

Urban Governance, Urbanization and Informal Sector in Solid Waste Management: A Case of Kathmandu, Nepal



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Urban Governance, Urbanization and Informal Sector in Solid Waste Management: A Case of Kathmandu, Nepal

Doctoral dissertation for obtaining the degree of

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Date of submission: September 7, 2021

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Cover Photo: (Author, 2019)

STATEMENT OF AUTHORSHIP

I, Nikita Sharma herewith declare that I am the sole author of this dissertation “**Urban Governance, Urbanization and Informal Sector in Solid Waste Management: A Case of Kathmandu, Nepal**” which has been submitted to Faculty of Architecture, TU-Dresden today. I have fully referenced all the work used in this thesis, published and un-published and sources of data and pictures used in the text are appropriately acknowledged and cited.

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ACKNOWLEDGEMENT

In the journey of pursuing my PhD, I came across some genuinely supporting and inspiring people. Here, I would like to express my gratitude towards all of them.

First, I would like to express my sincere gratitude to the academic and financial support provided by Dresden Leibniz Graduate School (DLGS) without it the whole journey would not have been possible. I am highly indebted to my supervisor Prof. Dr. Wolfgang Wende for helping me in the whole process relentlessly. He was always available to guide me in my scientific endeavors. I also want to thank my second supervisor Prof. Dr.-Ing habil. Christina Dornack for being a part of this dissertation and considerate guidance whenever required. I thank my academic mentor Dr. Gerd Lintz for his patience and support throughout my work.

This dissertation would not have been possible without the initial support of Prof. Dr. Dr. Bernhard Müller and Dr. Paulina Schiappacasse for their valuable inputs during the initial phase of the work. At DLGS, I specially would like to thank Sarah Carola Strugale and Dr. Shikha Ranjha for their assistance in making my PhD journey in Dresden less bumpy. Thanks go to all my DLGS colleagues who made the everyday life at work wonderful.

Leibniz-Institut für ökologische Raumentwicklung (IOER) provided me both technical and intellectual support during the phase of my work. Special thanks to Sabine Witschas, Ulrike Schinke for helping me in my map related quests. In addition, I would like to thank student assistants from Prof. Wende's, Chair of Urban Development TU-Dresden, Benedikt Taiber and Viktor Stiebe who helped me digitize the survey document.

A special thanks to all the individuals who helped me during my fieldwork in Kathmandu. Particularly to all my key informants, field supervisors of private waste companies who helped me in household survey. Special thanks and admiration for all the waste workers who irrespective of their immense workload agreed to be a part of my work.

I would like to thank my parents Prof. Dr. Ram Kumar Sharma and Parvati Sharma for supporting me immeasurably in my academic journey. My brothers Nripesh and Nikhilesh for their constant encouragement. Lastly, I would like to specially thank Robert Jackisch who supported me with all the patience and perseverance in this journey.

ABSTRACT

With the rising number of world population living in urban areas and the changing consumption habits, solid waste management has become a predominant urban problem. The problem is further compounded in urban areas of Global South where rapid unplanned urbanization has brought forward the issue of poor basic urban services like water supply, solid waste management, energy supply and transport. The rapid urban growth taking place in capital of Nepal, Kathmandu and the burgeoning solid waste management challenge in the metropolitan is a representative case put forward by this dissertation.

Solid waste management in Kathmandu is limited to collection and disposal with minimum consideration on ground to move from current disposal-oriented practices towards resource management-based approach. The existing government structure is struggling to provide waste services to the growing number of urban residents and does not have capacity to diversify solid waste management practices and move towards circular economy in waste. The inability to provide waste services to all residents and its non-compliance to solid waste management regulations indicate the weak government structure. This demands for the exploration of each actor and their engagement in solid waste management, for which the concept of solid waste governance is taken as an entry point. More specifically the governance aspect of integrated solid waste management framework is taken as a first step to investigate the situation. In addition, physical aspects as put forward by the integrated solid waste management framework such as storage, collection, reduce, reuse, recycle, recover, transportation and disposal are touched upon while delving into the everyday operations of waste management.

The governance aspect of the framework focuses on achieving actor inclusivity, financial sustainability with sound institutions and proactive policies for attaining integrated solid waste management. The integrated framework arose out of the need for the recognition of actors both formal and informal contributing to waste systems. It also marks for attaining financial sustainability with comprehensive institutions for implementing waste related policies. It embarks for a shift away from the state centric to an integrated approach for waste management.

However, the realization of solid waste governance for integrated solid waste management requires several pre-conditions such as involvement of all stakeholders, technical, human resources, sound institutions, policy mechanism and urban planning which are either absent or severely lacking in Global South cities. Thus, in the context of these countries an understanding of solid waste governance demands for the understanding of the existing everyday waste management process and practices. This is followed by unravelling the (formal and informal)

actors involved, role played by these actors in waste management and their interrelationships. In particular, relationship between the informal waste sector and authorities is mapped using five major theoretical approaches towards informal economy namely dualist, voluntarist, structuralist, legalist and co-production and its policy implications for the sector. Finally, current partnerships are outlined and potential role partnership between the actors can have is identified as a useful starting point to address waste management issues of the city.

This dissertation adopted a single case study approach, for this a rapidly urbanizing metropolitan of Global South Kathmandu, was selected. Past failures to reform and re-organize solid waste management, urban growth scenario together with increasing solid waste generation rate were the criteria for selection. Official documents concerning solid waste management, urban development, and urban governance, 182 household surveys, 28 key informant interviews with actors from the formal domain and 40 interviews with the informal waste sector were primary sources of data for the study. The concept of triangulation enabled for cross-verification of the data gathered from the various sources.

The study showed that waste governance in the context of Kathmandu is rooted in everyday practices with transversal engagement among formal and informal actors than on the waste management acts and regulations. Whereas the role played by the informal waste sector in addressing Nepal government's commitment to sustainable development goal numbers 6, 11 and 12 and their targets that directly relate to waste is unaccounted for and the sector continues to face neglect from the authorities. Especially, the informal waste workers who continue to be marginalized and remain obscure to authorities. Government's idea of solid waste planning and cleanliness in Kathmandu is based on removal of waste from one location to another and focused on crisis management rather than developing waste as a basic urban infrastructure. This dissertation further argues that it is necessary to re-consider the role of informal waste sector, its contribution to the formal recycling sector and providing viewpoints on how to improve urban planning and development practices in this respect.

At the same time, government's aim of attaining modernized waste management system by handing over the waste responsibility to a transnational corporation imposes threat on the existence of private waste companies as well as informal waste sector. However, there are efforts by formal private actors and informal actors to collaborate with each other and deal with waste management concerns of the city. Nevertheless, these one-sided efforts face challenges in the absence of government support.

This dissertation concludes that there exist gaps in the current government framework for solid waste management in Kathmandu. The local government lacks resources and fails to interfere

positively to cultivate partnership between existing actors. At the same time, it concludes that symbolic rhetoric and practice of inclusion focused on formalization and taxation without considering heterogeneity of the informal waste sector is counterproductive for city's solid waste management. Acknowledging the contribution of the informal sector in waste management and positive government intervention particularly supporting waste workers' organization is recommended. Furthermore, recommendations are made towards all actors' engagement for inclusive solid waste planning and governance in the city.

ZUSAMMENFASSUNG

Mit der steigenden Zahl der in städtischen Gebieten lebenden Weltbevölkerung und den sich ändernden Konsumgewohnheiten ist die Bewirtschaftung fester Abfälle zu einem vorrangigen städtischen Problem geworden. Das Problem wird in den städtischen Gebieten des globalen Südens noch verschärft, wo die rasche ungeplante Verstädterung das Problem der unzureichenden städtischen Grundversorgung wie Wasserversorgung, Abfallentsorgung, Energieversorgung und Verkehr mit sich gebracht hat. Das rasante städtische Wachstum in der nepalesischen Hauptstadt Kathmandu und die wachsende Herausforderung der Abfallentsorgung in der Metropole sind ein repräsentativer Fall, der in dieser Dissertation behandelt wird.

Die Bewirtschaftung fester Abfälle in Kathmandu beschränkt sich auf das Einsammeln und Entsorgen von Abfällen, ohne dass vor Ort eine Umstellung von den derzeitigen entsorgungsorientierten Praktiken auf ein ressourcenorientiertes Konzept in Betracht gezogen wird. Die bestehende Regierungsstruktur hat Schwierigkeiten, die wachsende Zahl von Stadtbewohnern mit Abfalldienstleistungen zu versorgen, und ist nicht in der Lage, die Abfallbewirtschaftungspraktiken zu diversifizieren und zu einer Kreislaufwirtschaft überzugehen. Die Unfähigkeit, alle Einwohner mit Abfalldienstleistungen zu versorgen, und die Nichteinhaltung der Vorschriften für die Bewirtschaftung fester Abfälle weisen auf die schwache Regierungsstruktur hin. Dies erfordert eine Untersuchung der einzelnen Akteure und ihres Engagements in der Abfallwirtschaft, für die das Konzept der Abfallwirtschaft als Ausgangspunkt genommen wird. Insbesondere der Governance-Aspekt des integrierten Rahmens für die Bewirtschaftung fester Abfälle wird als erster Schritt zur Untersuchung der Situation herangezogen. Darüber hinaus werden die physischen Aspekte des integrierten Rahmens für die Bewirtschaftung fester Abfälle wie Lagerung, Sammlung, Verringerung, Wiederverwendung, Wiederverwertung, Verwertung, Transport und Entsorgung behandelt, während die alltäglichen Abläufe der Abfallbewirtschaftung untersucht werden.

Der Governance-Aspekt des Rahmens konzentriert sich auf die Einbeziehung der Akteure, die finanzielle Nachhaltigkeit mit soliden Institutionen und proaktiven Maßnahmen zur Erreichung einer integrierten Abfallwirtschaft. Der integrierte Rahmen entstand aus der Notwendigkeit der Anerkennung von Akteuren, die sowohl formell als auch informell zu den Abfallsystemen beitragen. Er steht auch für die Erreichung finanzieller Nachhaltigkeit mit umfassenden Institutionen zur Umsetzung abfallbezogener Maßnahmen. Er leitet die Abkehr vom staatszentrierten zu einem integrierten Ansatz für die Abfallwirtschaft ein.

Die Verwirklichung einer Abfallpolitik für ein integriertes Abfallmanagement erfordert jedoch mehrere Voraussetzungen wie die Einbeziehung aller Interessengruppen, technische und personelle Ressourcen, solide Institutionen, politische Mechanismen und schließlich Stadtplanung, die in den Städten des Globalen Südens entweder nicht vorhanden sind oder stark fehlen. Im Kontext dieser Länder erfordert das Verständnis der Abfallbewirtschaftung daher ein Verständnis der bestehenden alltäglichen Abfallbewirtschaftungsprozesse und -praktiken. Im Anschluss daran werden die (formellen und informellen) die beteiligten Akteure, die Rolle dieser Akteure in der Abfallwirtschaft und ihre Beziehungen untereinander. Insbesondere werden die Beziehungen zwischen dem informellen Abfallsektor und den Behörden anhand von fünf wichtigen theoretischen Ansätzen zur informellen Wirtschaft, nämlich dem dualistischen, dem voluntaristischen, dem strukturalistischen, dem legalistischen und dem Koproduktionsansatz, sowie deren politische Auswirkungen auf den Sektor dargestellt. Abschließend werden die derzeitigen Partnerschaften skizziert und die mögliche Rolle von Partnerschaften zwischen den Akteuren als nützlicher Ausgangspunkt für die Bewältigung der Abfallbewirtschaftungsprobleme in der Stadt aufgezeigt.

Für diese Dissertation wurde ein Einzelfallstudienansatz gewählt, und zwar in einer schnell urbanisierenden Großstadt des globalen Südens, Kathmandu. Die Kriterien für die Auswahl waren das Versagen bei der Reform und Neuorganisation der Abfallwirtschaft in der Vergangenheit, das städtische Wachstumsszenario und die zunehmende Abfallerzeugung. Offizielle Dokumente zur Abfallwirtschaft, Stadtentwicklung und städtischen Verwaltung, 182 Haushaltsbefragungen, 28 Schlüsselinformanten-Interviews mit Akteuren aus dem formellen Bereich und 40 Interviews mit dem informellen Abfallsektor waren die primären Datenquellen für die Studie. Das Konzept der Triangulation ermöglichte eine Querverifizierung der aus den verschiedenen Quellen gewonnenen Daten.

Die Studie zeigte, dass die Abfallbewirtschaftung in Kathmandu eher in alltäglichen Praktiken verwurzelt ist, bei denen sich formelle und informelle Akteure übergreifend engagieren, als in Gesetzen und Vorschriften zur Abfallwirtschaft. Die Rolle des informellen Abfallsektors bei der Erfüllung der von der nepalesischen Regierung eingegangenen Verpflichtung zu den Zielen für nachhaltige Entwicklung Nr. 6, 11 und 12 und deren Vorgaben, die sich direkt auf den Abfall beziehen, bleibt unberücksichtigt und der Sektor wird von den Behörden weiterhin vernachlässigt. Dies gilt insbesondere für die informellen Müllarbeiter, die weiterhin an den Rand gedrängt werden und den Behörden unbekannt bleiben. Das Konzept der Regierung für die Planung fester Abfälle und die Sauberkeit in Kathmandu basiert auf der Beseitigung von Abfällen von einem Ort zum anderen und konzentriert sich eher auf das Krisenmanagement als auf die Entwicklung von

Abfall als städtische Infrastruktur. In dieser Dissertation wird ferner argumentiert, dass es notwendig ist, die Rolle des informellen Abfallsektors und seinen Beitrag zum formellen Recyclingsektor neu zu überdenken und zu überlegen. Zudem entwickelt die Arbeit Ideen, wie die Stadtplanung und -entwicklung in diesem Zusammenhang verbessert werden kann.

Gleichzeitig bedroht das Ziel der Regierung, ein modernisiertes Abfallwirtschaftssystem zu erreichen, indem sie die Verantwortung für die Abfallentsorgung an ein transnationales Unternehmen überträgt, die Existenz privater Abfallunternehmen und des informellen Abfallsektors. Es gibt jedoch Bemühungen von formellen privaten und informellen Akteuren, miteinander zusammenzuarbeiten und die Probleme der Abfallwirtschaft in der Stadt zu lösen. Diese einseitigen Bemühungen sind jedoch aufgrund fehlender staatlicher Unterstützung mit Herausforderungen verbunden.

Diese Dissertation kommt zu dem Schluss, dass der derzeitige staatliche Rahmen für die Abfallwirtschaft in Kathmandu Lücken aufweist. Der lokalen Regierung fehlt es an Ressourcen und sie greift nicht ein die Partnerschaft zwischen den bestehenden Akteuren positiv zu gestalten. Gleichzeitig kommt die Studie zu dem Schluss, dass eine symbolische Rhetorik und Praxis der Inklusion, die sich auf Formalisierung und Besteuerung konzentriert, ohne die Heterogenität des informellen Abfallsektors zu berücksichtigen, kontraproduktiv für die Abfallwirtschaft der Stadt ist. Es wird empfohlen, den Beitrag des informellen Sektors zur Abfallbewirtschaftung anzuerkennen und positive staatliche Maßnahmen zu ergreifen, insbesondere zur Unterstützung der Organisation von Abfallarbeitern. Darüber hinaus werden Empfehlungen für das Engagement aller Akteure für eine inklusive Abfallplanung und -verwaltung in der Stadt ausgesprochen.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
CBO	Community-Based Organization
DUDBC	Department of Urban Development and Building Construction
EIA	Environment Impact Assessment
GDP	Gross Domestic Product
HDPE	High Density Polyethylene
KMC	Kathmandu Metropolitan City
LDPE	Low Density Polyethylene
MoFALD	Ministry of Federal Affairs and Local Development
MoFAGA	Ministry of Federal Affairs and General Administration
MoUD	Ministry of Urban Development
MSW	Municipal Solid Waste
NEPCEMAC	Nepal Pollution Control and Environment Management Centre
NPR	Nepalese Rupees
PET/PETE	Polyethylene Terephthalate
SAARC	South Asian Association for Regional Cooperation
SASAJA	Samyukta Safai Jagaran Sahakari
SDG	Sustainable Development Goals
SWM	Solid Waste Management
SWMA	Solid Waste Management Association
SWMTSC	Solid Waste Management Technical Support Center
ISWM	Integrated Solid Waste Management
JICA	Japan International Cooperation Agency
PAN	Permanent Account Number
PPP	Public Private Partnership
UN	United Nations
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNDP	United Nations Development Program
USD	United States Dollar
WHO	World Health Organization

1 Introduction

Waste is a foreseeable outcome of human activities. As countries develop from lower economic level to higher level, their waste management issues start to evolve. Furthermore, unplanned urbanization and population growth has exacerbated the waste issue that carries environmental, social, political and economic facet (Baabereyir, 2009). Although urbanization is a global phenomenon, it has brought prospects as well as problems for countries around the world. These problems vary in scale but are generally environmental, social, political, and economic in nature. Urbanization processes in developing countries have specific features such as settlement in marginal and hazardous land areas, uncontrolled densification, urban sprawls that make the availability of urban services scarce and propagation of informal settlements and economy.

Municipal Solid Waste (MSW) is an indicator of changing urban lifestyle. Authors like Pacione (2013) have mentioned that municipal solid waste management is an issue for developing countries currently but many Western countries that have gained the status of developed countries were facing the same problem before 20th century. With time, they have found methods and techniques to deal with the waste management problems (Pacione, 2013).

Industrialization, rising standards of living and rapid increase in population tied with urbanization are major contributors to rising amount of waste generation. With the current level of urbanization, approximately 1.3 billion tons of municipal waste is produced per year in world cities. This is expected to reach 2.2 billion by 2025, especially in lower income countries waste generation rates will be more than double in next twenty years (Hoorweg & Bhada-Tata, 2012). This number is expected to grow to 3.40 billion tones by 2050 under a conventional scenario (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018). High-income countries and economies that are more urbanized generate more waste per capita and in total (Kaza et al., 2018). In terms of continent North America with the highest level of urbanization at 82 percent generates 2.21 kg per capita per day while Sub-Saharan Africa with an urbanization rate of 38 percent generate 0.49 kg per capita per day (ibid).

In the context of developing countries population growth and the shift from rural areas to urban areas for high paying urban jobs are major contributors to urbanization. As a result, developing countries are facing a predicament; on one hand, urbanization is occurring expeditiously triggering an increase in demand for urban services like waste management. Municipal solid

waste management is one of the burning challenges that urban areas in developing countries are facing (Ahmed & Ali, 2006). Solid Waste Management (SWM) is defined as a methodical handling of activities that constitutes collection, source separation, storage, transportation, transfer, processing (including recycling), treatment and disposal of solid waste (Tchobanoglous, Theisen, Vigil, & Alaniz, 1993).

As urbanization continues to take place at unparalleled level, management of solid waste is a major concern for public health and environment in urban areas of many developing countries around the world. Further, it has been projected that all of the world's population growth will occur in urban areas until 2050 (Cohen, 2004). This growth will be concentrated on the poorer regions which will perpetuate the issue of urban poverty and inability of governments to provide adequate services to public (Marshall & Farahbakhsh, 2013).

Currently, SWM has become a central issue of discussion for the policymakers in developing countries that are shifting to become the global hubs for production and population. While urbanization itself is not a problem, but haphazard urbanization tied with industrialization and economic activities, which changes the consumption habits of people leading to larger amount of waste, is an issue. One to two thirds of solid waste generated in developing countries are not collected (Zurbrugg, 2003). This uncollected waste often ends up being dumped on alongside streets, clogging drains leading to flooding, breeding ground for insects leading to spreading of numerous diseases. At the same time collected waste disposed of in unsanitary ways or burnt irregularly contribute to air, water and soil pollution (Medina, 2010; Zurbrugg, 2003). SWM can easily become a crisis if ignored for a while; plague epidemic in Indian city of Surat and mountains of waste piled up in Naples are few examples of it (UN-Habitat & Programme, 2010). Scholars have pointed out that the solid waste management in developing countries are driven by public health issues, nevertheless, priority is still to dispose it off somewhere, as it was in Europe and United States until 1960s (Wilson, 2007; Wilson, Rodic, Scheinberg, Velis, & Alabaster, 2012).

Challenges related to SWM in developing countries manifest in terms of sociocultural, political, technical and financial issues (Wilson, Velis, & Rodic, 2013). Socio-cultural issues are related to public behavior and attitude towards waste tied with their level of awareness regarding waste handling. Political issues are concerned with absence of national policies and legislations associated to solid waste management, political will towards waste management and governance structure and practices, technological issues in developing countries are linked to availability of appropriate vehicles and machineries along with proper waste infrastructure and technologies. While the financial drawbacks include unavailability of enough resources for

waste services within the local government (Guerrero, Maas, & Hogland, 2013; Marshall & Farahbakhsh, 2013).

SWM is one of the central urban services¹ of which the responsibility is vested on municipal government or local government (Jones, Clench, & Harris, 2014). At the same time, urban services like solid waste management have now become a proxy indicator of governance in urban areas (Wilson, 2007). Effective urban governance is believed to facilitate urban service delivery and, ultimately, more sustainable urban growth (Boex, Malik, Brookins, Edwards, & Zaidi, 2020). Local governments are assumed to be the key decision makers in urban governance whereas, urban local governments are limited in their capacities to provide and manage urban services like solid waste management in developing economies. Furthermore, responsibility towards urban services is fragmented among a range of actors from both formal and informal arena.

Informal sector is an integral part of waste management in developing countries at times running parallel to municipal waste services. The sector is able to provide services that local governments and formal companies cease to provide sustainably (Scheinberg, Simpson, & Gupta, 2010b). The existence of informal waste sector and their role in urban waste management systems is well documented (Ezeah, Fazakerley, & Roberts, 2013; Scheinberg, 2012). Importance of informal sector for urban poor, a need for its inclusion and vulnerability of the sector have been discussed widely in urban development literature.

Informal waste sector has been a common way to earn income for urban poor in developing countries (Medina, 2008) and it sees the value of materials in waste that has been discarded by larger population. The service that the informal sector provides is generally not accounted for. The social, economic, and environmental contributions made by informal sector has remained mostly unrecognized by governments and communities, despite saving local authorities around 20 percent or more of what they would otherwise spend on the collection and final disposal of these materials (Wilson, Velis, & Cheeseman, 2006). There are ample evidences formal recycling industries' output materials come largely from informal waste sector (Wilson, Araba, Chinwah, & Cheeseman, 2009). Thus, co-existence of formal and informal waste sector shows the diversity of actors in waste management.

Hence, this dissertation looks into the solid waste management problem from governance perspective and actors at play, most precisely informal sector, and its role in addressing waste

¹ In the study, urban services denote the process of municipal solid waste management with all its components.

issues. In doing so, it goes beyond acknowledging the presence of formal and informal actors and focuses on the relation between formal and informal sector to better understand the nature and role of informal sector in the context of a fast-urbanizing metropolis in the global south. At the same time, it considers the partnerships that have emerged between the identified actors and the way it contributes to the waste issues of the city.

1.1 Background of the Study

Nepal a rapidly urbanizing landlocked mountainous country with decades of political turmoil, faces challenges in planned urban development and waste management scenario here is no different. It is inhabited by 26.5 million people with an average annual population growth rate of 1.35 percent from 2001 to 2011 (CBoS, 2012). Rapid urban population growth has made Nepal one of the most rapidly urbanizing nation in Asia and the Pacific with the urbanization rate of 6 percent since the 1990s (Muzzini & Aparicio, 2013). While the rate of urbanization in neighboring countries are: India 2.9 percent, Pakistan 4.4 percent, and Bangladesh 5.3 percent (Portnov, Adhikari, & Schwartz, 2007). In Nepal, approximately 18 percent of the population resides in urban area making it top ten fastest urbanizing countries in the world (UN, 2015). Though the level of urbanization in Nepal is low as compared to other developing countries like Bhutan (38 percent), Pakistan (34 percent), Bangladesh (34 percent) or Myanmar (34 percent) (UNDP, 2014). However, as compared to the land area and availability of resources this level of urbanization is high (Bakrania, 2015). Not just increased population but also increased economic activities of the population leading to an increment in Gross Domestic Product (GDP) has been attributed to increased amount of waste generation. Gross Domestic Product in Nepal over the last five years has increased from 18.85 billion USD 2012 to 28.81 billion USD in 2018 (O'Neill, 2019). The positive relation between the progression in GDP and increment in waste generation has been pointed out by authors citing that, for the next few generations unless major new technological advances are achieved municipal solid waste quantities will continue to rise with GDP (Kinnaman, 2009). Thus, this outstanding rate of urbanization as compared to other countries in Global South makes Nepal a crucial study area to be explored (*see Table 1 in section 1.3.2*).

The study area Kathmandu Metropolitan² is the largest metropolitan and the heart of urbanization in Nepal. The Kathmandu metropolitan is the part of Kathmandu valley which

² In this dissertation terms such as metropolitan and municipality are used simultaneously to denote the local body.

comprises three districts namely Kathmandu, Lalitpur and Bhaktapur and has five municipalities (*see figure 1*).

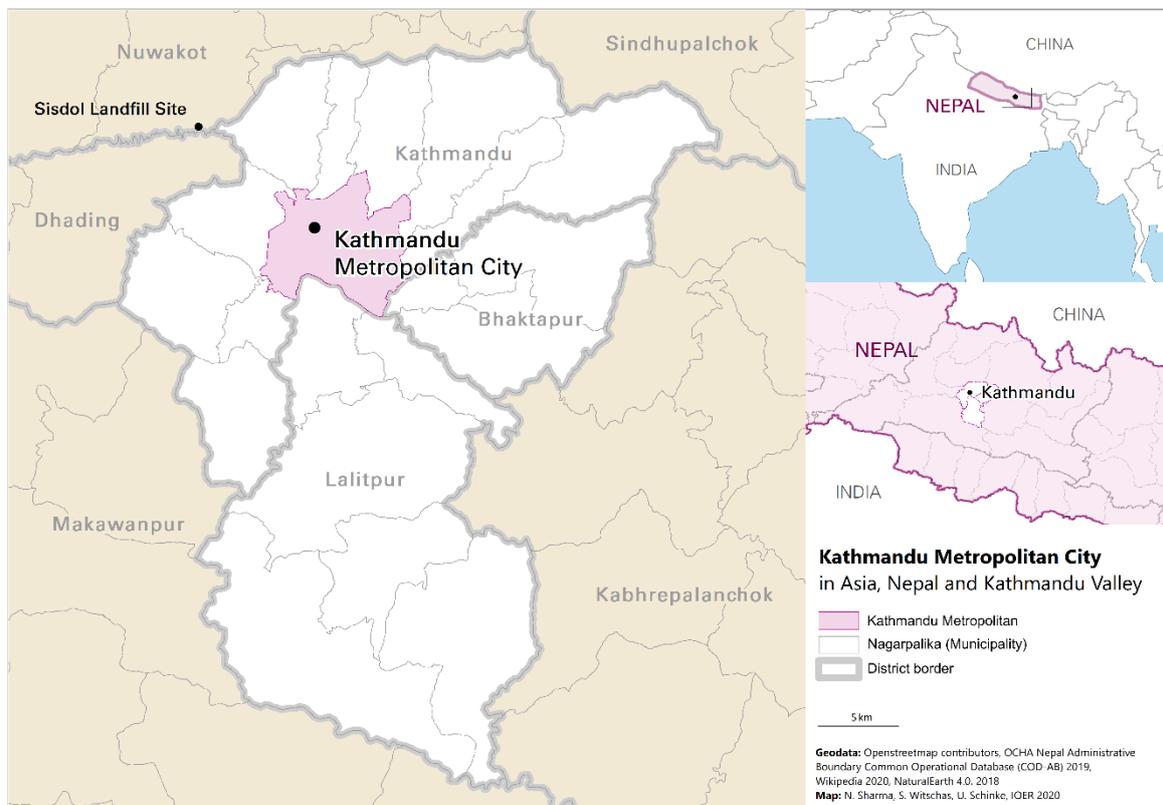


Figure 1: Kathmandu Metropolitan within Kathmandu Valley (Sharma, Witschas & Schinke, 2020)

Five municipalities in crux cover the core urban area of Kathmandu valley with the highest population concentration in those municipalities. The 2011 census population shows the population status in the municipalities of the valley where Kathmandu Metropolitan tops the list with the highest level of population density (*see table 1*). In Nepal migration from rural to urban areas is another contributing factor for the booming urban population. The net rural urban migration rate in Nepal is 29 percent where Kathmandu Valley alone holds 40 percent of that migration (Kumar, 2004; MoUD, 2017).

It is the most populated urban region in Nepal and one of the fastest growing urban accumulation in South Asia (MoUD, 2017; Muzzini & Aparicio, 2013). Kathmandu Valley alone is responsible for 29 percent of the total urban population of Nepal, with Kathmandu district handling 9.7 percent of that urban population (Bakrania, 2015). Currently, municipal

solid waste³ management is one of the basic urban services that metropolitans in Nepal are struggling to provide amply to the public. A study in 1992 revealed that in Nepal only 18 percent of the urban population is served by municipal solid waste management services (Sharma, 1992). This scenario has changed with the span of time, a comparatively recent study by Ministry of Urban Development of Nepal revealed 42.7 percent of urban household have access to waste management services (MoUD, 2017). Due to the consequences of population growth and migration from rural to urban areas, urbanization has been acknowledged as a critical process in the metropolitan of Nepal (Thapa, 2009). This level of urbanization has brought repercussions such as spontaneous urban development, deficiency of urban services like solid waste management, urban poverty, marginalization, and environmental degradation in the metropolitan areas of Nepal. However, the situation is dire in urban areas of Nepal where municipalities spent a large proportion of their limited budget on waste collection and disposal to landfills and no other measure is officially adopted to change this scenario. Still due to reasons like lack of human and technical resources large part of waste goes uncollected which eventually gets dumped on open areas, streets, and riverbanks. Worsening solid waste situation in Kathmandu Metropolitan city has become a matter of public attention. Issues related to waste collection and disposal are frequently covered by media by newspapers, TV, and radio. Strike by municipality workers halting the collection of waste, opposition by locals at the landfill site resulting in obstruction of waste disposal are common national newspaper headlines. Even the mayor electoral candidates for the recent local level election in 2018 made waste collection and disposal an issue for their electioneering campaigns. Municipal Solid Waste Management (MSW) in Kathmandu Metropolitan City (KMC) is motivating to be researched since it has gone through a series of changes over the years and is still facing crisis. A number of projects over the years have been implemented in the city to institutionalize the waste management process and make it more integrated, but the system has stagnated in the collection and disposal mode (*see chapter 4 for further description*). In broader context the situation of KMC can shed light on the problems that other growing cities in developing countries are facing. Nevertheless, we cannot generalize about other cities from the single case study of Kathmandu Metropolitan

³ Municipal Solid Waste (MSW) can be defined as solid waste which includes all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings and construction debris (Magutu & Onsongo, 2011). In the thesis MSW refers to all kind of solid waste generated from households in Kathmandu metropolitan. It does not consider commercial and institutional solid waste.

City. Still, current trends of growth make Kathmandu a role model study area for Nepal as well as for other megacities in Asia.

1.2 Solid Waste Management in Developing Countries

Solid waste generation in cities of developing countries has highly accelerated due to rapid urbanization, increase in the living standard of the public led by economic growth (Guerrero et al., 2013; Marshall & Farahbakhsh, 2013). Usually, municipalities are taken as responsible bodies for waste managed in the cities. Municipalities in developing countries face several constraints and complexities that hinder the provision of effective and efficient waste management services. In Municipal Solid Waste Management (MSWM) of developing countries the most common problem can be identified as inadequate coverage area of waste collection, operational inefficiencies of public services limited recycling activities, inadequate landfill disposal, and inadequate management of hazardous and hospital waste (Zurbrugg, 2003). When talking about household waste some common issues identified are improper bin location affecting collection, transfer and transport practices, poor collection practices, route planning and lack of information about collection schedule, inadequate infrastructure, poor road network and insufficient number of vehicles for waste collection (Moghadam, Mokhtarani, & Mokhtarani, 2009). Some factors that contribute directly to the performance of waste management system are technical, environmental, financial, socio-cultural, institutional and legal (Guerrero et al., 2013).

The technical factors influencing the waste management system are associated to lack of adequate technical capacities among the personnel involved in municipalities and local government, poor infrastructure like roads, vehicles and equipment (Hazra & Goel, 2009). Usually, these resources are scarce and if they are present, they are in a dire need of proper management. There is also the issue of lack of reliable and timely data about waste in developing countries (Mrayyan & Hamdi, 2006).

Environmental aspect affecting the waste management system is usually lack of appropriate environmental control system in developing countries. There are not enough mechanisms to detect the environmental effects of improper waste management practices. Whereas, in some cases where they exist it has been noted that real impact evaluation is not done (Matete & Trois, 2008). Financial resources are a major contributor for a well-functioning system. The increased amount of waste generation has posed a burden on municipalities which are already struggling with their budget for waste management (Sujauddin, Huda, & Hoque, 2008). There is a huge

amount of fiscal resources required to provide waste services to the public (Sharholy, Ahmad, Vaishya, & Gupta, 2007). Inadequate economic resources hamper the smooth functioning of the system but at the same time appropriate use of the available resources have a role to play. Public unwillingness to pay for the waste management services is another constraint as the public believe that it is the responsibility of local government to provide services to the public free of cost (Sujauddin et al., 2008). To solve these issues involvement of private sector through public private partnership for waste management was suggested. But the adoption of public private partnership itself does not solve the problem, a number of factors are to be considered for it to function and give results.

Sociocultural factors are related to the public knowledge and perception about waste. The public is typically not expected to contribute to waste management (Vidanaarachchi, Yuen, & Pilapitiya, 2006). Nonetheless, the efficiency of the system largely depends on the awareness and participation of the public. As the public becomes aware, they can contribute positively to the practices, at the same time including them in the decision-making process is also necessary to ensure sustainability of the waste system.

Institutions functioning incompetently are responsible for poor urban management and public service delivery in developing countries (Zurbrugg, 2003). Managerial and leadership capacities are often deficient among authorities. Local governments responsible for waste management seem to lack organizational capacities in developing countries. This is often reflected in the absence of clear definition of roles and responsibilities among the institutions involved. In addition, information available from the authorities is very limited and scattered which hinders the understanding of the complexity of solid waste management (Chung & Lo, 2008). Presence of good governance and its components are regarded as a necessity for the establishment of a well-functioning system. Some authors argue that good governance leads to participation and collaboration of all relevant stakeholders, even the ones at the lowest strata. Low-income countries tend to lack governance structures and institutions with competent local government and democratic structures as found in high-income countries that creates hurdles for proper SWM (Bhuiyan, 2010; Marshall & Farahbakhsh, 2013). Especially rampant corruption in public institutions of developing countries are responsible for retarding economic growth, incapacitating political system and obstructing the public welfare, but it still remains to be the most ubiquitous and least confronted issue (Bhuiyan, 2010).

Researchers have pointed towards the usefulness of legal framework for establishment of a well-functioning waste management system. In the report prepared for African Development Bank (ADB) on study of solid waste management options for Africa, Palczynski noted that “no

country [in the study] has a specific waste management legislation even though legislation is being drafted now in some countries” (Palczynski & Scotia, 2002). While in some countries the legislations are present, but proper implementation of these frameworks is an issue due to lack of awareness about the detrimental effects on public and environment.

In the absence of strong political will in developing states, influences of international institutions are seen in solid waste system development. Institutions such as World Bank, Asian Development Bank have shown strong interest and focus on environmental issues, institutional capacity building, good governance and private sector participation which are deemed crucial for SWM systems (Marshall & Farahbakhsh, 2013). These organizations always do not succeed as their approach may not always be appropriate to the context, for example failure of SWM projects during the 90s in Sri Lanka, Mexico and Philippines (Wilson, 2007). With the rising urgency for capacity building at municipal level to deal with SWM, there has been a number of multilateral and bilateral assistance with these agencies (Schübeler, Christen, & Wehrle, 1996). Though the presence of collaboration does not assure development as these donors may be biased towards their own bureaucratic goals. To the extent that the aim is just to capture the market to supply the sophisticated technical equipment (Coffey & Coad, 2010). Now urban waste researchers and practitioners are aiming for a multi-faceted SWM methods, tailored according to the needs and demands of the community (Jha, Singh, Singh, & Gupta, 2011). Thus, a need was felt for an integrated system which is appropriate to the particular circumstances, employing and developing the capacity of all stakeholders both formal and informal at level (Schübeler et al., 1996), leading to the development of integrated solid waste management approach with the ultimate aim to achieve sustainability in solid waste management.

A dominant paradigm for sustainable MSWM is the Integrated and Sustainable Solid Waste Management (ISWM) Framework, originated in the 1990s and was redefined throughout the 2000s, finally becoming a norm in the discussion of solid waste management. The framework advocates for the incorporation of technical, environmental, financial, sociocultural, institutional, and legal components for an integrated solid waste management system. The ISWM framework capture all the above-mentioned six dimensions into two aspects namely physical and governance. The physical aspect focuses on three key drivers for development of waste management while the governance aspect focuses on strategies to deliver a well-functioning system (*further description of ISWM framework in section 1.5*).

1.3 Contextualizing Solid Waste Management Problem of Kathmandu

The following section contextualizes solid waste problem of Kathmandu. In doing so it uncovers the way social and urban development context and links to solid waste management in the city.

1.3.1 Social context of solid waste management in Kathmandu

Nepal is dealing with issues related to proper waste management over three decades now. Especially, capital city Kathmandu where the existing state of solid waste management portrays a gray picture where there is no proper and effective waste collection and disposal system which is tied to limited recycling and composting activities (Asian Development Bank, 2010). Haphazard disposal and burning piles of waste along roadside and river banks are a common sight, causing hazards to health and environment (Dangi, Cohen, Urynowicz, & Poudyal, 2009; Pokhrel & Viraraghavan, 2005). A number of waste management projects with foreign assistance have been carried out in Nepal since the 1970s till date but still an effective and efficient solid waste management system is non-existent (Dangi et al., 2009; Thapa, 1998). Though chronic problems related to waste management in Kathmandu dates back to 1970, the city still struggles to maintain a sustainable solid waste management system (Dangi, 2009). Many earlier efforts to establish an effective and efficient system failed after the termination of foreign aid in those projects (Tuladhar, 1996). A study by Asian Development Bank on Solid Waste Management in Nepal concluded that municipalities in Nepal are unable to manage municipal solid waste effectively and efficiently because of the lack of technical and human resources, statistical records, and proper planning, as well as insufficient budget and lack of political leadership (Asian Development Bank, 2013, p. 29).

Most of the waste generated at municipal level are degradable which can be converted to manure and biogas; while the remaining waste can be recycled but due to lack of institutional capacity and awareness of segregation these waste are mostly disposed in landfills (Asian Development Bank, 2013). In addition, there is limited information regarding the quantity and generation of municipal waste in Kathmandu (Dangi, Pretz, Urynowicz, Gerow, & Reddy, 2011); also statistics related to solid waste management in Kathmandu valley has been highly uncertain as demonstrated by various inconsistency across studies which plays a role in inhibiting the waste management planning (Nippon Koei Co. & Yachiyo Engineering Co., 2005). Leading to the current situation where waste is predominantly disposed in landfill site and municipality is continuously in search of new landfill site after the expiration of one. This

disposal of waste to landfill site is not environmentally controlled and monitored. The current landfill site has been an issue of conflict between the locals and municipal authorities time and again. A report published in 2010 revealed that in 3 years, the landfill site remained non-operational; 53 times, at least for 209 days. While solid waste management resource mobilization center made settlements over 49 times with the landfill site struggle committee (Nyachhyon, 2010). It led to a situation where streets of Kathmandu were flooded with all kinds of waste creating environmental and public health hazard. The current landfill site has been subject of conflict between the municipal authorities and local residents over more than a decade, still the government has continued to throw mixed waste into the site violating national and international standards (Nyachhyon, 2010).

Similarly, issues related to financial, technical constraints and proper implementation of laws and regulations are persistent and material recovery from municipal waste is minimum (Government of Nepal, 2015; Singh, Yabar, Nozaki, & Rakwal, 2015). The system seems to have become stagnant where large part of waste ends up being landfilled and informal scavenging handles 10 percent of solid waste and formal recycling is still non-existent (Dangi, Schoenberger, & Boland, 2017; Nippon Koei Co. & Yachiyo Engineering Co., 2007).

As per the study carried out in 2003, itinerant waste buyers and waste pickers manage approximately 10 percent of total municipal solid waste of Kathmandu Metropolitan City which saves 371 million Nepali Rupees of national economy every year (Bhattarai, 2003). While the metropolitan doesn't recognize the informal waste picking activities (Dangi et al., 2009). It is estimated that municipalities in Nepal on average spend 13 percent of the total budget on waste management, while its efficiency is debatable (SWMRMC, 2004). Kathmandu metropolitan itself spends US \$2.71 per capita per annum on solid waste management which is more than its compeer cities in South Asia (Dangi et al., 2009).

In terms of regulation and acts, garbage/waste got attention from the state with the formulation of Solid Waste Act in 1987 which focused on distribution of duties and responsibilities for waste management. Consequently, came the Local Self-governance Act 1999. This act provided a basis for decentralization of power to local government and made them responsible for provision of public services like solid waste management. Similarly, in 2011 came a concrete and proactive waste management act, Solid Waste Management Act 2011 which provided framework for solid waste management. This made the municipal government responsible for waste management activities providing a direction to move towards integrated system with the concept of reduce, reuse, and recycle; public awareness, collaboration and cooperation with private sector; public private partnership and environmental conservation. In

addition, series of laws and regulations have been ratified since last two decades to deal with solid waste issues in Nepal.

Nevertheless, focus on Nepal mainly in Kathmandu over the years has been on waste disposal in landfill though financial burden, public health issues, environmental implications of this type of system have been widely discussed by experts. The burden on the municipal budget created by construction of new landfill such as increase in transportation cost for the transfer of garbage, maintenance of the infrastructure had been widely discussed in Kathmandu. Still the focus and tendency has been towards search for and construction of new landfills to dispose the waste rather than utilizing waste as a resource (Dangi et al., 2009; Tuladhar, 1996). This raises the question of why disposing of the waste always becomes a priority even when alternatives are provided. Studies have cited political instability in the country, lack of political commitment, poor institutions, inability to enforce legislations, lack of financial and human resources, as reasons for the current situation (Pokhrel & Viraraghavan, 2005; Thapa, 1998). Similarly, others have suggested private sector involvement, public awareness and participation for the improvement of the system (Alam, Chowdhury, Hasan, Karanjit, & Shrestha, 2008). While some studies opine towards the need of integration of informal sector into the system, private sector/NGOs involvement through further amendment of environmental policies, less reliance on foreign aid and generation of internal resources and formulation of policies to harness aid as solution for better system (Dangi et al., 2009; Dangi, Schoenberger, & Boland, 2015).

Researchers have suggested a number of ways to deal with the waste management issue in developing countries. A study on governance and solid waste management in Bangladesh focused on weak governance from the part of City Corporation as a constraint to effective waste services; public private partnership as a contributor to better services and good urban governance (Bhuiyan, 2010). Focus on all-encompassing and people oriented urban governance that takes into account actors from both formal and informal arena are stressed in developing country context. Especially for waste management consideration of all actors present in urban environment rather than one directional focus on ideals of modernized technical solution is desirable. Authors have gone to the extent to point out that state actors cannot achieve their interest of ensuring environmentally feasible and secure city if they fail to adopt mutual cooperation, coordination and most importantly integration of informal sector to achieve a collaborative governance mechanisms for urban sustainability (Amuzu, 2018).

Similarly, studies on solid waste management in developing countries of Africa focus on active participation of stakeholders in solid waste management activities, citizen awareness (Di

Maria, Lovat, & Caniato, 2018). Another study on sustainable solid waste management in Asian countries directs towards integration of appropriate technology, legal and policy framework, institutional arrangement to attain a sustainable system (Shekdar, 2009).

While a study in 22 developing countries about solid waste challenges pointed towards a need of reliable data, recognition of roles and responsibilities of stakeholders who shape the system, attention towards social, cultural, legal, environmental aspects not just on technical solution and public participation as answer to solid waste problems (Guerrero et al., 2013).

