may not have captured the various viewpoints of the public and private sectors involved in SWM in Vientiane. Furthermore,

despite efforts to maintain objectivity, the qualitative nature of the data processing process allows for interpretation bias. To avoid bias, efforts were made to oversee the data while it was being interpreted. All of these constraints have the potential to negatively impact the findings' reliability and validity.

Given that both the interviewer and the interviewee speak English as a second language, there was a possibility of a language barrier during the interviews. This could lead to difficulties in accurately capturing the perspectives of participants due to limitations in the interviewees' ability to express and elaborate on deeper information.

4. Findings

The thematic analysis has revealed three categories: overview of the waste management system, collaboration between the organization, and challenges.

This section provides an overview of the following subsection, "Overview of the waste management system," which presents a summary of the projects and programs of four major organizations: MONRE, Zero Waste Laos, Green Vientiane, and Recycle for Upcycle. The subsection, "Collaboration between organizations" will focus on the relationships between various sectors such as public, private, and community levels. Finally, based on the insights gained from the interviews and literature analysis, the issues affecting the WMS are categorized as regulation, monetary support, technical and institutional capacities, awareness, and coordination and collaboration in the "Challenges" subsection.

4.1 Overview of the waste management system

MONRE: The MONRE is in charge of policies, evaluates all waste management data, and regulates municipal waste collection and management in Vientiane and other provinces.

Zero Waste Laos: This is an NGO that focuses on communities and plastic policy. Within their organization, they approach more horizontally ensuring that every member's perspective is considered to promote clarity and fairness. When they come up with their own final decision, they send a letter to the government. Additionally, they organize activities in which members volunteer to clean up public spaces. Their ultimate goal is to raise awareness among young people about the importance of proper waste management.

Green Vientiane: This is an advocacy organization that was created in 2011. They are experts in waste management technology, with a particular emphasis on plastic pollution reduction. They expect companies that use plastic in their products and marketplaces to be responsible for their manufacturing. They install recycling bins in front of supermarkets to enhance waste collection.

Recycle for Upcycle: They are a grassroots-level organization that collects garbage from elderly and young people, as well as from a park along the Mekong River, and then distributes it to people with disabilities to recycle it and make a product out of it. They are supporting the inclusion of individuals with disabilities. They plan online and offline workshops and visit private school to demonstrate how to recycle and raise public awareness about recycling. Their main objective is to educate Laos' youth and elderly about the garbage problem, the importance of recycling, and environmental protection.

4.2 Collaboration between organizations

From the interview, it became clear that there is significant collaboration going on between the four organizations representing different sectors: public, private, and community. The organization with which they interact is determined by the activity they

are engaged in and the aims they seek to achieve. Table 2. The table shows the stakeholder collaboration in WM initiatives based on the interviews.

Table 2. Stakeholder collaboration in waste management initiatives

Sector	Collaboration with the public sectors	Collaboration with the private sectors	Collaboration with the communities
MONRE	- Central government: MONRE collaborates with the central government to secure financial support for waste management initiatives - MONRE also coordinates with the Ministry of Industry and the Ministry of Health on various waste-related projects and policies	- Recycling companies, Tiger-head (water company), and Coca-Cola: MONRE collaborates with these private sector entities to improve waste collection efficiency and explore recycling solutions for their products - NGOs: MONRE collaborates with other NGOs for financial support	N/A
Zero Waste Laos	- Central government: Zero Waste Laos collaborates with the central government - MONRE and the Ministry of Education collaborate to obtain financial support and access schools and facilities for waste management campaigns and programs	- Other NGOs: Zero Waste Laos collaborates with other NGOs for financial support and to amplify their waste management initiatives.	- Waste pickers: Zero Waste Laos collaborates with waste pickers at landfills through campaigns and support initiatives.
Green Vientiane	N/A	- United Nations Development Program (UNDP): Green Vientiane partnered with UNDP for the "Baby Bin" project, placing a recycling bin in front of the shop. - World Health Organization (WHO): Green Vientiane collaborates with WHO to improve waste collection at hospitals. - - Private companies producing plastic: Green Vientiane collaborates with private companies by holding meetings and sending documents to raise awareness about the plastic problem and advocate for sustainable practices.	- General public: Green Vientiane organizes specific activities, educational campaigns, and competitions to engage the public in waste management efforts.
Recycle for Upcycle	N/A	- Water company, Private school: Recycle for Upcycle collaborates with these private entities to implement waste management initiatives, such as exchanging water caps for keychains and books and educating students about waste risks and recycling.	- People with disabilities & Volunteer participants: Recycle for Upcycle collaborates with disabled individuals and volunteers to produce keychains and books from waste materials and to clean up public spaces.