Therefore, studies on municipal solid waste management have identified that numerous stakeholders play a role in shaping/governing the waste system in a city.

Though governance issues are of major concern in public services like solid waste management in Nepal and often serve as proxy indicator of quality of city governance (Scheinberg, Wilson, & Rodic-Wiersma, 2010c). Solid waste situation in Kathmandu remains under-researched and hence poorly understood from governance perspective where waste management process in the city is understood reckoning the role of formal and informal actors, their relationships and the contribution partnerships between existing actors could have in addressing waste management issues. As most of the studies in developing countries refer to application of governance in a sense of good governance where adoption of concepts like participation, decentralization will lead towards success in addressing solid waste management problem with few success stories. At the same time, contribution made by informal sector has remained largely unacknowledged by authorities. In cities of global south with no or irregular waste services along with the absence of municipal recycling system, private service providers and informal sector fill the gap. Especially informal sector retrieves recyclables and provides inputs, i.e., raw materials for the formal recycling chain but often go unnoticed by authorities. Conventional approaches towards urban solid waste management have been technical, unaccounted with the local realities, actors, and their relations.

Thus, there is a lack in understanding solid waste management from governance aspect in the given context and how governance together with the changing urban development scenario of the city affects the waste management. This situation creates a knowledge gap and makes it difficult to understand the worsening solid waste situation in the metropolitan. Considering the above, this study can be justified on the grounds that it will further the understanding of solid waste issue affecting Kathmandu from governance perspective and the role played by informal sector and provide a useful starting point for addressing an otherwise intractable problem.

1.3.2 Urban development context of Kathmandu

Kathmandu valley over the decades has seen an expeditious growth in its cities. This invited migration to Kathmandu mostly from the rural parts of Nepal. This led to the development of major physical infrastructure like road networks, health facilities and education. It has been reported that since the 1960s Kathmandu's urban landscape went through rapid transformation, rapid expansion of city cores. The contemporary urban scenario of the Kathmandu Valley demonstrates an uncontrolled and haphazard growth of urban sprawl (Chitrakar, Baker, & Guaralda, 2016).

Authors have put forward factors like concentration of political economic and administrative powers, development of physical infrastructure and the surge of migration and population in the region as major factors contributing the urban growth of the valley (Chitrakar et al., 2016; Thapa, Murayama, & Ale, 2008). This kind of urban growth can be reflected in matters related to urban amenities like solid waste management where there are disparities in waste services, also concerns related to unavailability of space for citing waste facilities are pertinent. Similar trends of urbanization have been reported in other cities of developing countries where urban growth has been unprecedented in the last decade. *Table 1* below shows the urban population growth trend in major cities of global south. In Kathmandu, the city population grew from 642,000 in 2000 to 1330,000 in 2018. In 2030, the city is expected to grow further and expected to have a population of 1939,000. The city holds 4.5 percent of the total population and 22.7 percent of the total urban population of Nepal, making it the single largest urban agglomeration in the country. Similar trends are seen in other cities of global south where urban population is growing expeditiously, and cities are holding a considerable percentage of country's population.

City	City population in thousands			Average annual rate of change (in percentage)			City population as the proportion of the country in 2018 (in percentage)
	2000	2018	2030	2000-2018	2018-2030	Total Population	Urban Population
Kathmandu	642	1,330	1,939	4	3.1	4.5	22.7
Dhaka	1,0285	19,578	28,076	3.6	3	11.8	32.1
Addis Ababa	2,377	4,400	7,352	3.4	4.3	4.1	19.7
Delhi	15,692	28,514	38,939	3.3	2.6	2.1	6.2
Kolkata	13,097	14,681	17,584	0.6	1.5	1.1	3.2
Islamabad	569	1,061	1,477	3.5	2.8	0.5	1.4
Accra	1,668	2,439	3,187	2.1	2.2	8.3	14.8

Table 1: Urban population growth in major Global South cities (United Nations, 2018b)

Meanwhile, this urbanization rate has outpaced urban infrastructure development in global south that often results in service deficiencies in environmental, social and health sectors. One of the core challenges faced by rapidly urbanizing cities in developing country context is availability and quality of infrastructure (World Economic Forum, 2018). This situation has also been reported by authors about African cities where supply of basic infrastructure is radically declining due to weakening economic condition in these cities (Okot-Okumu, 2015). This gap in infrastructure for one of the core services i.e., solid waste management, in developing countries is fulfilled by the informal sector, especially by the informal waste workers. These informal waste workers take over the work of picking recyclables from different parts of the city helping cities to achieve informal recycling rate. However, informal waste workers continue to function in poor conditions and are ascribed to low social status. They are subject to poor working and living conditions, limited access to facilities and infrastructure (Medina, 2000; Wilson et al., 2006). Informal waste workers in the context of Kathmandu have been reported to be one of the poorest communities in Kathmandu valley and are functioning in poor sanitary situation combined with poor living conditions (Black et al., 2019). The impoverished situation of the waste workers is compounded further by their daily

work in waste dumps without safety measures and facilities. It has been pointed out that the negative perception towards informal waste workers emanates from their association to waste, something that is no more useful and discarded from their households (Medina, 2000). There has been little attention given to the urban living conditions of the waste workers; provision of infrastructure to waste workers that support them in their daily work and providing them better working conditions. This eventually can contribute in achieving better recycling rates for the cities. As most of the resources in cities of developing countries are spent on the removal of waste from the public sight depending on the neighbourhood but little attention is given to finding sustainable solutions (Gutberlet, 2009). While supporting informal waste sector through viable urban infrastructure that supports their work is not given priority. Importance of improving urban infrastructure in addressing urban challenges has been widely acknowledged by Nepal's urban development strategy and periodic plans. Nepal's current urban development strategy aims to emphasize on mainstreaming urban informal economy through actions like provisioning time and space for those activities with an eventual aim of reducing urban poverty (MoUD, 2017).

However, for solid waste management the focus has been on promoting large scale waste projects in collaboration with private sector through public private partnership model. While the informal waste sector active in recycling activities of the city has received limited attention for improving their status. Particularly, informal waste workers and their recycling activities are generally overlooked in Kathmandu. The plight of informal waste workers in Kathmandu have been documented and attempts have been made to support them (Practical Action, 2014; Black et al., 2019; Rijal, Atreya, Adhikary, & Bhattarai, 2014) However, attention towards improving informal waste workers' working and living condition through provision of basic infrastructure and services has not been prioritized. It is estimated that 56 million, of which 15 million in developing countries work in dangerous and unsanitary conditions, collecting, sorting and disposing of waste (Linzner & Lange, 2013; Medina, 2008). The need to emphasize on ways to improve waste workers' working conditions, reduction of occupational health risks and poor public perception has been pointed out by authors (Gutberlet & Baeder, 2008; Oguntoyinbo, 2012). Research carried out to demonstrate the socioeconomic living situation of the informal waste workers demonstrated that these workers live in perilous housing conditions, often substandard housing lacking continuous access to water, electricity, and sewage (Da Silva, Fassa, Siqueira, & Kriebel, 2005; Gutberlet & Baeder, 2008).

Though information on informal settlement in Kathmandu is not comprehensive. In 1985 it was estimated that there were 17 squatter settlements in Kathmandu, this increased to 64

settlements by 2003. (Shrestha, 2013). Nearly two-thirds of these informal settlements are located alongside the banks of Bagmati and Bishnumati River; exposing the settlers to natural disasters such as floods and landslides (Sengupta & Sharma, 2006).

While a study in 2008 reported that informal settlement in Kathmandu are growing twice the rate of the city accounting to 12 percent per annum (Rademacher, 2008). In case of Kathmandu, slums and squatter settlements were found to be inhabited by informal sector workers. It was reported that a large number of the waste pickers in Kathmandu, live in squatter settlements along the riverbanks (Duzgun, 2013). In Kathmandu, the reasons for settling in ecologically sensitive and fringe areas like riverbanks have been access to water, dubious nature of land titles in these areas as they are prone to monsoon flooding and the proximity of rivers to city centre and job opportunities (Sengupta & Sharma, 2006).

Furthermore, waste pickers also reside in areas where their access to waste is faster and, in some cases, they wait for the arrival of waste vehicles at the landfill from different sources. Challenges faced by waste workers are related to access to adequate equipment for waste sorting compelling them to use bare hands and sticks, lack of storage place for sorted waste and exposure to public and environmental health hazards (Medina, 2000; Ojeda-Benitez, Armijo-de-Vega, & Ramírez-Barreto, 2002).

In Kathmandu, informal waste workers' health related challenges caused by working conditions are documented however, their destitute working situation lacking basic infrastructure like toilets, availability of drinking water and their squatter like living conditions have not received enough attention. Though capacity of infrastructure planning to make cities democratic, competitive, ecologically proficient, and socially just has received consideration (Swilling 2011). In case of developing countries, infrastructure planning though recognized as essential for inclusive cities, has not gathered enough impetus due to a number of reasons like weakly formulated policies, resource inadequacies, poor urban planning practices combined with governance issues and lack of political will. Considering these aforementioned conditions, this study aims to bring forward the role of the informal sector in solid waste, experiences of informal waste workers and informal sector operators. At the same time, it highlights the contemporary governance mechanism in solid waste management i.e., public-private partnership and its implication for the informal sector.

Fig 2 below shows the working condition of the waste workers in Kathmandu, on the left side waste workers are seen diving into a waste collection vehicle to segregate recyclables; on the right side a female waste worker is seen cleaning the white glasses with bare hands in a scrap centre.

Similarly, in *fig 3*, on the left side living quarter of an informal worker situated along the riverbank is seen and on the right side an itinerant waste buyer is seen in a scrap centre, which serves both as his living and working place.



Figure 2: Waste workers sorting recyclables in a waste vehicle and a waste worker cleaning white glasses at a scrap centre (Own photos)



Figure 3: Living quarter of an informal worker situated on a riverbank and working place functioning as a living place for an itinerant waste buyer (Own photos)

1.4 Objective and Research Questions

The aim of the study is to understand the debilitated solid waste situation of Kathmandu from governance perspective. Governance aspect as defined by integrated sustainable waste management framework (ISWM) comprises of financial sustainability of the system, sound institutions and proactive policies and inclusivity of user and provider (Wilson et al., 2013).

In the context of developing countries' municipalities, all the features of integrated solid waste system are either ignored or partially adopted (Henry, Yongsheng, & Jun, 2006; Marshall & Farahbakhsh, 2013). This has doomed a large number of projects aimed at achieving integrated solid waste management to failure (Abdel-Shafy & Mansour, 2018; Henry et al., 2006; Marshall & Farahbakhsh, 2013). However, the framework sets out clear elements to be achieved to accomplish solid waste governance and falls short of capturing the everyday complexities of solid waste management in developing countries. Inclusivity of stakeholders, being cost-effective and having supportive policies and institutions might be present to some extent or absent all together in developing countries (Mrayyan & Hamdi, 2006; Sharholly, Ahmad, Mahmood, & Trivedi, 2008; Sujauddin et al., 2008). Thus, this study places the governance dimension in the current realities of solid waste management of Kathmandu such that waste governance of the city can be unravelled and enriched. Furthermore, concept of informal sector and approaches to informal sector is given equal importance such that it provides opportunity to discover the role played by informal sector in waste and its relation to formal sector, since they continue to remain unrecognized as a part of waste systems (Guerrero et al., 2013). The thesis argues that it is necessary to bring forward the role played by the informal waste sector, mainly waste workers. It proceeds with the understanding that the potential role informal sector has in waste management needs to be considered in policy making and practice. Broadly the study aims to address the gaps in policy and discourse pertaining the formalization and inclusion of informal waste sector particularly the informal waste pickers.

To achieve this the study considers an understanding of solid waste management process of the city, charting the range of actors, precisely the role of informal sector, and their relationship with other actors and accentuating the partnerships between these actors as quintessential for achieving an integrated sustainable solid waste management.

Lastly, the study intends to contribute to the concept and practice of solid waste management in urban areas of developing countries. In the light of these concepts, the main research question with sub questions have been formulated. The overall hypothesis for the study is that in the absence of government capacity to respond to waste management problem spectrum of actors have entered the process and filled the vacuum. Thus, the emphasis on governance aspect and informal sector provides a better understanding to address the solid waste management issues of Kathmandu. However, this requires recognition of waste practices in the city, role of informal actors, relationships, and potential for partnerships.

- How does governance facilitate to understand and address the solid waste management situation in Kathmandu?
- What is the current solid waste management process and how does it acquaint governance?
- What is the role of informal sector in solid waste management and what is their relationship with other waste actors?
- What are the existing partnerships between the actors and how can it contribute to address the waste concerns?

1.5 Current Paradigm in Solid Waste Management and Research Contribution

Goal 11 and 12 of Sustainable Development Goals which is adopted by United Nations aims to make cities and human settlements inclusive, safe, resilient and sustainable and to ensure sustainable consumption and production pattern respectively (UN Desa, 2016). This is directly reflected in target 11.6 of goal 11 that intends to reduce by 2030 the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management through collection and management in controlled facilities. Target 12.4 and 12.5 further aims to substantially reduce waste generation through prevention, reduction, recycling and reuse and achieve environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil to minimize their adverse impacts on human health and the environment (UN Desa, 2016).

This further reverberated in Hanoi 3R declaration that aims to achieve resource efficient society and a green economy in the Asia-Pacific region through the implementation of the 3Rs (reduce, reuse, and recycle) principle. This shows that focus now is on leading societies to implement 3R principle and attain a green resource efficient economy, rather than focus on developing infrastructure focusing on waste disposal. It has given signatory government of these accords an opportunity to address solid waste management issues by regulating the waste generation and applying measures to recycle and reuse, especially the local governments upon whom responsibility of waste management is vested.

However, most studies on solid waste management in developing countries point towards the failure of public services due to reasons like many workers, no supervision, few incentives to perform and limited finances (Oteng-Ababio, 2010). Meanwhile, there has been extensive discussion about shift from government to governance largely after 1980s when governments

were forced to retrieve under neoliberal policies (Havekes et al., 2013). Thus, the state power and authority shifted towards market, civil society, independent bodies and both higher and lower jurisdictional levels and there was no longer just government but call for governance (ibid). In this thesis concept of governance for an integrated sustainable solid waste management is explored.

Diving into the concept of governance brings in actors from multiple arenas beyond the public sector. It can help in identifying which stakeholders are involved, who is responsible for what and giving suggestions on how to deal with the existing problems. As governance implies both policies, policy instruments, and networks and relationships with and between various actors and organizations (Bulkeley & Askins, 2009). Waste governance involves multiple stakeholders, typically drawn from both the formal and informal sectors, and is often shaped by local and international actors (Forsyth, 2005; Millington & Lawhon, 2019; Zapata Campos & Hall, 2013). This involvement of a complex group of actors in the process of waste governance makes it a complicated undertaking, raising the issue of its conceptualization. The most accepted framework for sustainable waste management sets out several indicators that are to be achieved to have an integrated sustainable waste management system. This falls short of capturing the realities of countries in the global south where understanding of waste is culturally specific and dealing with waste is based on specific regimes of knowledge (Millington & Lawhon, 2019).

Thus, governance aspect of integrated sustainable waste management framework is resorted as an outset to illustrate the current solid waste management in Kathmandu with the eventual aim of uncovering and supplementing waste governance of the city. In this undertaking, current solid waste management process of the city based on the literature from Global south (Davies, 2009; Guerrero et al., 2013; Gutberlet, 2009; Marshall & Farahbakhsh, 2013; Medina, 2000, 2007; Scheinberg et al., 2010c; Wilson et al., 2015) and own empirical study based on field study is accounted for. Thus, the dissertation first intends to recognize the complex process of solid waste management in a developing country context. This further reveals the vast range of actors involved in waste management of the city where some are exacerbating, and some are addressing the waste issues. It considers the role played by complex group of actors with special attention on the role of informal sector and its relationship with other actors in SWM.

Also, in the context of developing countries where actors are faced with the issue of limited resources and policy weaknesses (Konteh, 2009; Sharholy et al., 2007; Sujauddin et al., 2008), need is for finding an approach to make the system suitable to the niche and fitting the local circumstances (Wilson et al., 2015). In this regard, where actors face with inadequacy of

resources and policy weaknesses, this dissertation aims to contribute to the further conceptualization of solid waste governance in an emerging city of Global South.

Though the governance dimension of sustainable waste management identifies the need for inclusivity of service users and providers from both formal and informal sector as stakeholders, it remains unclear the way these stakeholders are to be made inclusive. Especially the informal sector and its contribution which has been a matter of wide discussion in literature (Guibrunet, 2019; Gutberlet, 2009, 2015; Sembiring & Nitivattananon, 2010). Understanding the contribution of informal sector and its relationships is crucial in reckoning them as urban dwellers and part of waste governance. Furthermore, consolidating policy approaches that adopts the contributions of informal sector can support in designing integrated waste systems, this is the second contribution this dissertation aims to make.

Moreover, the governance aspect aims for financial sustainability, sound institutions and proactive policies with cost-effectiveness, affordability, sufficient financing, adequate national framework, and comprehensive institutions among each other. Literature suggests that partnership with private sector could induce efficiency of waste system in developing countries (Sharholy et al., 2008). Meanwhile, literature also advocates partnership between public sector and private sector explicitly including the informal sector (Baud, Grafakos, Hordijk, & Post, 2001; Oteng-Ababio, 2010; Post, Broekema, & Obirih-Opareh, 2003; Wilson et al., 2015). Thus, recognizing the existence or non-existence of partnership between the actors and its role in solid waste governance is pivotal for attaining an integrated solid waste management. This is the third contribution that this dissertation aims to make.

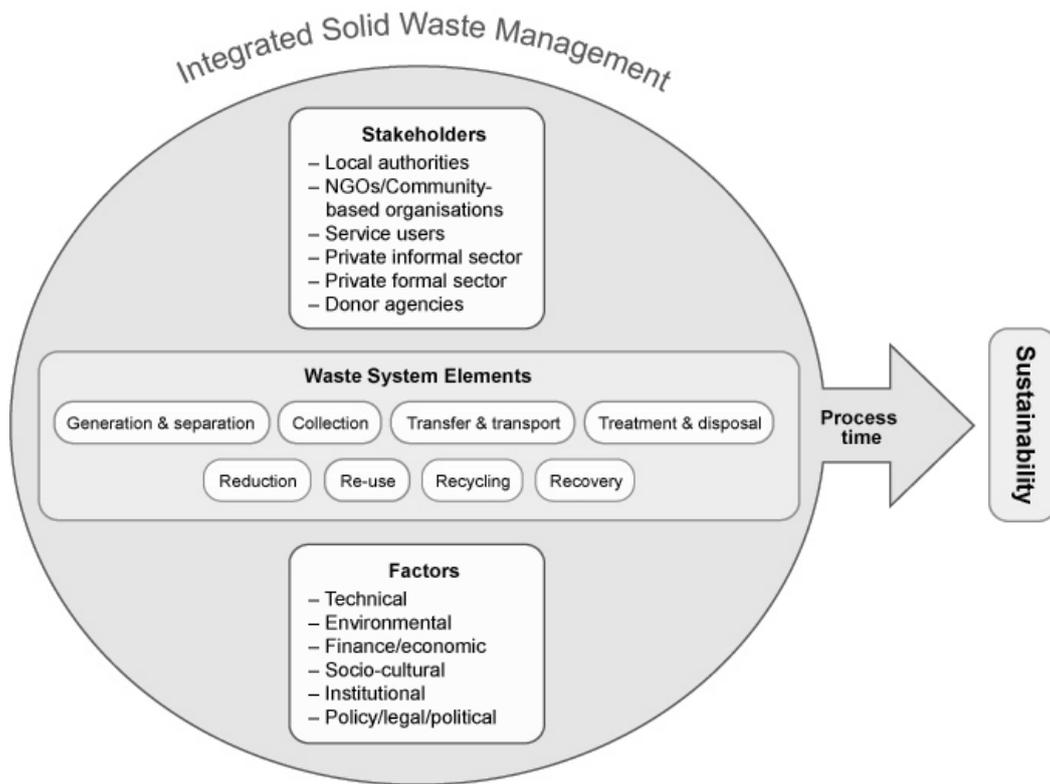


Figure 4: Integrated Solid Waste Management Framework (Van de Klundert & Anschutz, 1999)

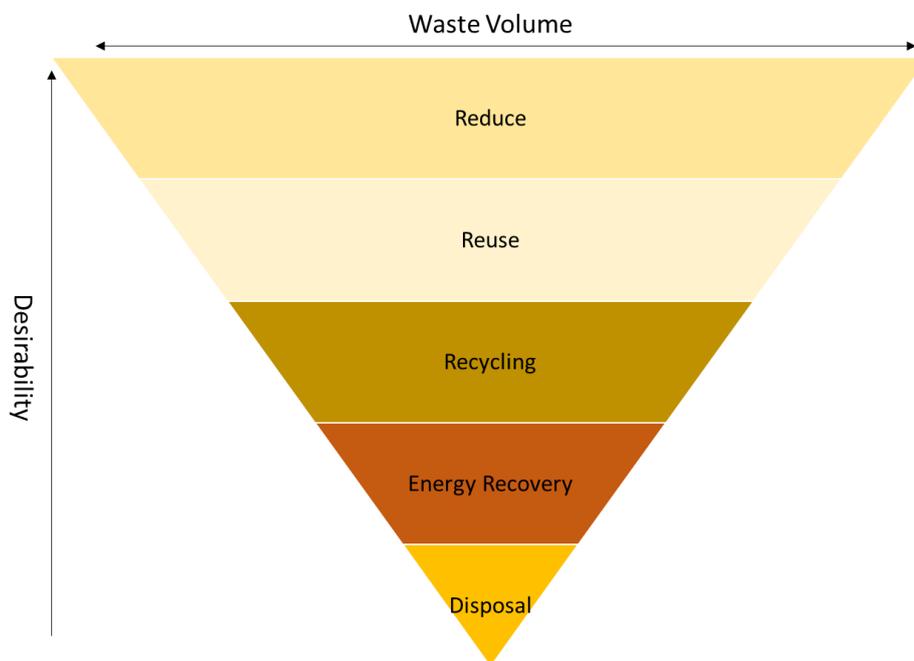


Figure 5: Waste management hierarchy (Wilson, 1996)

The current paradigm on SWM (*see fig 4*) emerged as a shift away from landfilling during the 1990s. Similarly, *fig 5* supplements this shift away from disposal-based practice. It shows the hierarchy of waste management practices, with disposal as the least desirable and reduction as the most desirable.

Though the modern SWM practices began in 1970s, it was defined to be technical solution to the waste problems (Van de Klundert, Anschütz, & Scheinberg, 2001). It was argued waste management is not just a technical issue it demands integration of many inter-related processes and entities that make up a waste management system (McDougall, White, Franke, & Hindle, 2001). Integrated solid waste management (ISWM) can be defined as the selection and application of suitable techniques, technologies and management programs to achieve specific waste management objectives and goals (Tchobanoglous et al., 1993). ISWM (*see fig 5*) aims to make a balance between three dimensions of waste management, environmental effectiveness, social acceptability and economic affordability (McDougall et al., 2001; Van de Klundert et al., 2001). The major goal of ISWM systems are to consider perspectives of all the stakeholders, the social, cultural, political, environmental, economic and institutional context and then provide the most appropriate methods for prevention, reduction, recovery and disposal (McDougall et al., 2001; Van de Klundert et al., 2001).

It has been widely documented that some technologies that appeared to be unsustainable in the given society, economy, and environment because the approach taken was focused only on the technical aspects ignoring the social components and priorities (Morrissey & Browne, 2004). An integrated waste management system includes waste hierarchy while considering the impacts of waste collection, transportation, treatment, and disposal also the impact of waste materials and energy outside the waste management system (Seadon, 2010).

The basic concept of ISWM is to provide a framework for the selection of appropriate technologies that pave a way for the development of sustainable waste management systems in general (Van de Klundert & Anschutz, 1999). ISWM is concerned with, waste collection, treatment, and disposal methods, with the objective of achieving environmental benefits, economic optimization and societal acceptability which finally leads to a practical waste management system for any specific region (McDougall et al., 2001). Similarly, it also considers a wide range of aspects like sociocultural, environmental, financial/economic, technical, institutional, political/legal aspects, stakeholders and their interests and the stages/flow of materials from generation point, treatment and final disposal (Wilson et al., 2012; Zurbrugg, 2003). In ISWM waste is regarded as a valuable resource from which useful products and energy can be generated (Dijkema, Reuter, & Verhoef, 2000).

However, ISWM is not defined as the best system as there is no universal best system, it is a framework which has the potential to be improved, and new systems can be designed from it (UNEP-IETC, 1996). It is a system that can be improved continually in order to the changing needs and conditions. ISWM has become a buzzword in the developing world. But when it comes to practice, actual components may not be fully taken into consideration. At some point collection and disposal may get attention without actual integration of public participation. Similarly, different institution/ companies may be controlling different components of waste cycle like recycling, incineration, composting and landfilling, where no one has control over the whole system (McDougall et al., 2001). Although considerable efforts are being made by high-income countries to deal with the waste problems, still there exists major gaps in practices, where a lack of systems thinking has been pointed as the major contributor (Seadon, 2010). The situation is more destitute in low-income countries where poor waste management practices are not only affecting the environment but also public health. Especially, impacts are more visible on the vulnerable section of the population.

Integrated solid waste management has been regarded as an ideal situation, but it is not to be used as a blueprint. For a solid waste management situation to be successful it needs to address both the physical elements; collection, disposal, recycling as well as the “soft governance” aspects like public acceptance, actors co-operation and inclusion (Wilson et al., 2013). There have been cases in developing countries where “proven” technologies have failed since sufficient attention was not paid to the soft governance aspects (ibid).

Therefore, in order to fully understand and address solid waste management there is a need to explore it from governance aspect. Particularly in the context of cities of developing countries where it involves several stakeholders with different fields of interest, and they have a considerable role to play in shaping the system of the city (Guerrero et al., 2013).

A detailed investigation of current process of waste management in the city, role and contribution of actors deemed informal and existence and non-existence of partnerships between actors and its role is to be undertaken, and this dissertation intends to make an empirical contribution in this path.

1.6 Structure of Dissertation

Chapter 1

Nepal is undergoing rapid urbanization, especially the capital city Kathmandu. This level of urbanization has brought a number of challenges for the local government especially for the provision of urban services like municipal solid waste management. Municipal solid waste management in Kathmandu is characterized by collection and haphazard disposal with limited recycling activity. Previous studies have adopted a technocratic approach resulting in adoption of inappropriate technology and finding infrastructure-based solution to the waste problem. This dissertation approaches the problem from governance perspective with a focus on informal sector and discusses actors from both formal and informal sphere in municipal solid waste management involved in addressing waste issues of the city. Chapter one provides an overview of the research problem, the justification for adopting the governance approach, and focus on role of informal sector, urban development implications, research questions set forward and the hypothesis proposed. It closes by discussing the current paradigm in solid waste management.

Chapter 2

Chapter two presents prominent discussions on concept of governance, solid waste governance, and integrated solid waste management framework, dominant schools of thought on urban informal sector and government approaches towards informal waste sector. In doing so, it unfolds the pivotal role of governance and informal sector in urban solid waste management in low- and middle-income country context. The need of studying solid waste management from governance and government's perception and attitude towards informal sector and its implications in developing country context is discussed. At the end, the chapter proposes a process-actor and partnership framework for understanding and enriching the governance aspect of integrated solid waste management in urban areas.

Chapter 3

Chapter three presents the overall research design, methodology adopted, and methods used for the study. It elucidates the motivation behind selecting a single case study approach for answering the research questions and also justifies the choice of case study area. It further expands on the methods used for data collection and analysis. Finally, it addresses the topics of positionality, reflexivity and ethical consideration adopted in the study.

Chapter 4

Chapter four embarks the start of the empirical part of the study. Here case study city Kathmandu metropolitan is introduced. It provides a description of urban development in parallel to solid waste management system in Nepal, with a focus on the case study area. It traces the urban development along with solid waste management in Kathmandu back to the 70s and its chronological progression till date. The chapter concludes by providing the detailed description of legislative aspects of solid waste management in Nepal.

Chapter 5

Chapter five compares the formal government framework for municipal solid waste management against everyday practices of solid waste management. The formal waste management framework is based on national, state, and local level laws and regulations. Similarly, everyday solid waste management practices in the city are drawn from the field study that comprised of survey data and key informant interviews. This combination of two approaches reveals a range of actors from both formal and informal arena involved in solid waste management and addressing waste issues of the city. It concludes by pointing out the need for a framework that addresses the current issues in waste management through the connection between formal government framework and everyday waste practices.

Chapter 6

The previous chapter identified a range of actors both formal and informal involved in dealing with solid waste management of the city. This chapter discusses the role of informal sector in solid waste management of the city and their relationship with other actors, more specifically with authorities. It elaborates on the nature of relationship of informal sector with the government, along with their engagement with other actors like households, private companies, non-government organizations and social enterprises. It concludes by that informal sector is integral for achieving integrated solid waste management in the city and a need for authorities to move away from their current stance towards informal sector and prioritize their integration into the formal system considering the realities of the informal sector.

Chapter 7

Chapter seven discusses the existing partnership between actors and its role in solid waste governance in the city. Partnerships between actors are regarded essential for solid waste

management where governments alone are incapacitated to deal with waste management. Municipality here is identified as a main actor with the authority to facilitate partnerships between actors. Results point towards the presence of informal partnerships between actors framed to deal with waste management of the city, at the same time nature of such kind of partnerships are discussed. The chapter concludes that binding formal partnerships can play a key role in achieving solid waste governance in the city.

Chapter 8

Chapter eight synthesizes the theoretical and empirical findings of the dissertation. It recalls into the theoretical underpinnings of integrated solid waste management framework and approaches to informal sector such that empirical findings of the dissertation can be contextualized for cities with similar situation.

Chapter 9

Chapter nine puts forward recommendations to strengthen solid waste governance in order to achieve integrated solid waste management. Recommendations are made for all the actors identified in the study. The recommendations are based on the ground reality of the city revealed through the study. The figure below represents the overall structure of the thesis.

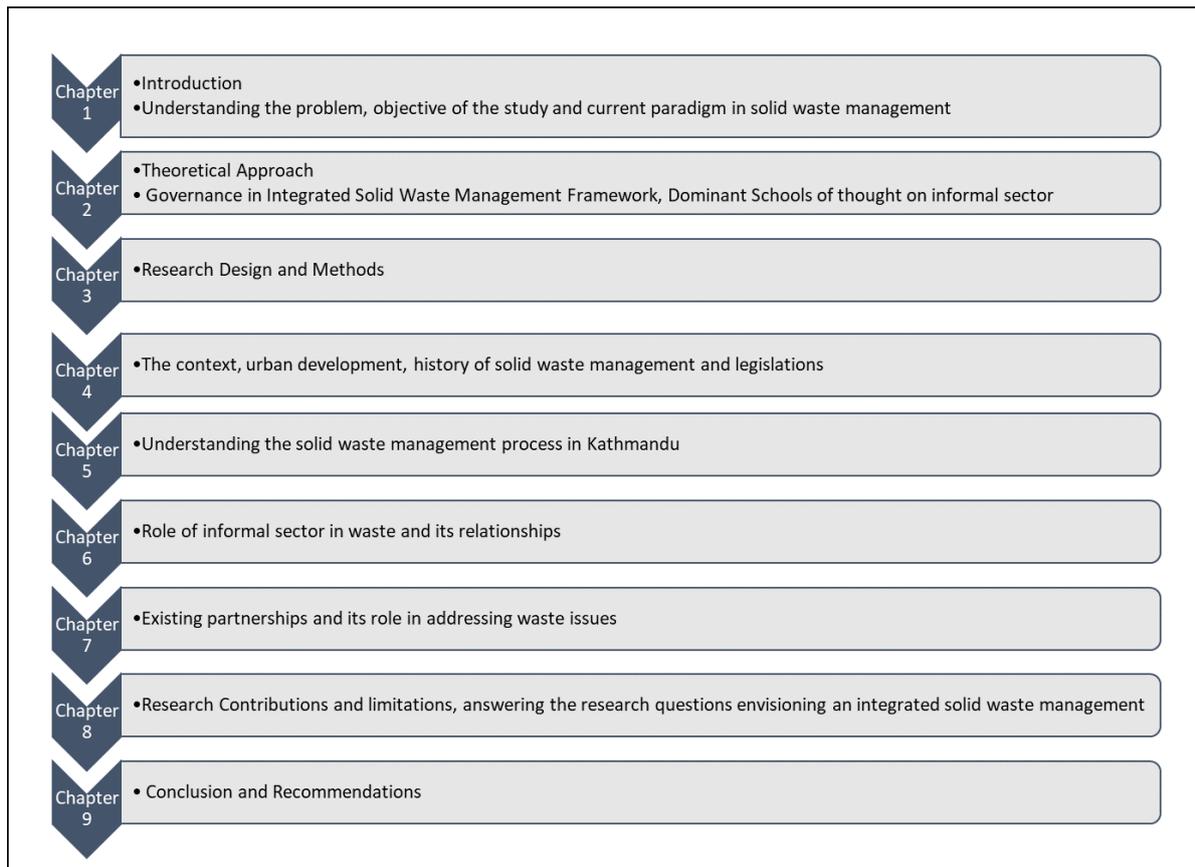


Figure 6: Structure of dissertation (Own compilation)

2 Theoretical Underpinnings

The dissertation intends to bring together two concepts governance and informal sector to create a theoretical basis for analyzing the solid waste situation emerging in the city. It will use the concept of governance since it has been believed to be adopted by most states for public sector reform and delivery of essential public services. This study intends to highlight the vital role played by governance and informal sector in urban solid waste management. Since failure from the government has led to the proliferation of multiple actors in waste and their ways of dealing with waste needs to be explored further and this dissertation aims to do so. The chapter concludes by proposing an actor-process and partnership-based framework for improving solid waste governance.

2.1 Governance

In 1992, the World Bank published a booklet entitled “Governance and Development”. In this publication, governance is defined as “exercise of authority, control, management and power of government”(World Bank, 1992, p. 29). Since then, it became a popular concept in development discourse. While the United Nations Development Program in its policy paper in 1997 defined governance as “the exercise of economic, political and administrative authority to manage a country’s affairs at all levels” (UNDP, 1997).

In simple terms, governance is concerned with the relationship between government and the governed, the way society is ruled, how policies are made and implemented (Frahm & Martin, 2009). It involves the roles of formal government institutions, informal networks, community-based organization, private sector, non-government organization in achieving collective actions (Boadway, Roberts, & Shah, 1994). Stoker argues: “Governance refers to the development of governance styles in which boundaries between and within public and private sectors have become blurred. The crux of governance is its focus on governing mechanisms which do not rest on being alternative to the authority and sanctions of government” (Stoker, 1998, p. 17).

Governance in contemporary sense is understood as a concept which focuses on networks, less hierarchical and decentralized ways to govern a society (Bevir, 2011). Governance in this context is stated as “forms of steering that are less hierarchical rather decentralized, open to self-organization, and inclusive of non-state actors” (Biermann, Pattberg, Van Asselt, & Zelli, 2009, p. 4). At the same time, using the perception that sees governance as an analytical tool that tries to understand how different actors behave with each other to deal with the issues in

the society gives a profound assessment of the everyday governance. This perspective attempts to investigate how exactly societal actors navigate themselves to carry out the daily practices and how the negotiation processes among the mutually dependent actors' function. Governance is a broad concept widely used to understand the way governing takes place, here it is used to discuss solid waste management issues in an urbanizing metropolitan.

2.2 Urban governance

In the current scenario when municipalities are struggling to deliver services like transportation, water, solid waste, and housing; while on the other hand they have to deal with air and water pollution, transportation gridlock, deteriorating infrastructure, violence, crime and income polarization (Slack, 2007, p. 2).; It becomes essential to analyze governance in urban areas as urban population of the world is higher than ever putting immense pressure on the urban environment and resources and process of urban development as a whole. Urban governance in simple terms can be defined as governance in urban areas. The term governance and urban governance can be used interchangeably, but scholars are in an agreement that urban governance is more apt to describe the relationships between the complications of the modern local government, particularly in bigger cities and their equally complex local setting (Peters & Pierre, 2012). Governance is a composite of both horizontal and vertical, both non-formal and formal activities that have structural significance for public issues, especially in urban areas (Pierre, 1999; Stewart, Haus, & Heinelt, 2005; Stoker, 1998). United Nations defines urban governance as an involvement of a range of actors and institutions; the relationships among them determine what happens in the city. In managing urban transformations, government (at all levels) need to play a strategic role in forging partnerships with and among key stakeholders (UN-Habitat & Programme, 2010, pp. 211-212). The concept of urban governance refers to longstanding working provisions that shape productive and corrective capacities in dealing with vital urban issues involving multiple governmental and nongovernmental actors (Hendriks, 2014). It is a process where a range of actors come together to deal with urban issues. These actors can be governmental, non-governmental and informal. Urban governance perception entitles non-elected actors a significant role in the process of collective goals, their implementation, and service delivery process (Pierre, 1999). When talking about urban governance the city government is the most dominant and noticeable governance actor but what actually happens in the city, especially for the urban poor lies outside the control of city administration; thus, it is argued that the market, private businesses, agencies of central

government and collective action of civil society that determine the daily life experiences of urban dwellers (Avis, 2016).

This idea of including all the actors in the process of governance differs from the normative concept of governance (ibid). For instance, currently when we talk about urban services, we deal with an extensive number of actors involved in the process. Rather than in a rural setting, governance in urban areas comprises a significant and varied number of actors working together to deliver urban services (Slack, 2007).

2.3 Governance in Development Discourse

Governance is a buzzword among development practitioners. It has been defined in a number of ways, mostly influenced by the definitions given by organizations like World Bank and United Nations. They focus on the concept of governance as the process necessary to manage all the public affairs of the state. As UN defines it “a process of decision-making and the process by which decisions are implemented or not implemented” (UNESCAP, 2009, p. 1). The focus of definitions given by development agencies has been on governance as a process carried out by the state, private sector and civil society organizations. Governance normatively is translated to be good governance. Since good governance carries a positive connotation it has become an imperative to poverty reduction eventually leading to development (Grindle, 2004). UN defines good governance on the basis of eight characteristics like participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and follows the rule of law (UNESCAP, 2009). United Nations Development Program (UNDP) defines governance as “the exercise of political, economic, and administrative authority to manage a nation’s affair. It is the complex mechanisms, processes, relationships and institutions through which citizens and groups articulate their interests, exercise their rights and obligations and mediate their differences (UNDP, 1997, p. 9). It has been put forward as a concept that moves beyond government and includes non-state actors for the better running of the affairs.

The core ideas of governance like accountability, rule of law, transparency and inclusiveness are laudable goals in themselves and can contribute largely towards poverty alleviation, but the reality is more complex than that, where perfect situations to employ these don’t exist (Grindle, 2004). Good governance was put forward as a condition necessary for the recipient countries to utilize the development assistance effectively. Since, accomplishing good governance stresses on changes in political organization, illustration of varied interests, and procedures for

public debate and decision-making with regard to policymaking (Grindle, 2007). However, advocating good governance raises a host of questions for recipient countries about what needs to be done, when it needs to be done, and how it needs to be done (Grindle, 2004, p. 514). As this kind of imposition has failed to grasp the idea that governance operates in a complex way depending on the local contexts. International donor organizations promote good governance as a pathway to development, leading to many governments adopting it in its policies. Though in reality there seems to be a huge gap between the aims of the government and what is actually practiced on the ground. Writers have argued that adoption of good governance policies cannot be untouched by the political process, power relationships and institutional pluralism at play (Hufty, 2011b). Grindle, in her paper *Good Enough Governance: Poverty Reduction and Reform in Developing Countries* ‘points to the need for more empirical research in the field of governance so that more can be explored beyond normative and technical approach to governance’ (Grindle, 2007, 2011). Such that governance is used not just as a rhetoric but also materialized on the ground to produce results.

In Nepal, the state government and local government has pledged for good governance agenda in its policies and programs since the revolution of 1951. In the period of 1951-1990 good governance started to evolve in Nepal. Public service commission, administrative reform, civil service act and Supreme Court was established (Dahal, 2017). The need for good governance became more pronounced with the mass movement of 2006 which transformed it to a democratic republic. In 2007, the country got a separate act called Good Governance Operation and Administration Act 2008 *Sushasan Ain 2064*, which puts sole emphasis on the need of good governance in public administration and in delivery of public services. This has been emphasized in Solid Waste Management Act 2011 and Solid Waste Management Rule 2013, underlining the need for a broad range of actors’ collaboration and co-operation to tackle waste management issues of the city.

2.4 Governance in Scientific Field

Governance has become a catchword in social sciences as well in the field of political science. The scientific concept of governance is not clearly defined, in simple terms it is governing through networks (Benz, Kuhlmann, & Sadowski, 2007). Governance in analytical terms is defined as a process of interaction between actors or the way societies are governed by a combination of governing efforts (Kooiman, 2003). Governance, the concept has dual existence, one as a project being promoted by the political actors and another as a set of ideas

facilitated by academia (Daly, 2003). Governance over the years has become a concept that can be utilized to analyze relationships among the actors, state level, local level and regional. Similarly, the relationship between the state, civil society, and other interest groups. Since its arrival in the field of social science, governance has played a major part in displacement of the concept of government, with a clear focus on networked form of governing and power inherent in those networks. Governance assists to analyze the relationships that exists among actors that affect everyday life experiences of the public (ibid). It is associated with changing nature of power and the state followed by public sector reform into a less hierarchical bureaucracy towards a greater focus on markets, quasi-markets and networks (Rhodes, 1997).

Governance refers to “a category of social facts, namely the processes of interaction and decision-making among the actors involved in a collective problem that lead to the creation, reinforcement, or reproduction of social norms and institutions” (Hufty, 2011a, p. 405). The analytical dimension of governance sees it not as a prescriptive or normative concept; or something good or bad but as a social fact which has characteristics that can be analyzed and interpreted (ibid).

While authors like Jessop point that “governance has been taken as a new social scientific paradigm, a new approach to problem-solving that helps to deal with the limitations of anarchic market exchange and top-down planning approach and also works as a solution to the perennial ethical, political, and civic problems of securing institutional integration and peaceful social co-existence” (Jessop, 2003, p. 1). For Jessop the concept of governance denotes a sense of reflexive self-organization where it has acquired positive connotations such as middle way, consultation, negotiation, and subsidiarity and dialogue in contrast to the anarchy of the market or iron fist of the state (ibid).

While critics of governance complain that state still remains an important and powerful actor in the policy process and governance literature tries to reassert an old state-centric approach (Bevir, 2011). Some strand of definitions on governance understand governance as a complex layered interaction process, where mutually dependent actors co-ordinate their modes of action to achieve a common goal (Kooiman, 2003). Governance as an arrangement where governing happens beyond the state where a network of private, state and civil society actors are involved. As Swyngedouw puts, “new actors, new organizational structures, and new modes of communication have appeared” (Swyngedouw, 2005, pp. 1991-1992). These understandings of governance focus more on governing practices which are shelved by the traditional understanding of governance. This leads us to understand the plurality that exists within the governance process and dispersed form of power. In line with this thinking some authors assert

that governance is steering, the state steering the society, but power vested on the state is less now as it has moved upwards to transnational institutions, downwards to regions and local authorities and outwards to autonomous agencies (Pierre, 2000). Governance in this context refers to “forms of steering that are less hierarchical rather decentralized, open to self-organization, and inclusive of non-state actors” (Biermann et al., 2009, p. 4). When used as an analytical concept, governance is a way to examine how interdependent state and non-state actors negotiate objectives, ways to reach them, and attempts to steer society (Cornea, 2016). These forms of apparently horizontally organized and polycentric assemblages in which power is dispersed are increasingly dominant in rule-making, rule-setting and rule implementation at a variety of geographical scales (Hajer, 2003b, p. 175 as cited in Swyngedouw, 2005). In this relation power should be considered more dialectically where the capacity to deploy power is not held by the agents and political territories but rather given by structures operating beneath and interacting within the governance arrangement (Griffin, 2012, p. 212).

In the context of solid waste management of Kathmandu Metropolitan City, this can be linked to the presence of a number of private waste management companies, NGOs and informal groups. Where there has been a shift from hierarchical and rigid practices by the municipality to manage waste in the 1980s to more flexible approach of governance since 1990s where a number of private actors have become involved in the process of waste management. This can explain by reasons like proliferation of neoliberalism into state policies exerted by international donor organizations. Another reason that can be indicated is the state failure to deal with the increasing population and demand with the limited state resources which in turn was also a result of neoliberal policies. Leading to the application of good governance policies as absence of good governance automatically implied bad governance and lack of development. Globalization and the appeal for democratization, helped to create conditions where the search for new methods of governing became a strong and near universal trend in advanced industrial societies and beyond that (Chhotray & Stoker, 2008, p. 17).

Chotray and Stoker analyze the lower tier of governance failure, as a lack of engagement resulting from weakly defined opportunities for dialogue and negotiation between partners leading to failure in achieving a common social purpose. At the same time a higher tier of governance failure is denoted as an inability to produce ‘more effective long-term outcomes that otherwise could have been achieved using markets or authoritative hand of state authority Attention towards governance failure is essential since it draws attention not only to the process of governance but also its impacts and how those impacts are dealt with (Chhotray & Stoker, 2008). This dissertation dives into what is perceived as governance in Kathmandu and reasons

for its failure to live up to its expectations when it comes to solid waste management. When examining the governance of a public service such as solid waste, here necessary attention is given to the practices of actors and informality that occurs even when official regulations and guidelines exist.

2.5 Governance in Waste Management

Waste has traditionally been something that needs to be disposed so that the city looks clean and habitable. Local authorities, private sector, civil society, national and international entities now are concerned with production, transport, and treatment of waste along with the social, political, economic, and environmental impacts of it.

Governance is a broad topic, multi-faceted, and of great complexity (Andrews, 2008). Much of recent work has given special focus on environmental governance primarily on issues of climate change, biodiversity or ozone depletion. As compared to these topics waste governance and particularly the governance of household waste has received limited attention (Davies, 2008). Waste governance is essentially understood as the manner in which issues (in this case waste) are governed and the respective roles and responsibilities of actors and institutions in practices related to that governing (Davies, 2008, p. 16). Davies in her book, "*The Geographies of Garbage Governance*" have pointed out that various authors have developed governance frameworks for the specific analysis of waste. Fagan has emphasized the role of networks in operation of waste practices (Fagan, 2004), while others have emphasized institutions as driving force in waste management systems (Parto, 2005) as cited in (Davies, 2008).

In relation to waste systems in the United Kingdom, Bulkeley has gone beyond expanding on conventional network and institutions analysis and engaged with the Foucauldian concept of governmentality (Bulkeley, Watson, Hudson, & Weaver, 2005). Myers on the other hand has tried to use political ecology to understand how waste is governed in states of Sub Saharan Africa (Myers, 2017). One of the most accepted frameworks for analysing physical and governance aspect of solid waste management system is integrated sustainable waste management framework (ISWM). This framework was first developed by WASTE, a Dutch NGO during the 1990s. It was developed as an analytical tool and a development framework (Van de Klundert et al., 2001). It was further elaborated by a collaborative working group which adapted the ISWM framework consisting of two overlapping triangles *as shown in figure 7 below* (Wilson et al., 2013). Since, then it has been regarded as a popular approach to attain integrated solid waste management in developing countries. The framework focuses on all

elements of waste hierarchy including social, environmental, institutional, political, technical, and financial aspects while emphasizing the role played by stakeholders in order to achieve a sustainable integrated waste management system. Now it has become a norm in the discussion of solid waste management in developing countries. The focus of ISWM framework has been on both dimensions, the physical dimension and governance dimension. The physical dimension considers three key drivers for solid waste management 3R reduce, reuse, and recycle, collection-public health and environment treatment disposal which propels each component of waste management. Meanwhile, governance dimension focuses on the softer aspects required for integrated solid waste management. These are concerned about inclusivity of stakeholders, financial sustainability and sound institutions and policies (ibid).

The framework has been a buzzword in developing countries trying to adapt an integrated sustainable solid waste management system. Though in reality integrated sustainable waste management is a theoretical basis, an optimal outcome framework designed to reduce the negative implications on environment (McDougall et al., 2001), as there are variations in the local context geographically, politically, socially and financially.

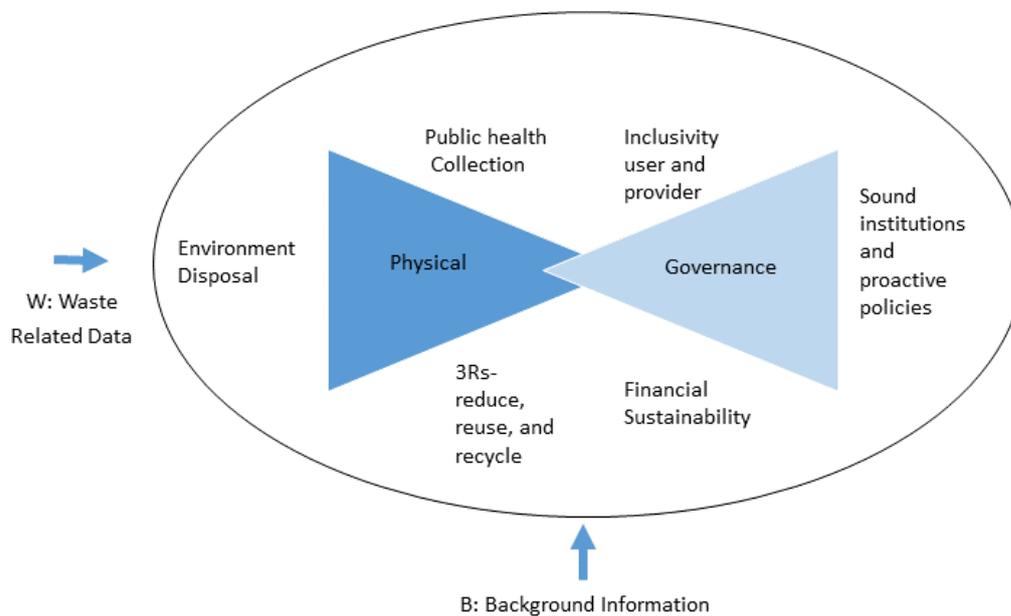


Figure 7: Two triangles representation of integrated solid waste management framework (Wilson et al., 2013) concept adapted from (Scheinberg, et al., 2010c).

2.6 Integrated Solid Waste Management in Developing Countries

Integrated sustainable waste management framework demands for the steps and aspects that are needed to solve waste management problem in low- and middle-income countries.

In the framework shown above in *fig:7* the first triangle focuses on three key physical components, protection of public health through good waste collection services, environment protection when waste disposal and treatment and focusing on 3R principles of reduce, reuse, and recycle. The second triangle focuses on the governance strategies such as inclusivity of user and provider, sound institutions and proactive policies and financial sustainability for achieving a well-functioning solid waste system (Wilson et al., 2013). Governance and physical aspects of integrated sustainable waste management system are discussed below.

2.6.1 Public health (collection)

Public health is one of the key drivers of solid waste management. Uncollected waste is a nuisance to public health. It is based on the view that waste collection needs to be provided to the whole society for its own good irrespective of the willingness to pay for the services. At the same time there are visible difference in collection services between upper-middle, lower-middle income to lower income countries (Wilson et al., 2013). Whereas, within countries waste services vary between business industrial areas, high-income neighbourhoods to low-income and informal settlements (*ibid*). Some reasons for no waste collection in unplanned settlements is due to lack of space for refuse containers, narrow roadways, steep slopes and unsurfaced roads (Coffey & Coad, 2010). Due to these difficulties waste end up in open space and water bodies creating a breeding ground for water-borne and airborne diseases. Also, waste composition in developing countries have more organic content than in developed countries creating difficulties for waste collection and transfer (Wilson et al., 2012).

2.6.2 Environmental protection (waste treatment and disposal)

Since 1970s onwards the major driver behind the current modern waste management system has been environmental protection (Wilson, 2007). It calls for a treatment facility rather than to open or uncontrolled dumping or open burning. Dumping of waste in unsanitary sites without leachate treatment, geomembrane and clay lines and lack of treatment of gases were common features of waste disposal in developing countries (Guerrero et al., 2013). In a number of developing countries, there have been major accidents caused by unstable waste slopes killing hundreds of people, there are examples from countries like Turkey, Indonesia and Philippines

(Wilson et al., 2013). Improving waste disposal practices in developing countries are often faced by governance issues, also the issue of high infrastructure cost and operating costs come into play when modern infrastructure are thought of for waste management (ibid).

Environmentally sound waste treatment and disposal practices are a major indicator of physical aspect of an integrated waste system.

2.6.3 3R reduce, recycle and reuse

This indicator is focused on hierarchical handling of waste, starting from prevention to re-use, reduction, recycling, energy recovery, treatment and finally landfill disposal (Wilson, 2007). But with the increasing unavailability of land has sparked a transition from end of pipe solutions to preventive measures and composting activities. In developing countries informal sector is responsible for reuse, recycle and repair to generate income. Whereas many industrialized countries can establish a formal recycling system through the proper involvement of government, legislation, and production activities.

These physical indicators of solid waste management have potential to be measured in quantitative terms and represent the technical aspect of solid waste management. Waste collection efficiency of the city, amount of waste that is treated using various methods, percentage that ends up in landfill. Also, reduced, recycled, and reused amount of waste from the total waste can be measured quantitatively.

2.6.4 Inclusivity

Local government is regarded as legally responsible body for solid waste management in a city. At the same time, they are unable to deliver these services isolated without partnership with other active stakeholders (Wilson, 2007; Wilson et al., 2013). Different authors have pointed out group of stakeholders that are involved in the waste management of a city namely, local authorities, NGOs/CBOs, service users, private informal sector, private formal sector, donor agencies (Henry et al., 2006; Scheinberg et al., 2010c). Each actor has a distinct role and responsibility within the system. It has been pointed out that inclusive plans prepared in a participatory manner are necessary for the inclusivity of all stakeholders from private formal and informal sector (Memon, 2010). Meanwhile, waste management systems that have ignored components such as public involvement and focused on traditional technical consultative methods are destined to failure (Henry et al., 2006).

Inclusivity becomes important, especially in case of countries where municipalities lack capacity to provide services to everyone. There are examples from India, Tanzania and Brazil

where micro small community-based enterprises, informal sector workers with NGOs and waste picker co-operatives have succeeded in service provision to the public (Dias, 2016; Scheinberg et al., 2010b). Also, these practices are promoted such that informal sector can have better participation and access to recycling materials (Aparcana, Linzner, & Salhofer, 2013).

2.6.5 Financial sustainability

Financial sustainability plays a decisive role in functioning of countries' waste systems, especially in case of developing countries where local government's during the 1990s have had series of unsuccessful SWM projects due to lack of financial capacity (Wilson, 2007) (Wilson, 2007). Solid waste management services are essential to the physical and economic health of society and are often a priority budget item for cities (Kaza et al., 2018). Modern waste management in developing countries is regarded expensive, often costing USD 75 or more per capita per year (Brunner & Fellner, 2007). In a recent report published by the World Bank it was reported that cities in low-income countries on average spend 19 percent of municipal budgets on solid waste management (Kaza et al., 2018).

2.6.6 Sound institutions and proactive policies

To improve solid waste management, a city needs to address underlying issues relating to management structures, contracting procedures, labor practices, accounting, cost recovery and corruption (Wilson et al., 2013). In a study done by World Bank vis-à-vis waste situation in 218 countries across five continents, it was reported that in most countries, solid waste management operations were typically a local responsibility, and nearly 70 percent of countries have established institutions with responsibility for policy development and regulatory oversight in the waste sector (Kaza et al., 2018).

Cleanliness of a city along with effectiveness and efficiency of its solid waste management system is regarded as proxy indicator of good governance (Bhuiyan, 2010; Whiteman et al., 2001). Similarly, the need for clear definition of roles and responsibilities in institutions to make solid waste systems politically stable and avert controversies and inaction has been pointed as a crucial issue (Schübeler et al., 1996). Governments with weak institutional structures are easily overwhelmed by the growing population's increasing demand for solid waste management services (Hardoy, Mitlin, & Satterthwaite, 2001).

Governments try to deal with this through private sector involvement in solid waste management. However, private sector involvement itself does not guarantee success in service provision. Municipal authorities are responsible for ensuring transparency, fair competition,

free from corruption and accountability (Coad, 2005). In addition, developing countries deal with poor enforcement policies and laws related to solid waste and project implementation is often poor which results in inadequately functioning solid waste management systems (Henry et al., 2006). Nevertheless, waste quantities in developing context are increasing rapidly in most cities at a greater rate than in high-income countries *see fig 8* largely due to increase in wealth with an increase quantity of waste produced per person conjoined with the number of people living and working in the city and rising quantities of waste produced by businesses (UN-Habitat & Programme, 2010).

In the *fig 8* below global waste generation is projected based on the population growth, gross domestic product growth based on the trend reported by World Bank on 2018 (Kaza et al., 2018). Another *fig 9* below shows the projected waste generation by region. In particular the sub-Saharan Africa and South Asia regions are expected to see waste generation to be doubled and tripled in the next three decades due to economic growth and urbanization. While regions like North America, Europe and Central Asia are expected to have a gradual rise in waste level.

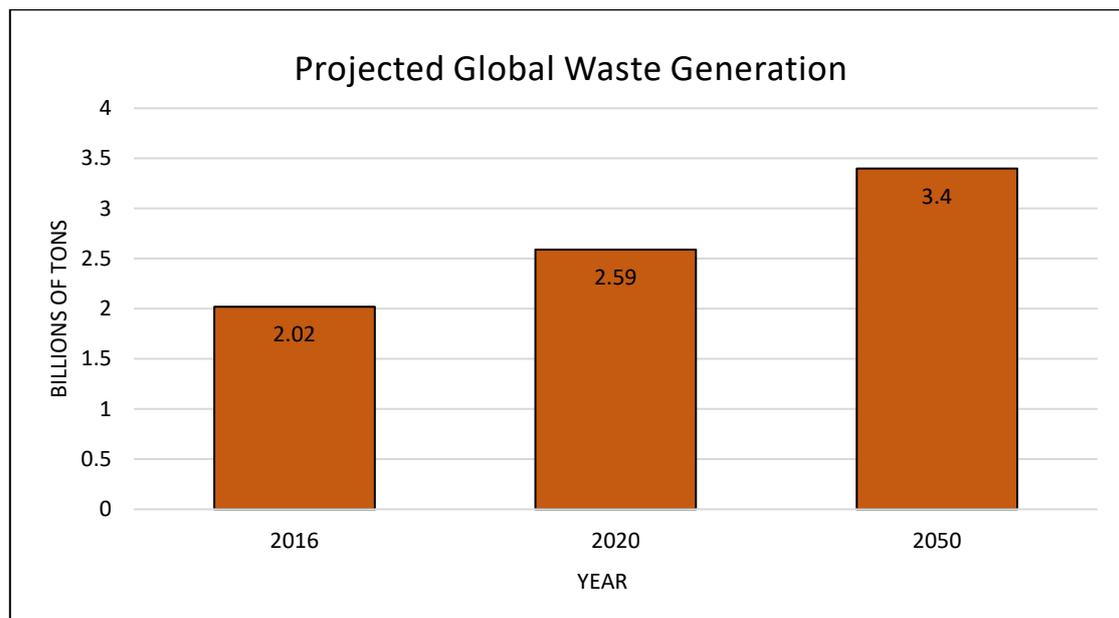


Figure 8: Global waste generation projection Own compilation based on (Kaza et al., 2018).

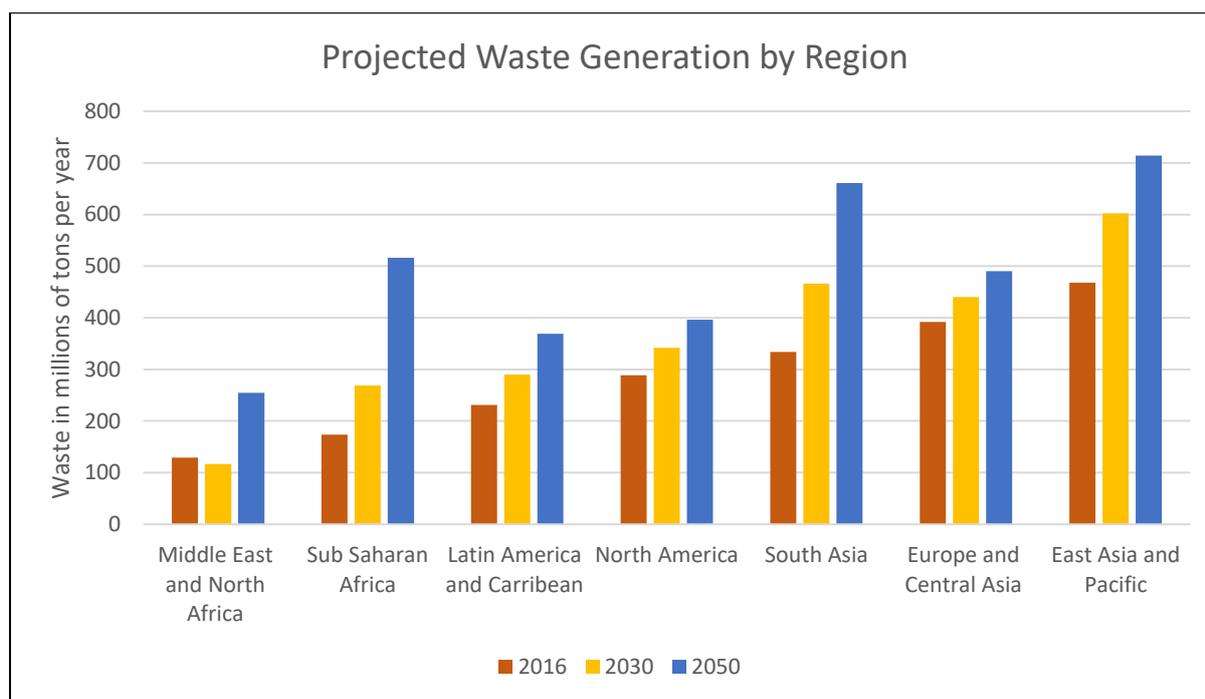


Figure 9: Waste projection by region Own compilation based on (Kaza et al., 2018).

However, in the context of low- and middle-income countries preconditions required for its application may be limited or severely lacking (Coffey & Coad, 2010; Henry et al., 2006; Zurbrugg, 2003). Aspects related to both physical and governance aspect representing the hardware and software of the system respectively can be deficit in countries of global south. In a study carried out in more than thirty urban areas in 22 low- and middle-income countries across 4 continents pointed out that there exists a range of factors that influence the performance of waste management system in these cities (Guerrero et al., 2013). Similarly, a study carried out in 20 reference cities from six continents showed that integrated waste management system in high-income countries is technical. At the same time in developing countries' context, attention needs to be paid to all aspects including complex local realities (Wilson et al., 2013) and informality which is as an imperative vector in waste management of these countries (Millington & Lawhon, 2019).

The thesis focuses on the solid waste governance, considers the governance aspect of ISWM framework. However, in developing economies governance aspect of the framework alone is inadequate of capturing the realities of solid waste management. Thus, applying this aspect needs to take into consideration the ground realities, which this study aims to do through acknowledging the complex process of waste management, role of actors and their partnerships.

2.7 Informal Sector

Keith Hart (Hart, 1973, 2006) was the first person to introduce the term informal sector into the academic literature. The focus of his work was on self-employed people living outside the formal wage economy in Accra, Ghana (Chen, 2012; Gerxhani, 2004). But the concept of informal sector became analyzed only in 1972 by an international labor organization on employment in Kenya, where the sector was characterized by avoidance of government regulations and taxes (Chen, 2012). Later, criteria to define the informal sector evolved, as the focus shifted more towards regulatory framework. As given by Hernando De Soto, legal status is the main element distinguishing informal from formal activities (La Porta & Shleifer, 2014). Meanwhile, the informal sector grabbed more attention during the economic crisis in Latin America in the 1980s when employment in the informal sector was more popular than unemployment in formal sector (Chen, 2012). At the same time during the economic crisis of the 1990s in Asia, millions of people resorted to informal economy to find jobs. Similarly, structural adjustment programs (SAP) are linked to expansion of employment in the informal sector in former Soviet Union states, Central and Eastern Europe, and Africa (ibid).

With this informal economy garnered renewed interest among international community. In a study done to assess the statistics of informal economy it was revealed that current informal employment is more than half of non-agricultural employment in most developed regions and as high as 82 percent of non-agricultural employment in South Asia (Chen & Vanek, 2013).

The debate between formal and informal is an ongoing process there has been a persistent discussion on the best way to conceptualize informal sector and the way it is perceived by the formal sector. Informal economy means various activities ranging from unlicensed street trading to waste picking/segregating from landfill sites. At the same time the concept of urban informality incorporates multiple uses of urban space, such as development of residential space altering the designated land-use violating formal regulations (Roy, 2009). Nevertheless, the focus of this dissertation is not on these aspects of informality but rather on informality in the waste sector.

Relationship with the state and its regulatory system has been the basis for defining and analyzing informality (Coletto & Bisschop, 2017). Informality being regarded as something out of place that needs to be controlled. They are viewed as something that is unregulated and seen by the state or local government as a phenomenon that needs to be fought (Centeno & Portes, 2006). Attitude and perception of public and authorities towards informal sector has been largely negative. This is derived from cultural values, belief systems, caste and class

division and ethnicity. Though the informal actors are not the poorest of the poor, their work is ascribed the lowest status in society. In general, people associated with waste collection, transportation and segregation suffer a stigma as they are associated with waste (Chen, 2012). In addition, they face harassment from officials, middlemen, police personnel and exclusion from society as they cannot keep up with the appearance that is expected as normal which is due to their hazardous working environment. These workers barely find citizens who esteem and appreciate their work, or partners at the political and legal levels who defend their interests (ibid). Though there are movements around the world at grass root level to help the informal workers and have produced positive outcome. It is still a long way ahead to establish a coherent process where informal actors are assimilated into the system to create an inclusive city. For the most part informal sector is ignored as a part of the urban system. However, it cannot be denied that in many countries around the world attempts of modernity have further pushed the informal sector into marginalization through loss of livelihood and housing. In Indian cities, projects targeted for urban renewal, 'revitalization', and 'beautification' are promised with imaginaries and ideals of modernity, invoking practices of 'informality' in the pursuit of a form of urban development (Roy, 2009). In waste sector there have been instances from Delhi where the scrap dealers and recycling market has been forcefully relocated to peripheral areas through land seizure as a part of municipal urban renewal project (Gill, 2009).

While in the other hand there have been attempts to make cities more inclusive and deal with urban segregation in its all three scopes such as economic exclusion, social exclusion and unfair access to urban and environmental benefits and resources (Wende, Nijhuis, Jong, & Humann, 2020). One such attempt is done in planning through applying the term spontaneous settlements that carries a positive connotation for the informal urban areas and structures (Noev, 2020).

This thesis poses the line of thought that it is necessary to acknowledge and document the contribution informal sector to urban waste management and consider them as actors of urban waste governance.

This thesis also raises concerns about the inclusion and participation of informal waste sector in modernization oriented integrated waste management under public-private partnership scheme envisioned for the city. Projects inspired by the idea of clean and modern city in the past have overlooked the urban poor or even when acknowledged them, have left them behind. Urban revitalization and large scale privatization of urban services project in India are examples of so-called inclusive waste governance and planning (Desai, 2018; Roy, 2005).

In this thesis, I ground my theoretical analysis of the role of informal sector in waste management considering the current scenario of urbanization of the city on five dominant

schools of thought on informal economy. This classification supports the understanding of informal waste sector debate and its policy implications for the sector. Along with-it sub-concept of government perception and attitude towards informal waste workers based on Martin Medina's classification is drawn to ground and support the analysis. This approach aims to bring forward the critical understanding of the role of the informal actors and their interactions with the authority and other waste actors.

2.7.1 Competing approaches towards informal economy/sector

Informal sector⁴ persists to remain an integral part of the current era of globalization. It continues to be the same in waste sector. A study estimated that in developing countries informal economy accounted for 41 percent of official GDP, 35 percent in transition countries and 18 percent in OECD countries (Schneider, 2002). This shows that informal sector is not just a phenomenon in developing countries but also in developed ones.

In case of developed countries, the dominant approach towards informal economy has been to control, deter and eradicate it (Sepulveda & Syrett, 2007). This is mostly guided by issues like loss of revenue, loss of regulatory control, unfair competition, health and safety issues, loss of labor rights and lower productivity (ibid).

However, in developing countries where informal economy accounts for a larger proportion in terms of economic contribution, the state has adopted a laissez-faire attitude. At the same time even in advanced economic nations the attitude towards informal sector is diverging from deterrence to transition into formal economy (Williams, 2004).

But it has been estimated that informal economy in developing countries can easily make up to 50 percent of economic activity (Schneider, 2002). This can be the reason behind authorities in developing countries not pressing on the issue of formalization. When it comes to debates about informal economy it concentrates to four dominant schools of thought based on causes, structure, nature and how they should be dealt with it (Chen, 2005). These approaches are namely dualists, structuralists, legalists and voluntarists and in addition, co-production approach which is relatively new is discussed subsequently.

⁴ Informal sector and informal economy can be used interchangeably. Though in the second half of 1990s many scholars started to use the term "informal economy instead of "informal sector" to make it broader concept that includes enterprises, as well as employment in developing, transition and advanced economies (GIZ, 2011).

2.7.1.1 Dualist

Dualist's school of thought was introduced by International Labor Organization during its Kenya mission in 1972. It pledges to the notion that informal sector is comprised of marginal traditional activities, carried out as survival mechanism. In this perspective informal sector has few links to the formal economy, provides income for the poor and a safety net in the times of crisis (Chen, 2005). From the perspective of this school of thought, slow economic growth has not been able to produce more jobs where the surplus labor from faster rate of population growth could be absorbed. In addition, the skill set that informal work force doesn't match the requirement of formal sector. Basic characteristics of informal economy as per this school is ease of entry, reliance on native resources, family ownership and labor intensive, small scale, unregulated and competitive (Chen, 2012). The way to go forward with this situation is governments should create more formal jobs and provide financial services to informal sector (Chen, 2012).

2.7.1.2 Structuralist

This school of thought was introduced by Manuel Castells, Alejandro Portes and Caroline Moser in the late 1970s and 1980s. According to this view, informal sector should be seen as subordinated economic units that serve large capitalistic firms by providing low-cost inputs and labor. In the structuralist model, different modes and forms of production are not only co-existing but also intricately connected and interdependent (Castells & Portes, 1989). In this perspective informality is due to the nature of capitalism and capitalistic growth (Chen, 2012). Here informal sector is regarded as a provider of cheap labor which is needed for the capitalist market. While government's way to deal with them should be to address the unequal relations between the big capitalist businesses and subordinate providers of input and labors (ibid).

2.7.1.3 Legalists

The legalist school was popularized by Hernando De Soto late 1980s. This subscribes to the idea that the informal sector is composed of micro entrepreneurs. These are entrepreneurs who choose to avoid the hustle to get registered, go through the burdensome costs and time loss. The way to deal with them from this perspective is to simplify the bureaucratic procedures, extend legal property rights and encourage informal enterprises so that their real potential can be unleashed (Chen, 2005, 2012).

2.7.1.4 Voluntarists

In this view, informal sector is composed of self-employed entrepreneurs, especially male entrepreneurs. Mostly, the informal sector is made up of entrepreneurs who choose to avoid taxation, all day-to-day costs involved in operating the businesses formally. Sometimes they can choose to operate criminally as they figure out the benefits of informality as compared to formality. In this view formality is by choice not because of the hefty regulations (Chen, 2005).

2.7.1.5 Co-production

Though this approach has been present for decades, little empirical work has been done to evaluate their impact on the ground. From this perspective informal sector is seen as micro-enterprise in a need of governmental support so that they can flourish. Focuses on the mutual provision of services using the common resources where state supports the informal sector. At the same time, co-production arrangements can be a strategy for the informal sector to work along with the powerful state and avoid opposition (Mitlin, 2008).

Ostrom defined co-production as “the process through which inputs used to provide a good or service are contributions by individuals who are not in the same organization” (Ostrom, 1996, p. 1073). Pioneer of the theory of co-production Elinor Ostrom analyzes the contribution of the concept to condominium sewerage systems to address the sanitation needs in northeast of Brazil. She describes a system through which low-income settlements are connected to the city sewerage system. This is achieved by keeping the conventional engineering standards to minimum and involving local residents in local planning decisions, financing to some extent including voluntary labor (Ostrom, 1996). It has been noted that these systems have been successful in providing low-cost essential services to the poorest of the urban population in Brazil (Mitlin, 2008).

Joshi and Moore define it as “institutionalized co-production is the provision of public services (broadly defined to include regulation) through regular, long-term relations between state agencies and organized groups of citizens, who both make substantial resource contributions” (Joshi & Moore, 2004, p. 40). There has been extensive use of co-production approach to study solid waste management while lately the focus has shifted towards water/sanitation, housing and power (Meagher, 2013). There has been criticism that Ostrom’s definition of co-production is too wide as it talks about multiple partnership arrangements for service provision but Joshi and Moore’s definition is considered too narrow as it focuses only on state agencies and

excludes professional service providers (Bovaird, 2007). All these dominant approaches mentioned above have a different policy orientation towards informal sector, and sometimes they are overlapping as there is no explicit differentiation between two (ibid) Nevertheless, the usefulness of co-production approach becomes more relevant in developing countries' context, as countries have to deal with the issue of government incapacity to provide services. In addition, the problem of logistic restrictions to deliver services are also more prevalent in developing countries. To deal with this dual problem of governance incapacity and logistic failure, co-production can be a useful strategy. The concept has been widely used as a route to improve public service delivery but rarely as a way through which the urban poor, in this case informal waste workers⁵ can strengthen themselves as a group, extending their capacities to better negotiate with the state. There are some successful examples from Namibia and Pakistan where grassroots organizations used co-production as a means to achieve access to services (Mitlin, 2008). Thus, co-production in waste management recommends for the organization of waste pickers and support by the state so that the real potential can be unleashed, maximize their productivity, achieve economic gains, and promote environmental gains of their activity (Fergutz, Dias, & Mitlin, 2011).

2.8 Informal Sector in Waste Management

The term informal sector has been a highly debated socio-economic concept for more than four decades since its first use by British anthropologist, Keith Hart in 1971 (Chen, 2012). In simple terms informal sector can be understood as all income-generating economic activities not authorized or regulated by the state whereas other similar activities are monitored and authorized as formal in the same social context (ibid). Beginning as a way of conceptualizing the unregulated activities of the marginal poor in Third World cities, 'the informal sector' has become recognized as a universal feature of the modern economy (Hart, 2006, p. 3). With time the concept of informal sector has become broadened to be called informal economy encompassing a wide range of activities running parallel to the formal regulations. Current scenario, there is an increased interest in the informal economy worldwide. Today, informal employment is more than half of non-agricultural employment in most developed regions and as high as eighty-two percent of non-agricultural employment in South Asian countries (Chen, 2012).

⁵ Informal waste workers in this thesis denotes, waste pickers/workers at landfill site, transfer stations and scrap centres.

Within solid waste management formal and informal sector can be identified. The formal system consists of public service providers and private waste management companies, informal sector consists of individuals or firms that are working as waste pickers, waste collectors, itinerant buyers, and recyclers (Katusiimeh, Burger, & Mol, 2013; Wilson, 2007). Informal solid waste sector refers to individual and enterprises who are involved in private sector recycling and waste management activities which are not financed, recognized, sponsored, organized, supported and acknowledged by formal solid waste authorities or which operate in competition with or violation of formal authorities (Scheinberg & Mol, 2010a).

Similarly, as mentioned in *section 2.7.1* approaches to informal sector have implications on a range of sectors like land use, sanitation, and solid waste where informal actors are largely present. Informal waste sector is responsible for providing employment to millions of poor people around the world. In most parts it has helped in solving the issue of inadequate waste services in addition to addressing the unemployment problem. There is evidence from different parts of the world that informal actors are making significant contributions to the solid waste management of the cities. This has benefits on the urban areas, environment, and economy of informal actors themselves. Informal waste sector provides employment to the marginalized and urban poor (Katusiimeh et al., 2013), collects recyclables from the waste stream increasing the recycling rate and preventing the otherwise burning of waste. At the same time, informal sector in some cities reduce considerable amount of waste that is to be collected by formal sector (Aparcana, 2017). Authors have provided enough evidence from countries about the contributions made by informal sector in increasing the life span of landfills, providing valuable materials for recycling and also better their quality of life. For instance, in Nuevo Laredo (México), where population due to migration has increased to over two hundred fifty thousand inhabitants, led to informal recyclers recovering 20 kg of aluminium cans and cardboard per day, making their one-day minimum wage equals to one week of a factory worker (Medina, 2005). In Tunisia, 8,000 waste pickers (*Barbechas*) managed to recycle 5,000 out of 8,400 tonnes of PET plastic annually. At the same time in Brazil, informal recycling is recycling high rates of cardboard and aluminium 80 percent and 92 percent respectively (Dias, 2016). Similarly, this study investigates the role played by informal sector in solid waste management of Kathmandu, at the same time it explores the government's approach towards the sector.

2.9 Informality in Waste Sector and Approaches to address it

As mentioned by (Navarrete-Hernández & Navarrete-Hernández, 2018), in their extensive research on informal waste sector in Chile, dualists and voluntarists school of thought propose for an oppressive policy against informal waste sector. As informal waste sector is believed to counter cyclical to economic growth, where it arises during the times of crisis as the need for survival activities increases. They promote the establishment of formal waste management systems so that informal systems can be displaced. Private formal sector involvement has been widely promoted in municipal solid waste management, especially in cities of global south as market-oriented prescriptions (Gandy, 1994). There have been instances where informal waste pickers were displaced and excluded from the formal municipal solid waste management due to privatization, one such example is from Egypt (Fahmi, 2005). Dualist policy approach towards informal waste pickers are based on repression that focuses on creation of more formal jobs in waste management to reduce the number of informal waste pickers (Fahmi, 2005; Furedy, 1984).

Though the voluntarist school of thought regard informal waste workers as entrepreneurs, popularity of informality is regarded as a symptom of underdevelopment (Maloney, 2004). Both voluntarists and dualists recommend for government interventions that are utilitarian (ibid). Thus, the formal sector is more attractive for employment than the informal sector.

Whereas structuralist approach targets towards weak policies that helps a little in strengthening informal waste sector⁶. It perceives that the relationship between formal sector and informal is exploitative and the role of informal waste sector is to provide cheap raw materials (Birkbeck, 1979). Structuralist policies endorse waste-picker associations and unions, to emphasize waste-pickers' power to negotiate for better prices for the materials and working conditions (ibid).

Legalists identify informal waste pickers as micro entrepreneurs (Medina, 2007). They promote competition between all types of recycling activities including informal waste sector. This view also supports no government intervention in recycling activities. Legalist policies towards waste pickers were strongly promoted in the early 2000s in Latin America. For example, in Peru, where waste-picking was legalized and government intervention in informal waste picking was drawn back (Aparcana, 2017). At the same time, decreased government

⁶ Informal waste sector in this thesis is designated for people making their living through waste but are not officially assigned to provide the waste services by authorities. Here itinerant waste buyers, waste pickers/waste segregators at transfer stations, landfill site and scrap dealers are put under the term "informal waste sector".

involvement is a common policy feature for developing countries, which manifests largely as an attitude of neglect towards their activity (Medina, 1997, 2000).

Lastly, a view that promotes the informal sector for playing a supplementing role to the gap left by formal sector when it comes to public goods and services is co-production (Joshi & Moore, 2004; Meagher, 2013). Co-production supports informal waste workers with policies that enhance their productivity. Also, it endorses collaboration between informal sector and state for better waste services for the public. Authors have tried to analyse reasons behind the need for co-production in the South. Most prominent one being given as variants of the imperfections or incompleteness of states (Joshi & Moore, 2004, p. 41). These imperfections can be categorized as governance drivers and logistical drivers. Governance drivers largely being failure of the state to provide mandated services to the public and the other one being inability to provide services due to administrative and logistical reasons (Mitlin, 2008). At the same time, there have also been debates that co-production can be a secondary strategy for service delivery before the state gathers the political will and bureaucratic capacity (Leftwich, 2005). As it can be driven by the motivation to have different kind of authority, which is not derived from upper level and imposed to the lower level but something that is agreed upon and maintained through social relation and support for each other.

Similarly, studies have been carried out to show how co-production can be used as strategy to provide services to the public as well as to make them actively involved in the policymaking process, examples can be taken from Pakistan, Brazil, and Namibia. In these states co-production was introduced as a strategy so that sanitation and shelter could be provided to low-income communities of the cities (Mitlin, 2008; Mitlin & Muller, 2004). Also, in the context of global north, co-production is a widely promoted concept when it comes to urban development and planning. *Holzmarkt* (Timber Market) of Berlin is a good example of application of the concept of co-production, where informal actors successfully contributed to build a co-operative building project addressing the community needs (Humann, 2020).

At the same time there have been critics of co-production specifically while talking about informal waste pickers who argue that unequal economic and power relations between formal and informal actors might lead waste-pickers to more destitute situations and help less in transforming the condition. The processes of co-production and political inclusion, when introduced to enhance informal political voice, can also turn formal-informal ties into techniques of governance and subordination (Meagher, 2013).

Furthermore, researchers have pointed out that local level organizations/ NGOs as intermediaries, can always not balance the unequal powers between the actors and can be used

by the powerful actor, i.e., the state to advance their ends (Zérah, 2009), it is rather important to separate co-production from legalist school of thought. Since the legalist policy approach focuses mainly on legalization of informal activity. In this approach, little attention is given towards participation of waste workers and the tendency of tolerance or neglect is still prevalent (Navarrete-Hernández & Navarrete-Hernández, 2018). There exists a vast range of analyses that talk about how informal sector can be dealt with, but there is no one size fits all approach towards informal sector. It has been apparent over the years that governments have varied responses to informal sector and how to deal with them, but all these have happened with a fair share of difficulties.

2.10 Government's Perception and Relationship towards Informal Sector

Another aspect that the dissertation looks into is the relationship between the informal sector and authorities. Government's perception and relationship towards informal sector has been varying. The general attitude towards the informal waste sector has been negative. Medina in his work on informal waste sector and government attitude and relationships in developing countries towards them has classified it into four categories (Medina, 1997, 2005).

2.10.1 Repression

In this view, so-called scavengers or informal waste workers are regarded as backward, who bring shame and show backwardness of modern cities. Thus, scavenging is even declared illegal and subject to punishment in countries like India, Columbia and Philippines (Medina, 1997). Hostile attitude and restrictions towards informal waste workers has led to acts of violence even leading to death of waste workers. One example of this kind of hostility against waste workers was the killing of around forty scavengers in Colombia where their bodies were sold to medical school (ibid).

2.10.2 Neglect

In this case, authorities simply take a stance where they ignore the scavengers and their acts. Their contribution to waste management is not taken into consideration. They are neither persecuted nor helped in their activities. At the same time this kind of attitude signifies that municipalities do not consider contribution towards waste reduction, segregation and recycling which can eventually support to achieve sustainable waste management.

2.10.3 Collusion

Collusion is a form of partnership between informal sector and government authorities which is based on exploitation, mutual profit, and mutual assistance. It provides a ground to flourish corruption and bribery leading to a relation of political clientelism. This kind of partnership was seen in Mexico, between the ruling party and the *caciques* the local bosses of scavengers' cooperatives. It led to the situation where the most powerful scavenger boss became deputy representative in Mexican congress in the mid -1980s. Creating a situation where the politicians and government get bribe from scavenger bosses and in turn these scavenger bosses gain legitimacy in their work. This kind of partnership is not necessarily positive for all.

2.10.4 Stimulation

Municipalities continued to fail to provide adequate municipal solid waste management services to the public even after introduction of American and European waste management technology. In addition, the issue of environmental awareness grabbed attention, this led to the change of policies of authorities towards scavengers. Some examples of these type of changes were seen in Indonesia, Egypt, Brazil, and China. In these countries governments started to recognize the economic, social, and environmental benefits of informal sector altering their negative attitude towards the sector. In Indonesia, as the president declared that scavengers are beneficial to the economy, they were supported to form co-operatives. Similarly, in Egypt informal waste collectors and recyclers community was provided with infrastructure for more effective functioning, in Brazil scavengers got integrated into curbside recycling program. While in China government program embraced 10,000 free collectors (Medina, 1997, 2005). This category has a more positive connotation where scavengers/ informal waste workers are at least recognized by the system as something that has potential to be integrated at some point. Based on Medina's classification of relations between informal waste sector and authorities, a more elaborate model showing what factors lead to what level of success in integration was presented. The model shown in the *fig 10* below is adapted from Nas and Jaffe, denotes the interaction between various factors and success level for integration. These factors namely being, the level of organization ranges from low to high; the socio-political context can be one of repression, neglect, collusion or support; sociocultural differentiation can be restricted to social status or extend to ethnicity; and the technical context can comprise a situation where modern technology (methods and technology used in collection, transport, sorting and disposal of waste) is either appropriate or inappropriate (Nas & Jaffe, 2004, p. 250).

The figure below shows that waste worker systems with a high level of organization, or the prospect of such an order (for example presence of conditions conducive to the formation of co-operatives), have a higher possibility of integrating in or becoming part of formal waste management, especially if the socio-political context is one of stimulation. Nonetheless, a situation of collusion or neglect may not always mean great obstacle. An approach of repression, if combined with a low level of organization, is more likely to lead to exploitation resulting into unsafe and unhealthy circumstances for waste workers. Meanwhile, potential success of a system does not seem to be directly linked to whether waste workers are of a different ethnic background than the majority, or whether the sociocultural differentiation is restricted to low status. Levels of organization are sometimes but not always higher amongst a distinct ethnic group, an example from San Francisco, where Italian Americans dominated the work as waste collectors and scavengers that later became a case of successful integration. It indicated that governments are more likely to adopt a stimulation policy if those involved in informal recycling activities are of the dominant ethnic group. Finally, informal waste management systems are more likely to adapt to the local condition where modern, expensive technology is inappropriate (Nas & Jaffe, 2004).

Together with these factors, the type of intervention can also be significant in determining the integration of informal waste workers into the formal system. Case studies have revealed that in some situations, a government intervention may be the most beneficial while in others an NGO or CBO may be in a better situation to make a change (Gunsilius, 2011b; Wilson et al., 2012).

Case	Organization			Socio-Political Context				Socio-Cultural Differentiation		Advanced Technology		Success Factor
	Low	Med	Hi	Repression	Neglect	Collusion	Stimulation	Ethnic	Status	Appropriate	Inappropriate	
A			x				x		x		x	++
B			x			x		x	x		x	+
C		x			x				x	x		-
D	x			x				x	x	x		--

Figure 10: Interaction between different characteristics of informal waste worker systems for success in integration to formal system Adapted from (Nas & Jaffe, 2004)

There are cases, from around the world that represent the successful integration through partnerships. There is an increased interest on partnership between formal and informal actors such that it can benefit both sides and achieve the common goal of inclusive waste management

structure. It has been noted that the informal private sector and community groups are also gradually undertaken as partners by municipalities in developing countries (Van de Klundert & Lardinois, 1995). These collaborations, partnerships can be a way to deal with the waste problems in developing countries where authorities' stance have moved towards an approach of stimulation towards informal sector. At the same time, these associations can also be for the betterment of the services, upliftment of the status of informal waste workers or just a political engagement of the state to have a hold on informal sector (ibid).

However, there are some good examples of working partnership between government and informal sector. For example, Indonesian government enacted laws that restrict import of waste materials to support the scavengers. Since the persistence of sneaking of waste materials from developed countries kept the price of recyclable materials low (Medina, 1997). While Philippine government's effort to support scavengers in Manila in 1978 failed as it attempted to substitute the informal system with government control of scavengers.

At the same time there have been efforts by the private sector to work with scavengers. NGOs in countries like Mexico, India and Colombia have played an important role in the formation of scavenger co-operatives (Medina, 1997). One good example of this has been the NGO "Fundación Social" that has supported the formation of scavenger cooperative throughout Columbia since 1986. This has resulted in more bargaining power with industry and authorities amongst the 78 co-operatives in various regions (ibid).