MONRE is an important government agency that works closely with the central government and other ministries such as the Ministry of Health and the Ministry of Industry, as well as with institutions that oversee landfill development, waste operations, and transportation. Their partnerships also extend to the private sector. They work with other NGOs to obtain financial support, recycling companies, Tiger-head (water company), and Coca-Cola company to improve waste collection and system efficiency.

Zero Waste Laos, an NGO financially supported by the central government, promotes waste management awareness and practices in schools and communities, working with MONRE, the Ministry of Education, and other NGOs. They run school campaigns to make young people (students) aware of the importance of WM and have a program that tries to compost waste and use it for the school garden. They also run campaigns for the protection of waste pickers' rights and working conditions for those who work in the landfill.

Green Vientiane, an advocacy group, collaborated with the United Nations Development Program (UNDP) to perform the "Baby Bin" project by installing a recycling bin in front of the shop to improve waste collection. Furthermore, it collaborates with the World Health Organization (WHO) to collect hospital garbage. They hold meetings and send documents to private enterprises that use plastic to raise awareness about the plastic crisis. Their outreach efforts include collaborating with private companies and the community to address the plastic problem and raise public awareness about WM issues by organizing some activities, taking some videos and uploaded in their social media account, and opening a competition regarding the waste problem to target the general public

Recycle for Upcycle is a community group supported by an international organization, the United Nations Population Fund (UNFPA) as part of the Youth Renovation Challenges 2023 project. They work with the water corporation, Vari, which provides water caps in exchange for key chains and books. They also continuously educate young people about the risks of waste and recycling at a private Vietnamese school in Vientiane. At the grassroots level, they engage people with disabilities to manufacture keychains and books out of garbage and get reimbursed for it.

Based on the literature, there is a partnership among VCOMS, waste collection firms, recycling companies, households, and small and medium-sized businesses. VCOMS is

critical in ensuring that solid waste is collected, transported, and disposed of properly. At the same time, VCOMS collaborates with waste collection and recycling firms, as well as municipal governments, to provide waste collection services while promoting recycling programs. This united effort demonstrates Vientiane's concerted commitment to sustainable WM practices. Moreover, the NGO, Environment Conservation and Community Development Association (ECCDA) initiated programs in Vientiane aimed at enhancing the work and living conditions of waste pickers.

4.3 Challenges

Several issues were raised during the interviews, reports, policy documents, and international research articles on WM in Vientiane. Using theme analysis, challenges are divided into five categories: regulation, funding, capacity, awareness, and coordination and collaboration.

4.3.1 Regulation

Throughout the interviews, different respondents expressed worries about the legislation several times. Almost every participant pointed out there are no regulations on waste management to enforce in the first place. Also, one interviewee pointed out the poor regulation, with one stating: “The regulations are not strong enough to impose compulsory money collection for waste collection service. Our main issue is collecting the waste at the district level. The service is expensive, I will say there is a problem with not making it obligatory to use the service.” Furthermore, a participant stated that it is necessary for those who sell, produce, and import plastic to be responsible and make it mandatory to place a recycling container in front of the shop to facilitate waste collection and recycling.

Furthermore, the problem of low waste collection was revealed as a result of high service prices, and the fact using the service is optional (GGGI, 2020). Also, the data mentioned above, as the price of the service climbed, fewer households maintained the contract, and more than one household used a single contract (GGGI, 2020). According to the literature reviewed, there are significant deficiencies in Vientiane's regulatory system. Laws such as the Environmental Protection Law and the Chemicals Management Law are present that encompass many elements such as pollution control, natural resource management, and waste treatment and disposal (JICA, 2021). However, there is no particular legislation addressing plastic and solid waste policy. (GGGI, 2020). This legislative gap has a severe influence on the implementation of sustainable practices in SWM, particularly in crucial sectors such as recycling and composting. While the National Green Growth Plan 2030 stresses reduction, reuse, and recycling (3R) techniques, these practices are not widely used due to economic restrictions and insufficient regulatory support (GGGI, 2020).

4.3.2 Funding and Technical and institutional capacities

Again, almost every participant mentioned financial problems. The existing circumstances and the lack of financial support from the central government limit their efforts to collaborate or develop programs.

1: We are getting funding only once a year and this is not enough to hold the system. I believe this applies to all sectors.

4: The challenge is related to funding

2: The government doesn’t have money

Furthermore, challenges are found in technological and institutional fields. Interlocutors emphasized the need for additional support in technical expertise and facilities. One of

the participants expressed the lack of a monitoring system for waste collection, highlighting the importance of such a system overseen by a capable third party. In addition, some of the participants stated that there is a shortage of skilled professionals as well as those who are eager to solve the issues. As a result, MONRE, which is in charge of the plastic issue, has made some modest progress in implementing measures to tackle plastic pollution, which was announced in 2019.

In 2022, the World Bank supported the improvement of capacity and monitoring mechanisms in waste management, however, Vientiane continues to struggle (Environment Protection Fund, 2022). Also, Certain districts of Vientiane lack proper road connectivity, resulting in 14% of the population being out of service (Kim et al., 2020). The municipal waste service gathers non-recyclable garbage in bamboo containers or plastic bags from sidewalks and roadsides, diminishing the opportunity to recover valuable waste (GGGI, 2020). Furthermore, there are currently no facilities available to handle organic waste or plastic waste. Due to financial constraints, incinerators and other thermal treatments are not viable options. Furthermore, an industry for composting from solid waste is yet to develop in Lao PDR. (GGGI 2020).

4.3.3 Awareness

According to the interviews, there is a lack of public awareness about recycling, which can lead to the development of enormous amounts of waste. One of the participants also claimed that there was a push to raise public awareness by MONRE, but it did not succeed because of insufficient effort and lack of awareness among the general population. One person stated that they have noticed many people are unconcerned about the impact of waste on their health and the environment and there is a lack of knowledge to differentiate between sorts of waste. Low public awareness can lead to inadequate waste collection and handling, which can reduce recycling rates (Kim et al., 2020).

4.3.4 Coordination and collaboration

One interviewee stated that mostly NGOs are particularly working with students and it may be limited in reach because students here are only young and attend school which excludes the rest of the community. Also, there is an absence of collaboration with plastic-producing companies. One of the interviewees highlighted the plastic maker as the focal point of the solution, urging them to accept responsibility for recollecting their goods and educating their customers to recycle which can significantly contribute to addressing the plastic waste challenges. This can be summarized as a lack of effective communication programs that can reach the general public regardless of age or background level. Finally, other issues were pointed out; one of the participants mentioned that the most important thing to enhance waste management is to work together, yet there is no collaboration between the public sector, advocacy groups, and small grassroots-level organizations.

5. Discussion

The implementation of SWM in Vientiane faces challenges, particularly in the context of governance and resource allocation. Konteh (2009) highlights how poor governance can lead to failed policy implementation in low-income nations.

5.1 Top-Down and Bottom-Up Approaches

In Vientiane's SWM system, the top-down approach is evident through the involvement of government agencies such as the MONRE, which sets policies and regulations for waste management (GGGI, 2020). MONRE plays a central role in evaluating waste management data and regulating municipal waste collection and management. However, challenges such as inadequate regulation pose obstacles to effective SWM (GGGI, 2020).

On the other hand, bottom-up approaches are observed through the initiatives of organizations of Zero Waste Laos, Green Vientiane, and Recycle for Upcycle. These organizations focus on community engagement, raising awareness, and implementing practical solutions to waste management issues. For example, Zero Waste Laos works horizontally within its organization, ensuring that every member's perspective is considered, and collaborates with government agencies and other NGOs to promote waste management awareness in schools. Similarly, Recycle for Upcycle engages community members, including those with disabilities in recycling programs. As noted by Trinh et al. (2021), the implementation stage is important to the success of SWM efforts. During this stage, numerous stakeholders, primarily bureaucrats, work at various levels of bureaucratic agencies.

Moreover, Vientiane's SWM system adopts a decentralized approach. Due to its decentralized structure, SWM programs can be more easily customized to meet specific local concerns (Valera, 2020).

5.2 Resource Allocation and Regulation

Resource allocation and regulation are crucial aspects of waste management governance. Effective governance frameworks help in establishing clear policies, regulations, and mechanisms for allocating resources efficiently and equitably (Agrawal 2001, Konteh, 2009).