From the above literature it is clear that that informal sector is an important contributor to solid waste management in many developing countries. Also, there have been studies about assimilation of informal sector into formal recycling and solid waste management in developing countries such that an integrated solid waste system can be established. However, there are different stances of government on informal waste picking, which are peculiarly negative. Nevertheless, the latest addition to the block, theory of co-production advocate that waste-picking could be the best available alternative means to achieve integrated solid waste management system in developing countries (Fergutz et al., 2011, p. 597). In Nepal, research on the way solid waste management could move towards an integrated system is still limited. Authorities' stance on informal waste sector and their prospect for integration remain unexplored in Nepal. Though such research exists elsewhere (Dias, 2016; Sicular, 1992; Wilson et al., 2006). This study anticipates bridging this existing gap.

2.11 Understanding the Process of Solid Waste Management

The thesis focuses on governance strategies that needs to be addressed for a well-functioning solid waste system. These features as specifically laid out by integrated sustainable waste management framework that are; inclusive, allowing stakeholders as users, providers, and enablers, being financially sustainable, cost-effective, and affordable with sound institutions and proactive policies.

However, these features fail to capture the everyday realities of waste management in low- and middle-income countries which already heavily lag in fulfilling these governance-based preconditions. Municipal governments have been regarded highly relevant for fostering and obstruction of municipal waste management sustainable transition (Bulkeley and Kern, 2006 as cited in Bulkeley, 2010). Such that municipal government's lack of capacity to address waste management issues creates a void for the waste system to take further steps towards sustainability. Thus, waste management in developing economies is not a neat and clean process following clear steps as put forward by integrated solid waste management framework. Everyday process of waste management in the city is filled with complexities and local realities. Waste management process has been subject to substantial contestation as it comprises both formal and informal spectrum of activities (Banks, Lombard, & Mitlin, 2020). Thus, this dissertation proposes to stem governance dimension of integrated sustainable waste management in the current municipal solid waste management practices. With this, the study aims to capture the waste management realities of a developing economy context. In doing so, it maps the actors who are involved in the process as well. Using existing solid waste management and urban waste planning realities as an entry point can be helpful to address solid waste management issues such that waste governance can be rethought and integrated sustainable waste management fitting to the context can be attained. This would also support to enrich the governance dimension of ISWM. Also, in the process physical dimensions such as collection, transportation, treatment and disposal aspects of household solid waste are considered to provide a clear picture.

2.12 Actors in Municipal Solid Waste Management Process

Integrated solid waste management framework identifies local government (municipality), private formal sector, private informal sector, service users, NGOs/CBOs, and donor agencies as key stakeholders in solid waste management. Local government (metropolitan) has been

regarded as a key actor or even reasonable degree of autonomy in solid waste management in some cases (Banks et al., 2020; Boex et al., 2020; Millington & Lawhon, 2019). At the same time, local governments are discussed in terms of their constrained authority and discretion to deliver basic services like solid waste management (Boex et al., 2020). Some studies have discussed the role of private sector in addressing waste management issues (Chaturvedi, Arora, & Saluja, 2015), while others have discussed the role of households (Davies, 2005). Meanwhile, literature has also discussed the role of informal sector in waste management in developing economies (Medina, 2005, 2007). Literature has discussed the contribution of informal sector in providing waste service, recycling activities, provision of livelihood to millions of urban populations (Fergutz et al., 2011; Wilson et al., 2013). Outside the light of the formal public sector exists a vibrant ‘informal’ private sector in almost all cities in the developing world playing a significant role in SWM (Ahmed & Ali, 2004, p. 469). However, other actors’ influence in solid waste management has been varying.

This thesis aims to decipher the actors active in solid waste management of the city at the same time delineate the roles and relationships of these actors. Especially in case of developing economies where informal actors have a significant role to play but goes unnoticed as the consideration goes on to the formal process of solid waste management. Thus, the role of these actors and their relationship with each other in dealing with solid waste issues of the city becomes imperative. As waste management process in Kathmandu metropolitan is largely carried out by actors other than formal designated ones, where private actors formal and informal drive the waste management process. Thus, understanding their roles and responsibilities is crucial for apprehending the factuality of waste governance in the city.

2.13 Understanding the need for Partnership in Solid Waste Management

It has been classically posited that public private partnerships provide reliable, effective, competitive services and enhanced customer-satisfaction; however, that proposal also comes with its own challenges (Lorrain & Stoker, 1997). Though public private partnership has been regarded as a solution to waste issues in given development context, community participation have been widely neglected in the design of privatisation policies leading to lack of sense of ownership from public (Post et al., 2003). Meanwhile, government’s failure to recognize role played by informal sector, NGOs and CBOs when talking about public private partnership has been explicitly mentioned by some authors (Hardoy et al., 2001).

Governance aspect of integrated solid waste management demands for the inclusivity of actors, which relates to partnership between actors. However, it is necessary to understand the already existing partnerships between the actors. Also, to identify gaps such that waste governance can be improved. Here consideration is given to partnership that encompasses the role of informal sector along with private sector, NGOs/CBOs. While doing it is taken into account that top-down and focusing on technocratic solutions have led to failure in attempted partnerships in waste management in the past (Oteng-Ababio, 2010).

The next section explains the intricacies of municipal solid waste management along with the current urban planning scenario in Kathmandu metropolitan and provides justification for using governance dimension and approaches to informal sector as analytical lens for understanding solid waste issues realizing the need for addressing the role of informal actors and partnering with active formal and informal actors.

2.14 Governance of Solid Waste Management in Kathmandu Metropolitan

“By 2030 halve per capita food waste at the retail and consumer levels and reduce food losses. Achieve by 2020 environmentally sound management of chemicals and all wastes throughout their life cycles. Substantially reduce, by 2030, waste generation through prevention, reduction, recycling, and reuse in accordance with agreed international framework. To achieve this, proper laws and enforcement of these laws and a monitoring mechanism need to be put in place. A coordinated effort between several agencies is necessary as well” (National Planning Commission, 2015, 2017).

Waste management falls under Nepal government’s priority issue in its way to achieve sustainable development goals 6, 11 and 12. For achieving SDG 6, its national target is to achieve 100 percentage coverage of basic water supply and sanitation by 2017. For SDG 11 the aim is to increase sanitation systems in urban households as well as to close the gap in sanitation services across geographic regions. For SDG 12 the aim is to achieve environmentally sound management of all kinds of waste, starting from the stage of waste generation (National Planning Commission, 2015).

Lack of institutional setup and mechanism to implement the policy has been regarded as main reason behind inability to achieve government’s target (ibid). While government aims to achieve this through enforcement of proper laws and putting the monitoring mechanism in place. It also puts emphasis on the coordinated effort between agencies required to achieve these goals. However, it fails to address the role played by different institutions and their

capacities to achieve these goals. Nepal's urban development strategy aims to narrow down the deficits in basic urban infrastructure such as roads, waste supply, sewerage, solid waste, energy, open space, and housing by realizing the comparative advantages based on resource potentials of each region. It stresses the role of Ministry of Urban Development (MoUD) in achieving these goals while emphasizing that municipalities can develop by-laws and guidelines for waste management. Also, role played by Ministry of Federal Affairs and General Administration (MoFAGA) in delineation of boundaries of local bodies, decentralization and devolution, intergovernmental fiscal transfer, human resource development of local bodies including the role played by (MoFAGA) in strengthening local bodies in terms of fiscal and human resources has been pointed out.

Thus, two ministries MoFALD and MoUD take up a supplementing role for urban development in Nepal, but institutional coordination mechanisms between these two ministries are deficient (MoUD, 2017). MoFALD had allocated 20.69 billion Nepalese rupees (NPR) to support municipalities in the fiscal year 2016/17, referring to the fact that municipalities in Nepal are still dependent on state level resources for urban development issues.

Meanwhile, planned urban development with attention to all sectors in Nepal is complicated as urban planning, implementation, and financing are to be achieved under one umbrella institution as per National Urban Policy 2007. However, in reality, municipalities are aligned under Ministry of Federal Affairs and General Administration (MoFAGA) and critical implementation agencies for sectorial development of water and waste such as department of water supply and sewerage fall under Ministry of Water Supply and Sanitation; SWMTSC used to fall under Ministry of Finance and Ministry of Federal Affairs and Local Development (MoFLAD) now called Ministry of Federal Affairs and General Administration (MoFAGA) (MoUD, 2017). This created a situation where co-ordination and collaboration between ministries is largely a bureaucratic process and municipalities are not equipped enough to carry out implementation of policies and plans on their own. This has led to the dependence of municipality on Ministry of Urban Development for construction of infrastructure such as landfill site for waste disposal. In turn ministries deal with issue of absence of co-ordination and collaboration with the municipality as municipalities fall under another ministry.

In addition, the constitution of Nepal promulgated in September 2015, implicitly acknowledges the role of municipalities in governing urban areas. It assigns responsibilities to local government for the provision of basic urban infrastructures and services like local road, water supply, waste, and sanitation. At the same time lack of technical expertise and resources in municipalities of Nepal to pursue urban planning and development has been widely discussed.

Kathmandu is the largest metropolitan of Nepal in terms of population, waste generation, municipal budget and municipal budget allocation for solid waste management (Asian Development Bank, 2013). It is a forerunner in urbanization in Nepal being the only city with one million plus population and holding 9.06 percent of total urban population of Nepal (CBoS, 2012). In terms of resources the metropolitan holds an upper hand as compared to other municipalities of Nepal ranking top in terms of urban infrastructure condition index. Still solid waste management issues in Kathmandu metropolitan fails to be addressed, and it faces the issue of low capacity and priority in planning. The subsequent section conceptualizes integrated sustainable solid waste management in Kathmandu proposing a process- actor and partnership approach.

2.15 Conceptualizing Integrated Solid Waste Management in Kathmandu Metropolitan

To study the problem of solid waste management from the governance perspective and understand role of informal sector in the city, waste process-actor-partnership approach to understand the waste concerns and enrich the integrated solid waste management framework is proposed. Here process is not focused on purely technical sense which entails various steps of waste treatment, but the way waste flows in a city. Waste governance is essentially understood as the manner in which issues related to waste are governed and the respective roles and responsibilities of actors and institutions in practices related to that governing (Davies, 2008, p. 29). The reason behind inspecting solid waste management from governance perspective in low and middle-income countries is that government role of public service delivery in these countries is dispersed among a range of actors from private formal and informal sector. This is largely due to the fact that local government in these countries are failing to address the increasing need for services creating a vacuum for others to enter.

Thus, this dissertation aims to address the longstanding problem of solid waste management in developing country context through governance based on everyday waste management practice and planning combined with the debate on role and relationship with informal sector. This by itself is a novel attempt operationalizes the waste governance based on waste practices and process, role of the informal sector and the existing partnership between the actors. The thesis contextualizes governance in waste management firstly through understanding the current solid waste management process in the city. In addition, role played by actors, especially ones regarded as informal and the interrelationship between these actors is charted so that their ways

and capacities to deal with waste issues can be mapped. Finally, after drawing upon the relationships, this thesis looks into the existing partnerships between the actors.

The actors function on a daily basis to deal with the waste of the city, there are possibilities of partnerships that might either be apparent or hidden. Thus, the existing partnerships will be analysed considering the rationalities of actors for supporting or opposing partnerships. Finally, it investigates the role partnerships can play in addressing waste issues in the city.

In this regard this dissertation has formulated an overall research question followed by sub-research questions.

2.15.1 Research Questions

- How does governance facilitate to understand and address the solid waste management situation in Kathmandu?
- What is the current solid waste management process and how does it acquaint governance?
- What is the role of informal sector in solid waste management and what is their relationship with other waste actors?
- What are the existing partnerships between the actors and how can it contribute to address the waste concerns?

To answer these research questions, process-actor and partnership approach is proposed in *Fig 11* below as a necessary prerequisite to understand and address solid waste management related concerns of the city. It is engrained in the current urban solid waste management process, practices, and planning. The overall objective is to understand how governance and informal sector can facilitate to address solid waste management issues in Kathmandu metropolitan. In the *fig 11* below a proposed approach to understand waste governance in the city. It is based on the current everyday waste practices and realities of the city. It proposes that understanding the waste process, role of informal actors, their relationships and partnership between actors is a precondition to achieve solid waste governance in the city. The approach adds on to the existing governance aspect of integrated solid waste management framework which is focused on inclusivity of actors, financial sustainability, and sound acts regulations and policies as prerequisites to achieve waste governance

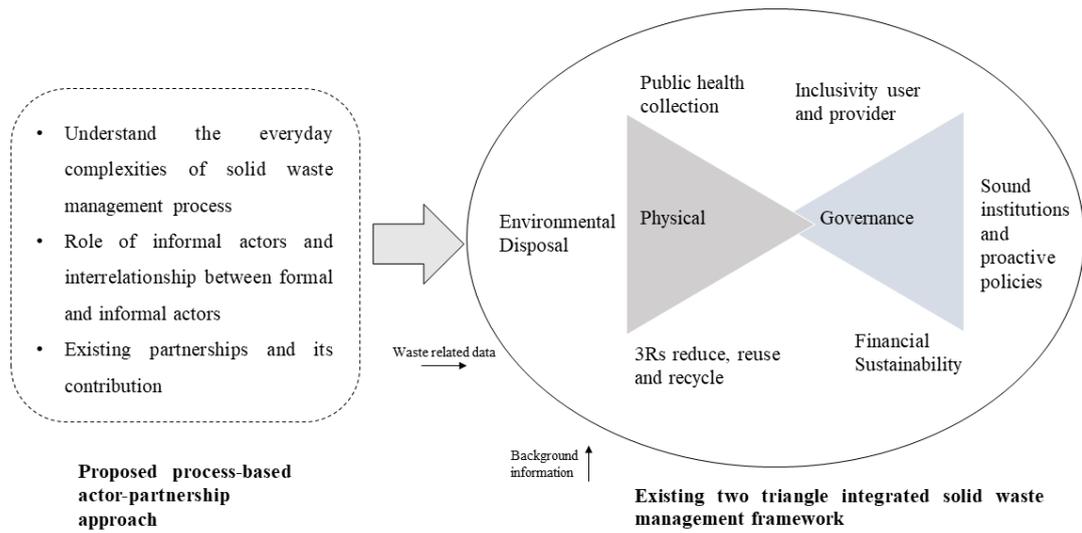


Figure 11: Waste management process- actor-partnership approach for understanding waste governance and enriching governance aspect of ISWM framework Own compilation based on (Scheinberg, et al., 2010c; Wilson et al., 2013).

3 Research Design

This chapter discusses the methodology adopted and methods used to achieve research objectives. It begins with a discussion of ontological and epistemological footings of qualitative and quantitative research, also reasons for combining two methods in single research. The chapter presents the research design and methods used to select the participant and collect data. In addition, how data was analysed and interpreted are briefly discussed, similarly issues related to positionality and reflexivity are discussed. The chapter then concludes with a short description of limitations of the methodology employed in the study.

3.1 Ontological and Epistemological Position of the Study

This section discusses the paradigm that influenced the research design of the study. Ontology is the philosophical field revolving around the study of the nature of reality, what is true or real. While epistemology is concerned with nature of knowledge and different methods of gaining knowledge (Crotty, 1998). Both epistemology and ontology are essential in carrying out research as they are about the way we know things and what things really are in real.

In research these two philosophical underpinnings facilitate in choosing research design and methods (Guba & Lincoln, 1994). The methodology we follow in our research is guided by our epistemological and ontological understanding of the reality (Grix, 2004). Ontology is concerned with how things are in reality whereas epistemology apprehends how knowledge can be created, assimilated and communicated (Scotland, 2012). The two dominant ontological perspectives that have inspired social science research have been positivism and interpretivism (Grix, 2004; Guba & Lincoln, 1994).

Ontologically, the knowledge here will be constructed through interpretivist approach; by understanding the phenomenon from the perspective of individuals, investigation of historical and cultural context and interaction with and among individuals inhabiting (Bryman, 2004; Creswell, 2009). With a consideration that social reality is accomplished by social actors and transmitted within a social context (Kim, 2001). Keeping the concept in mind that researchers should try to understand complex reality of the world through the lived experiences of people who live it (Schwandt, 2000).

Interpretivist aims to provide a perception that there are hidden social forces and structures that guide the societal actors to act the way they do. Frequently data gathered using interpretivist techniques like observations, interviews, documents and audio-visual materials such data is

‘soft data’ and verbal, seeking to reveal and describe social phenomena by the attribution of words (Bryman, 2004; Creswell, 2003). It carries a viewpoint that the social world can only be understood from the viewpoint of individuals who are participating in it (Scotland, 2012).

The goal of the study will be to understand the multiple social constructions of meaning and knowledge about the object of study, i.e., solid waste management of Kathmandu. To get the social significance or interpretation the actors have of the situation they are in and the reason behind the course of action. Contrary to interpretivist approach to acquire hard data for the study positivist approach was followed. Positivism as an approach which subscribes to the application of natural science methods and practice to social sciences (Miller & Brewer, 2003). It assumes that the real world out there is independent of our perception and the social world is revealed to us, we are not the ones who create it. Questionnaires and surveys are archetypal to carry out positivist model of social research. As it will help to collect numerate data, depicting a social phenomenon which is neither constructed nor interpreted (ibid). Here household surveys were administered to gather the numerate data related to waste management of the city. In the dissertation, object of study is the solid waste management which includes number of intricate processes and surrounded by complexity of relationships between actors. Strictly following a positivist approach could overlook the larger social, political, cultural, and economic context that could have influences on waste management. Thus, the research adopts both positivist and interpretivist approach.

3.2 Quantitative and Qualitative Approaches

Debate over which method qualitative or quantitative is better for conducting research with social aspect has been going on over the years in the scientific community. But the fact that each method has a unique way to gather and analyse data with their logic and strengths cannot be denied. In both approaches the keywords “explaining phenomena” are used irrespective of which method is being followed (Muijs, 2004, p. 7). In social science research, quantitative research usually follows the conventions of positivism while qualitative research follows interpretivist assumptions (Bryman, 2012). Qualitative approach is based on the intensive study of a phenomena which seeks to understand it in depth. Meaning in qualitative research is achieved not by looking at particular features of many instances of a phenomenon but rather by looking at all aspects of the same phenomenon to see their inter-relationships and establish how they come together to form a whole (Miller & Brewer, 2003, p. 193).

These qualities of qualitative approach make it fit to achieve the objective of this dissertation, where solid waste management is the phenomena to be understood from the governance aspect. The ability of qualitative research methods to provide a textual description of how people experience the given research problem encourages researchers to adopt it in their study. Qualitative research allows to see the study area through the eyes of people (Bryman, 2012). Some researchers, criticize qualitative approach for being small scale and non-representative, leading to results that cannot be generalized beyond the case of investigation (Grix, 2004). Such that results from qualitative research is argued to be difficult to replicate, have problems of generalization, lack of transparency and too subjective in nature (Bryman, 2012). Thus, keeping both positive and negative notions in mind the study will use qualitative methods to unravel the matters related to SWM in Kathmandu Metropolitan such that the objective of the research can be achieved.

In contrast to qualitative research, quantitative research works with a positivist approach, following the path of numerical measurement for understanding social phenomena (Bryman, 2004). It is a way of creating knowledge following a natural science model, where the scientist adopts the position of objective researcher building up upon explanation of social life by arranging such facts in chain of causality (Finch, 1986). The focus of quantitative research is on generalization. In quantitative research the researcher is usually concerned to be able to say that his or her findings can be generalized beyond the confines of the particular context in which the research was conducted (Bryman, 2004, p. 219). Eventual goal of quantitative research is “to find as small a set of variables as possible which explain as much as possible”(Miller & Brewer, 2003, p. 193). Quantitative method is deductive in nature that accentuates quantification in the collection and analysis of data. Here the use of quantitative approach is done to depict the current realities of household solid waste management process. The focus is on the physical dimensions of solid waste management as put forward by integrated solid waste management framework.

3.3 Case Study Approach

The study follows a case study approach in order to get an in-depth understanding of the processes in its real-life context (Yin, 2003). Case study design or approach reacts promptly and positively to research questions of ‘why’ and ‘how’ also this approach satisfies the so-called exploratory, descriptive, and critical interpretation of data (ibid).

There is a misconception that a case study strategy provides little basis for scientific generalisation (Dubois & Gadde, 2002). As generalization is a logical argument for extending one's claims beyond the data, positing a connection between events that were studied and those that were not (Maxwell, 1992). However, case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes (Flyvbjerg, Landman, & Schram, 2012). In its truest sense case-study approach helps to explore and investigate real-life phenomenon through comprehensive analysis of events, conditions and their relationships (Yin, 1984). Yin, has pointed out that case study approach is used when the boundary between phenomenon and context are not evident; and in which several sources of evidence are used (Yin, 2017).

In the dissertation, case study is useful to answer “how” question of how can governance facilitate to address solid waste management situation in Kathmandu? It aims to do so by realizing the phenomenon of solid waste management in a rapidly growing urban center in South Asia, by considering role played by informal actors, relation between formal and informal actors and partnership between the actors.

The dissertation uses single case study method since this type of case study is the best suitable when the researcher has no control over the actual behavioral events. Use of case study method has enabled to explore and investigate the actual phenomenon occurring in the city with the use of multiple sources. At the same time case studies are recommended when the problem being dealt with are place specific in nature. This was earlier achieved when case study approach conveyed insightful results in the past when it was used to assess the need for infrastructure in solid waste management and failure of foreign aid over the years to harbor sustainable outcome in solid waste management in Kathmandu (Alam et al., 2008; Dangi, Schoenberger, et al., 2015). It has been a helpful method to bring forth local level challenges in the matter of solid waste management.

In the dissertation this approach is used to unravel the process of waste management in Kathmandu, roles and relations between formal and informal actors involved, their actions within wider social, political, and cultural context and partnership between the actors as this still remains missing from the solid waste literature of Kathmandu. Thus, case study approach is a promising method to explore solid waste management process in Kathmandu which is entrenched in context-specific practices.

3.4 Mixed Approach

The study followed a mixed approach where both qualitative and quantitative methods were used. In research the assumptions of positivism are followed by quantitative research and qualitative research follows interpretivist conventions (Bryman, 2004). Delineating, which ontological position whether positivist or interpretivist the researcher plans to use is necessary. Such that it helps to understand which epistemological stand to take and what implications will come up for the social phenomena (Robson, 2002). Qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them.” (Denzin & Lincoln, 2002). Qualitative data sources include observation and participant observation mostly done through field work, interviews, documents and texts analysis and the researcher's impressions and reactions about the field (Myers, 2009). Thus, the study used qualitative methods that are flexible and viable according to context were used. Along with-it quantitative method that focuses on establishing relationships, recognizing general patterns, and making predictions about the situation were deployed.

Quantitative researchers make use of questionnaires, surveys and experiments to gather data that is reviewed and organized in numbers, which allows the data to be characterized employing statistical analysis (Hittleman & Simon, 1997, p. 31). Quantitative researchers measure variables on a sample of subjects and express the relationship between variables, making them deductive in nature, such that generalization can be done at the end (Miller & Brewer, 2003). Quantitative methods in research presents a single reality by establishing relationships between variables which is measured by an instrument (Thomas, 2010). While in qualitative research, there are multiple realities which is to be understood from participant’s perspectives and researcher’s interpretation of the reality (ibid).

Even with the difference between two methods scholars suggest that combining these two approaches can complement each other if we want to study a single phenomenon.

Though qualitative and quantitative research methods have some major differences choice to combine quantitative and qualitative methods in the study is to explore the research questions from different perspectives, such that we could get a broader understanding of solid waste management situation in cities of developing countries with similar level of economic development. In line to the methodological approach, methods related to both qualitative and quantitative approach are combined in the study. Such that the use of combination of qualitative

and quantitative in the study can help to elucidate complimentary aspects of the same phenomenon (Patton, 1999).

As stated earlier the purpose of the study is to reveal the solid waste management process in the city, decipher the actors involved, role played by informal actors and partnership among these actors.

The study demanded for a varied nature of data that had to be gathered from mixed approach. Research tools associated with both qualitative and quantitative approaches that included interviews, questionnaires, field observation and document analysis were deployed.

Along with it, participation in workshops and seminars on solid waste management in KMC were part of data collection procedure. While secondary data relevant to SWM in Nepal and other developing countries were collected from national and international reports, studies, and literature. Quantitative method such as household survey was carried out. Households are one of the major stakeholders in solid waste management. They are the generators of solid waste, they require the waste disposal services; their knowledge, perception, and their suggestions about waste situation in the city is an important aspect to be considered in the study. For household surveys where structured interview schedule was administered to get both subjective views of people and numerical data.

Similarly, keeping in mind the significance of triangulation; both method triangulation and data source triangulation were used in the research. Method triangulations were followed using multiple methods such as interviews, survey, and observation. Similarly, data source triangulation was carried out since data was collected from different individuals involved in formal and informal sectors. Such that multiple perspectives can be gained, and the data could also be validated. The combination of different methodology in a single study enhances the researcher's assertion for the conclusion, if all of them provide a mutual confirmation (Bryman, 2004). Combination of different methods for data collection provided me as a researcher more prospect to get hold of in-depth information from different stakeholders involved in solid waste management of the city.

3.5 Selection of the Study Site

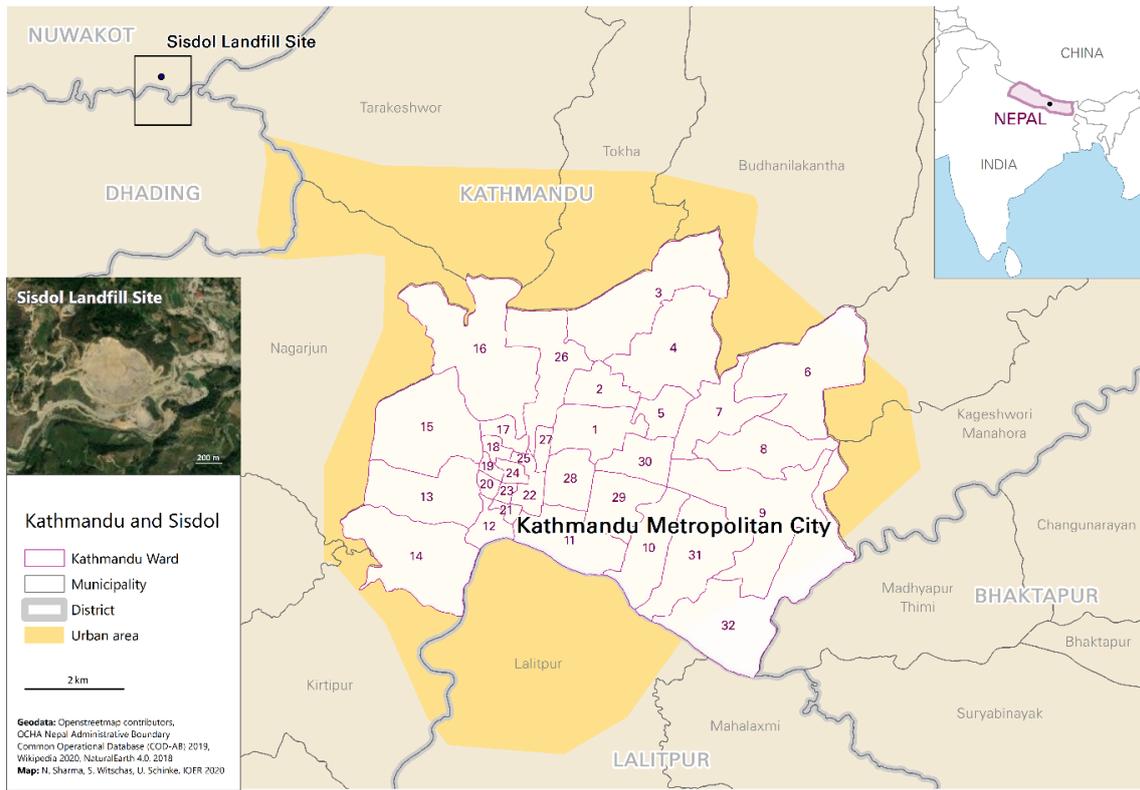


Figure 12: Nepal and study area Kathmandu with landfill site (Sharma, Witschas & Schinke, 2020)

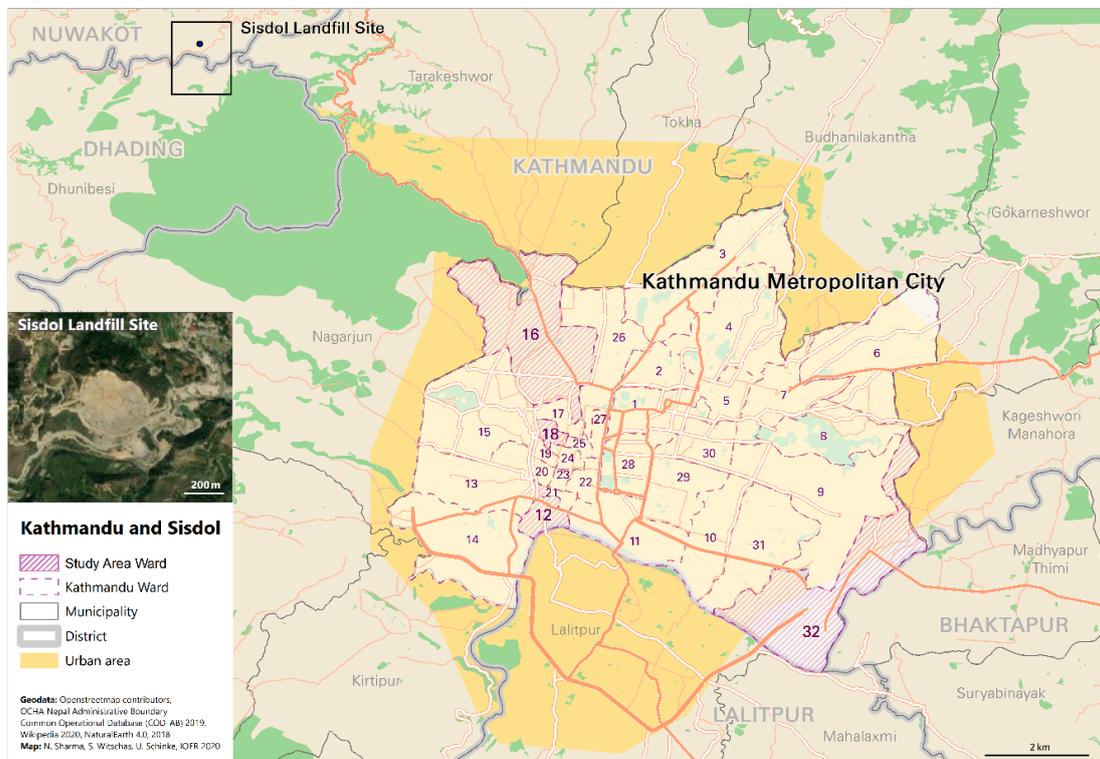


Figure 13: Study area with selected wards (Sharma, Witschas & Schinke, 2020)

Kathmandu metropolitan city (KMC) is chosen as a case in the study, as shown in *fig 12* above. It is the forerunner for urbanization in Nepal with the changing pattern of waste generation over the years. With the growing urbanization and changing waste composition makes it a representative case for other fast-growing cities in Nepal. Kathmandu Metropolitan City is the only metropolitan in Nepal with a population over 1 million, shown in *table 2* below. *Fig 13* above shows the study area KMC with selected wards 12,18,16,32. The waste composition in the city is largely organic followed by plastic and then only paper. While the major attribute of waste in Kathmandu is that the waste is largely organic in nature carrying huge potential for composting and anaerobic digestion for biogas, waste composition of Kathmandu metropolitan is shown in *table 3* below (Asian Development Bank, 2013). While the major focus in Kathmandu has been on dumping the waste in landfill site over the years which qualifies it as a city for research study.

Another motivation to select Kathmandu comes from the fact that is the gateway to the Himalayas in Nepal with its only international airport situated in the city. In this regard the issue of waste management in the city becomes essential as during the 90s the city was covered with piles of dumps along the roadsides and rivers that had a negative impact on the tourism. It has been pointed out that the repercussion effect of unmanaged waste negatively impacts the fragile economies of those countries that heavily rely on tourism (Henry et al., 2006).

Kathmandu metropolitan city as mentioned previously is one of the fastest growing urban agglomeration in South Asia. It has intensified city's waste problem where population is increasing rapidly but answers to deal with waste issues have not been altered according to changing needs. Also, the city has been dumping its waste along with other nearby metropolitans in the same landfill site since a decade, though the site has long passed its closure date and facing widespread opposition from locals. This suggests the problem of waste management is complicated in Kathmandu. At the same time literature suggests that informal sector is a major contributor in solid waste management of the city, employing large number of people, last estimate being 15,000 waste workers (Practical Action, 2014). Meanwhile, metropolitan is the capital of Nepal where central government, federal and local government work together and where there is an abundance of resources. This provides a potential for studying the concept of governance in the city where governments at all levels are working closely and problems such as waste management are constantly under media scrutiny.

Municipality	2011 Census Population	Population Density (Person per sq. km)
Kathmandu	1,003,285	20,289
Lalitpur	226,728	14,966
Bhaktapur	83,658	12,753
Madhyapur	84,142	7,574
Kirtipur	67,171	4,551

Table 2: Population status of municipalities in Kathmandu Valley (CBoS, 2012)

Municipality	Organic Waste	Plastics	Paper and paper products	Glass	Metals	Textiles	Rubber and Leather	Other
Kathmandu	64.24	15.96	8.66	3.75	1.72	3.40	1.12	1.15

Table 3: Waste composition (in percentage) Kathmandu Metropolitan (Asian Development Bank, 2013)

3.6 Collecting the Data

The study employed mixed methods for data collection. Data collection for the study was done from the mid of July 2019 to mid of September 2019. In the fieldwork six key staffs responsible for municipal solid waste management in environment department of Kathmandu metropolitan city, two ward officials of surveyed wards, seven private waste companies, and five solid waste management experts with consultant experiences in waste management projects were interviewed. Similarly, three social enterprises, four itinerant waste buyers, two scrap dealers thirty-two informal waste workers, two non-government organizations, later three phone interviews with engineers working at new landfill site and one hundred and eighty-two surveys with households were carried out.

3.6.1 Selecting the respondents

Initially, respondents for interviews were purposively identified through document review. These were individuals working in government sector and private sector for municipal solid waste management. In the municipality waste related activities fall under responsibility of environment department. Earlier the state had a central body called Solid Waste Management Technical Support Center (SWMTSC) responsible to provide technical support, but it was dissolved in December 2018 by the cabinet, reciting the reason that in a federal state, local government are capable of generating and managing all types of resources. Due to the dismissal of SWMTSC the whole responsibility of waste management landed into Kathmandu metropolitan. For the interviews with local government officials main aim was to interview officials who are in position within the municipality to provide information about waste management plans and day to day waste activities of the city. Respondents were identified through snowballing primarily, developing a rapport with respondents helped to induce the further interviews. In addition, to get the views from the former officials of SWMTSC, offices where these officials had been transferred were tracked. The reason to do so was these officials had worked for more than a decade in solid waste management of the city and their views and opinions on the issue were essential for the study.

Later, second set of respondents were identified through snowballing, mainly through the interviews with private waste companies. These informants were waste experts, non-government organizations, waste dealers and waste workers. Similarly, interviews with private waste companies and NGOs helped in identifying the wards where household surveys are to be carried out. As in the metropolitan waste management services are provided by both the metropolitan and private waste companies, this is elaborated in later section.

S.N.	Key Stakeholders	Interviews
1	Kathmandu Metropolitan City Office/ Environment Management Department	6
2	Private Waste Companies	7
3	Ward Officials	2
4	Social Enterprises	3
5	Waste Experts	5
6	Itinerant Waste Buyers (Waste Workers)	4
7	Informal Waste Workers (<i>Kawad</i>), Transfer Station, Landfill site	32
8	Non- Government Organizations	2
9	Scrap Dealers	4
10	Households	182
11	Civil and Geotechnical Engineers	3

Table 4: Key stakeholders interviewed (Own compilation from fieldwork)

3.6.2 Developing the interview guides

Adequate preparations were done before the actual interviews. In doing so, interview guides were prepared beforehand keeping in mind the organization interviewees were involved with and their roles in solid waste management. In addition, developing interview guides based on research questions and objective of the study was a priority. The questions had to be inquiry-based such that themes could be identified from these interviews for analysis later. Separate interview guides were developed for the different stakeholders that were to be interviewed (*see annex*). These guides were simple but tried to cover all the relevant issues relating to their work in waste management. In all case these guides were semi-structured in nature, it allowed for the respondents to go beyond the questions and provide additional information about the issue.

3.7 Data Collection Methods

3.7.1 Semi-structured interviews

Semi-structured in-depth interview was one of the methods used with all the waste actors identified for the study. It included municipality, non-government organizations, informal waste actors, waste experts and social enterprises. The purpose to use this method was to collect their opinions, insights, and experiences in solid waste management situation in the city. In addition, the role played by the respondents in waste management process and planning, also, their relationship with other actors. These interviews were in-depth in nature. In-depth interviews are regarded as one of the most beneficial tools for gaining an understanding of human beings, getting in-depth understandings, personal experiences and perspectives (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014). The interviewees were selected through simple purposive sampling method where the participants deemed to provide necessary information about waste phenomena in the city were selected. The use of purposive sampling approach is to attain cases that are rich in information such that a great deal of information about the issue can be learned (Patton, 1999). Additionally, in the study maximal variation sampling strategy was applied since selecting participants from public, private, social enterprises and non-government organizations so that different perspectives can be accrued in the study (Creswell, 2009). The main aim of this approach was to describe a central theme that traverses all the actors. Though receiving heterogeneous answers can be problematic but identifying a common pattern in the responses can be useful to capture the core aspect (Patton, 1999). In the study people working within the formal waste management system as well as in the informal waste management sector were included. This variation provides a scope to get responses with heterogeneity as each actor have had different experiences, this would be useful to elucidate differences at the same time identify the shared elements and patterns that arise from these variations (ibid).

To identify and contact first set of participants/individuals involved in solid waste management a review of the government plans and policies as well as reports on solid waste management was done. Semi-structured interviews were expert interviews in nature. Experts here were metropolitan authorities designated for solid waste management in the city, waste management professionals from NGOs and private waste management companies. These experts were selected on the basis that they have technical process-oriented and interpretive knowledge referring to their profession (Flick, 2009). The use of expert interview is expected to provide a strong directive towards focusing on process knowledge and context knowledge (ibid).

To carry out these interviews semi-structured open-ended interview guides (*see annex*) were used. Focus was on people who hold responsibility of SWM in the metropolitan and officials from SWMTSC. Since these are the people who are designated to have resource and responsibility according to laws and regulations for waste management activities in the city. At the same time have invested years in solid waste management sector. Similarly, phone interviews were conducted later in 2020 from workstation in Germany with three respondents to know about the progress in construction of Banchare Danda landfill site. A standardized questionnaire (*see annex*) specifically focused on the new landfill site was used for these interviews. As the news about public opposition about waste disposal and blockage at the current landfill site was growing more and more during 2020, it became essential to get information from the concerned people about the progress at the site.

Similarly, second set of actors in SWM like private companies who are providing SWM services, NGOs, social enterprises and informal actors like waste workers, itinerant waste buyers were identified through first set of actors. Interviews with the informal waste workers, scrap dealers, itinerant waste workers were done in trips to their workplaces like transfer stations, landfill site and segregation center (*kawads*). In *table 5* below key topics that were discussed during the interviews are shown and in *fig 14* an example of percentage coverage of some of the codes from the transcripts of semi-structured interviews generated using MAXQDA is shown. This helped in understanding what are the most pressing topics for which actor in waste and later connecting these with other codes with the help of co-occurrence function.

Key topics of discussion
Intent of the interview and research purpose, consent form
Respondents background in solid waste management, views on waste challenges
History and most pressing issues in waste and role in addressing challenges in solid waste
Views and perceptions on informal waste sector and their relationship with the sector
Informal waste sector and recycling practices, organization of the sector, relationship with authorities, daily obstacles, support from other actors
Partnerships and collaboration between actors, its benefits
Measures adopted to address solid waste challenges of the city

Table 5: Major topics of discussion during field interviews (Own compilation)

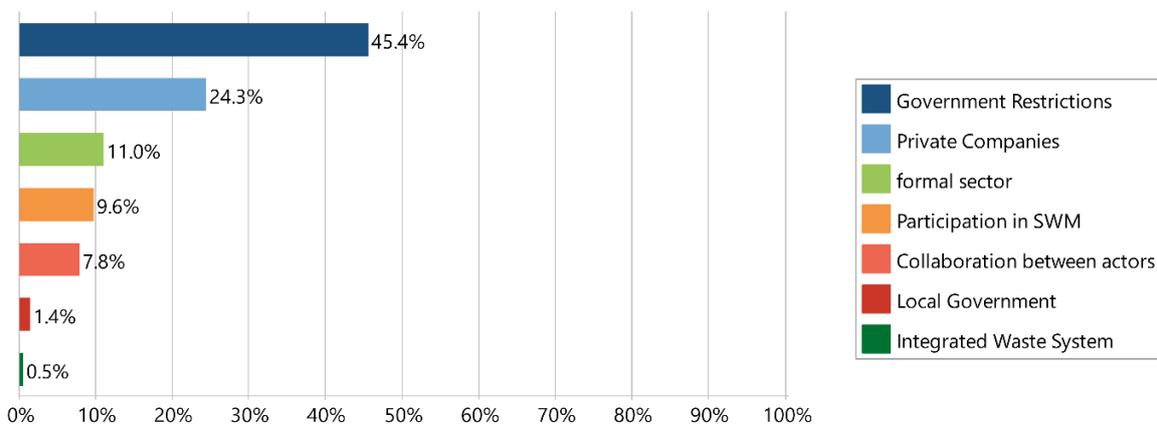


Figure 14: Example of percentage coverage of codes generated using MAXQDA (Author, 2020, generated using MAXQDA)

3.7.2 Surveys

3.7.2.1 Household surveys

Objectives of the study were to assess the solid waste management process and practices of waste service providers and service seekers, including identification of engagement of households with their service providers and informal waste sector. This necessitated the interviewing of households receiving waste services from both public and private service

providers. Survey was carried out in two wards catered by municipality and two wards of private companies. This included the wards served by metropolitan with older settlements while the wards served by private companies with relatively new settlements. Detailed questionnaires are in *Annex*. There were in total 34 questions, a mix of multiple choice and open-ended in nature. The questions were planned in an order that followed waste type and handling method, engagement with service provider, level of awareness and perceptions about waste responsibility. The household survey typically lasted for 30-40 minutes. Interview questions were prepared in English, but the communication with households were done in Nepali and later translated in English to fill into the survey forms and further data from paper format was transferred into digital form into MS-Access.

3.7.2.2 Sampling and data collection

Sampling is an important aspect to consider in research as the researcher needs to consider both time and resource to carry it out. For this, study purposive sampling was used to select Kathmandu and its four wards. The reasons to select Kathmandu has already been explained in previous section. Purposive sampling is known for selecting the best data sources that answers research questions, the same line was followed for the study. Households in four wards of the metropolitan served by both public and private sector were surveyed, these wards were namely (18, 12, 16, and 32). Field officer and community development officer of metropolitan and field coordinators of private waste management companies were able to point out those wards. Also, metropolitan's ongoing source segregation pilot project in its four wards, two of which 18 and 12 were selected for the study, helped in identifying the households. Further households in the survey were identified through snowballing. A total of 182 households were surveyed; the survey was concluded when the answers started to become recurrent. 109 households served by private waste companies and 73 households served by metropolitan waste services were included. All the respondents in the survey were homeowners. *Fig 15* below shows the household survey interview schedules piled up for entry into MS-Access, as the interface of Access is user-friendly to enter data from survey forms. Later, data was exported to MS-Excel for analysis.

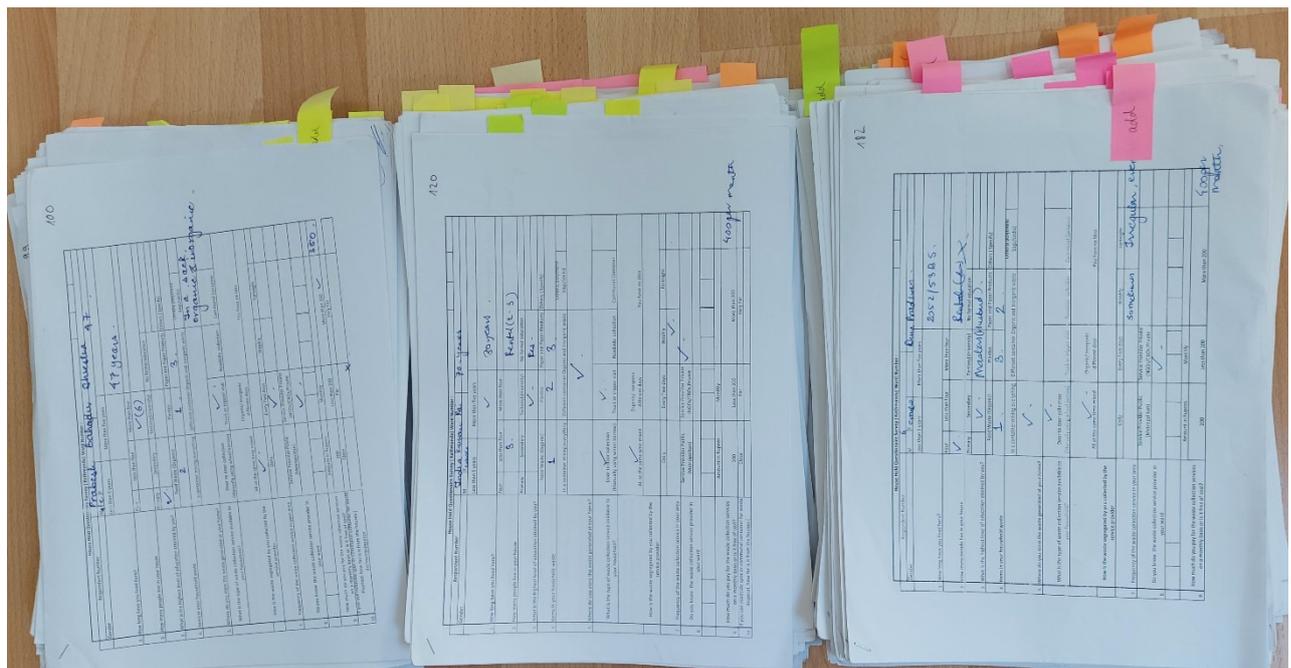


Figure 15: Interview schedules before entry into digital format (Own photo)

3.7.3 Observation

Observation is “the systematic description of actions, behaviors, and relics in the social setting chosen for study” (Marshall & Rossman, 1989, p. 217). In addition to questionnaire schedules and interviews, I also conducted field observation as part of data collection method.

Observation was used as a method to see what is actually happening in the city, as solid waste management is one of the most visible ways to measure the efficiency of urban services along with it being an indicator of local governance. As per Yin observations are a form of evidence that are independent of verbal communication that helps the researcher to observe the phenomenon directly (Yin, 1984). Observation of the waste collection, sorting and disposal sites were conducive to understand the different stages of waste management in the city. Specifically, observation of the way waste is collected on a daily basis, waste coming in and out of the sorting center, number of vehicles used for collection and number of people involved in waste collection to disposal were done. More specifically waste collected from the city that goes to the sorting station where it is stored, weighed, and transferred to a landfill site for disposal. Observation of the practices and process in the sorting center were done to get the first-hand information about how waste proceeds in the city. Waste situations and other conditions that could affect waste management at household level such as the settlement pattern

and road access in residential communities were also considered. The situations observed were mostly waste acts like street litter, river side dumping and open air burning of waste, this was done in ways that did not usually attract the attention of people around.

Also, observation of activities of informal waste workers in transfer stations and in landfill sites were done, such that their working conditions and the health hazards associated with their work came into light. In order to get in contact with the informal waste workers was a challenge, so the best way to meet them was to reach to the places where they start their work early morning. Since they were reluctant to talk to anybody from outside, talking first with the person in charge of the area where they work helped to build initial contact.

In the process of field observation, photographs were taken of waste collection containers, storage, transportation, and disposal. The observation was largely done in an unobtrusive manner. The field observations were used to match the actual waste situations in the cities with the information gathered through interviews, household survey and documentary analysis.

3.7.4 Secondary data

Documentary analysis was one of the methods used to gather secondary data. Documents were reviewed and evaluated both the printed ones and electronic. Document analysis requires the information to be interpreted to elicit meaning, gain understanding and develop empirical data (Bowen, 2009). Documentary analysis can be a useful check on primary information gathered through other methods. Documents used in the thesis were in form of reports, newspaper articles, journal articles, charts, and books. A focus on solid waste management, informal sector, governance from developing countries in addition to documents from the study area was a priority. A literature search based on the following search engines; Google Scholar, Scopus and Web of Science using the key terms urban governance municipal solid waste informal sector public private partnership integrated approach and developing countries (and their combinations and alternative words) were used. Literature search and review process throughout the thesis was made easier by the use of software tool called VOSviewer It was used to construct the network and overlay maps based on key terms, co-occurrences analysis and bibliographic coupling analysis (Van Eck & Waltman, 2013) literature on, urban solid waste governance, environmental, problems socio-cultural, political- economic dimensions of waste ,informal sector and recycling was searched from Scopus and then fed into VOS viewer. The example of the network maps created using VOS viewer software based on co-occurrence of key terms in urban solid waste literature in *fig 16* and *fig 17* visualizes author's cited together at least four times in urban solid waste literature since early 2000s till 2019. Also, the focus

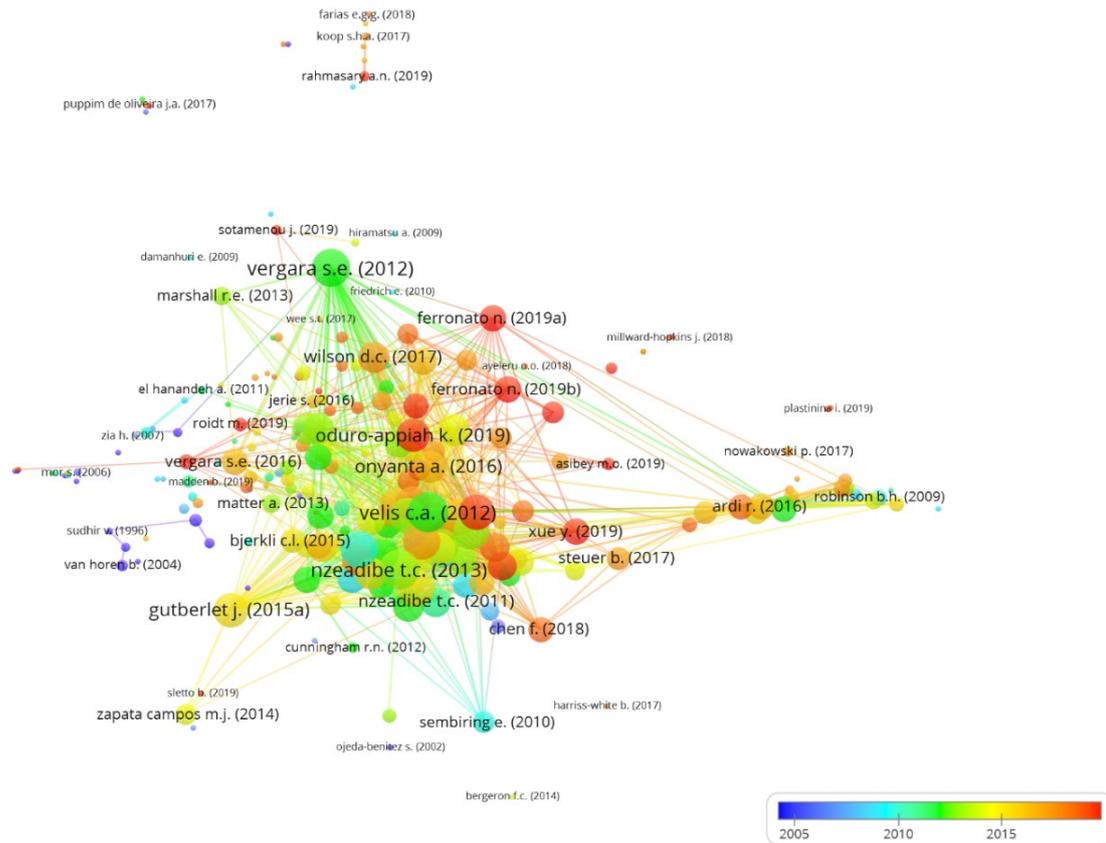


Figure 17: Example of overlay visualization map based on author’s bibliographic coupling in urban solid waste literature (Author, 2019, generated using VOS viewer)

3.8 Analysis of Data

Analysis of data started from the phase of data collection and documentation since it is a back-and-forth process. The data analysis stage is essentially a data reduction stage as well. In this phase a researcher is concerned with reducing the large amount of information he/she has gathered, in order to make sense of it (Bryman, 2008). The audio recorded interviews were transcribed. Later all the interviews were examined to extract core themes, for this each interview transcript was coded. For the coding process information was broken down so that it could be given different labels. Then the data was interpreted so that it answers the research questions. The study gathered both qualitative and quantitative data using methods like questionnaire survey, structured interviews, field observation and documentary sources. After cleaning up the data from the household questionnaire survey and revising the errors while filling up the questionnaires, the data was coded and fed into MS-Access and consequently to Excel for statistical analysis. Mainly to get a picture of household waste handling practices,

services available to households for waste disposal and collection their satisfaction with the quality of service. It also covered questions relating to their views on payment for the services, awareness about segregation, haphazard disposal and burning. Followed by questions related to household participation and perception about the service provider. Questions in the survey were concerned with both the physical and governance dimensions of solid waste management.

3.8.1 Thematic analysis

Use of thematic analysis allows flexibility to researchers as it is not tied to a specific theory. It allows for rich and detailed description of the data for qualitative data. Thematic analysis is a method rather than a methodology since it is not tied to a particular epistemological or theoretical perspective (Clarke & Braun, 2013). Thematic analysis is a qualitative approach mainly described as “a method for identifying, analyzing and reporting patterns (themes) within data” (Braun & Clarke, 2006, p. 79). To extract data from the interviews, thematic analysis was carried out. It helped to identify and analyze the pattern and generate codes. Such that themes could be generated for those codes. Then finally elaborating on the themes and writing the interpretation from it. The aim of thematic analysis was to identify themes, i.e., patterns in the data that are important and use these themes to address the research questions. For example, codes, such as relationship, co-operation, collaboration, and co-operation generated from the different parts of the interviews with formal and informal waste actors helped in reaching the broader theme i.e., partnership.

Fig 18 shows the code and sub codes generated from interviews with informal waste workers, main code government support for informal waste workers is further divided into sub-codes such as health hazards and safety, education for waste workers and degrading job and these were also further sub-divided. *Fig 19* below shows the co-occurrences of the codes such as land related issues, technology in waste, private companies, and capital in waste in the inner circle appear at least one time together with other codes such as participation in SWM, community, segregation issue, degrading job etc. mentioned on the outer circle of the figure. The colors given to each code is for the visual differentiation purpose.

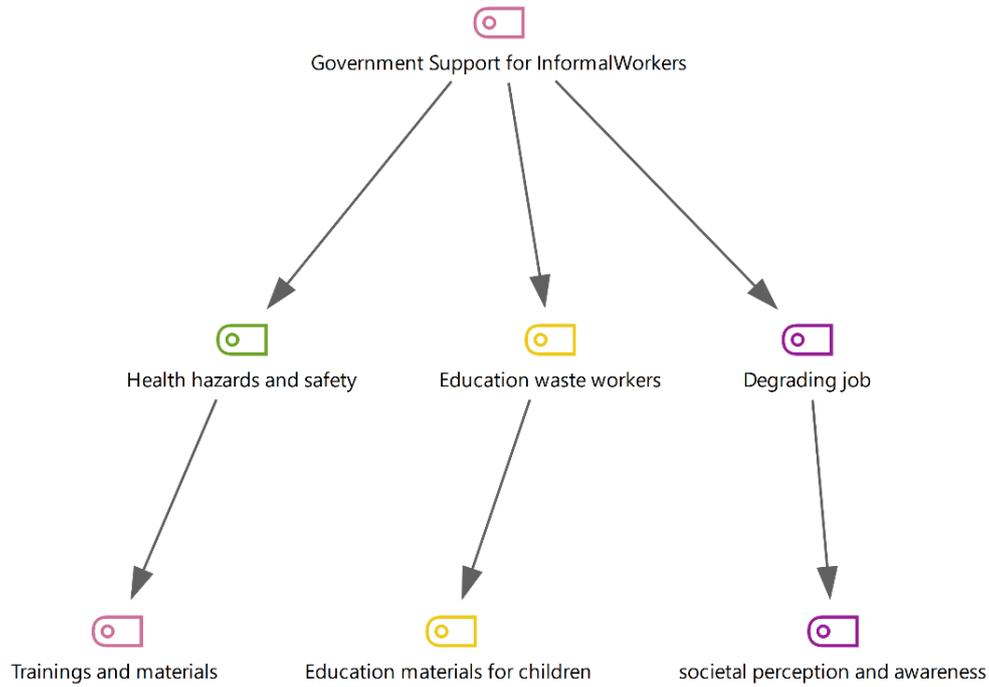


Figure 18: Example of codes and sub-codes generated using MAXQDA (Author, 2020, generated using MAXQDA)

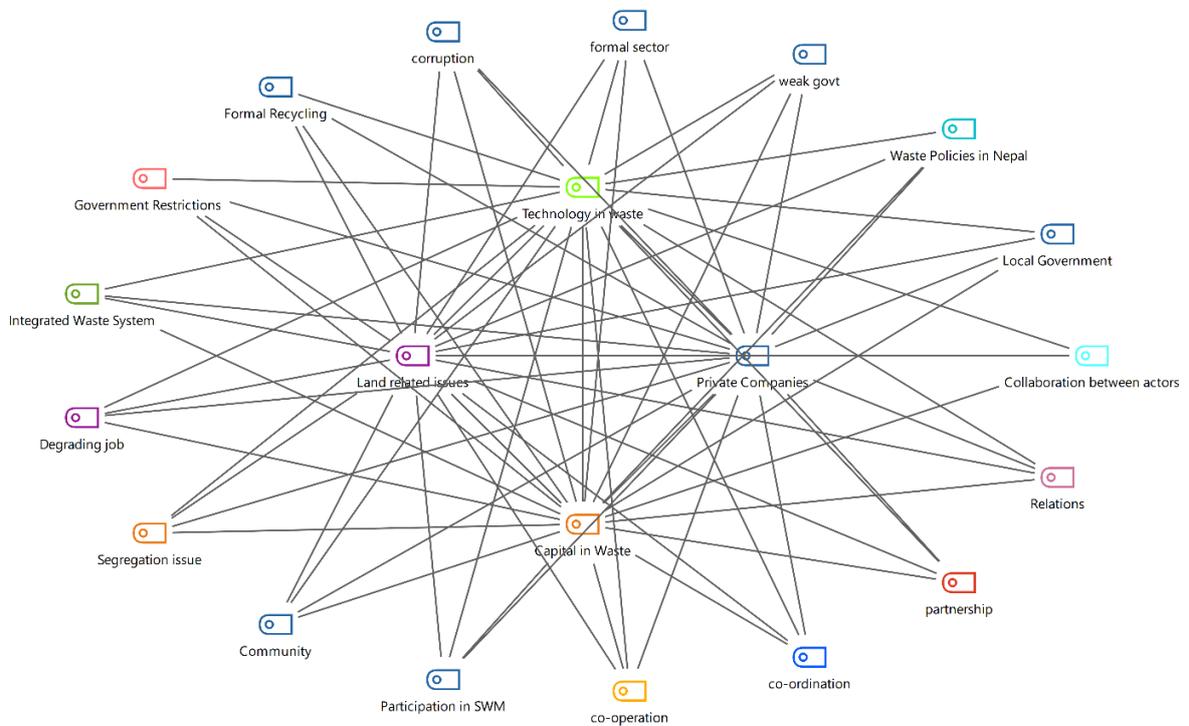


Figure 19: Code occurrences generated using MAXQDA (Author, 2020, generated using MAXQDA)

3.8.2 Content analysis

It is a systematic coding and categorizing method used to deal with large amount of textual information to discover trends and patterns of words used, their frequency, their relationships, and the structures and discourses of communication (Vaismoradi, Turunen, & Bondas, 2013). The purpose of content analysis is to explain a document's content by examining who says what, to whom, and with what effect (Bloor & Wood, 2006). Content analysis is used to analyze the textual information from the interviews and documents. Latent content of the data was given consideration when doing the interpretation. Specially to expose the meaning embedded in the text. Then to establish categories from the text that are relevant to the research issues. Thus, expanding on the categories, establishing relationships between them, and generating results. Text from the interviews and open-ended answers from the survey were analyzed using content analysis. For example, recurrences of words such as local government responsibility, partnership, public awareness, and segregation priority were counted such that what is important for which actor could be understood while answering the research questions. Also, code relations and code matrix function of MAXQDA helped in visualizing the occurrences of codes and later further elaboration of those codes were done. *Fig 20* below illustrates one such example of content analysis of an interview with an informal waste worker based at the landfill site. *Fig 21* shows the overall research design of the study.

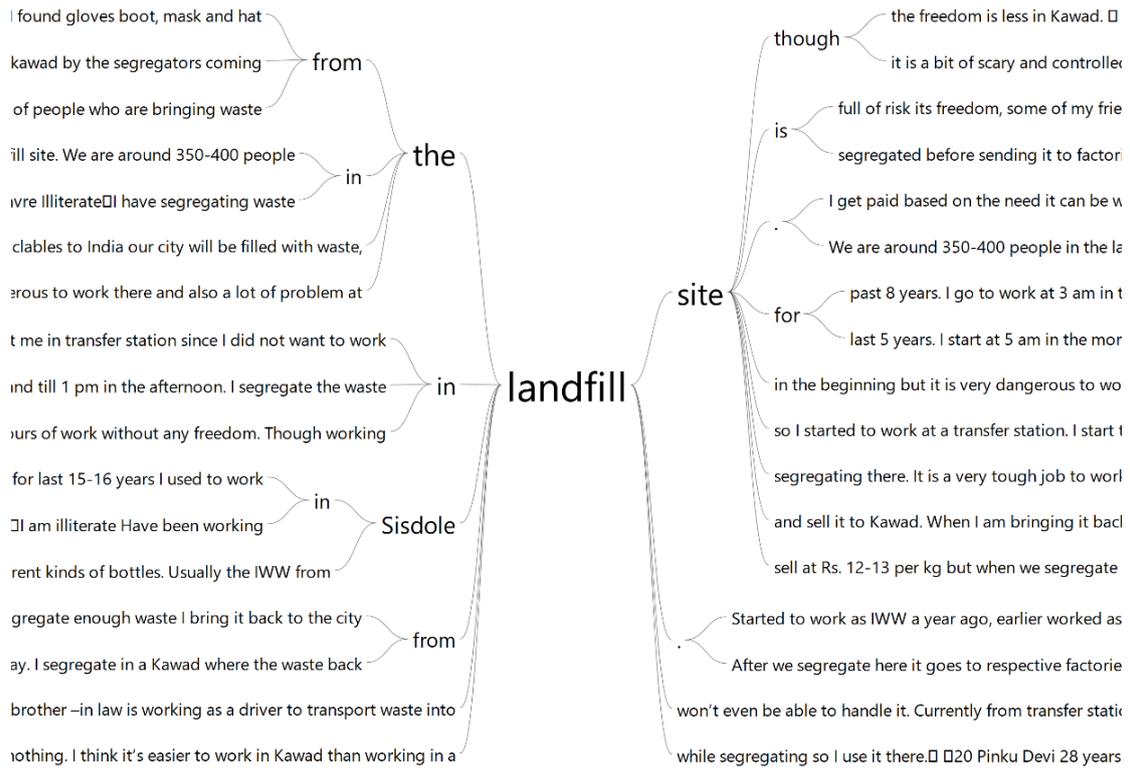


Figure 20: Interactive content analysis of an interview using MAXQDA (Author, 2020, generated using MAXQDA)

Overall research question	How does governance facilitate to understand and address solid waste management situation in Kathmandu?		
Sub-research questions	What is the current solid waste management process in the city and how does it acquaint governance?	What is the role of informal sector in solid waste management and what is their relation with other actors?	What are the existing partnerships between actors in waste and how can it contribute to address the waste concerns?
Sources of data	Formal Process/ Guidelines for Solid Waste Management Solid Waste Management Acts , Regulations, Policies, Strategy and Reports On ground solid waste management process: 68 interviews at local level both formal and informal sector actors Household survey: 182 households selected through purposive method, receiving waste services from both public and private sector		
Data Analysis	Analysis and observation of both formal and informal waste management process Document Analysis Descriptive Statistics MS-Excel Thematic and content analysis of Interview with MAXQDA	Thematic and content analysis of interviews using MAXQDA Document Analysis Descriptive Statistical analysis of household survey (MS-Excel)	Document Analysis Thematic and content analysis of interviews using MAXQDA
Conclusion, Discussion and Recommendations	Challenges and role of governance in addressing waste issues and achieving integrated solid waste management. Recommendations for inclusive solid waste governance and planning in the city.		

Figure 21: Overall research design (Own compilation)

3.9 Data Limitations

Kathmandu metropolitan in general lacked up-to-date data on solid waste, though it has been facing challenges related to waste management for more than a decade. Data deficit in Kathmandu manifested in terms of absence of map of newly formed wards of the city, waste route maps, updated data on waste quantity and quality, landfill site maps. Metropolitan and private companies used a hand drawn route as waste map to delineate the waste flow in the city. To overcome the challenge of absence of ward map, satellite data was used to create maps including the map for landfill site. A study done by Asian Development Bank in 2013 was used as a base for secondary waste data in combination with the census of Nepal.

Another major challenge in data collection was securing interviews with key respondents situated in government offices. The majority of respondents there did not respond to the email. They could only be contacted in person on the field and appointments were taken in person; even after fixed appointments, there was a waiting time. This led to investing the limited field work time to secure the interviews.

Moreover, getting in touch and ensuring an interview with informal waste worker and scrap dealers was challenging. Scrap dealers were hesitant to open up about their ways of dealing with recyclables as they feared that it was by government and meant for levying more taxes on their businesses. To overcome this scrap dealers were clarified that it will not sabotage their businesses. Furthermore, it was a challenge to secure interviews with informal waste workers as they were reluctant to provide time for talking, since that time could be used for sorting waste. Also, carrying out interviews with informal waste workers while they were segregating and cleaning the waste was demanding as the environment was harsh due to pungent waste smell and constant noise made by large waste vehicles constantly dumping waste.

Figure 22 shows informal waste workers in their work area and *figure 23* shows an interview with a waste worker in her lunch hour. In addition, logistic difficulties to reach the landfill site due to bad road conditions were further aggravated by heavy the monsoon rain. This on the other hand provided evidence to ask questions to metropolitan officials about the infrastructure situation.



Figure 22: Waste workers in transfer station busy segregating (Own photo)



Figure 23: Interview with a waste worker (Own photo)

While conducting household surveys the first challenge was to identify households that were receiving waste services from different set of service providers. To deal with this issue field supervisor of private companies and municipality were contacted through the key informants

identified beforehand. This was later elaborated through snowballing from the initial households. Mostly through the women who participated actively in the household survey (see *figure 24 and 25*) as they provided the information about active women's group in their ward. This helped in getting information about households that received waste segregation, waste composting trainings from municipality and non-government organizations. However, certain households left the survey in the middle of the conservation as they were fed up with people doing surveys and not being able to see a tangible result in their issues through research.



Figure 24: Conducting household survey in Kathmandu ward 32 (Own photo)



Figure 25: Conducting household survey in Kathmandu ward 16 (Own photo)

Some other challenges were reluctance of the government officials to provide documents of their latest plans and programs and redirecting towards other officials to find those.

Another limitation is about techniques employed in the analysis of the quantitative data which is rather simplistic and does not provide sophisticated statistical analysis of the household questionnaire data. This is mostly due to the nature of the research design which is largely qualitative in nature. Lastly, the limited amount of time for field work which was two months from the mid of July to mid-September 2019, this aspect was always considered while carrying out the data collection process.

3.10 Triangulation

Triangulation is a process that uses multiple methods or data sources in qualitative research to get a compendious understanding of the phenomenon being studied (Carter et al., 2014). Triangulation has been described as a strategy to test validity through convergence of information from different sources (Patton, 1999). In order to check the consistency of the data in the research, various data collection methods were employed. The study employed method triangulation process where it used multiple methods for data collection. The methods used were interviews, observation, household survey document analysis and observation since no

one method could fully capture all intended aspects of the study. Similarly, data source triangulation, identified by (Patton, 1999) was considered where data was collected from formal and informal sector actors, engaged at different level in solid waste management process. For example, the use of direct field observation provided with the opportunity to obtain first-hand information on the waste situation in the metropolitan. At the same time household surveys enabled to cover residents view and interviews with stakeholders in the waste sector helped to generate rich qualitative data for further analysis. Study's approach to use multiple sources of data provided the opportunity to encompass perspectives of different stakeholders like metropolitan department, private waste companies, households, informal waste workers and workers to get a more comprehensive view on solid waste situation in the fast-urbanizing city.

3.11 Ethical Considerations

Ethical considerations are present in all kinds of research. Especially in qualitative research which focuses on exploring and describing the people in their natural settings; a sense of power relationship between the researcher and the participants exist (Orb, Eisenhauer, & Wynaden, 2001). In this case, awareness from the researcher's side to stay neutral without any preconceived ideas about the participants that could hamper the process becomes essential. There are three types of problems that affect qualitative research, participant /researcher relationship, researcher's subjective interpretation of the information and the research design itself (Ramos 1989 as cited in Orb et al., 2001) all these aspects were given utter importance while carrying out the research. Researchers carrying out field work in socially oriented research should be clear about the way how they want to make the research as ethical as possible within the framework of time and finances available to them (Abed, 2015). In this study these factors were given sheer importance due to the design of the study and technical aspects in play.

As per Hay, ethical issues related to informed consent/access, privacy and avoidance of harm to participants are the ones that are to be upheld by the researcher (Hay, 2000). In the study, all participants were informed about the aim of the study and the reasons for including them in the research. Related with the matter of informed consent is access. Access to the organizations and institutions were essential to carry out the research, to do so access to the organizations were negotiated beforehand. Prior to the conduction of interviews an official letter from the research institute in Germany was provided to get approval for the interviews. Quite a few

researchers have pointed towards the importance of voluntary participation, this was also mentioned to the participants. Confidentiality and privacy of the participants were also be taken care of especially about the opinion of individuals that had political implication. Private information about the government officials were only revealed if they provide consent for it. In case of government officials privacy becomes more important due to the political scenario of Nepal where everybody is inclined to one of the political parties and their opinions about the situation might bring out their political background. Thus, for some government officials' opinion identity has been kept anonymous. While conducting the household surveys, confidentiality and anonymity of the householders was also considered. Their personal information was not disclosed to others. For all respondents, a brief introduction about the objective of the research was given. Their participation in the research was voluntary, and a consent form was signed both by the researcher and the participant/respondent at the beginning of the interview (*see annex for consent form*). In some cases, the respondents did not care about the consent form and were ready to provide their views. In cases where participants provided information that could potentially harm them, or others will be revealed in a cautious way such that it cannot be traced back to them. Nevertheless, withdrawal from the participation was possible at every stage of the interview.

3.12 Positionality and Reflexivity

It is critical to pay attention to positionality and reflexivity in order to undertake an ethical research. There have been debates on a researcher's position as an insider or outsider to the area/territory being studied as his/her position can affect the research both negatively and positively (Holmes, 2014). Positionality refers to the position the researcher has adopted within the research process and context. Positionality can be culturally ascribed like gender, race, and nationality whereas things like personal history, experiences are subjective, and context based (ibid). Whereas, reflexivity is a continual process of critical self-evaluation of researcher's positionality as well as active acknowledgement and explicit recognition that his/her position may affect the research process and outcome of the research (Berger, 2015). Reflexivity involves clear self-consciousness and self-assessment by the researcher about their views and positions and how these might have influenced the design, execution and interpretation of the research data and results (D'silva et al., 2016). In simple terms it is a process where the researchers turn back to look onto themselves, take responsibility of their situation, its effect on the settings, people being studied, questions asked, data collected and its interpretation.

As a researcher, my position of a person coming from the same cultural background may have given more willingness for the respondents to share their experiences as they could relate more to me than a person coming from the west with an entirely different background. Also, during the interviews with informal waste workers, I tried to dress the simplest without any accessories so that they feel more comfortable to involve in a conversation with me. While being a female helped to build rapport with female waste workers, though they were a bit reluctant in the beginning due to bad experiences from the past. At the same time, as a woman researcher, it took me some time to convince some male respondents holding different positions in government and private organizations. Similarly, the worldview and experience of the researcher affects the way he or she constructs the world, uses language, poses questions and scrutinizes the information gathered so that they can make meaning of it and reach to the conclusions of the study (Kacen & Chaitin, 2006). The way I have seen and experienced the solid waste management situation in Kathmandu over the years has given me my understanding of the situation there. With this in mind I could pose my questions towards my respondents, gather the responses screen them and produce the results.

4 Urban Development and History of Solid Waste Management in Nepal

“The true plight of Kathmandu was clearly described by Radmacher on her visit to Nepal during the South Asian Association of Regional Cooperation (SAARC) summit, Kathmandu Valley’s rivers Bagmati, Bishnumati, Dhobikhola, Hanumante and Tukucha continue to serve as massive sewerage system for the Valley’s population, a total lack of accountability and coordination among more than a dozen authorities that are supposed to be responsible towards rivers and environment in general fail to do so” (Rademacher, 2008).

This chapter introduces the urban development process in Nepal which has been dominated by the case study city of Kathmandu. In addition, it portrays the history of solid waste management in Kathmandu which corresponds to the history of waste management in Nepal as well. Also, legislative aspects of solid waste management in Nepal are described.

4.1 Urban Development Process in Nepal

Nepal is going through rapid urbanization. It has experienced a steady rate of population growth of 6 percent since 1970 and has gone from being 13.9 percent urbanized in 1954 to 19.7 percent in 2018 (United Nations, 2018a). Meanwhile, in 2015 it was reported that 38.3 percent of population out of total population is urban in nature making Kathmandu valley one of the fastest growing metropolitan regions in Asia (MoUD, 2017).

Urban areas in Nepal generate around 60 percent of the country's GDP where Kathmandu valley metropolitan region alone contributes to 23.4 percent of national GDP (ibid). The importance of Kathmandu metropolitan region to national economy is undeniable, though infrastructure development in urban areas of Nepal have not matched to its South Asian counterparts, mainly in terms of development of urban infrastructure like solid waste, power supply, provision of piped water and sewerage system (Muzzini & Aparicio, 2013).

Urban development in Nepal is spurred by the political instability that the country has been facing since 1996 (MoUD, 2017). Though Nepal became a democratic state in 1991, a guerilla movement raged by Maoists in 1996 that lasted till 2006 jolted its newly established democracy and toppled down its 104-year-old monarchy. Finally, in November 2006, a comprehensive peace accord was signed between the government of Nepal and rebellious Communist party of Nepal-Maoists. This brought them to the mainstream politics and laid down their arms. This peace accord paved a path for fresh democratic elections in the country, an interim constitution, power-sharing pact to run the state and a constituent assembly to draft a new constitution of the country. Due to the decade long insurgency and failure by Nepalese state to provide opportunities to its citizens led to huge influx of people to Kathmandu valley and its periphery in search of better opportunities. Key drivers contributing to the rapid urbanization of Kathmandu valley are rural-urban migration, economic centrality, socio-political factors, booming real estate market and all of these are directly linked to government policies or lack of thereof (Ishtiaque, Shrestha, & Chhetri, 2017).

Kathmandu became a metropolitan city in 1995, it has been 25 years since it has enjoyed the status of metropolitan city. Since then, population growth in the city has been unprecedented making it a hub of urban growth and development in Nepal. In *fig 26* and *fig 27* below shows the urban growth in Kathmandu metropolitan from the year 1999 to 2018. It reflects how the expansion has happened and reached the neighbouring districts.

One of the indicators of urban development, solid waste management's progression in Kathmandu is discussed in the section below.

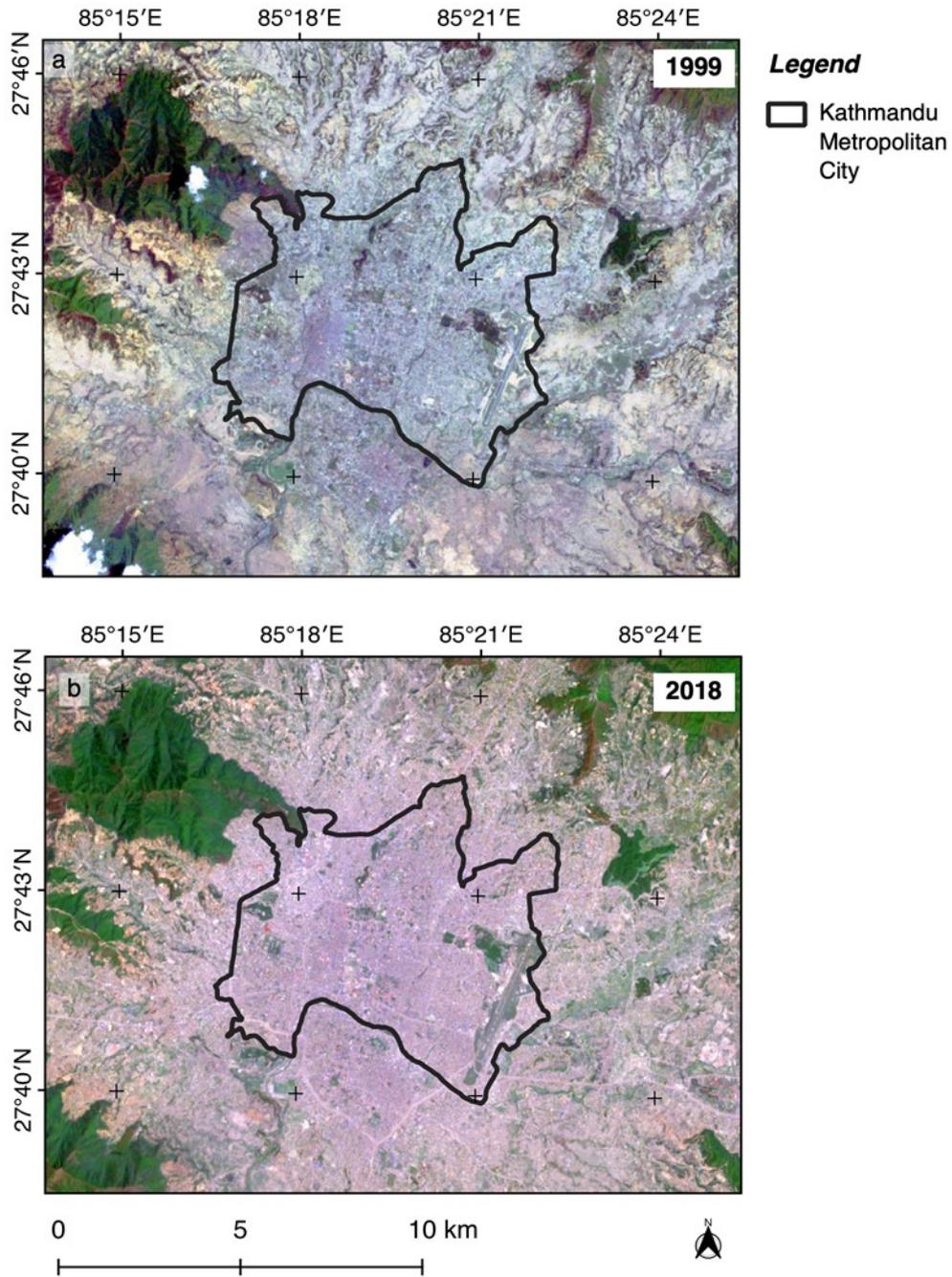


Figure 26: Satellite map of urban growth in Kathmandu metropolitan (Source: Author, 2021, Geodata contributors: Landsat-5 and Landsat -8 image courtesy of the US Geological Survey)

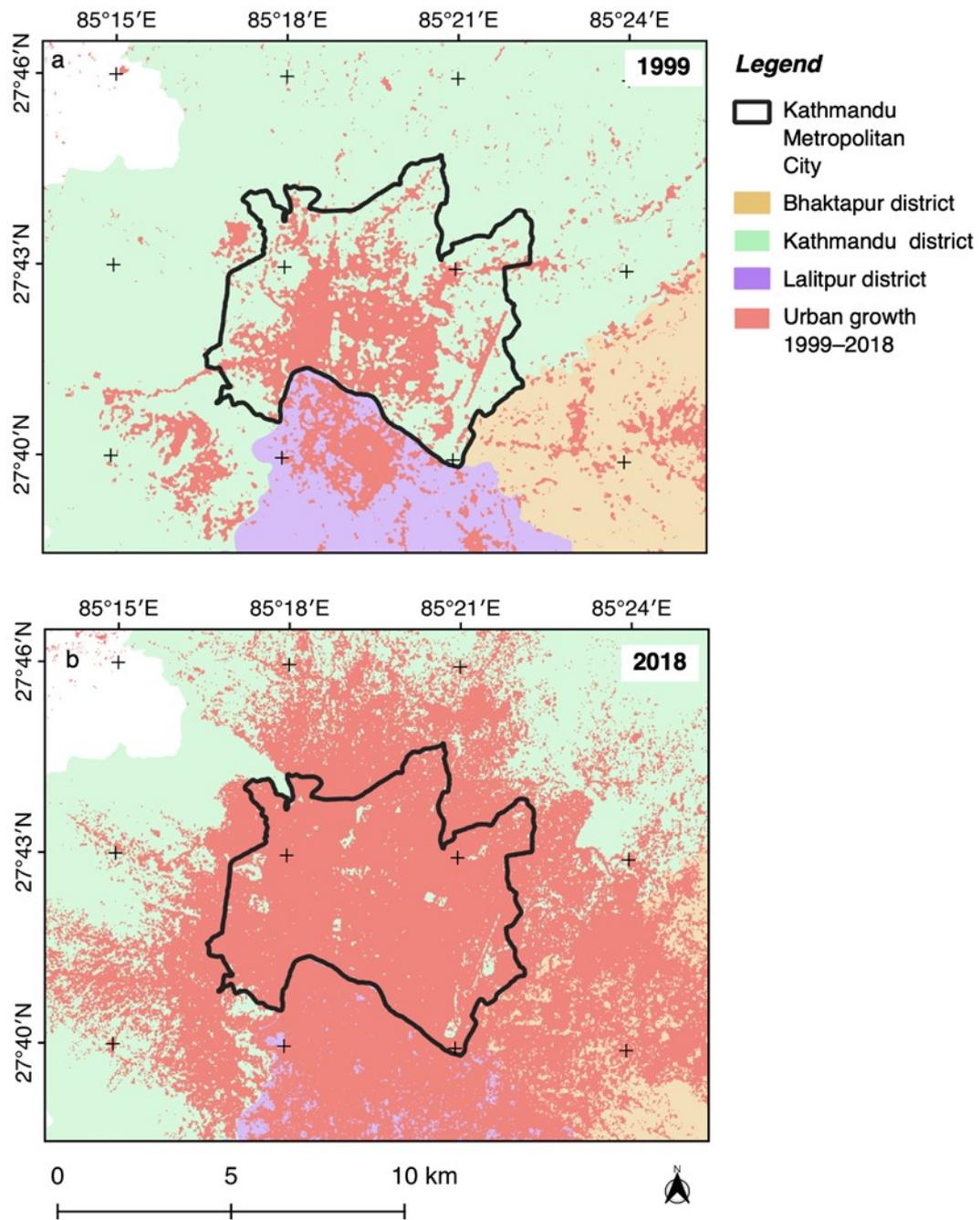


Figure 27: Urban growth in Kathmandu metropolitan from 1999-2018(Author, 2021, Geodata Open Street contributors, Landsat-5, and Landsat -8 image courtesy of the US Geological Survey)

4.2 Historical Progression of Solid Waste Management in Kathmandu

Nepal a formerly secluded Himalayan Hindu kingdom opened its border to the outside world in the 1950s. Since then, it started to do trade with other countries which marked a change in

composition of its waste from organic to more inorganic waste. This change was due to the changing habits and living standard of the population. Earlier people in the Kathmandu valley used to make manure pit “Saaga” and “Nauga” in their households to make organic fertilizer from the waste. This fertilizer they used in their agricultural land. With the shift in the composition of the waste, making organic manure became less feasible.

Since the advent of Green Revolution in Nepal in the 1960s, use of chemical fertilizers became more popular among the farmers. This created a complete halt in the process of making organic fertilizers. With the changing time migration and urbanization to Kathmandu Valley also became rapid. Now the only concern for people was to get rid of waste from their household and dispose it off anywhere. Ackermans has pointed out that this has to do with the cultural context and rural habits of throwing the waste out of the household (Ackermans, 1992). Baker adds to it, indicating that attitude towards solid waste in Kathmandu is deeply entrenched in religious, cultural and social institutions (Baker, 1997).

Traditionally waste management was considered as the responsibility of the untouchable castes. Especially women from those castes were hired by the administration to collect solid waste; they were equipped with tools like buffalo ribs and *kharpan* (traditional baskets hung on the shoulders) to collect and dump on open fields and river banks (Thapa 1985 as cited in Yoshida, 1997). But these practices were not able to keep up the pace with the growing population and increasing amount of waste. Quite a number of waste dump sites started to develop which transformed the urban settings of Kathmandu into slums hampering its beauty and causing threats to public health (Thapa 1985 as cited in Yoshida, 1997). The traditional methods of waste handling started to become inadequate and inappropriate to the changing population and industrial activities of Kathmandu, indicating a need for changes in municipal solid waste management activities (Spren, 1992; Tabasaran, 1976). It seemed there was a lack of political will and capital to deal with the waste issues. This haphazard attitude towards waste started to affect the tourism sector of the country, leading the government to focus on the problem of waste eventually (Ackermans, 1992). Then came the studies carried out by professors Flintoff in 1970 and O’Tabasaran in 1976 both from Stuttgart University. These studies led to German assistance for waste management in the form of a bilateral agreement in 1978 with government of Nepal and government of Germany such that Deutsche *Gesellschaft für Technische Zusammenarbeit* (GTZ) looked after the work. Consequently, Solid Waste Management and Resource Mobilization Committee was formed for the purpose of planning the solid waste management in Kathmandu Valley (Spren, 1992; Tabasaran, 1976).

The agreement marked a new era for solid waste management in municipalities of Kathmandu valley. Plans and policies including Solid Waste Management and Resource Mobilization Act 1988 were developed, necessary infrastructures required were built, traditional equipment were replaced by modern ones and a compost plant was established. Subsequently, a sanitary landfill site in Gokarna was established, also a system of levying service charges on the public to assure the sustainability of the project (Thapa, 1998) But after withdrawal of financial support from Germany, the project could not sustain due to number of reasons like lack of co-operation and co-ordination between the municipality and solid waste management resource mobilization center and inability to ensure the sustainability of resources (Former official SWTSC, Personal Communication, July 18, 2019). After the GTZ project came the Indian assistance followed by Japanese assistance for solid waste management in Kathmandu Valley (Dangi, Schoenberger, et al., 2015). It has been well documented that since the withdrawal of German support in 1993, SWM in Kathmandu has received support from a number of other foreign aid agencies to improve SWM (ibid).

Long before the introduction of international aid, waste was managed by the public and the municipality (Thapa, 1998).⁷ However, the assistance of foreign donor organizations into waste management without taking into consideration the public participation and municipality in Kathmandu turned detrimental in Kathmandu (Ackermans, 1992; Dangi et al., 2011; Thapa, 1998). Even today despite, years of effort and modifications in solid waste management system, the issue of efficient waste management persists. Time and again the problem of waste being piled up on the streets of the capital, uncollected for days due to the blockade by residents near the landfill site, strike of waste workers is rampant (Kathmandu Post Editorial, 2017). Government bodies responsible for SWM services have not been able to institutionalize an effective waste management system (Dangi et al., 2011). Information regarding the quantity of total municipal waste generated in the Kathmandu is ambiguous (Dangi, 2009). As the municipality records the waste collected by them from the households and other institutions terming it as Municipal Solid Waste (MSW), while the waste accumulated in inner streets, dumped in river banks, open land, waste from demolished buildings are not considered (Dangi et al., 2011).