The findings demonstrate that resource allocation is a key factor in determining whether SWM is productive or not. In SWM in Vientiane, there are huge issues caused by institutional and technical incapacity, which results in management shortcomings (Chug and Lo, 2008; Seng et al, 2010). Management problems may be made worse by local authorities' lack of technical expertise (Zurbrugg, 2022). To address the low collection

rate, participants underlined the significance of having a suitable waste monitoring system in place. Despite the World Bank's support in 2022 to accelerate capacity building in the technical field, Vientiane keeps facing challenges due to a lack of technical expertise and experts willing to tackle these issues. This underscores the constant focus of MONRE and MPTW to advance the institutional and technical domains to overcome obstacles and successfully implement efficient SWM.

Financial constraints emerge as a recurring topic, representing the insufficient finance provided by the central government that impedes the development of WM projects. This lack of financial support impedes collaborative efforts and the implementation of comprehensive WM initiatives in Vientiane, affecting local government agencies and NGOs.

Furthermore, the absence of regulation in solid waste and plastic is a major contributor to Vientiane's SWM inadequacy. Proper regulation and government aid are required to help overcome financial, and capability concerns and regulatory issues. Pro-environmental policies, such as requiring recycling and ensuring that everyone uses the waste collection service, may enhance the waste collection rate and foster more sustainable SWM practices in Vientiane (Freeman, 1997; Gonzalez-Torre and Adenso-Diaz, 2005).

5.3 Collaborations among stakeholders

The interviews and literature review articles emphasized the significance of stakeholder participation, collaborative governance, and cooperation in Vientiane's SWM. It has been seen that there is a wide range of collaboration with key stakeholders at many levels, including the public, private, and community sectors. However, there is a shortage of collaboration between the public sector, advocacy groups, grassroots communities, and

non-students (general public). There is also no partnership between the government and companies that generate recyclable waste to collect their products and educate their customers about recycling.

Aside from that, the collaboration between the local government, VCOMS, waste collection and recycling companies, NGOs, private organizations, grassroots organizations, and an advocacy group enables the improvement of the efficiency and effectiveness of WM initiatives. The NGO and grassroots organizations work hard to raise citizen awareness, especially among students. The stakeholders build trust and transparency by actively participating in meetings, and discussions, and sharing information (Ansel & Gash, Bhuiyan, 2010). Furthermore, cooperation with NGOs, waste pickers and recycling firms, advocacy groups, and grassroots-level organizations is critical in addressing SWM issues in low- and middle-income countries, where resources and ability are typically limited (Ahmed & Ali 2006). This diverse involvement highlights a dedication to inclusivity and responsiveness to particular community needs through institutions that support a community-driven approach to WM.

Waste pickers are a vulnerable group in Vientiane's WM, and they get active support from NGOs. ECCDA facilitates coordination and organization among waste pickers in a neighborhood and provides basic training in waste segregation, medical treatment, and sanitation. Another NGO group (Zero Waste Laos) has a campaign for waste pickers in landfills. Furthermore, Recycle for Upcycle, a grassroots organization, works with and supports persons with disabilities. Inclusive participation, which involves the engagement of vulnerable groups, can help mitigate the impact of other public policy challenges through collective actions (Casady et al., 2019). The collaborations among stakeholders exemplify collaborative governance principles, which emphasize inclusive decision-making processes and partnerships between various stakeholders.

5.4 Citizen awareness

Citizen awareness and engagement are critical factors in the successful implementation of WM initiatives since they are in charge of waste reduction, recycling, and reuse (Ahmed and Ali, 2006; Casady et al., 2019; Edgar et al., 2006).

It has been established that diverse stakeholders can work together to promote awareness of the waste problem and the importance of recycling. A lack of public understanding regarding recycling frequently results in large amounts of waste (Moghadam et al., 2009). Based on the interview the majority of the population cannot discriminate between different types of waste in Vientiane. Necessitating an education campaign that emphasizes the environmental and health consequences of inappropriate waste disposal for the entire community. Low-middle-income nations, such as Laos, have a lack of awareness and involvement resulting in a low waste collection rate (GGGI, 2020). Currently, different stakeholders are attempting to raise community awareness and promote public engagement through educational initiatives aimed at young people. Debrah, Vidal, and Dinis (2021) stated it is vital to have an environmental understanding early on. However, it is also essential to educate the entire population to promote an integrated SWM approach.

Collaboration between various organizations in Vientiane promotes inclusivity and develops a sense of ownership among the general public. Citizen attention and participation in waste control activities reflect collaborative governance ideals that encourage relationships among a wide range of stakeholders, including government agencies, VCOMS, NGOs, advocacy groups, and grassroots organizations.