⁷ According to Solid Waste Management Act 2011 of Nepal the responsibility to contract out and operate infrastructure for collection, disposal, and processing of solid waste, including the construction of transfer station, landfill site, processing plant, compost plant and biogas plant rests on local body. Similarly, Local Self-governance Act 1999 and Local Self-governance Regulation 2000 provides functions, duties, power, responsibilities and authorities in solid waste management, environment protection related to water resources and sanitation on local bodies.

Studies done by Asian Development Bank in 2006 show that up to 80 percent of municipal solid waste⁸ in Kathmandu is from household waste; while the study by Nippon Kei Limited and Yachiyo Engineering in 2004 reveal that household, waste contributes to 54 percent of MSW. While there has not been a general consistency about the data for total MSW, the literature shows that household waste contributes considerably to municipal waste (Asian Development Bank, 2013; Dangi, 2009). According to a relatively recent study done by Asian Development Bank in 2013, Kathmandu on average in a day generates a total of 466 tons of municipal solid waste, while 405 tons of it is collected in a daily basis (Asian Development Bank, 2013).

Whereas, cities in India like Delhi, Kolkata and Jaipur generate 5,875 tons, 2,652 tons and 906 tons of MSW per day respectively which is comparatively higher than Kathmandu (Hoornweg & Bhada-Tata, 2012). In Kathmandu, organic waste accounts for more than 64 percent of the total waste composition, plastic 15 percent and rest of it is paper, glass and others (Asian Development Bank, 2013). Still in the metropolitan's activities related to waste composting is significantly low and burning of waste is carried out in open areas (Pokhrel & Viraraghavan, 2005). Similarly, a large amount of waste is also disposed in river banks and open areas which has deteriorated the river ecosystem and affected the public health, suggesting towards an urgent need of adaptation of sustainable solid waste management in Kathmandu (Dangi, Schoenberger, et al., 2015). Looking into the past projects and their inability to deliver expected results points out that there are no policies and procedures to harness aid for appropriate solution at the local level, thus deteriorating the situation in the long run (ibid). The fact that the local actors can play a vital role in waste management has been overlooked in Nepal. Most of the waste management projects have been donor-driven as the government of Nepal have been accepting whatever is received in the aid. Rather than understanding the local need and capacity (Dangi et al., 2011; Dangi, Schoenberger, et al., 2015; Thapa, 1998). Specifically, the role played by formal and informal actors in shaping the system dealing with the constraints typical to developing country context.

⁸ Municipal Solid Waste, especially household solid waste is the focus of the study, it comprises of refuse from household and street-sweepings. Non-hazardous solid waste from industrial, commercial, and institutional establishments like schools, hospital, and market waste were not the scope of the study.

4.3 Detailed Account of Failure to Re-organize Solid Waste Management in Kathmandu

In Nepal, the municipality was first established in 1919 under the name *Safai Adda*, which literally translates to a cleaning office. It was renamed as Municipality Office in 1931 and only later in 1995 it became a metropolitan with 12 departments and 32 sections (Urban Environment Section, 2007). Under the environment department falls the solid waste management section, full organization structure is shown in *fig50*.

Traditionally waste management work was assigned by *Safai Adda* to *kuchikaars* (*sweepers*) belonging to so-called untouchables like *Podey*, *Chyame* and *Halahulu* from the larger Newar ethnic group Former head environment section KMC, personal communication, September 1, 2019. These castes were assigned the job of street sweeping and garbage collection and then dumping it to riverbanks and open spaces located in the outskirts of the city. In 1950, Kathmandu valley established three municipalities and solid waste collection and disposal became the responsibility of the municipalities. *Kuchikaars* were employed by the municipality to collect waste from streets and alleys with eventual dumping along two main Bagmati and Bishnumati rivers (Thapa, 1998). At the same time there were initiatives by public to collect and dispose waste from their area, but attention was not given to merge these efforts to institutionalize a sustainable solid waste management system in the municipality (*ibid*). This created a situation where public participation in waste management ceased. This was the first instance where the municipality could have utilized the public participation and shaped the solid waste management of the city, but it failed to do so.

A report prepared by World Health Organization (WHO) consultant Frank Flintoff in 1970 assigned to study SWM in Kathmandu described the waste situation as: “If solid waste management is considered to comprise three services, refuse collection, refuse disposal and street cleansing, then only street cleansing exists in Kathmandu” (Flintoff, 1971, p. 1).

This report was followed by German support in SWM of Kathmandu from 1978 to 1993. This project developed a SWM system in the country where technical equipment was used, and waste started to get dumped into Gokarna Landfill site (GLS) 16 km northeast of Kathmandu (Personal Communication, 2019). The project also facilitated the opening of a compost plant in Teku with a capacity of 15 metric tons, but it was closed off untimely in 1990 due to large public opposition from the area. Meanwhile, GLS also had to be closed down in 1993 due to complaints by locals.

Even after years of foreign aid for SWM project, Kathmandu had to resort back to throwing waste into riverbanks throughout the 1990s. During this period waste management in Kathmandu was largely collection and disposal to riverbanks and available open spaces. The German funded project was able to reshuffle the organizational structure for solid waste management in Kathmandu. It showed that waste can be managed using technology as opposed to the traditional methods followed in Kathmandu, but proper technology transfer did not happen, and waste went back to the rivers and streets after the project ended (Former official SWTSC, Personal Communication, July 18, 2019).

Year	Major milestones in solid waste management of Kathmandu
1950-1978	Traditional solid waste collection and disposal by so-called <i>untouchable castes</i>
1976	Study on the re-organization of waste disposal in Kathmandu valley
1978-1983	Phase I of first international support GTZ project for solid waste management
1983-1986	Phase II of SWM project, establishment of first landfill site (Gokarna Landfill Site) First compost plant in Teku
1987-1990	Phase III of the project, Introduction of tariff system in solid waste management
1990-1993	Phase IV, Handover of SWM project to Nepalese side
1990	Closure of compost plant in Teku
1993	Closure of Gokarna landfill site due to local opposition
1994-2005	Waste Dumping on the banks of Bishnumati and Bagmati river
2005- Present	Waste disposal in Sisdole landfill site in Okarpauwa village- Nuwakot district

Table 6: Chronological progression of solid waste management in Nepal, Based on (Nippon Koei Co. & Yachiyo Engineering Co., 2005) and (Former official SWMTSC, personal communication, August 6, 2019).

4.3.1 Development of new landfill site in Banachare Danda in Okharpauwa village

In 2005 with the support from JICA a new landfill site was developed to solve the immediate waste problem of Kathmandu. This new temporary site, Sisdole landfill site (SLS) was inaugurated in June 2005 on world environment day with an aim to serve the waste problem for time span of 36 months maximum (Environment Engineer KMC, personal communication, August 8, 2019). This site still serves as the only landfill site available for Kathmandu to dispose its waste, more about SLS is discussed in *Chapter 5*. A long-term landfill site was proposed for Kathmandu valley in Banachare Danda, Nuwakot district 26 km from the city and 2.5 km away from SLS. Nepal government received support from JICA to plan, design and strengthen its bodies to develop the new landfill site. The landfill site was supposed to be developed by 2008-09 and operated as a permanent landfill site for Kathmandu (Nippon Koei Co. & Yachiyo Engineering Co., 2005). Though till September 2019, during the time of field study the landfill site was still under construction. Later, when inquired during phone interviews in 2020, the site was not completed.

4.4 Timeline of Legislative aspect of Waste Management in Nepal

4.4.1 Solid waste management policies in Nepal.

Solid Waste Management policies in Nepal were not evident before the 1980s. As it was managed by the municipality by employing people and dumping it on fields and riverbanks. With the changing population density and urbanization, the issue of waste caught government's attention. This led to the provision of policy related to solid waste management in Nepal.

4.4.2 Solid Waste Management and Resource Mobilization Act, 1987

This act came into force in Kathmandu Metropolitan City, Lalitpur Metropolitan and Bhaktapur metropolitan as they were considered the most urbanized area in Nepal. This act provided a ground for the establishment of an autonomous body called Solid Waste Management and Resource Mobilization Centre (SWMRMC) for the purpose of effective management of solid waste and mobilization of resources. The act provided a structure for SWMRMC, with designated responsibilities. This act provided a clear definition of terminologies like solid waste, harmful solid waste, dumping sites, pollution, and reuse. According to Section 1.2.1.8 of the act, "solid waste means materials which are in a state of disuse, or which have been disposed of or such other materials which are declared as solid waste by the center from time

to time” (ibid). Whereas the act also talks about recycling of the collected waste by making compost fertilizer, biogas or by producing briquettes (Nepal Law Commission, 1987).

4.4.3 Solid Waste Management and Resource Mobilization Rules 1989

Solid Waste Management and Resource Mobilization Rules was enacted in 1989 by the then His Majesty’s Government of Nepal exercising the power conferred by Section 7.6 of Solid Waste Management and Resource Mobilization Act, 1987 to fulfill the objectives of the act. These rules provided detailed guidelines for SWMRMC to implement the act. The rules stated that SWMRMC will be responsible to provide SWM related services, but no guidelines and responsibilities were allocated to the local government for solid waste. At the same time, these rules also give power to the SWMRMC to involve the private sector in solid waste collection and transportation activities (Nepal Law Commission, 1989).

4.4.4 Solid Waste Management National Policy 1996

This was a national policy on solid waste that addressed the increasing urbanization, industrialization and increasing volume of solid waste in urban areas. This policy shifted its focus from solid waste management resource mobilization center to the local bodies. It was focused on the areas like increasing competency of local bodies for effective waste management. Development of appropriate technology, increasing public participation, involvement of private and social organizations were its priority areas. Sanitation and public health and privatization of solid waste management also came under its core areas (Nepal Law Commission, 1996)

4.4.5 Environment Protection Act, 1997

Only few things were different in this act such as it, emphasized on concepts like environment impact assessment, initial environmental examination, prevention and control of pollution, punishment, compensation, and environment inspector. It also re-defined the following terms in section 2 of the act “Wastes means the liquid, solid, gas, slurry, smoke, dust, radiated element or substance, or similar other materials disposed in a manner to degrade the environment.” (Section 2 H) “Disposal means the act of emission, storage, or disposal of sound, heat or wastes.” (Section 2 I). (Nepal Law Commission, 1997a).

4.4.6 Environment Protection Rules, 1997

Environment Protection Rules made a comprehensive description of Initial Environmental Assessment (IEA) and Environmental Impact Assessment (EIA) and its procedure. It elaborates further about the duties/responsibility and qualification of the environment inspector. About pollution control certificate, complaints, punishment were mentioned. The rule also describes about areas for waste storage and disposal, provision for hazardous and lethal waste (Nepal Law Commission, 1997b).

4.4.7 Local Self-Government Act, 1999

This act came as a fruit of prevalence of democracy in Nepal. It emphasized on decentralization of roles and responsibilities from central to local government. The act vested responsibilities on local bodies for solid waste management. Where wards (the smallest administrative unit) are made responsible to keep the roads, bridges, water bodies, temples, and public places clean. While the municipalities became responsible for sanitation, pollution control and solid waste management (including collection, transportation, and disposal) (Nepal Law Commission 1999).

4.4.8 Solid Waste Management Act, 2011

Solid Waste Management Act, 2011 is the latest and most comprehensive SWM law in Nepal. It provides a detailed description that local bodies are responsible for the management of solid waste. For the first time, it talks about reduction of waste at source, reuse and recycle. Sanitary landfill sites and their use for the discharge and processing of waste was also highlighted in the act. The act made provisions for the private sector and community organization's involvement in solid waste management through the acquisition of license. Other salient features of the act were establishment of Solid Waste Management Technical Support Centre (SWMTSC) for the provision of technical support to the municipality, levying service charge for waste management facilities, public private partnership, and segregation of waste at source by waste generators. While provision for punishment to the violators was also stated (Nepal Law Commission, 2011).

4.4.9 Solid Waste Management Rules, 2013

These rules further described on issues related to discharge and management of industrial, chemical, hospital and institutional waste. Provision of license to private organization, its renewal and revoke in case of violation of laws were stated. It further expanded the role and

responsibility of SWMTSC such as organizing awareness programs by mobilizing local bodies and private sector, resolve disputes between local bodies and act as a liaison between local bodies for the construction, management, operation, and closure of landfill sites. (Nepal Law Commission, 2013).

The above section tried to provide a brief overview of the development of solid waste management laws and regulations in Nepal. The way government has tried to broaden the features of its regulations with the changing political context. Where focus has shifted from just solid waste management to environmental concerns, dispersal of responsibilities to local bodies, enclosure of 3R (reduce, reuse, and recycle) principle in waste management, public private partnership, and polluter's pay principle for waste generators. This shows that in terms of policies and regulations government has tried to diversify with the changing economic, social, and political development of the country.

4.4.10 Law relevant for partnership in solid waste management

The Investment Board Act 2011 provides a provision to have an Investment Board that has authority for economic development in Nepal. The board is responsible for mobilizing and managing public private partnership, create cooperative environment, induce domestic and foreign investments to promote industrialization, create employment opportunities with an eventual aim to contribute to poverty alleviation. It stipulates the duties and responsibilities of the board. This includes, selecting priority sector or competitive sectors among investment sectors. Conduct invitation for proposals, evaluation of those proposals and negotiations with investors, monitoring the construction, implementation and execution of projects based on agreement. It also holds responsibility to coordinate with ministries, government, and local agencies for investment promotion. Additionally, making government land available or to make arrangements for acquirement of the land as per existing rules and regulations.

Similarly, Article 9 of the act, emphasizes solid waste management as a priority investment sector in Nepal. It underlines the requirement for investment in solid waste management and treatment in urban areas of Nepal (Nepal Law Commission, 2011)

This act in combination with the solid waste management act 2011, provides legal basis for partnership and private domestic and foreign investment in solid waste management and technology development in Nepal. This act was utilized by investment board of Nepal to initiate the ongoing public-private partnership (PPP) with a transnational company, more about the PPP initiative is discussed in *chapter7*.

This chapter concludes by establishing that Kathmandu has long been critical territory for the Nepali state and has been central to the matters of urban development and governance in Nepal (Rademacher, 2008).

Solid waste management in Kathmandu has been one of the first urban issues to be studied, funded, and aimed to be reformed by foreign aid. Attempts have been made by internationally funded projects together with Nepalese government to restructure the institutional and policy framework for solid waste management in Nepal. Nevertheless, Kathmandu has been struggling to establish a sustainable SWM system recognizing the changing urban demographics. The following chapters explore what is the current waste management process, why it is so and who are the actors responsible for it.

5 Understanding the Solid Waste Management Process in Kathmandu

“Solid waste management in Kathmandu is a part of a complex set of political, caste, and gender hierarchies which has resisted the technological solutions proposed and transiently implemented.” (Waltner-Toews, Kay, Kay, & Lister, 2008, p. 157).

In this chapter formal government framework for solid waste management of the city is compared to the everyday solid waste management process as it happens in the city. The formal framework is based on the national legislations and policies outlined for waste management. Everyday solid waste management process is mapped based on the household survey and the interviews. These two processes are brought together such that the waste governance reality of the city can be revealed.

5.1 Waste Management Planning in Nepal

The everyday practices of solid waste management are drawn from the field study, which constitutes household surveys and interviews with people involved in waste management of the city. With the advent of democracy and toppling down of oligarchic rule of Ranas in 1951, the power went back to Shah Kings. Then only, planned economic development was instigated in Nepal in the year 1956 A.D., when first five-year plan (1956-61) came out. But Nepal's aim to achieve development through planning was outdone till early 1990, as the country was still a monarchical power and democracy was a far cry.

But in 1991 the country got its long-awaited multiparty democracy where powers shifted from then King to democratically elected prime minister. Since then, Nepal has been a democratic state with a number of movements eventually leading to a new constitution in September 2015 making it a federal republic. Constitution of government of Nepal 2015, provides a basis for policy formulation in Nepal. Sectorial ministries develop relevant policies, regulations, and guidelines for achieving them in line with the acts. But ministries do not perform this activity. The National Planning Commission (NPC), apex government body for countrywide planning and Ministry of Finance (MOF) for administering resources, and sectorial ministries are responsible for providing budget to different sectors (*see figure 23*).

Policies directed towards waste management were non-existent in Nepal until 1990s. The government's five-year plans were not directly addressing waste management issues, though the country had disposed Solid Waste Management and Resource Mobilization Act 1987. This legal act only got reflected in policies later. Solid waste management got attention in five-year plans only from the eighth five-year plan and ninth five-year plan⁹. These plans talked about the mitigation of air, water and land pollution, waste minimization adopting appropriate technology, engagement of private sector actors and non-government organizations in municipal solid waste management. Emphasis was given to composting of waste, setting up norms and standards for waste management, its implementation and capacity building of municipalities for solid waste related issues (Health Research Council, 2002). In these plans the primary focus was on environment protection and making the local government responsible for it. In the tenth five-year plan (2002-07), the topic of landfill site construction for solid waste management of Kathmandu valley arose. It proposed to construct a long-term landfill site in Bancharedanda hill site. But for the mean time landfill site in Sisdole (current waste disposal

⁹ The eighth five-year plan lasted from (1992/97), completion of it brought ninth five-year plan (1997/02).

site) was constructed to dispose waste for 2-3 years maximum. Before this waste was being disposed in Gokarna landfill site and riverbanks of Kathmandu.

The tenth national plan was important in a sense that it brought up the issues of polluters pay principle for waste management of the city, directed towards development of programs for solid waste management and environmental protection at municipal level, also stressed the involvement of private sector for waste management of urban areas (Nepal Planning Commission, 2002).

Inability of planning in Nepal to achieve expected goals have been widely accepted. Existing literature has pointed out three of the major reasons behind this failure. Firstly, lack of political participation in planning including the dominance of technocratic model in planning. Planning has been centralized in Nepal, high dependence on foreign aid and lack of acknowledgement of ground realities are attributed to this failure (Dangi, 2009). Second point raised is the political practices in Nepal, tendency to put ruling political party's interest first and installing development work based on the interests and influences of political leaders. Development planning in Nepal suffers a top-down planning approach, lack of regional balance, high dependence on foreign aid and corruption at political and bureaucratic level (ibid). Thirdly, lack of capacity and administrative incompetence also acts as barrier to successful achievement of planning goals (Dhakal, 2007; Wildavsky, 1972, 1979). The issue is even more convoluted for urban development, where it still has to set a firm foot in terms of planning, governance, and public service delivery (Devkota, 2018).

Nevertheless, against all odds, there have been attempts to reform the planning process in Nepal. One major attempt for reform came through Local Self Governance Act 1999. This act was promulgated to provide more autonomy to local bodies, at the same time it required municipalities to encompass and strengthen traditional forms of participatory practices. It also stressed on facilitating the role of local government in public participation in local decision-making process. This act focused more on delegation than devolution, unlike the earlier attempts for decentralization. However, lack of elected leadership in local government from 2002 to 2017 in municipalities significantly hindered the urban planning process. From 2002 no local elections were held such that municipalities were governed either by centrally appointed officials or local political representatives creating a situation of lack of accountability towards the public.

Later, to make local government actors responsible for the process of planning and development and enhance their roles and responsibilities, constitution of Federal Nepal (2015) introduced a three-tier structure of government (federal, provincial, and local) (*see annex for*

detailed map of Federal Nepal) and all three levels have been entitled with constitutional power to enact laws, prepare budgets, and mobilize their resources. It had been decades since local level elections were held in Nepal, this had created a gap in local level government where administrators were functioning as elected bodies. While in 2017 local elections were held, these elections constitutionally assigned executive, judicial, and legislative powers to local bodies. Local Government Operation Act 2017 was also promulgated that provides local government with exclusive power and concurrent power. In the context of Nepal local bodies also function as service providers with direct contact to local people. Local bodies are not subordinate to provincial government but are only sub-ordinate to the constitution of Nepal.

The *fig 28* below illustrates current government structure in Nepal, a three-tier federal structure with central, state, and local level government and *fig 29*, represent institutional framework for solid waste management. *Table 7¹⁰* shows the responsibilities of different actors active in SWM and the dimension of integrated solid waste management they address. In *fig 29* below institutional framework for solid waste management in Nepal is presented. Constitution of Nepal 2015 provides government of Nepal to function under its mandate. National planning commission is the apex planning body for the government of Nepal where the prime minister is the chairman. It is responsible for formulating national periodic plans and policies, and it evaluates the resource needs for each sector, identifies sources of funding, and allocates budget for achieving the goals of periodic plans. Meanwhile, Ministry of Finance is responsible body to allocate the actual resources for each line ministry. After that, those resources are channelled to each line ministries to be distributed further to the lower levels of government.

Meanwhile, at the local level to make planning process transparent and participatory, local bodies prioritize plans and budget based on the local needs. Local level government that includes municipalities, wards, village development committees and district development committees formulate their plans and priorities and budget need through a seven-step participatory process. This is submitted to the municipal assembly for the approval, and then it finally reaches to the Ministry of Finance and planning commission for final approval.

Municipalities in Nepal come under Ministry of Federal Affairs and General Administration (MoFAGA). While Ministry of Urban Development and its department of urban development and building construction (DUDBC) is responsible for infrastructure development for solid waste and disaster waste management for the municipalities. Wards and private sector

¹⁰ Actors marked * in table 7 were out of the scope of study as they were not involved in day- to- day waste management process of the city. Solid waste management technical support centre and solid waste management council were in dissolved state.

operating at local level are linked to both (MoFAGA) and (MoUD) through their involvement in solid waste management. Meanwhile, there are a bunch of line ministries and their departments responsible for sanitation and all other kinds of waste. Ministry of Water Supply and its department of water supply and sewerage is responsible for faecal sludge and wastewater, Ministry of Forests and Environment and its department of environment is responsible for hazardous waste, e-waste, and overall pollution control. Ministry of Health and Population and its department of health services is responsible for health care waste generated by health care institutions in the country. Ministry of Industry and Commerce and its federation of industry commerce and supplies is responsible for the management of industrial waste.

As the focus of the thesis is on solid waste management, further elaboration, and discussion on government bodies responsible for solid waste management is done in upcoming sections. At urban level, municipality is the main local body responsible for the enactment of government acts, plans and policies related to waste management. A municipal area is further sub-divided into the smallest local administrative unit called wards.

With the new federal government structure, the municipality is headed by the mayor who gets elected through the local elections for a term of 5 years. Post decentralization in 1992 and enactment of Local Self Governance Act in 1999 limited fiscal power and resources utilization authorities were given to local government. With the promulgation of new constitution of Nepal in 2015 the country became a federal republic with additional decentralized powers. This made local governments in Nepal responsible to exercise legislative, executive, and limited judicial power. Schedule-8 of the constitution of Nepal 2015, includes 22 types of powers for the local levels ranging from local taxes to local level development plans and projects (Chaudhary, 2019).

These powers to local level government include formulation of town policy, management of the local services, collection of local statistics and records, formulation of local level development plans and projects, basic and secondary education, basic health, and sanitation including solid waste management, local market management, environment, and biodiversity protection (ibid). In urban areas municipality is further sub-divided into wards where there is a presence of elected local representatives for the ease of governing. Each ward has elected officials, who represent the issues of their areas and work at the grassroots level to deal with the issues. Each ward committee is elected and has a ward chairperson, a woman ward member, and three other ward members. But in reality, there were some deflections from the legal framework laid out in the constitution and realities of solid waste management in Kathmandu, discussed in sections below.

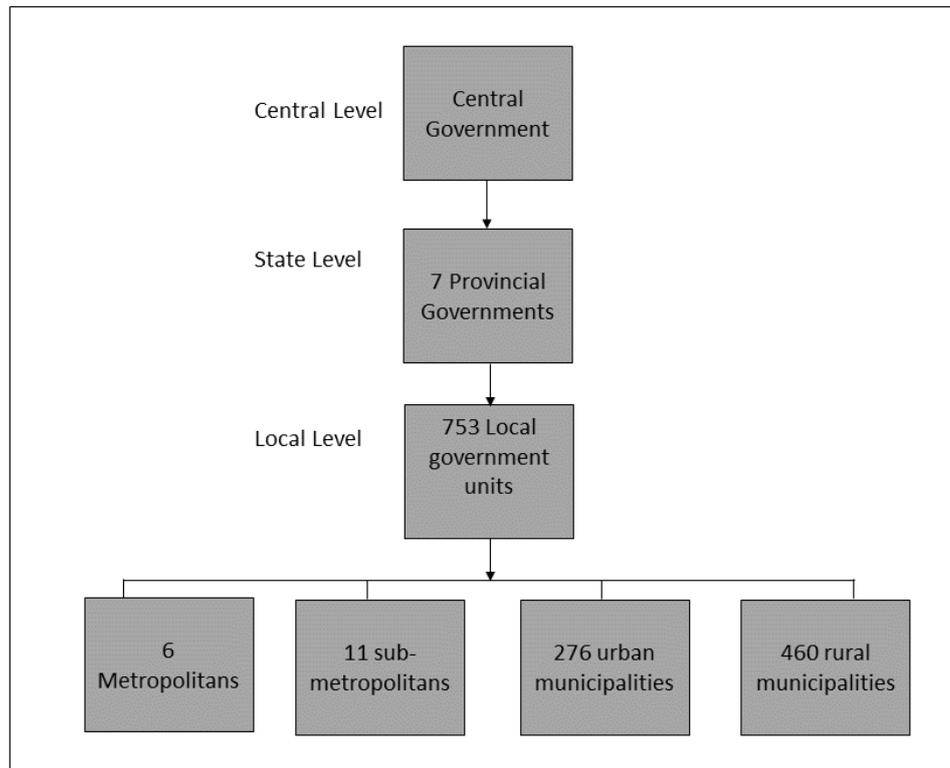


Figure 28: Current government structure in Nepal (Own compilation based on (MoUD, 2017))

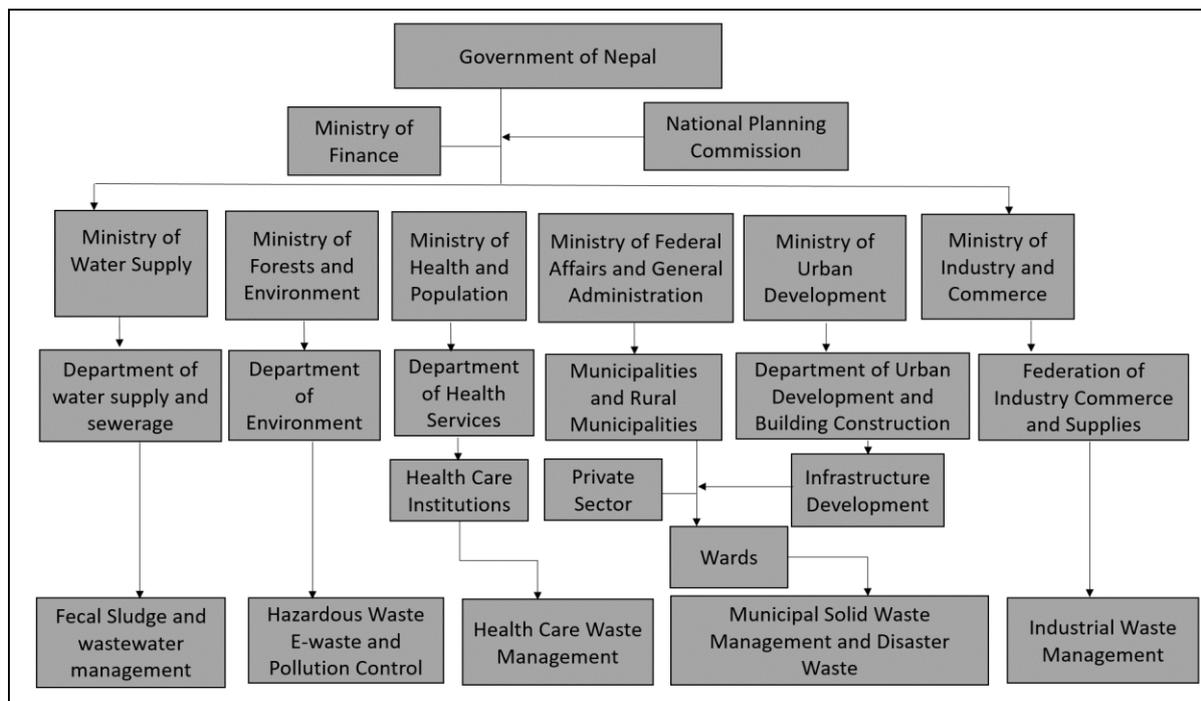


Figure 29: Institutional framework for waste management and sanitation in Nepal (Own compilation, 2019)

Actor	Level	Main Institution	Dimension of ISWM	Main Role/responsibilities
Solid Waste Management Council *	National Government –Local Government		Governance	<ul style="list-style-type: none"> Formulates the national SWM policy Facilitate funding from central and local government
Ministry of Urban Development *	National Government	Department of Urban development and Building Construction (DUDBC)	Physical	<ul style="list-style-type: none"> Construction of landfill site and necessary infrastructure for solid waste management
Solid Waste Management * Technical Support Centre	Autonomous Body		Physical /Governance	<ul style="list-style-type: none"> Extend technical assistance to the local body Make standards for waste collection, treatment, transportation and disposal
Metropolitan	Local Government (Under Ministry of Federal Affairs and General Administration)	Environment Division	Physical/Governance	<ul style="list-style-type: none"> responsible for the management of solid waste collection of waste, final disposal and processing Environment protection Co-ordinate, collaborate and give responsibilities to private sector
Wards, administrative units of the city	Local Government	32 Wards of Kathmandu metropolitan	Physical/ Governance	<ul style="list-style-type: none"> Support metropolitan in day-to-day waste collection activities
Households	Service Users		Physical /Governance	<ul style="list-style-type: none"> Segregate organic and inorganic waste Pay service charges for waste
Private Waste Management Companies	Service Providers		Physical /Governance	<ul style="list-style-type: none"> Provide waste services, treatment and processing based on municipal contract
Informal Waste Sector	Waste Pickers, Middlemen Scrap Dealers		Physical	<ul style="list-style-type: none"> Collect recyclable materials, sell it to middlemen and recycling industries
NGOs/CBOs	Profit		Physical /Governance	<ul style="list-style-type: none"> Promotion of public awareness for reduction of solid waste collaborate with local government Utilize recyclables for profit making and reduction of waste to landfills
Social Enterprises				
International Organizations *	ADB World Bank JICA GIZ		Physical/Governance	<ul style="list-style-type: none"> Enable access to external funding capacity building activities for various actors Develop and execute joint projects with local government

Table 7: Actors involved in solid waste management of KMC (Own compilation, 2019)

5.2 Decentralization, De-concentration, and Devolution in Practice?

Despite the devolution of power to local levels through the constitution and acts, local government has still not become fully effective and has been facing several problems. Still, local authorities are seeking center's order and direction to make big decisions as they are still not clear about what power they are entitled through newfound federalism in the country (Private waste management company, personal communication, September 12, 2019). Though local levels have been given enough power and authority to make necessary laws and implement them, this has not happened yet. Local government especially Kathmandu metropolitan, is facing issues like inadequate human resources especially staffs for solid waste management. This lack of staff is at the technical level as well as at the ground level. While municipality is also dealing with lack of co-ordination with the departments at ministry level (Private waste management company, personal communication, September 12, 2019). Earlier responsibility to construct the landfill site was on Solid Waste Management Technical Support Center (SWMTSC) but with the dissolution of the center, responsibility is now vested on Ministry of Urban Development (Department of Urban Development and Building

Construction) this has led to confusion on who performs what role; though municipality is responsible for the operation and maintenance of the landfill site after the construction is complete (Private waste management company, personal communication, September 12, 2019). With the changing governance structure in the country after the new constitution in 2015 and Local Governance Operation and Management Act in 2017, 22 exclusive and 15 concurrent power and responsibility were devolved to local government at rural and urban level, however the capacity of local government to practice all the given powers is debatable owing to the long political transition that the country is facing (Acharya, 2018). Local Government Operation Act 2017 has provisioned that local bodies should manage solid waste on their own. However, the Environment Department of Kathmandu Metropolitan City states that the federal government should support them in waste management. As they feel that they are not well-equipped in terms of human, financial, and technical resources to handle everything (Field Supervisor Operations Section KMC, personal communication, July 22, 2019).

Kathmandu metropolitan is administratively divided into 32 wards. These wards are the smallest unit that are directly in contact to the public. They are also responsible to deploy staffs from each ward to collect waste and sweep the streets. Each ward is provided with a fixed number of staff to work on the sanitation jobs. But due to the issue of lack of staff at municipal level wards are also facing problems. There is an inadequacy of staff at ground level as well as staff at upper level. The municipality is in a need of 700 workers for waste activities but are functioning with 450 workers. The available workers are divided into drivers, sweepers, cleaners, and helpers in municipality; in addition, 32 *Naike* lead workers each for a ward are sent from the metropolitan to support ward offices in sanitation activities, since wards are also lacking in human resources (Personal communication, July 2019, Field Supervisor Operations Section KMC). *“We at ward level need at least 30 staffs for the cleaning and sanitation work but in the current scenario we are only getting 14 staffs, out of which we have 13 staffs from the ward itself and 1 Naike is sent by the municipality to look all others”* (Ward member ward 21, Personal communication, August 26, 2019). Officials both at the municipal level and ward level pointed out that they had limited human resources to handle the amount of waste that is being generated on a daily basis in the neighborhood where they are based.

5.3 Dissolution of the Solid Waste Management Technical Support Centre

The Solid Waste Management Technical Support Centre (SWMTSC) was first established as Solid Waste Management and Resource Mobilization Centre (SWMRMC). It was developed as a national organization through a solid waste management project supported by GTZ. It was created as an autonomous body during the German assistance project period in Kathmandu such that there would be less bureaucratic hurdles while dealing with municipalities. Also, to support the municipality that was deficient in technical, human, and financial resources. But the institution was highly criticized for being highly reliant on the German project money and regarded as one of the failures of German project (Thapa, 1998; Tuladhar, 1996). Nevertheless, SWMRMC continued to provide technical assistance to the municipalities of Kathmandu. It continued its work during the Indian assistance and Japanese assistance period for waste management. In the Japanese assistance period, the center contributed as a part of technical working group (Nippon Koei Co. & Yachiyo Engineering Co., 2007, pp. 3-1).

Solid Waste Management and Resource Mobilization Act and Regulations of 1987 specified the establishment of the center. But when the Local Self-Governance Act 1999 came into practice, roles and responsibilities of the center was largely cut down. It was aimed at decentralization of role and responsibilities to municipalities. It stipulated that all responsibilities for solid waste management including collection, transportation and final disposal have been transferred over to municipalities, together with other duties and authority to protect local environment (Nippon Koei Co. & Yachiyo Engineering Co., 2005)

Later again, Solid Waste Management Act 2011 provided a legal basis for the establishment of Solid Waste Management Technical Support Centre (SWMTSC) which was directly functioning as a central government body under then Ministry of Local Development (MoLD). Major roles assigned to the center were to extend co-operation with local body for waste management and provide appropriate technical assistance to the local body. Also, capacity building of the human resources of local body for solid waste management and carry out research in solid waste management such that public can have accurate knowledge on waste management.

“There was one government body Solid Waste Management Technical Support Centre (SWMTSC) to mediate collaboration between different government bodies and also support the private companies, but the central government dissolved it. Whereas major act for waste management Solid Waste Management (SWM Act 2011), is largely based on SWMTSC. We private companies need such a central government that body again, it was a helpful coordinating body with the government. Now, to coordinate with the metropolitan we have to

do it based on personal relations, hold talks based on our own connections” (Private waste management company, personal communication, July 24, 2019).

Government decision to dissolve technical support center is believed to be based on the fact that in a federal state local government are independent to carry out its activities based on local self-governance act 2017, a central body is not needed for co-ordination. But this decision of the central government took place without reforming existing waste management act and rules. Whereas, current rules are based on technical support, coordination and mediation, mobilization of local bodies and private sector. After the dissolution of the body there is a void between the local bodies and central government. A gap in information flow between the metropolitan and central government could be seen in the delay of landfill site construction. Metropolitan’s environment section seems to be unaware about the reality of the ongoing site construction work, though they are the main body to take over and manage the landfill site after construction is done. Metropolitan’s internal report cited that *“ongoing construction work is not satisfactory, and it seems that it will not be done in assigned time”* (Environment Department 2019, p. 3). Moreover, private companies and NGOs also felt the need of a body with which they can collaborate and get support time and again, as they were actively receiving such support from the center. This reflects towards haphazard decision-making in solid waste management from the side of the government.

5.4 Existing Solid Waste Management Process in Kathmandu

For understanding the waste management realities, the thesis first takes into consideration governance aspect of integrated solid waste management, but this cannot be explained alone without considering the physical aspects of waste management. These physical aspects are concerned with waste collection, recycling, and disposal. The section below discusses the current waste management process in Kathmandu metropolitan city. Firstly, it takes into account physical and governance aspect of ISWM framework as a first step to enter the reality of solid waste management. In doing so, it then considers how waste moves in the city, waste handling practices of the waste generators and waste managers of the city. *Fig 30* below shows waste the flow in the city from the point of generation to disposal. The focus of the study is household solid waste, it is the starting point of the figure below. This waste in the city is collected using three methods namely door-to-door collection using tricycle, roadside and point-based collection and truck, and tractor visit. Then the waste is taken into the transfer station of the service provider private company or metropolitan. Some private companies do

not have a transfer station so the waste stays either in the collection vehicle itself or temporarily dumped in an open area or riverbank for segregation before hauling it back for larger transportation vehicle. At the transfer station of metropolitan there is no segregation of recyclables while at the transfer station of private companies segregation activities are carried out by informal waste workers.

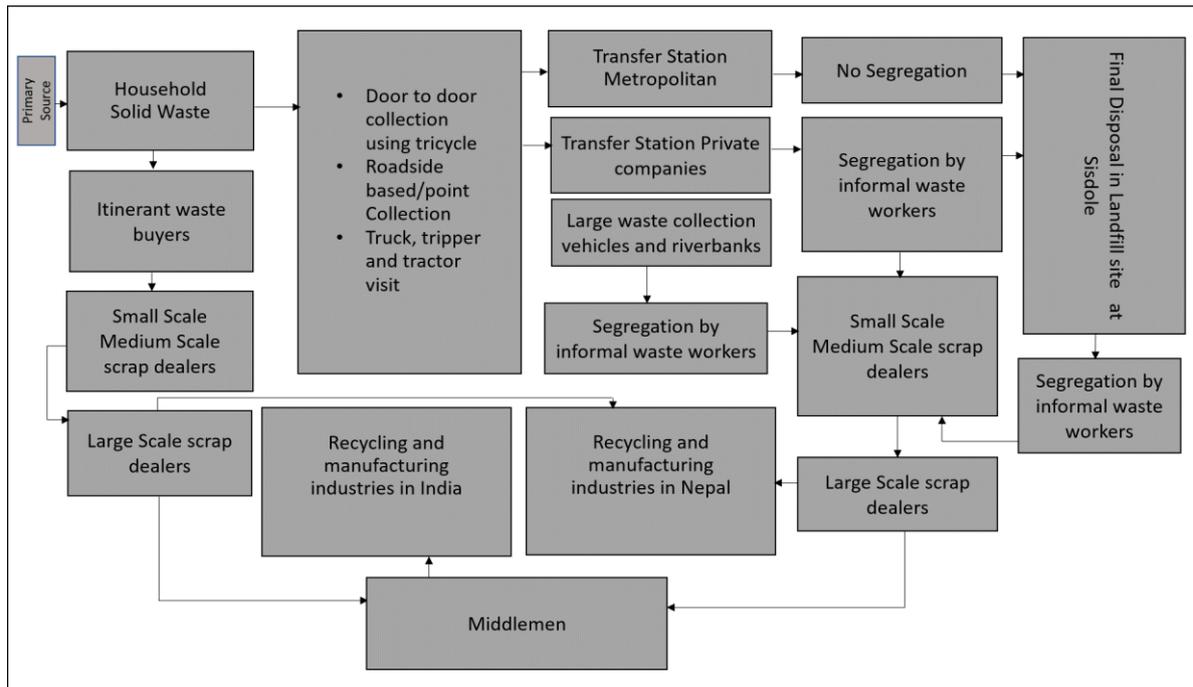


Figure 30: Current waste flow in KMC (Own compilation based on fieldwork)

After segregation and non-segregation of waste, depending on the service provider, waste goes to the landfill site situated in Sisdole. At the landfill site, waste is further segregated by informal waste workers. The recyclables segregated by waste workers are taken to the scrap dealers, small/ medium scale who then sell it to large scale dealers. These recyclables then go to the recycling industries in Nepal and India depending upon the type of recyclable. Recyclable going to India usually go through middlemen, as transportation of scrap materials is not allowed, this usually happens through illegal route.

Also, recyclables are sold by households to itinerant waste buyers which go through the scrap dealers to the recycling industries in Nepal and India. Thus, solid waste in Kathmandu flows through various channels and end up in landfill site and for recycling. Previous studies showed that solid waste collection, storage, transportation, and final disposal are a major problem in

urban cities and areas in developing countries. The major issue being limited available resources and competing priorities over those resources (Abdel-Shafy & Mansour, 2018). It is noted that composition of solid waste is influenced by the socio- economic status of the society too (ibid). While developed economies like Germany have already been able to achieve a decreased amount of residual waste through increasing the collection of organic and recyclable material separately (Dornack, 2017). Households surveyed for the study were divided into two categories one was households getting waste services from private waste management companies and another category was households receiving waste management services from the metropolitan city through environment department's solid waste management section.

Though economic status of the households was not measured in absolute economic terms through their level of income. It was clear during the interviews with the officials from the metropolitan that the households served by metropolitan are situated in the wards that are one of the oldest settlements of Kathmandu inhabited mostly by ethnic *Newar*¹¹ population of Kathmandu Valley. *"In these older settlement areas households are reluctant to pay for the waste services also private companies are not willing to enter these areas to provide services as they see they cannot make profit from these areas"* (Environment Engineer KMC, personal communication, August 8, 2019). Therefore, a disparity exists within the metropolitan in terms of payment for household waste services. At the same time if the ongoing public private partnership negotiations between the metropolitan and the private company succeeds all households in the metropolitan will be obliged to pay certain amount of monthly fees to the company for waste services (Private waste management company, personal communication, August 11, 2019). Households' willingness to pay, and current practice related to payment and government's inability to regulate the activities of private waste management companies are discussed in further chapter.

Functional elements of solid waste management system in Kathmandu metropolitan city are discussed below. These elements are put forward by integrated sustainable waste management framework, the dissertation does not strictly dwell on the physical elements of the waste system but provides a brief introduction of waste elements based on household survey and field interviews and observation. Waste elements based on integrated sustainable waste management were shown in *fig 4* in section 1.5.

¹¹ Newars are historical/ethnic communities of Kathmandu valley

5.4.1 Waste generation

Waste generated is a product of human activity. With urbanization, economic and population growth the amount of waste generated has also increased hastily. In KMC population growth has been one of the major contributors to increased amount of waste generation. However, reports say that household waste is the largest contributor to the municipal solid waste in KMC accounting for more than 60 percent of municipal waste (Asian Development Bank, 2013). A number of factors are to be considered when dealing with the amount of waste generated and its composition. Population growth, changing lifestyle, economic activities, cultural traditions and also changing season (ibid). Major contributor to municipal solid waste in Kathmandu is residential waste and non-residential waste, where residential waste is household waste and non-residential waste is institutional waste and commercial waste. A study conducted in 2005 by JICA in Kathmandu showed that organic content was 70 percent, paper 11 percent, plastic 8 percent, textiles 3 percent, wood 3 percent, rubber/ leather 3 percent and other 2 percent (Nippon Koei Co. & Yachiyo Engineering Co., 2005). While another study showed that organic matter constitutes 66 percent, plastics 12 percent, paper and paper products 9 percent, other 5 percent, glass 3 percent while metal, textiles, rubber, and leather accounts for 2 percent and less (Asian Development Bank, 2013). The high organic content in the waste stream of household waste indicates the potential for making compost out of the organic waste whereas the content of recyclables and reusable shows the prospect for resource recovery.