6. Conclusion

In conclusion, the study and research questions aimed to look into and identify the major obstacles influencing WM practice in Vientiane, with a specific focus on stakeholder collaboration, regulation, resource allocation, and citizen awareness within the context of implementation and governance. Through interviews, reports, policy documents, and international research articles, several key findings emerged.

Vientiane's WM system combines top-down and bottom-up perspectives and includes national rules established by the central government in collaboration with the MONRE and local projects driven by civil society corporations, NGOs, advocacy groups, and grassroots-level organizations. This decentralized approach enables specialized solutions for locals and fosters inclusivity by bringing stakeholders together from the public and private sectors, as well as the community.

Vientiane is facing issues as a result of insufficient regulation, and resource allocation, including financial, technical, and institutional capacities. In particular, a lack of financial assistance can influence local agencies and other groups such as NGOs to develop or maintain their program regarding SWM initiatives. Furthermore, a lack of experts in the industry, inadequate infrastructure, and a lack of regulation can all have an impact on the development and outcome of the WM system.

Vientiane has shown a lack of awareness and knowledge among the public about recycling, which is affecting waste collection rates, recycling rates, and producing massive volumes of garbage. Raising awareness about recycling and waste reduction not only environmental outcomes be improved but strengthens the overall implementation of waste management policies and programs in Vientiane.

Despite the problems described above, the main stakeholders in Vientiane have a strong relationship in various sectors. Various stakeholders, including government agencies, NGOs, VCOMS, waste collecting and recycling companies, international organizations, advocacy groups, and grassroots communities are cooperating to promote WM efficiency in Vientiane. MONRE and Zero Waste Laos have formed networks to raise awareness among students in schools. Private international organizations such as WHO, UNDP, and UNFPA collaborate with Green Vientiane, an advocacy group, and Recycle for Upcycle, a grassroots-level organization. Furthermore, NGOs engage with waste pickers to improve working conditions, and Green Vientiane installed recycling containers in front of stores to increase recycling rates around Vientiane. Nevertheless, there are gaps in interaction with non-student populations, and businesses that generate recyclable waste. Various organizations are working together to build long-term and effective WM practices in Vientiane with limited resources.

Governance and implementation play an important role in shaping the outcomes of WM projects. In addition, Vientiane's SWM system should improve governance structures to promote sustainable SWM. By promoting increased collaboration, openness, and accountability among stakeholders, the city is able to overcome difficulties such as regulatory gaps, funding constraints, gaps in collaboration, and a lack of technical and institutional competence.

The study used interviews and secondary sources, which may have had some limitations in data collection. Furthermore, the study focused on Vientiane, and the findings may not apply to other countries or regions with different socioeconomic situations. For future research, recommendations can be made to enhance SWM strategies in Vientiane, particularly focusing on collaboration among various stakeholders.

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Appendices

- **Question**

1. Could you give an overview of the initiatives your organization is currently pursuing to enhance the environment and address waste management issues in the capital?

2. Are there particular waste management activities or practices that your organization advocates or implements specifically in Vientiane?

3. How do these activities contribute to overcoming challenges within the existing waste management system?

4. Do you collaborate with government agencies or receive support from the government for your waste management initiatives?

5. If so, how does this collaboration or support impact the effectiveness of your programs?

6. Can you share success stories or positive outcomes resulting from your organization's initiatives in waste management?

7. What are the major challenges your organization encounters in addressing waste management issues, and how do you navigate these challenges?

8. What are your organization's plans or goals concerning waste management and environmental improvement in the capital?

9. Is there a community-based solution that the communities ran successfully, and if so, could you share it?

10. Based on your experience, what recommendations would you propose for enhancing the waste management system in Vientiane?

11. How does your organization work with both official and community groups to handle waste in our area?

12. Can you tell me about any ways your organization encourages different groups to team up and deal with waste together?

13. How does your organization make sure that everyone involved in waste management does their part properly? Do you have any special methods for keeping track?

14. How do you ensure that everyone knows what's happening with waste management decisions and resources? Is there anything your organization does to make this process clearer?

15. How does your organization support people who handle waste in informal ways, while still keeping everything fair and transparent?

16. Could you share any success stories of collaboration between different groups in waste management? What lessons have you learned from these experiences?

17. Can you tell whether waste management decisions in your community are mostly made by higher-level authorities, such as the government, or by local organizations? Or is it more of a collaborative approach?

18. What does your organization do if there are disagreements or problems between formal and community waste management groups?

19. In your opinion, what are the most important factors for fostering effective collaboration in waste management, and how does your organization work towards promoting these factors?

- **Thematic map**