To understand the major contributor in household waste for the dissertation, households were asked to rank waste with numbers 1, 2, 3 and 4 for options that were as follows, organic waste, plastic waste, paper, and others. Through the household responses, it was disclosed that organic waste was the major contributor to household waste, 161 households gave number 1 for organic waste, followed by plastic and plastic materials for which 134 households gave number 2 making it the second-largest contributor and 139 households gave number 3 for paper and paper products and followed by others which were classified as glasses, metals, and clothes. Organic waste in line with the previous studies came up as the highest contributor from households that carries a large potential for composting and biogas generation for the metropolitan. Plastic waste is the second largest contributor from the household waste, which carries potential for recycle and reuse, meanwhile paper and paper products also carry same potential to be recycled and reused in Nepal.

Type of Waste	Ranking 1	Ranking 2	Ranking 3
Organic	161	15	1
Plastic	16	134	19
Paper	1	25	139
	n=178	n=174	n= 159

Table 8: Waste ranking according to households (Author, 2019)

5.4.2 Waste handling, storage, and processing

The way households or waste generators handle the waste is an essential stage of the waste management chain. It begins when the households or waste generators store their waste before collection. The choice of waste container depends on several factors like amount of waste, economic status also on the type of collection available. Waste collection practices could be waste collected from outside the house, households may have to empty the waste into the waste vehicle, and households have to empty it into a communal waste collection area/container. In the study different ways households store waste were revealed, it included use of buckets, plastic drums or old metal bins, polythene bags and sacks of jute or nylon. Among 182 households surveyed 49 percent of the households were segregating waste at household level while 51 percent of the households were not practicing segregation and mixing organic and inorganic waste together (*see fig 33*). The way households handled waste also differed, households that were segregating the waste were storing it in different containers mostly plastic buckets or metal containers, and non-segregating households were storing waste in one container or in polythene bags mixing it all. Storing waste in polythene bags was a common method of waste storage, some also used sacks of jute or nylon to store.



Figure 31: Segregated organic waste storage practice (Own photos)



Figure 32: Mixed waste storage practice of households (Own photos)

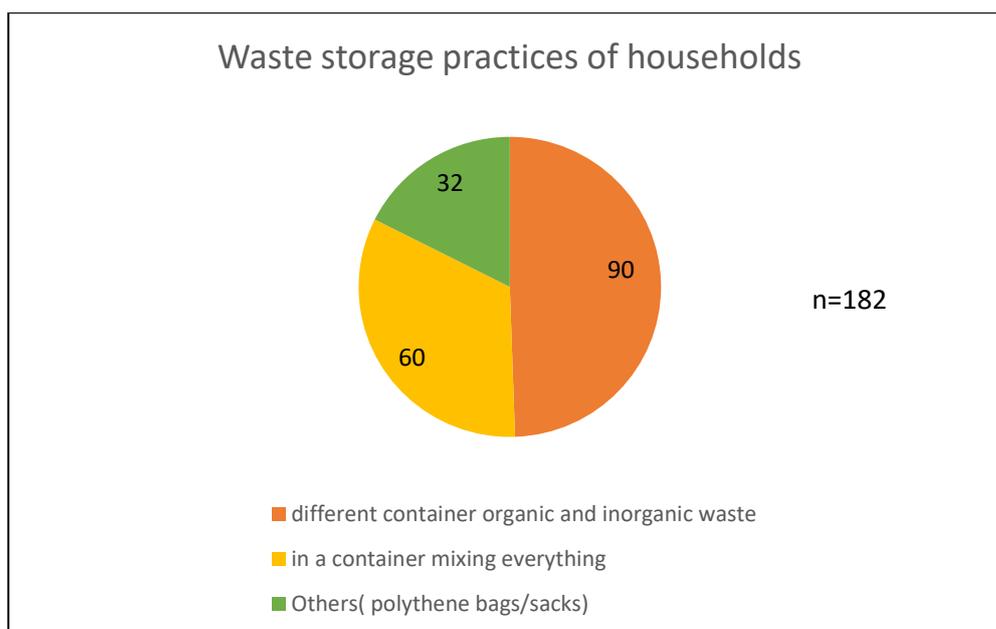


Figure 33: Waste storage practices of households (Author, 2020)

5.4.3 Waste collection

Collection is the next step in waste management after on-site storage. Primary waste collection is the collection of waste from the point/place where the producer has placed it. In Kathmandu metropolitan waste collection varied depending upon the where the households were situated. If households were situated where large vehicles were accessible, waste was kept outside each individual household or roadside and the service providers could pick it up (*see fig 35*). Whereas, if households were situated where there is no large vehicle accessibility waste is picked up using tricycle (*see fig 36*). Similarly, households also come out on the main street to dump the waste into vehicles (*see fig 34*) or dump waste into communal collection point, called *chowk* in local language. Usually, waste collection from communal collection point and dumping into waste vehicles is a common practice for households that get waste services from the metropolitan. Since, in these old settlements' roads are too narrow for large vehicles to reach. Thus, the collection practice in Kathmandu metropolitan can be divided into door-to-door collection, vehicle collection and roadside point-based collection, *fig 37* shows the common waste collection methods found out through the household survey.



Figure 34: Vehicle collection (Own photo)



Figure 35: Roadside point-based and outside individual house for door-to-door collection (Own photos)



Figure 36: Door to door collection (Own photo)

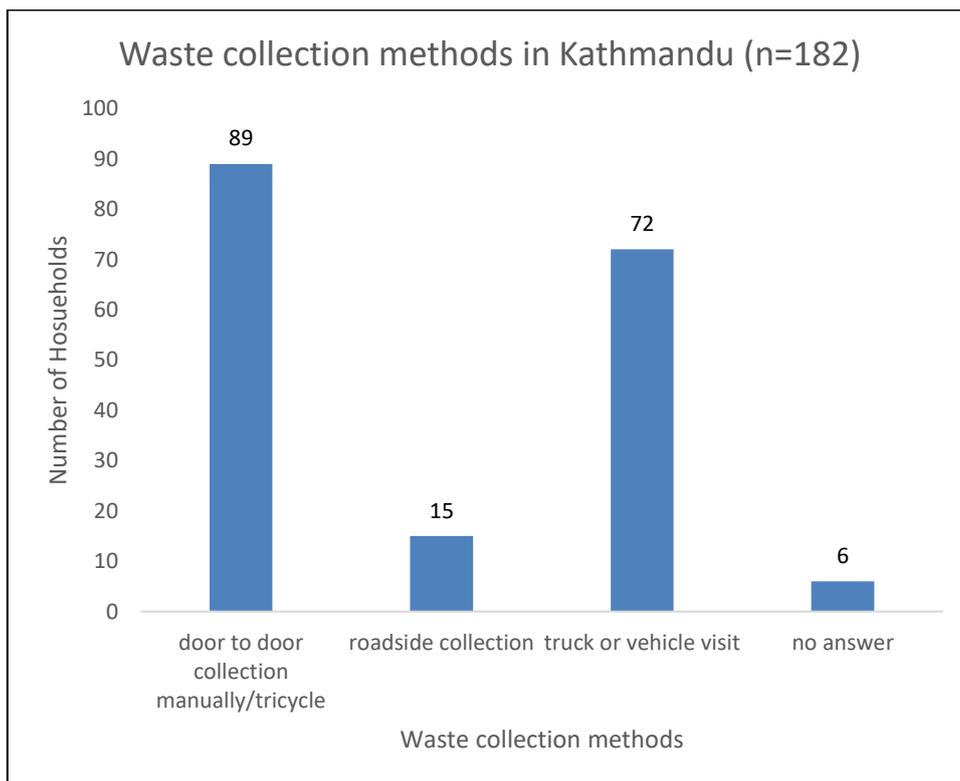


Figure 37: Waste collection methods in Kathmandu metropolitan (Author, 2019)

Secondary collection of waste is where the waste collected from households/ generators is taken from transfer stations to final disposal site. Transfer station is the station used to carry out the removal and transfer of solid waste from the collection site and the other small vehicles

to larger transport equipment. In Kathmandu metropolitan waste collected by the metropolitan city is taken to such station at Teku. Here the waste is transferred from the primary vehicle to the larger hydraulic vehicle which transports the waste to landfill site in Sisdole, situated in Nuwakot district, 28 km from the city. According to the status report by ADB in 2013, it was estimated that out of 466.14 tons of waste generated in the city 405 tons waste per day was collected giving an efficiency of 86.90 percent, but it was also mentioned that the lack of appropriate scientific data/logger system, this data could be an overestimation by the municipality (Asian Development Bank, 2013). While audit report published by MoUD in 2015 reported that there are 1100 employees including administration staffs were involved in the SWM activities, where 135 drivers were collecting and transporting waste from KMC to landfill site in 2014 (Ministry of Urban Development, 2015). During the field observation and interviews, it was found that the transportation of waste from primary collection points to transfer stations are done in trucks. The metropolitan has limited fully covered waste tractors but most of the waste vehicles/ tractors are open, and waste is transferred in these vehicles by covering it using tarpaulin. These vehicles without the cover are not the most preferred ones as there are chances of waste falling off the vehicles and causing nuisance for city residents but still, it is one of the common ways of waste transfer in the metropolitan (*see fig 38*). Absence of adequate number of fully covered waste transportation tractors and dumpers were mentioned by service providers as a reason for still using old and open waste vehicles.



Figure 38: Open waste transportation vehicle of a private company at landfill site (Own photo)

Waste collected from households are then taken to transfer stations. Waste collected by private companies is taken to their respective transfer stations, where it is segregated by the informal waste workers. Some private companies do not have a transfer station so the whole process of waste transfer and segregation takes place at an open secluded place or somewhere near a riverbank in the city, each private company has a fixed spot where they carry out this process. Segregation process is labor-intensive carried out by informal waste workers in transfer stations or in these open places. *“We have to do the segregation process as fast as possible in our transfer stations, so the waste workers are ready to segregate whenever the waste vehicles arrive, also keeping waste for longer time in the transfer station is a nuisance for the locals living nearby the transfer station”* (Informal waste worker transfer station, personal communication, July 25, 2019).

5.4.4 Transfer station

As per Solid Waste Management Act 2011, “transfer center” or transfer station means a place prescribed by the local body where the solid waste is collected before its final disposal to the sanitary landfill site. Kathmandu metropolitan city has only one transfer station situated in the southwest region of KMC covering an area of 1.5-hectare area and a capacity of 10,000 tons (Alam et al., 2008). During the field visit it was observed that the transfer station of the

metropolitan is an open area without roof, situated in the middle of a residential area (*see fig 39*). Upon inquisition it was discovered that during the design and construction of the site there was not such a dense settlement in the surrounding, however now the station is surrounded by houses, affecting the public health. Section 11 of SWM Act states that local body can have a transfer station to manage the collected solid waste. It also mentions the fact that the site should be managed taking into consideration the environment and public health.



Figure 39: Waste accumulated at the transfer station of Kathmandu Metropolitan (Own photo)

When asked about the potential problems related to foul odor and encroachment of birds like crow and vulture arising due to open nature of the transfer station to metropolitan officials. *“This transfer station was built when there wasn’t such a dense settlement, but later settlement developed around it; we do want to turn this into a closed transfer station, but we are dealing with the issue of lack of enough financial resources for this”* (Field operation supervisor KMC, personal communication, August 8, 2019).

Reports in the past have pointed towards the issue that nearby people have complained that they are suffering from health-related problems like vomiting, allergy, respiratory problem, bad odor (Ministry of Urban Development, 2015). The *figure 40* below shows the map of transfer station prepared by the JICA team in 2005.

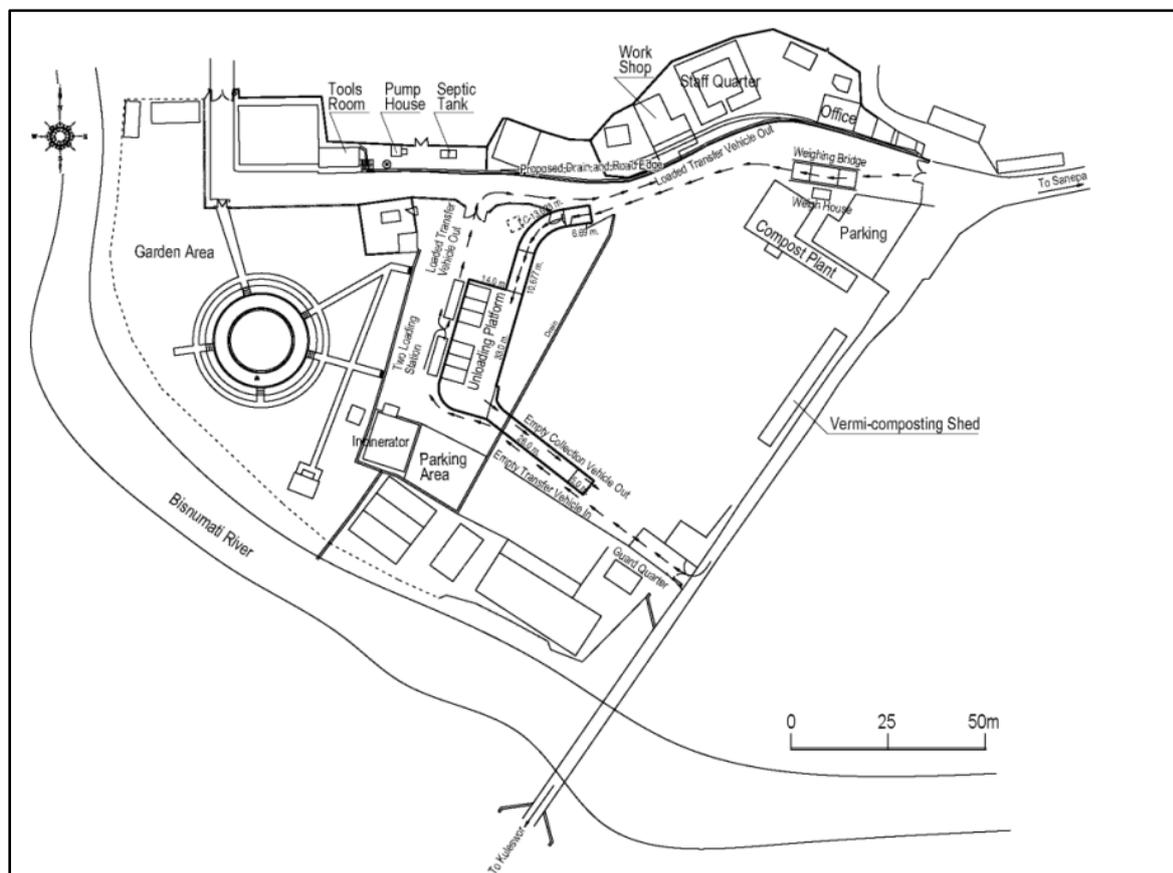


Figure 40: Map of transfer station of Kathmandu metropolitan in Teku (Nippon and Koieci, 2005)

This station was designed with facilities such as unloading platform, approach and exit ramps, weighbridge, scale house, compost plant and a garden area. However, in reality only some aspects of the design exist in the actual transfer station. Activities like incineration and compost making is not feasible in an area next to dense settlement. While metropolitan has not found any other alternative to carry out these activities such that only the basic activity of transfer of waste from smaller vehicles to larger transport vehicles is done in this station. There is no immediate waste treatment done at the transfer station. The waste collected by the collection vehicles are unloaded onto the ground and then again scooped back up again to larger vehicles using excavators to transport them to landfill site. While the transfer station itself is open top which creates a lot of trouble in rainy season especially for organic waste loading and

unloading. At the same time, the transfer station was initially designed with vermi-composting shed for segregation of different types of waste and carrying out composting of organic waste but in reality, these things are not practiced, and managerial issues have been blamed for this (Private waste management company, personal communication August 4, 2019, and Field Observation, 2019). These issues show that metropolitan is lagging to use its available infrastructure to the fullest. Also, during the visit to the transfer station, it was observed that a fleet of vehicles were standing without any use, when asked the field in-charge responsible to look after the operation and maintenance of transfer station said, *“most of these vehicles were given as donation through foreign agencies when they broke down it was difficult to get the spare parts for them, so they are just standing there without repair”* (Field operation supervisor KMC, personal communication, August 8, 2019).

This inability of KMC to use its infrastructure fully hinders its waste handling efficiency, also lack of segregation has hindered the revenue generation by using waste as a resource.

In case of private companies functioning in the metropolitan not all of them have transfer stations. Some companies use open areas by the side of the river or a secluded area in the city. Waste segregation is done by informal waste workers manually in these places. In the presence of stations waste is dislodged from the vehicles onto the ground and the whole process of segregation takes place. After the segregation process waste is scooped back into large vehicles using excavators for a final transport to landfill site.

5.4.5 Land availability for transfer stations and waste treatment facilities for private waste management companies

In the current waste management scenario of Kathmandu, transfer stations are critical for waste segregation and transfer of the waste for further transportation to landfill site. Unavailability of land to situate the transfer station has been one major issue for all the private companies included in the study. Nobody is ready to lease their land for transfer station as providing land for waste means opposition from the locals and fear of not having a future tenant, as the land was used for waste work earlier. At the same time, transfer stations cannot be situated too far away from the municipality as it increases day to day operation cost for the companies.

“One major problem that we are facing is lack of land, we cannot find land to open a transfer station, even where we have stations there is opposition from public about the bad odor. But transfer stations are important for us, as waste can be segregated there, and we can have income from it” (Chief operation officer private waste management company, personal communication, July 20, 2019).

“Land is a huge issue for waste work in Kathmandu, there is lack of land for transfer station and even to establish a compost plant. Land is already expensive on top of it when it is asked to be leased for waste, people are hesitant” (Field officer Private waste Management Company, personal communication, July 22, 2019).

Increasing land prices in the city and even in the outskirts is one major reason; reports suggest that land prices in Kathmandu valley have risen 300 percent since 2003 (UN-Habitat, 2017). Availability of land for siting transfer stations, treatment plants are specially affecting the private companies as they prefer to have those places not so far away from the municipality to reduce costs, but it has become impossible to acquire land for waste related work within the city. Transfer stations visited for the study were situated mostly on the riverbanks relatively further from dense settlement. Some private companies did not have transfer station, so they used open spaces near riverbanks or under the bridge as makeshift transfer station (*see fig 2*).

5.4.6 Waste transportation and disposal

Transportation of waste to final treatment site or disposal site is an important component of solid waste management. Though the responsibility to transport waste for final disposal site vests to municipality according to SWM Act 2011, private waste management companies also transport the collected waste to the landfill site. Lack of proper transportation vehicles is also one of the challenges faced by SWM in developing countries, as most of the vehicles used for transporting waste in these countries are outdated, improper and non-functional (Zerbock, 2003). A World Bank report on solid waste management in developing countries mentions that as much as 80 percent of the collection and transport equipment is out of service, in need of repair or maintenance (Kaza et al., 2018). Waste is transported to Sisdole landfill site which is situated 28 km away from the transfer station. Sisdole landfill site is a semi-aerobic landfill site constructed for a short-term waste disposal. It was formally opened in June 2005 and was officially closed off in September 2009. After this closure of landfill site, Aletar Landfill Site was constructed at Aletar-4 in Okharpauwa of Nuwakot for a short-term garbage dumping which was used from mid-September 2009 till mid-July 2011. But due to the opposition of locals in Aletar-4 area waste had to be diverted back to Sisdole landfill site again ((Environment Engineer KMC, personal communication, August 8, 2019).

In the current scenario, waste is being dumped at Sisdole landfill site which has already passed its mandated operation time by seven years, this is due to the lack of alternative for disposal and delay in construction of new landfill sites. While audit report published by Ministry of Urban Development in 2015 reported that there are 1100 employees including administration staffs

involved in SWM activities, where 135 drivers were collecting and transporting waste from KMC to landfill site in 2014 (Ministry of Urban Development, 2015). According to the department of environment of KMC, around 1000 tons of municipal solid waste is dumped into the landfill site daily from all the municipalities of Kathmandu Valley which include KMC too. Out of this around 400-500 tons of municipal solid waste is from Kathmandu metropolitan, making it the largest contributor of waste to the site and also the responsible metropolitan for landfill site management (Chief operation officer, private waste management company, personal communication, July 20, 2019).

5.4.7 Landfill site

Landfills stands alone as the only waste disposal method that can deal with all materials in the solid waste stream, it is also considered the simplest, and in many areas the cheapest, of disposal methods, so has historically been relied on for the majority of solid waste disposal (McDougall et al., 2001, p. 297). However, it is widely discussed that landfill should not be taken as last resort for waste disposal but as a waste treatment process. Waste disposal to landfill site is the final stage of municipal solid waste management in Kathmandu. Waste collected from Kathmandu metropolitan is finally disposed in Sissole sanitary landfill¹² site situated 28 km north of Kathmandu in Nuwakot district. The site covers a total area of 15 hectares with an actual site covering an area of 2 hectares. 13 hectares is occupied for protection and buffer zones, access and internal services roads, administration facilities and leachate treatment plant (Nippon Koei Co. and Yachiyo Co., 2005) The site consists of two landfill basins called valley I and valley II. Valley I is stretched from north to south downwards while Valley II stretched from north-west to southwest downwards. It was a pilot project constructed under the technical assistance of Japan International Cooperation Agency (JICA). It was made for short term at least 2-3 years to have a long-term landfill site constructed in a nearby area of the current site. Though Sissole landfill site is considered as a semi-aerobic sanitary landfill site which prevents the contamination of groundwater, surface water as well as soil. In reality, it does not fulfill the criteria of sanitary landfill of national standard guideline for municipality prepared by SWMTSC as the site exposes the surrounding environment to air pollution,

¹² A sanitary landfill is a land disposal site that employs the principle of spreading solid wastes in thin layers, compacting the material to the smallest possible volume, and applying cover material at the conclusion of each operating day which eliminates the smoke, odor, insect, and rodent problems (Cardenas Jr & Wang, 1980).

releasing greenhouse gases like methane and leachate¹³ contamination of nearby water source (Ministry of Urban Development, 2015). The extended use of the landfill site has created issues for the locals leading to frequent protests and roadblocks in the area (Former official SWMTSC, personal communication, July 18, 2019). The figure below shows the satellite view of Sisdole landfill site in Okharpauwa village of Nuwakot district.

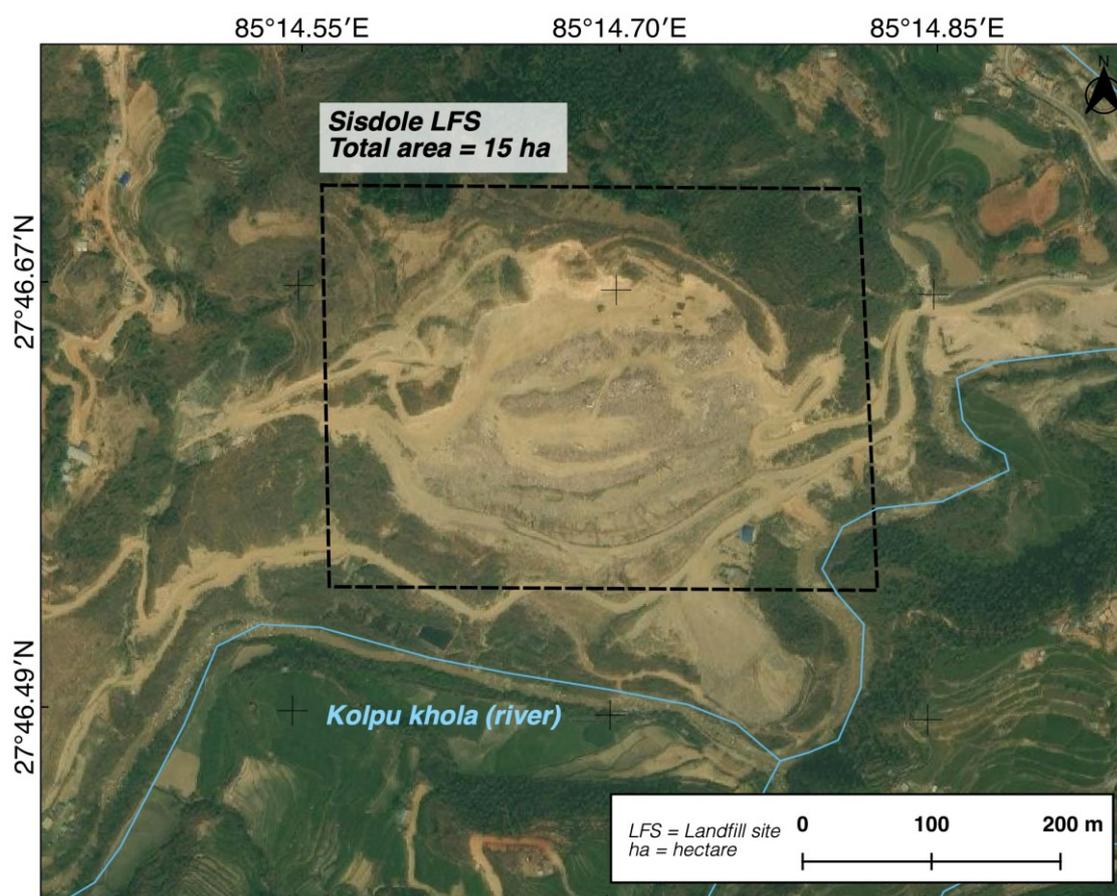


Figure 41: Satellite view of Sisdole landfill site (Geodata: Google Earth, Author, 2019)

During the field visit to the landfill site current situation of the site became more apparent. More than 100 vehicles were in line to dump waste into the landfill since 5 am in the morning. Upon inquisition, it was discovered that it was due to the ongoing rainy season, road leading to the site was blocked and finally opened when the heavy rain stopped and blockages due to landslide were removed using excavators. *“Issue like this is common, every year we have issues*

¹³ Leachate is the black liquid that contains organic and inorganic chemicals, heavy metals as well as pathogens; it can pollute the groundwater, soil and therefore poses a public health risk (Osterath, 2010).

to dump waste to landfill site due to bad road conditions that worsens further in rainy season. Also, at times, waste dumping is halted due to blockage by the locals protesting for the closure of the site and demanding for compensation” (Former official SWMTSC, personal communication, July 18, 2019).

“The highway strip connecting the city to landfill site is in bad condition, the situation worsens during rainy season. But the problem with the municipality is they are busy planning during the dry season and want to do the actual construction /maintenance work in rainy season when it is not possible to work. Then later when problem resurfaces, ministry and metropolitan blame each other for the incompetence” (Anonymous, personal communication, August 22, 2019).



Figure 42: Waste disposal vehicle at the landfill site, dry season (DokoRecyclers, 2020)



Figure 43: Waste disposal vehicle waiting at the landfill site, rainy season (Own photo)

Issue of blockage at the landfill site by locals have been a common news story in daily newspapers in Kathmandu. Some examples of the news articles dedicated to covering the issue of blockage at landfill site that were published in the year 2019 in the English daily newspaper are follows

- Irate locals obstruct garbage vehicles at Sisdole landfill site (Times, 2019)
- Kathmandu not prepared to manage its waste in monsoon (Poudel, 2019)
- The garbage pile grows (Editorial, 2019).
- Lack of efficient garbage disposal and management system spells trouble for Valley residents this monsoon (Ojha, 2019b).

During the household survey the major reason for the delay of waste collection came out as blockage at the landfill site due to locals. Out of 182 households surveyed 64 households responded that waste is not collected from their houses due to blockage at landfill site by locals, 25 households thought it is due to inefficiency of service provider, 13 responded due to strike of workers collecting waste, 28 responded to no idea and 52 to other reasons like rainy season/ landslides, lack of human resources etc.



Figure 44: Public perception about halt of waste services in the city (Author, 2019)

5.4.8 Longstanding issue of protest by locals at the landfill site

During this research, Kathmandu metropolitan and its wards were holding talks with the locals of Sisdole landfill site. For this, a thirteen-member working committee constituting the officials from metropolitan, wards representatives of the metropolitan, ward representative and locals' representative of landfill site was formed. The demands from the side of locals' representative were primarily related to government takeover of their affected land, revision of the compensation amount currently being provided, job priority for local youth, health services and facilities for the locals adversely affected by the site, farm and cattle insurance and black topping of the road in the area so that other development work can reach the area (Internal Report KMC, 2019).

In addition, issue of local politicians fueling the matter by staging protests to get personal benefits have also surfaced time and again. Also, political influence inflicted by the contractors responsible for the construction work was pointed out as a reason for the delay.

“The contractor responsible for the work is directly in contact to the ministers and prime ministers, they feed money, and they have a grip on the ministers. This gives them freedom to not listen to the ministerial departments and do the work according to their willingness. In Nepal, a culture of nobody being accountable towards each other has developed” (Anonymous, personal communication, August 16, 2019).

Strike by the locals of at the landfill site owing to reasons like foul smell, respiratory diseases in locals and illness among cattle are common but due to lack of alternatives government continues to dispose waste in the site. During the household survey, strike/blockage by locals at the site was the most common reason cited for waste not being picked up from the city (see fig 44).

5.4.9 Government attempts to deal with public opposition and failures

Over the years there have been numerous committees formed to deal with the locals' complaints and demands, but the ultimate solution to the situation has not been found yet. Legal post closure maintenance of the current landfill site considering the environmental and social criteria still remains a question till the new site is completed. Though protection of the environment and public health has been explicitly mentioned in Environment Protection Act of Nepal, 1997 "*Nobody shall create pollution in such a manner as to cause significant adverse impacts on the environment or likely to be hazardous to public health*" (Environment Protection Act of Nepal 1997, p.3). But its actual enforcement during the siting, construction and closing of the site is debatable. National environmental impact assessment (EIA) guidelines for solid waste management projects for municipalities in Nepal were finalized only in 2005 (Former official SWMTSC, personal communication, July 18, 2019). Little priority is given to EIA in solid waste management sector has been pointed out time and again. EIAs carried out for SWM sector are relatively low in quality as compared to hydropower, transmission lines and road (Bhatt & Khanal, 2010; Uprety, 2008). Also, EIA guidelines for solid waste management have been condemned for missing scientific approach prepared by inept contractors with reports poorly published, too technical in nature written in English language which is difficult to understand for locals (Dangi, Fernandez, Bom, Belbase, & Kaphle, 2015). While EIA processes in Nepal are linked to dearth of qualified personnel, low standards, public participation, using segments from previous EIA reports and submission of report after the construction of project (Uprety, 2008). Construction of Sisdole landfill site before the completion of EIA was documented by the report published by Nippon Koei Co. Ltd. and Yachiyo Engineering Co. Ltd. (Nippon Koei Co. & Yachiyo Engineering Co., 2005). During the interviews waste expert showed skepticism about the due closure of Sisdole landfill site with garden construction, beautification activities, careful collection and leachate treatment as mentioned in the earlier reports published during the construction of the site.

"Waste only becomes an issue when it becomes a crisis in the city, we have not even thought about the issue of environmental cost yet, EIA is just a formality in Nepal, environmental justice

has not materialized on ground here” (Waste Expert, personal communication, September 8, 2019). Public opposition towards infrastructure like landfill site was mentioned by the geotechnical engineer involved in the construction of current Bancharedanda Landfill site. The government had designated a 3 km area around the site as a buffer zone, however, public demand their land to be bought by the government even though it is outside the buffer zone. EIA for the site was done by a contractor, but it is being revised again through forest department of government of Nepal as there are trees in the area that need to be cut and it falls under the jurisdiction of Ministry of Forest (Phone interview, geotechnical engineer August 26, 2020).

“For the construction of landfill site, we required specific type of clay and the locals even refused to give that, government then took over the land in the area as it was its land, and we took the clay” (Phone interview geotechnical engineer landfill site, June 22, 2020).

“Environmental injustice that has been caused to the locals of Okharpauwa village around the Sissole landfill site cannot be denied, they have faced a lot in these years. EIA report is necessary to operate the landfill site, but responsible authorities do not care about it, environmental guidelines are not a concern for the metropolitan who is responsible to maintain and manage the landfill” (Anonymous, personal communication, August 6, 2019).

With EIA it is believed to have full public support so that the long-term success of the project can be achieved but in case of the current landfill site and the ongoing new landfill site construction public hostility has been a concern. EIA in the context of solid waste management in Nepal is carried out to fulfill the formality that every project should follow based on national environmental guidelines.

“Even in the new landfill site EIA is carried out by urban development department of Ministry of Urban Development, we do not have a specific environment department with all the expertise to carry out the process. We have tried to collaborate with department of forest in the EIA process. We severely lack in human resources to carry out the EIA process, there is a need for an environment department in the Ministry of Local Development, so that matters related to environment e.g., waste can be performed by qualified and trained people” (Phone interview geotechnical engineer landfill site, June 26, 2020).

The above section reflects that the issue of *not in my backyard* has been prevalent in solid waste management of Kathmandu. While local authorities’ inability to comply with environmental regulations and finding short term solutions to public demands have exacerbated the issue further over the years.

5.4.10 Construction of a long-term landfill site in Bancharedanda

The constitution of Nepal 2015 envisions an extended responsibility of local level government for the development of infrastructure for solid waste management. However, in the current scenario the local government is still dependent on government body at the central level for infrastructure development for waste. Department of Urban Development and Building Construction (DUDBC) under the Ministry of Urban Development is responsible for the construction of the sanitary landfill site for Kathmandu and its peripheral municipalities. The landfill site is situated around 2 km away from the current Sisdole landfill site. This site was designated as a long-term landfill site by the comprehensive study carried out by JICA on solid waste management for the Kathmandu valley. The study was carried out in phases in 2005 and 2007 and had laid down the foundation for the construction of Banchare Danda site, citing the responsibility for EIA and construction work on SWMTSC. As per the study the landfill site should start operation from 2009/10 and carry out operation for around 20 years with post closure maintenance from 2029/30 to 2038/39 (Nippon Koei Co. & Yachiyo Engineering Co., 2007; Nippon Koei Co. & Yachiyo Engineering Co., 2005). The *fig 45* below shows the Banchare Danda Landfill that is under construction beside the Sisdole site in Okharpauwa village of Nuwakot district.

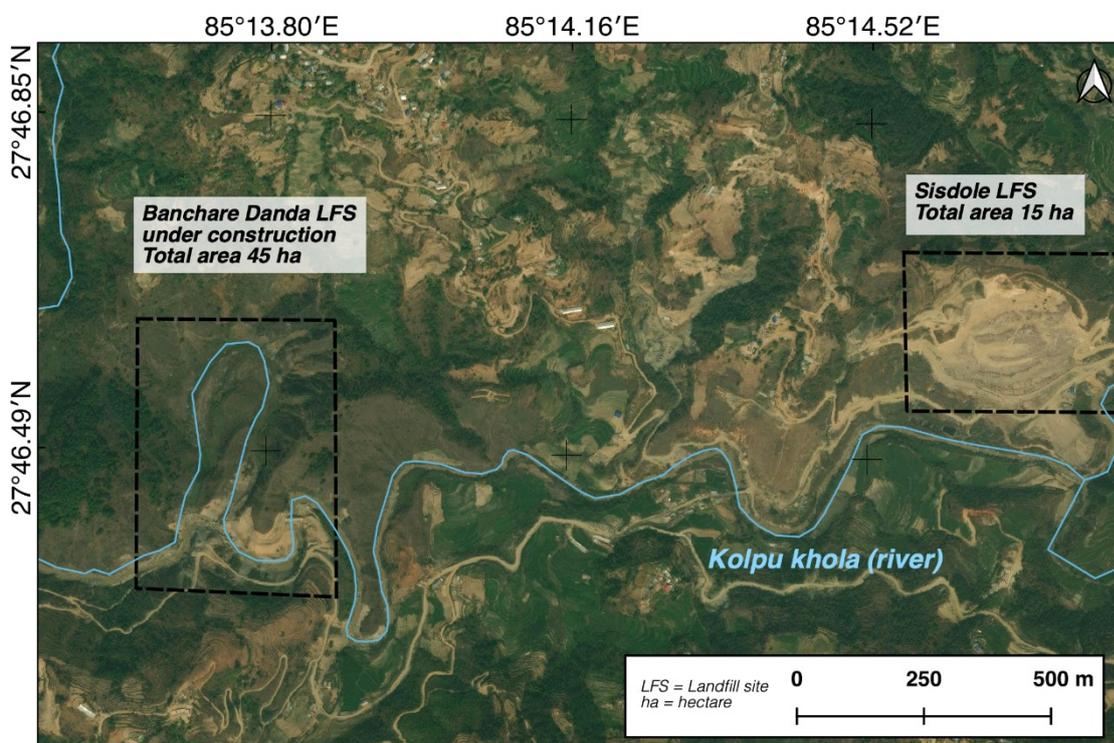


Figure 45: Banchare Danda landfill site and Sisdole landfill site (Geodata: Google Earth, Author, 2020)

With the changed government structure in Nepal the responsibility for waste infrastructure development is now vested on central government body. As the provincial and local level government bodies are still not resource efficient to carry out infrastructure development activities. While the Ministry of Urban Development contracted out the construction responsibility to an external contractor through the bidding process, and it was pointed out in the interviews that this process started later than required.

“One of the reasons for the delay in construction of landfill site is delay in providing a contract to a consulting firm that looks after the design and monitors the construction of the site. Logically, contract should be first given to the consulting firm then to a contractor but for this site it was not done in this order” (Phone interview, geotechnical engineer, August 26, 2020). There was an eight-month delay in hiring the consulting firm, while the contractor had already been given the work without any monitoring of the consulting firm. A contract was given based on the bidder with the lowest cost, there was no quality check of the materials used for the work. It was pointed out in interviews that it has increased the probability of substandard materials being used for construction. At the same time, the site was also delayed by six months due to corona lockdown in Nepal in 2020, which was confirmed through the phone interviews carried out in June 2020.

“The contractor who took over the work could not mobilize the resources and the construction process was already delayed by a year. Such that, a sub-contractor (petty contractor) was hired to do the work, but this work was also delayed. The relation between contractor and sub-contractor went sour. Eventually, the department of urban development and building construction had to intervene and put pressure on the contractor to start the work. Thus, actual work at the landfill site started around February 2020. For now, the Ministry has provided six more months for the completion of the site. If they keep working in the current phase, there is a chance for the site to be completed” (Phone Interview, geotechnical engineer landfill site, June 26, 2020). This at the same time this raises the question of quality maintenance in the construction of a semi-aerobic sanitary landfill site.

It was pointed out in that the whole landfill site is not going to be constructed in mandated time, only a part of it will be made ready for the waste disposal since Kathmandu metropolitan and its neighboring municipalities are facing crisis in lack of waste disposal site. A containment of 10 cubic meters out of the total 5,000,000 cubic meters is to be provided for temporary disposal of waste (Phone interview, geotechnical engineer landfill site, June 26, 2020).

“The current area which is about to be designated for the waste disposal within the site is Kam Chalau (just for immediate solution), it will only serve for the current crisis of the metropolitan.

We need to finish the construction of the landfill site as soon as possible, as it is already delayed by a year” (Phone interview, anonymous, June 22, 2020).

Meanwhile, it also came up during the interviews that there was a proposal to establish an organic waste treatment plant nearby the landfill site to make compost out of it and also release treated pure water from the plant for irrigation purpose. This treatment plant was not in the initial design of the site, but it was proposed later. But in the current construction of the site the treatment plant is not a priority. This looms a fear that the current landfill site will be treated as earlier sites, where the name itself is sanitary landfill but no sanitary measures are followed. All types of mixed waste get dumped into the site that contributes to reducing its life span. Segregation of the waste is essential for increasing the life span of this new site and protect the contamination of *Kholpu* River flowing downstream but with current measures in place and waste practices further river pollution seems inevitable.

Whereas Kathmandu metropolitan city, the body responsible for the operation and maintenance of landfill site still has no role to play in the construction process, but they will be handed over the site. Also, Kathmandu and its neighboring sixteen municipalities at the moment throw their waste in one landfill site, and the same will be continued in the new site; this has created an ambiguity which municipality should take the responsibility of site management and deal with public demands. Kathmandu metropolitan is currently dumping the highest amount of waste into the landfill, so it was automatically perceived that the site management and dealing with the issues that arise with locals is their responsibility. From this, it can be concluded that there are gaps in bureaucratic procedures that has led to the delay in site construction. At the same time, lack of cooperation and coordination between government bodies (Ministry of Urban Development and Municipality) is reflected in public opposition to daily operation of the landfill site.

5.4.11 Combustion and open dumping

In addition to landfill disposal, burning off the waste and open dumping are some common methods of waste management in developing countries. In Kathmandu metropolitan open burning of waste is a common way of waste management. This open burning or combustion of solid waste is practiced near the banks of rivers and on the open dumping sites.

Combustion can be a useful way to reduce the volume of waste going to landfills and to generate energy if done in a controlled way. But this rarely happens in developing countries where, getting rid of the waste is most desired. Thus, open uncontrolled burning and dumping along the riverbank and open areas are common. Though implications of this kind of

uncontrolled combustion and disposal leading to serious public health hazards and environmental pollution are discussed widespread.

During the field visit it was apparent that open burning is practiced in the city around corners and waste dumping in open areas is also common practice (see fig 46 and 47). Though there is no official data about the amount of waste that is burnt openly or dumped into rivers and open fields, the issue has been mentioned time and again in literature. Large quantities of waste can be found along the waterways of Bagmati and Bishnumati, two major rivers flowing through Kathmandu (Pokhrel & Viraraghavan, 2005). While a study carried out in 2018 correlated rampant open burning of waste to lower waste collection rate in urban areas of Kathmandu (Das, Bhave, Sapkota, & Byanju, 2018). In the household survey of 182 households when asked about how they deal with the waste when waste services are halted, 14 households responded to burning off the waste and 16 responded to dumping off the waste in open areas and fields, while 7 households responded to throwing it on the streets. Largest number of households 124 responded to waste getting piled up in their houses when waste services are halted.

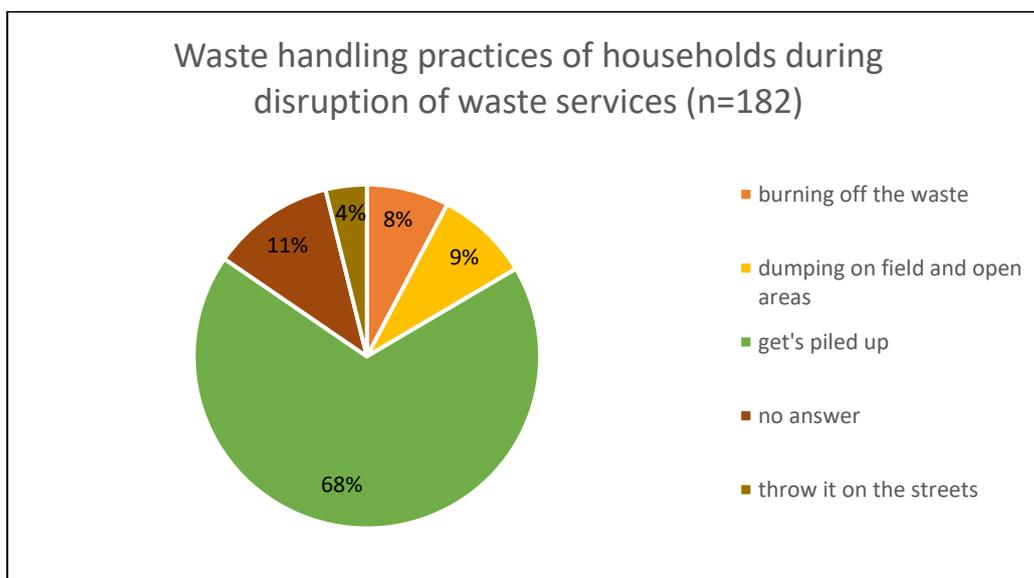


Figure 46: Waste handling practices during service disruption (Author, 2020)



Figure 47: Open dumping of waste in Kathmandu (Own photo)

5.4.12 Resource Recovery, Recycling

Tight municipal budgets and scarce resources have made municipal SWM an environmental, financial, and social burden to the municipalities in Nepal (Asian Development Bank, 2013). A way to generate revenue through waste in municipalities can be resource recovery and recycling activities. Recovery of materials from municipal solid waste (MSW) can reduce burden on available natural resources, reduce environmental risks as it decreases the amount of waste ending up in landfill and also saves the operation cost that incurs during final waste disposal (Pathak & Mainali, 2018). In addition, resource recovery and recycling done in a regulated manner can be a potential source of livelihood for urban poor in developing countries. Though the idea of sustainable solid waste management comprising resource recovery and recycling has been growing around the world, it got recently introduced in Nepal. A study carried out in Latin America and Caribbean countries showed that most of the countries have not overcome the traditional non-segregated waste collection practices, while the formal means of recycling is limited to 2 percent (Hettiarachchi, Ryu, Caucci, & Silva, 2018). Similar is the case in Kathmandu, where collection of segregated waste is still not a norm but limited to personal preference for segregation, provision of waste segregation materials and availability of incentives for segregation. In the household survey it was revealed that out of 182 households 92 households were not segregating the waste, 90 households were segregating waste.

Among the segregators, the major reason to segregate the waste was metropolitan's pilot project for household waste segregation followed by personal preference to make compost for home garden. Kathmandu metropolitan was implementing a segregated waste collection pilot project during the course of field study. In wards 12 18 and 21 segregated waste collection pilot project was being implemented by Kathmandu metropolitan city together with the respective ward offices. In the study, wards 12 and 18 were taken as study area for household survey. Further details about Kathmandu metropolitan's waste segregation pilot project are discussed in later section.

5.4.13 Composting

Traditionally composting is a common practice in Kathmandu, where a considerable amount of organic waste used to be converted into compost at household level. In earlier times making compost from organic household waste including human excreta was a common practice among Kathmandu locals to use it in their farm. These organic fertilizers were responsible to give good yield to farmers of Kathmandu. But with the advent of urbanization in the city these practices started to diminish, and inorganic waste started to become a major fraction of solid waste. During early 1980s when solid waste management of Kathmandu was carried out under GTZ project, compost was produced using aerobic technology at municipal level in Kathmandu. But the production of compost was stopped in 1991 due to public opposition, since then, utilization of organic waste has not been done at municipal level (Former head environment section KMC, personal communication, September 1, 2019). Though there exist initiatives from private waste management companies and NGOs to produce compost from organic waste. One of the oldest private waste management company in Kathmandu, NEPCEMAC operating in KMC is producing compost from the organic waste at commercial level. But the production of compost is done from organic waste collected from the municipality that lie at the outskirts of the valley, where the level of urbanization is still lower as compared to Kathmandu.

"We are collecting organic and inorganic waste in different days from Nagarjun Municipality from around 9000 households. From the organic waste collected we make the compost. The whole process of making compost is not highly profitable for us since a lot of money goes into processing activity" (Chief operation officer private waste management company, personal communication, July 20, 2019).

In the survey carried out at household level in Kathmandu metropolitan it was revealed that out of 182 households, 157 were interested to carry out mandatory segregation activities if imposed

by their service providers which could lead to composting practices at home in the future. While 19 households preferred not to carry out segregation or composting stating reasons like lack of time, busy life, and unavailability of space to do so. At the same time 4 households refuse to answer to the question and 2 households responded to having no idea what they would do if they were asked to segregate and compost organic household waste. It reveals that public is highly interested in composting the organic waste when materials are provided and made a compulsion. However, it cannot be denied that in an urban area with such high population density as Kathmandu metropolitan, success of household composting of solid waste needs to consider the issue of availability of space and alternatives like roof-top gardening for the interested households.

It was discovered during the field work that Kathmandu metropolitan had started collecting source segregated waste from three wards (12, 18, and 21) from mid-August 2019. According to the environment department head of the metropolitan, segregated waste collection in three wards is a pilot project that would be launched in the whole metropolitan after some time.

But during the field visit which coincided with the pilot project of metropolitan, things that were happening on the ground were revealed. Training about how to segregate the organic and inorganic waste were provided by the metropolitan community development division to the women's group active in targeted wards. Along with that segregation bins were provided to participating women. But when it came to collection of segregated waste from the targeted wards, there was a lack of co-ordination between the metropolitan and concerned wards.

"We were waiting to mobilize the volunteers in our ward for the collection campaign but were called by the metropolitan officials in another ward, this did not make sense since we are supposed to be present in our ward" (Ward member ward 12, Personal communication, August 26, 2019).

"Also, public is still not aware about where they can throw waste and where they cannot anymore, since large number of households throw waste in common collection points but now, they complain that they are confused" (Ward member ward 18, Personal communication, August 26, 2019).

"This issue arose because people are used to throwing their mixed waste at a collection point of another ward for example there is a huge dumping and collection point in Lagan Chowk of ward 21, so all other wards' households throw their waste there. It is hard to control this since they dump it from 8pm to 11pm when there is nobody to check and penalize. Thus, the whole process of collecting segregated waste by the metropolitan seems to have already become a failed attempt" (Ward member ward 12, Personal communication, August 26, 2019).

The above excerpt is from an interview with ward members from the wards where metropolitan is implementing a pilot source segregation project. This shows that elected official at ward level themselves lack trust on metropolitan and its capacity to succeed in its project.

Within two months of commencement of the project, daily newspapers started to publish about how the source segregation initiative of the metropolitan could not be implemented. Publications with headlines like: *“Waste segregation plan of KMC gathers dust”*, October 23, 2019; *“Kathmandu Metropolitan City once again starts waste segregation campaign”*, January 4, 2020, widely criticized this initiative for its ill preparedness.

Thus, for composting the main contributing factor is segregation at source and this has not been carried out at uniform level in all wards of the metropolitan. Both private waste management companies and metropolitan are collecting mixed waste from the households which limits the possibilities of utilizing the organic waste, leading to dumping into landfill site.

In the survey of 182 households, 109 households were served by two private waste management companies and 73 households were served by the metropolitan. Among the households served by private companies only 47 households are carrying out segregation at source which was mostly due to the personal preference of the households to make compost for their kitchen garden. Households served by private companies are not explicitly asked to segregate the waste, even when household’s segregate waste is collected all at once. Upon inquisition with private companies about the reason behind lack of focus on collecting segregated waste, major reasons given were as follows. (Compilation from personal communication, private waste management companies, September 2019)

- *“Landfilling is the cheapest option for waste management in Kathmandu, especially for us, where there is no assurance about our future in the sector, investing more infrastructure for composting is risky.”*
- *“Making a habit among public to segregate waste is a time-consuming process, we tried source segregation in one municipality near Kathmandu it took us one year to make it a habit, and we also had financial support from Japanese Embassy.”*

It was discovered from the interviews that tipping fees charged for dumping waste into the landfill is really low ranging around Rs. 250-300 per trip which roughly translates to USD 2.6 at the given market rate. These fees are based on the vehicle entry into the site, rather than on the weight/ amount of waste being dumped. This provides opportunities for companies to load the vehicles as much as possible and get rid of the waste at low cost, as compared to finding alternative solutions like diverting the large amount of organic waste

produced in the city into composting. It is beneficial for the private companies to load waste vehicles to the fullest and dispose of the waste at landfill rather than investing in diversifying ways to deal with the waste generated in the city.

5.5 Public Awareness and Attitude towards Waste, are Trainings Enough?

Public concern and awareness have acted as SWM drivers in high-income countries (Marshall & Farahbakhsh, 2013). Activities like open burning of waste, open dumping of waste including dumping into water resources are some common issues in developing countries.

In addition, public may agree for the waste management facilities but “Not in my backyard” or NIMBY attitude can direct towards a condition where they can have it located somewhere else (Schübeler et al., 1996). While public might not have proper knowledge and education about the new system and due to this lack of clarity, they can oppose it though the system itself can be fairly sustainable (Wilson, 2007). The issue of public opposing the siting of landfill and protesting against the disposal of waste even after it is constructed is not a new issue for Kathmandu. The current landfill site in Nuwakot district, 28 km north of Kathmandu was constructed to solve the immediate problem of waste disposal for Kathmandu and adjacent municipalities. But due to lack of alternatives it has been continuously used beyond its mandated time. At the same time, public opposition, and blockage of the site by locals has been a regular issue for the metropolitan.

Focus of the study is household waste, also in developing countries household waste is the major contributor to municipal waste. In Nepal, it is estimated that household waste in general contributes to about 50–75 percent of the total MSW generated (Asian Development Bank, 2013). It shows the contribution segregation of waste at household level can make in dealing with the waste issues of developing countries. Studies reveal that quantity of solid waste generated in any society is associated with the economic status of a society, revealing that quantity of waste is low in countries with low GDP (Shekdar, 2009).

While some studies show factors that contribute to waste segregation at household level include awareness and knowledge while availability of equipment and machinery to manage segregated waste plays a role in promotion of segregation at source (Guerrero et al., 2013). The investigation into household attitude and action towards waste management offered a range of interesting information and raised a range of questions worthy for further research.

In the study, questionnaires were administered among the households served by both private sector and the municipality to get views about knowledge awareness and attitudes of

householders in waste management. A total of 182 households were surveyed. A key point here is that though the survey is not statistically representative of a population of 1,003,285 of Kathmandu Metropolitan (CBS, 2012), but respondents reflected diversity in terms of their service provider, waste collection services and level of education.

Importance of public awareness, attitude and knowledge towards waste have been widely discussed in literature, especially of developing countries. Public participation, awareness and cooperation are regarded as contributors for establishing the best systems, Japan is one such example (Shekdar, 2009). Programs intended to raise public awareness and training courses for better waste practices help to raise awareness and consciousness among all stakeholders involved in waste. Households in Kathmandu are rarely given formal recognition in terms of waste management, and they do not feel part of the waste management system (Ručevska, Seager, Schoolmeester, Gjerdi, & Westerveld, 2019, p. 47).

During the field exploration, responses from 63 households pointed towards a need for public participation and awareness for the improvement in waste management system and cleanliness of the city. Similar was the response from the officials of private waste management company. *“Waste management in the city cannot be improved unless public is aware about waste management issues and the whole chain of waste management is explained to them with the importance of segregation at household level. In our country we plan our programs badly, only focusing on training and awareness; implementation of programs with a focus on monitoring and evaluation is also a must, if we want to succeed”* (Senior official private waste management company, personal communication, September 9, 2019).

This could be due to the reason that public has not been made fully informed about the benefits of segregation with full waste cycle and environmental implications of dumping mixed waste by their service providers. Most of the householders were focused on regular waste collection and timely sweeping of neighborhood. Only few householders had idea about the importance of segregated waste and its timely collection.

Meanwhile, 34 householders expressed for regularity in waste collection from their service provider with an increased importance on street sweeping could help in keeping the city clean. At the same time relatively few householders 22 of them articulated a need for basic segregation of organic and inorganic waste including a separate collection of organic and inorganic waste as essential for improving the waste management system of the city. While 11 householders suggested for imposition of strict regulations and penalty for litterbugs could be a possible option for improving the cleanliness of the neighborhood and the city as a whole. While 18 householders blamed local government for being non-competent; active and stronger

government is needed for better waste situation of the city. Though public opinion on how waste situation can be improved varied, commonly expressed concern among all of them was cleanliness of the neighborhood and the city.

An official of the largest waste management company even went on records to say *“Providing composting trainings and distributing composting bins to public became a way to spend the donor money/just to use the project money without having a clear plan for future about how to utilize organic waste in the long run. This clearly has instilled a bad habit among public that is to collect equipment at subsidized price or even for free. For example, there have been cases where people have collected segregation bins and use it to store rice, flour or even water in some cases”* (Chief operation officer private waste management company, personal communication, July 20, 2019).

“It took us over a year to change the public habit in Nagarjuna Municipality adjunct to KMC. There we had distributed segregation bins with the support from Japan Aid, and eventually, we were successful in collecting segregated organic and inorganic waste from 9000 HHs. Now we make compost from the organic waste, inorganic gets further segregated before ending up in the landfill site. This project took time but eventually, we managed. But these kinds of projects take more time in such an urban area like Kathmandu metropolitan where people are so used to buying and consuming packaged food products on a daily basis” (Chief operation officer private waste management company, personal communication, July 20, 2019).

Over the time in Kathmandu metropolitan these trainings and awareness programs seem to have just become a method to use the budget. This is carried out mostly by distributing waste segregation bins and compost bins for free or at reduced price to promote the idea of integrated solid waste management in the city. But little attention is given to follow-up about the effect of these materials and trainings on actual daily practices and changing waste habits of the public. This has made these efforts futile in the long run. On the other hand, service providers also struggle to incorporate sustainable waste practices like segregated waste collection, compost making and recovery of recyclables in their activities in long term.

At municipal level, Kathmandu metropolitan has a separate community mobilization unit within environment department that is focused on raising public awareness and promote 3R principle. The community mobilization unit has a community development officer dedicated to train and mobilize community in various awareness campaigns and activities.

In these core areas there has been a strong presence of women’s group and the municipality has been targeting these groups in awareness programs and bins distribution. There are more than fifty women’s group in these core wards of the metropolitan. Awareness and trainings

related to waste segregation, composting, vermicomposting, roof-top gardening is commonly provided to these women's group (Community development officer KMC, personal communication, August 20, 2019). At the same time, it also raises the issue that if someone is not in those women groups, there is a possibility of them being left out from these programs. In addition, household surveys revealed that these trainings are provided by private companies together with NGOs in areas served by private companies also segregation materials and composting equipment are provided to public at subsidized rate.

“Our target has always been to get women members of the community. They can bring other women members of the community for trainings, and later we mobilize them. Women are more efficient in communicating and networking within the community, this can help us in running our programs smoothly” (Community development officer KMC, personal communication, August 20, 2019). However, absence of source segregated waste collection by the private companies that were included in the study and lack of initiatives by them in KMC raises the question, whether finding an alternative to landfill site is lack of political disinterest from the local government side but also dearth of willingness to invest in long- term sustainable solutions by private companies.

Another interesting aspect that came up in the survey was that gender plays a role in household solid waste management. Women were the main respondents in the survey as they are automatically regarded as a responsible person for waste management in households. This can be related to the fact that women in Nepal have traditionally been regarded as responsible person for domestic chores and waste management at household level is one of them. Even in cases when male respondents were approached, they had to ask women of the household about the actual waste management scenario of their household. In the survey 143 respondents were female and only 39 were male in a total of 182 respondents. A percent representation of the participants is shown in the diagram below.

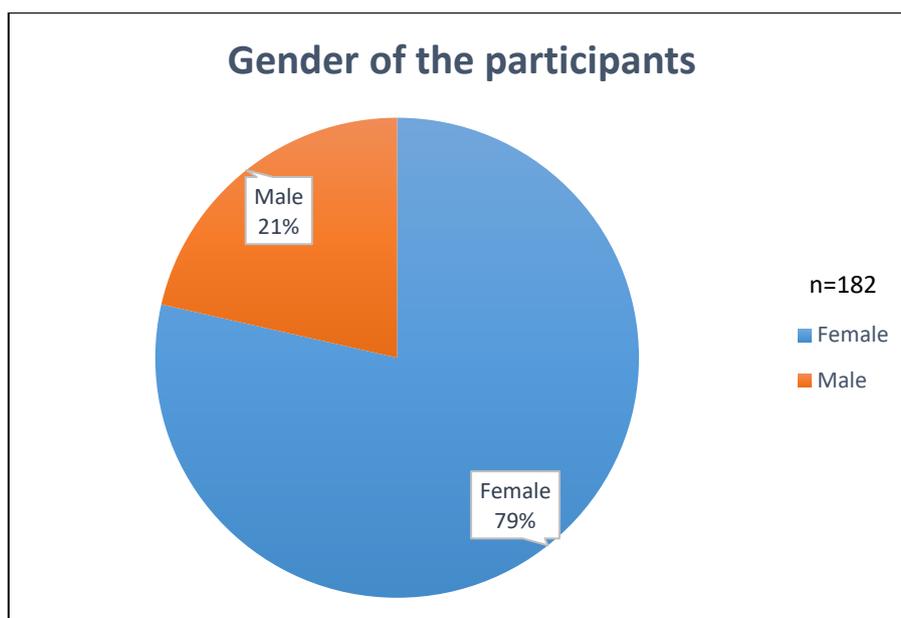


Figure 48: Gender representation of household survey participants (Author, 2019)

During the field investigation it became clear that women are the principal managers of household waste, and this has been acknowledged by the metropolitan, NGOs, and private companies. Awareness programs/ orientations and trainings related to waste segregation into organic and inorganic, compost making, and roof-top gardening are targeted and designed for women participants generally.

But the major issue with these awareness programs and trainings that was identified during the study was lack of monitoring and evaluation of trainings and campaigns. This has made it difficult to judge the success of these programs, making it just a way to use the municipal budget assigned for public awareness or the use of budget assigned for that heading.

An evaluation report published by Ministry of Urban Development in 2015 disclosed that KMC has distributed 1,500 compost bins in fiscal year 2011/12. The policy was not continued in fiscal year 2012/13 and in fiscal year 2013/14, 1,739 compost bins were distributed. During those 3 years only 3,239 compost bins were distributed which is very low as compared to the 1.12 million population of KMC. This is a vast gap between what is needed and what is given to the population (Ministry of Urban Development, 2015).

At the same time municipality over the years has been providing public with segregation bins without having a functional system that collects segregated organic and inorganic from the source. This has led to a situation where segregation activities of public have gone vain as mixed waste was collected at the end. This shows a situation where there is a lack of planning

to implement sustainable end of pipe solutions in waste management at municipal level. Municipality has carried out training and awareness programs over the past years but quality and evident differences before and after the program have not been found (Ministry of Urban Development, 2015).

The municipal program to collect segregated waste (organic and inorganic) from the households only started in mid-August 2019 during the field visit for the study.

Public satisfaction about the current waste situation and towards their service providers was assessed in the study. On a scale of 1 to 5 from very satisfied to very dissatisfied households were asked to rate their level of satisfaction towards service provider and waste situation in their area. As shown in the *fig 49* below 12 percent of the households were very satisfied, 57 percent were somewhat satisfied, 21 percent were neither satisfied nor dissatisfied, 8 percent somewhat dissatisfied, 2 percent very dissatisfied with the current service provider. 13 percent were very satisfied, 37 percent somewhat satisfied, 41 percent were neither satisfied nor dissatisfied, 6 percent somewhat dissatisfied and 3 percent were very dissatisfied with the waste situation in the area.

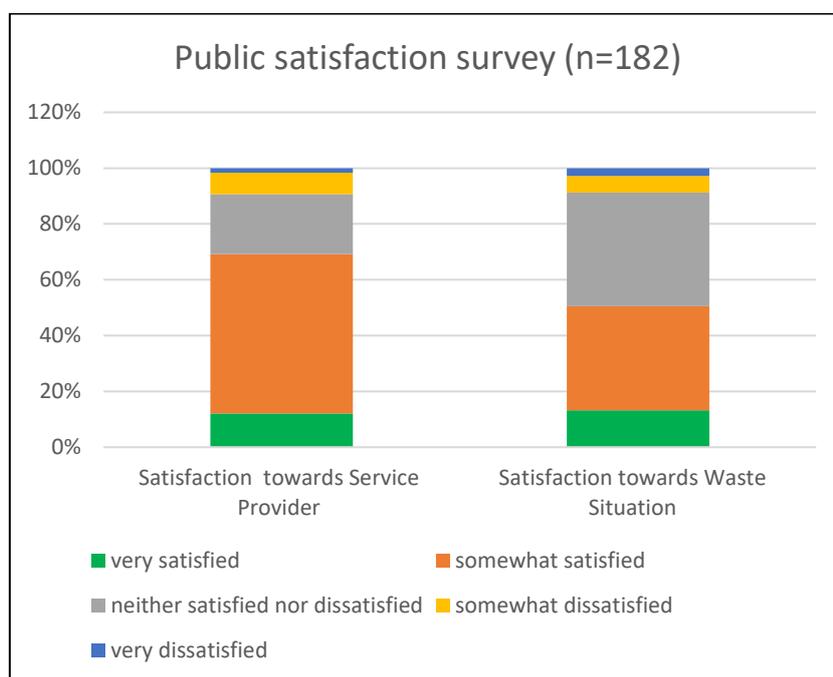


Figure 49: Household's view on waste situation and service provider (Author, 2019)

The survey revealed that the highest percentage, 57 percent of respondents were somewhat satisfied with the service provider, while minimum 2 percent of respondents were very

dissatisfied with the service provider. It was revealed that the main concern of the public was that they want waste to be removed from their vicinity and service providers were providing this service. But they had complaints related to irregular services, especially for private service providers even after the payment for services. When it came to the public satisfaction towards the waste situation in their neighbourhood, reflected through the cleanliness of the streets and timely clearance of waste from waste collection points, 41 percent were neither satisfied nor dissatisfied about the current waste situation in their area, while 13 percent were very satisfied about the current situation in their neighbourhood.

5.6 Municipal Waste Segregation Pilot Project

In August 2019, Kathmandu Metropolitan city started its initiative to collect segregated waste from households in ward 12, 18 and 21 of the metropolitan (*see fig 13*). This initiative took place at the time of field work for the study. It provided an opportunity to get insights from the municipal officials as well as public from the selected wards.

Solid Waste Management Act 2011 makes a provision for waste segregation at source along with the collection of segregated waste by service provider. In line with this main act, government of Nepal has formulated policies and agendas that promote segregation at source and promotion of 3R. In addition, the act mandates use of appropriate methods to utilize organic and inorganic waste and only use landfilling as a last resort.

The municipal pilot project to collect segregated waste in the wards where it provides waste collection service was a strategy aimed at changing public habit in those areas and eventually replicating it in other wards of the city. Metropolitan carried out awareness campaigns and segregation trainings with provision of bins to women's group of wards 12, 18, 21 and 23. Presence of women's group in these core areas of the metropolitan is a common practice where they form groups that consists of 25-50 women and give it a specific name. Through these groups, women gather for social activities, organize trainings for capacity building and even establish co-operatives for money lending. In addition, the metropolitan carried out miking with loudspeakers in those areas so that everyone could hear about the waste collection days for organic and inorganic waste.

After this awareness program, segregated waste collection started in those wards. This initiative of the metropolitan had to be done in co-ordination with the respective wards. But on the ground the reality of the pilot project was a bit different. Upon inquisition with ward officials, it came up those wards were not fully informed about the whole process, and they lacked

enough human resources in their respective wards to carry out the segregation campaign. They need at least 30 waste workers in each ward, but now they have to function with only 14 waste workers for the cleanliness of the whole ward. (Ward member ward 21, personal communication, August 26, 2019). During the field observation it was revealed that these municipal waste workers cover the inner parts of the whole ward manually and are supplied by most primitive equipment like broom, shovel, and wheelbarrow to carry out the waste collection and cleaning process

Also, there are designated places in wards where people bring in and throw their waste which is later collected by the waste workers of the metropolitan and taken to the transfer station. This practice is largely done by households where the streets are too narrow for the vehicles to enter, so the only method is to bring waste out to *chowks* (common public area).

This kind of situation creates a nuisance for segregated waste collection as anybody can come and throw mixed waste into the common area, as there is nobody to monitor and provision of CCTV camera is not in scope in those areas.

This issue was pointed by one of the ward officials too. *“There are common places where people come and dump their waste, how can we control that since anyone from another ward can also come and throw it during early morning or late night. This kind of segregated waste collection is a good initiative by the metropolitan, but I doubt the success of it. As we are already less in human resource cannot afford to use this human resource to guard around waste collection areas”* (Ward member ward 21, personal communication, August 26, 2019,).

As per the Head of environment division of the metropolitan, major division responsible for waste management of KMC; *“The main idea behind this waste segregation pilot project is to develop a waste segregation habit in public. The metropolitan has made timetable for segregated waste collection four time a week for organic waste and three time for inorganic waste, also provision of a monitoring committee is made that watches out for litterbugs in the ward and penalize them. In addition, metropolitan encourages public to make compost out of the organic waste which they can use in their kitchen garden, also municipality’s aim is to start a compost plant such that this can be sold to farmers in reduced price”* (Head environment section, personal communication, August 20, 2019).

This plan of the metropolitan looked like a noble one but when household survey was carried out in two of the wards where segregation project was being implemented, public opinion and perception towards the pilot project varied.

5.6.1 Public viewpoint on metropolitan's pilot project

Most of the respondents in the survey were skeptical about the success of metropolitan's waste segregation project, it included ones who received trainings and ones who did not as well. The major reasons pointed out by respondents was haphazardness of the project.

Most of the respondents had started to segregate the waste into two categories organic and inorganic because of this pilot project, still there were households that were not doing it. Major reason for that being skeptical towards government and its failure in the past to deliver concrete results to public. Even the households who were implementing the segregation practice were not sure that this project would go for long time and will be successful.

"I want to follow the segregation at source project but the vehicle coming to collect the waste is not waiting for me to bring out the waste and dump into the vehicle, it goes away too quick. Then I have to go and throw the waste in those common collection points where all kinds of waste are thrown in the same place. They do not have two different bins in those collection points, in my view it would be more useful to have that there" (Household Survey, August 2019). Similar views were expressed by other respondents, where their houses lie near narrow roads and large waste vehicles cannot enter, so they have to come out and dump the waste. Similar situation was reported from the adjacent Lalitpur metropolitan, where the authorities first mobilized women's group for collection of source segregated waste. However, later stages were carried out in an ad-hoc manner where waste segregated at source was mixed during collection quoting the shortage of collection vehicles in the municipality (Sharma, 2017).

Issue of distrust on local government and its programs became apparent in the household survey. This could be related to the macro-political situation of Nepal too. Over the years government has failed to deliver results from its large-scale investment water supply and hydroelectricity projects and the issue of corruption at highest level till the lowest is of public knowledge. This kind of history has created an ambience of lack of public trust on government. Some participants even voiced that this project is a way for the mayor to gain popularity among his voters

In one of the interviews, it was noted that there is a difference between what the mayor says and what is actually done in the city for waste management. Mayor only has a political advisor not a technical advisor for sensitive issues like waste management. For the most part, these projects are just started to gain popularity without proper planning and vision (Former official SMTSC, personal communication, July 18, 2019).

Even the person who is responsible to head all waste management activity in the metropolitan has no experience in environment and waste management, just got transferred to the division because of political influence. Waste is not a priority in the metropolitan unless crisis hits up. Most of the things said by the mayor with regard to waste is just “lip-service” a way to garner support or gain popularity. This pilot project for segregation can also be a way to do so (Anonymous, personal communication, September 1, 2019).

5.7 Metropolitan Capacity to deal with Solid Waste Management

Effective and efficient solid waste management requires the capacity of responsible institutions in addition to involvement of other sectors and distribution of authorities, functions and responsibilities (Schübeler et al., 1996). Kathmandu Metropolitan is the prime actor for solid waste governance in Nepal. It has already been discussed earlier that it holds the authority through local governance and solid waste management acts. But as the process of decentralization is specified by the Constitution of Nepal 2015 and Local Government Operation Act 2017 has not occurred as laid out metropolitan still looks upon ministry at state level and national planning commission for the planning process. Decentralization is still regarded as an ongoing process in Nepal (Ruszczuk, 2020) though local self-governance act was enacted in 1999 laying out roles and responsibilities of local government. In 2015 Nepal adopted a new constitution declaring Nepal as a federal republic where powers for sanitation are divided among the federal government and state government. Meanwhile, basic sanitation (waste management) responsibility is assigned to local level government (Constituent Assembly, 2015). Also, the Constitution clearly recognizes citizens’ rights to sanitation pointing out that every person shall have the right to live in a clean and healthy environment (ibid).

5.7.1 Human resources

The local government is responsible to collect taxes and address day to day functioning of the city. Its basis for solid waste management comes from Solid Waste Management Act and rules, Local Government Operation Act. But during the interviews it was emerged that it faces challenges in addressing waste management issues of the city, *figure 50 below shows the organizational structure of KMC for environment management*. Kathmandu metropolitan is headed by the mayor elected through the local elections held every five years, mayor function as the leader of the metropolitan with the highest authority in the metropolitan. It is followed

by the deputy mayor then by the chief executive officer, which is an administrative position, responsible for executing mayor's decisions. Under the chief executive officer there are 6 departments 15 divisions and 33 sections. The environment management department is responsible for managing solid waste and environment of the city. It has 4 sections namely solid waste section, landfill management section, parks and greenery promotion section and mechanical section. Meanwhile environment management department has 2 divisions environment division and environment administration division. Under the environment division are the four sections. Solid waste management section is responsible for planning and monitoring day-to-day waste activities in the city, mobilization of the community, Landfill management section is for the landfill and transfer station management, mechanical section for the procurement of equipment and parks and greenery section for the maintenance of urban environment. While environment administration division is related to the administrative part, largely for the daily mobilization of field level staff for waste management and city cleaning. During the study, Kathmandu metropolitan environment department, responsible for SWM of the city had appointed a new head/ director. As the person under which all environment related activities of the city are carried out, it is usually preferred to have someone with the background in environment studies and working experience. But it emerged that the new director has had no previous experience of working in environment related issues including solid waste. The new head of the department had plans to carry out clean city campaign, greenery, and island park construction but activities were criticized for being a way to gain popularity and use up the financial resources but not focused on solving the core waste management issues of the city (Anonymous, personal communication, September 1, 2019).

“In Nepal there is a culture of transferring government employees based on their affiliation to the political party in power. Employees close to the ruling party gets better positions there is no evaluation of the work, qualification and experience” (Anonymous, personal communication, September 6, 2019).

The municipality also has an environmental engineer to look after the issues related to safe waste handling and disposal, including the management of landfill site according to environmental standards. However, it emerged from the interviews and field observation that the landfill management is not based on the environment regulations rather done by municipal waste vehicle drivers based on their understanding (Anonymous, personal communication, September 1, 2019, and Field observation, September 10, 2019).

Similarly, the bio-methanation plant (*see annex*) that was installed in the metropolitan with the support from European Union is currently not in a full working condition (Field Observation,

August 20, 2019). The plant was inaugurated in June 2017 amid a grand ceremony with an aim to produce 14 KW of electricity, 300 kg of compost and 500 liters processed water every day from three tons of organic waste. The project was a joint investment of NRs.18.2 million¹⁴ of Kathmandu metropolitan and European Union (Post, 2017 accessed January 2019 from <https://kathmandupost.com/valley/2017/06/28/kmcs-bioplant-in-teku-starts-producing-fuel>). Currently, the plant is not functioning largely due to the lack of trained personnel to operate the plant. Presently, a municipal driver and municipal sweepers are operating it. The engineer who was responsible for operation of the plant came during the installation period and left after few months of installation. Currently, there is no technically sound person appointed by the metropolitan to operate the methanation plant. The plant was operated by the municipal driver who learned the basics of operation from the engineer during the installation. But since they are not fully trained with the details of the handling process, there have been technical issues with the plant halting the electricity and compost production during the field study as well. (Field operation supervisor KMC, personal communication, August 8, 2019)

“The plant is operated by municipal workers who are responsible for sweeping and driving the municipal vehicle. The organic waste that needs to be fed to the machine has to be minutely checked without any traces of inorganic content, there have been issues where human hair mixed in organic waste has blocked the machine, once it stops working then again, and a time-consuming administrative process to repair the machinery starts” (Anonymous, personal communication August 20, 2019).

¹⁴ 1 USD =118 Nepali Rupees (NRs) at the time of the study

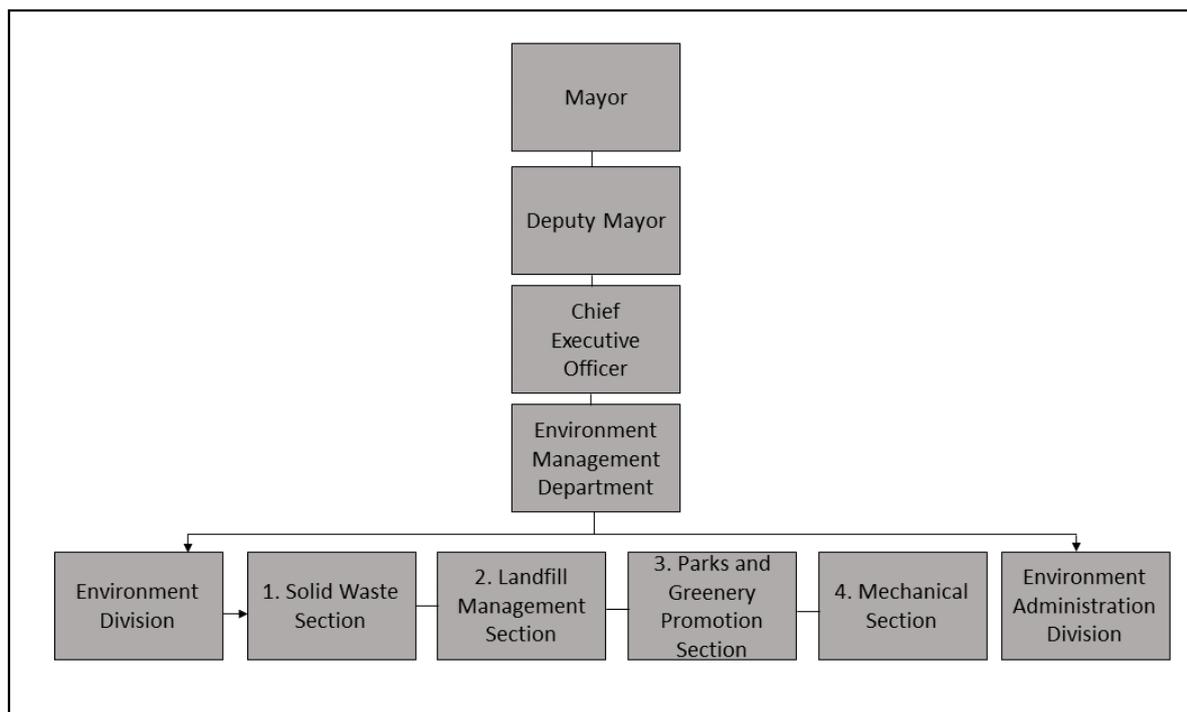


Figure 50: Organizational structure of KMC for environment Management (Own compilation based on fieldwork)

5.7.2 Financial Resources and sustainability

In developing countries, SWM often remain under-funded mainly due to inadequate resources from municipal tax revenues, insufficient user fees, and the mismanagement of funds (Coffey & Coad, 2010). A study shows that typically 3–15 percent of the total recurrent budget of a city is spent on solid waste management where per capita budget is USD 1–10 (Scheinberg et al., 2010c; Wilson et al., 2013). Especially in low-income countries municipalities can spend around 20 percent of their budget on waste, still 90 percent of the waste is openly dumped and burnt (Kaza et al., 2018). Kathmandu metropolitan on average spent 24.34 percent of the total municipal budget for SWM in fiscal years 2010/11/12/13 (KMC, 2015). This is higher than any other municipality in Nepal (ADB, 2013). Kathmandu Metropolitan has been blamed for not fully utilizing the budget allocated by municipal council. This is mostly due to low expenditure on Landfill/Transfer station management and community mobilization which takes up 1.8 and 1.1 percent of the total budget respectively in FY 2013/14. Whereas budget heads like salaries for staff, fuel and maintenance take up 61.1, 18.5 and 6.3 percent of the total budget respectively in FY 2013/14 (KMC, 2015). The budgetary expenditure shows that the focus of metropolitan has been on day-to-day waste collection, street sweeping and dumping

rather than investing on the betterment of transfer station and environmental standard maintenance at landfill site.

From the field study, it was discovered that the municipality is not charging waste fees to the households where it provides waste services, whereas it charges waste fees to organizations and businesses.

Though, the Solid Waste Management Act 2011, allows local level governments to fix a service charge for both private and commercial waste generators. In addition, the act emphasizes on utilization of income from solid waste management service charge for further waste management activities, environmental protection, landfill site development and management. Governance aspect of integrated solid waste management framework demands for the financial sustainability of waste systems which is to be achieved through recovery of operation and maintenance costs as well as capital costs through service charges. In Kathmandu metropolitan, finances for solid waste management are acquired either from central government or from municipal service charges and property taxes. It is reported that a large part up to 95 percent of local government's budget in Nepal are attained through intergovernmental fiscal transfers; development of solid waste management infrastructure through resource at local level is regarded ideal but seems impossible in the current scenario for local government (World Bank, 2020). In the context of Kathmandu, the situation is different from other local governments of the country, for the fiscal year (2019/2020), it generated 40.71 percent of its budget from its own sources, 46.97 percent from intergovernmental fiscal transfers and 12.32 from other sources, this in total accounted for a total budget of 13 billion Nepali Rupees (KMC Report, 2020).

During the study it was discovered that the metropolitan targets to manage the waste within the allocated budget. At ground level for waste management, they find the best fuel saving routes for waste collection and collect as much as in the trips they make to the city. There is manual entry on the white office board and paper logs that are filled in the transfer station about how much waste each vehicle brought in and how much distance covered, and fuel consumed. In addition, logs about trips to the landfill site are also kept. The system is highly manual and reliant on the vehicle drivers for their honesty. One of the ward officials complained that *“municipal vehicle drivers are doing most corruption in Kathmandu metropolitan by not doing the complete trips of the city and filling the wrong fuel consumption records”* (Ward member ward 18, Personal communication, August 26, 2019).

It was found that current financial practices for household waste management in KMC does not permit a thorough assessment of operational costs that includes collection, transportation,

processing and disposal and street sweeping. To achieve a financial sustainability which is a pillar for integrated solid waste management, accurate operation and management cost valuation is of sheer importance. However, in KMC, currently there is no service charges for households and households' willingness to pay has not been taken into consideration yet (*further elaboration about willingness to pay in chapter 7*). Currently, the metropolitan is highly dependent on the financial resources from the central government for waste management which it largely invests on collection, sweeping and disposal. Though the municipality charges waste fees to commercial enterprises, this was out of the scope of the dissertation. In terms of financial resources, Kathmandu metropolitan is one of the most prosperous municipalities in Nepal as compared to other, largely due to its revenue base from the various service sectors. However, it is still largely reliant on funds from the provincial and central government, one way it can increase its revenue base is by providing efficient waste services and imposing tariff for domestic generators.

“Kathmandu spends around 70 percent of its solid waste budget in waste collection and disposal this is the capital city, and it has resources as compared to other municipalities of the country, what will other municipalities learn if KMC cannot function with all the resources at its disposal. It is supposed to set an example, but it is failing to do so currently” (Waste expert personal communication, September 17, 2019).

Annual budget reports from KMC reveal that a considerable part of the budget remain unspent on the targeted budget heads including solid waste management. This shows a contradiction to the current scenario where lack of financial resources for infrastructure development is a major issue local government are facing, on the other hand it is not able to fully spend the available budget. The section above-described various concerns encountered by the metropolitan in the process of solid waste management. Major issues arose due to inability to mobilize available financial resources and inadequacy of human resources at various level. Recommendations related to the concern over the capacity building of the local government for solid waste management is discussed in *chapter 9*.

5.8 Chapter Conclusion

Discussed below are the conclusions drawn from the analysis of urban solid waste management process. The current government framework provides the province level government with powers to have province-specific legal and regulatory framework for solid waste management. Currently, provincial governments are not actively involved in SWM, this makes the local

government accountable for waste management but in the current situation where decentralization has not been fully materialized on ground, the local government is struggling to deal with its responsibility; intensified by the abolishment of two organizations, SWMTSC and solid waste management council. These organizations provided the required institutional framework and technical support. Currently local government is lacking the handholding that it enjoyed before while the redistribution of power and resources envisioned through the new constitution and local governance acts have not found a foot in reality.

Solid waste management in Kathmandu involves co-ordination and co-operation of a range of government bodies. It involves an array of ministries and requires their co-operation with each other. As shown in *fig 29* institutional framework for solid waste management planning starts from national planning commission and concludes at municipal level. The municipality as a major actor at local level struggles to co-ordinate with Ministry of Urban Development, responsible for the construction of new landfill site for the city. Whilst lack of cooperation and coordination between the municipality and its administrative units “wards” was seen to affect the waste segregation pilot project of the municipality.

Governance in case of solid waste management in Kathmandu is discrepant from the conceptualization done by integrated solid waste management framework (ISWM) rather based on the everyday practices of actors involved. In absence of municipal capacity to provide waste services a large part of the city is covered by private companies. Existing waste management situation in the city reveals that the metropolitan has been backlogged by issues such as lack of trained human resources, mobilization and maintenance of available physical resources, political influence in waste management, availability, and generation of waste data and low priority given to waste as essential urban infrastructure. Public is the first generator of waste and key in achieving source segregation. The municipality has not been fully able to give importance to households as important contributors and design projects that focus on educating the public about the value chain of waste. Current focus has only been on providing segregation training and bins which has failed to establish a segregation habit among the householders. Also, municipality has not attempted to find ways to engage with public since the project design phase resulting in failure to its source segregation pilot project. Recent efforts of the metropolitan were found to be ill prepared and without co-ordination with wards and private companies. In the long run coordinating with them along with non-government organizations can be fruitful in achieving source segregation of waste. Metropolitan’s only resort for waste management is dumping the waste into the landfill site. This high dependence on a landfill site has raised waste problems for the city time and again in the past. As the integrated solid waste

management framework suggests, landfilling is the least preferred method of waste management. Metropolitan has been giving high importance to construction of a large landfill site, without giving much consideration to finding alternative ways to reduce and recycle waste. Though the city has had a history of failure to solve waste issues by constructing new landfill sites without addressing the impending issues of public opposition, and co-operation with ministry, it continues to follow the same path again.

In addition, understanding the waste governance and waste management process of the city reveals multitude of actors' involvement. Actors like private companies, non-government organizations and informal sector are recognized by urban waste management literature (Wilson et al., 2013; Konteh, 2009; Medina, 2005). The case of Kathmandu reveals that not all actors involved in the waste management process are recognized by the municipality. Few actors maintain a relation with the metropolitan, especially the informal actors are completely out of the radar of authorities. Informal actors like waste workers, scrap dealers and itinerant waste buyers are excluded from the policy discussions. Therefore, the following chapter further elaborates on the array of actors active in Kathmandu, the role of informal sector, and their relationships.

6 Role of Informal Sector in Waste Management and their Relationships

“Informal economy is people’s spontaneous and creative response to the state’s inability to satisfy the basic needs of the disadvantaged part of the population” (De Soto, 1989).

This chapter intends to contribute towards looking deeper into the role played by informal actors in addressing waste issues and their relationship with formal sector actors. It builds the analysis and discussion on the set of actors identified in previous chapters and mentioned in *table 7* that fall under the scope of study namely local government, i.e., metropolitan, households, private companies and informal sector and actors with fringe status like NGOs and social enterprises. In doing so, methods involved were thematic and content analysis of interviews with informal waste workers, itinerant waste buyers and scrap dealers. In addition, review of available scientific and grey literature was done. The chapter concludes that informal sector is the main contributor to recycling in the city their relationship with formal authorities is ambiguous and with other actors like non-government organizations and private companies were varying. It identifies that organization of informal sector paves a path for their inclusion and initiating an integrated solid waste management.

6.1 Actors in Solid Waste Management

As solid waste management process in the city is not driven by an actor but a range of actors where informal actors are also key contributors, it becomes necessary to understand the role of informal actors in addressing waste issues and their relationship to other actors specifically to the authorities upon whom legal powers are vested. Solid waste management process in developing countries is not a neat and clean process, it involves an array of actors. As per integrated sustainable waste management framework a range of actors/ stakeholders are involved in the waste management process. These stakeholders are local authorities, NGOs/CBOs, service users, private informal sector, private formal sector, and donor agencies. Presence of both formal and informal actors in solid waste management is acknowledged in waste literature, especially the contribution of informal sector in solid waste management has been widely discussed. Many cities in developing countries have a robust informal sector that successfully evolved around waste providing employment opportunities for all age group (Medina, 2008).

In the context of Nepal, a large part of recyclable materials goes into the informal sector. Literature reveals that informal waste pickers are helping a lot in terms of reuse and recycle, where they operate by collecting recyclables from households, transfer stations and landfill sites. Their contribution in the waste segregation at the transfer station and landfill site is significant (Luitel & Khanal, 2010). These people work at relatively low cost and do not even get recognized for their contribution to municipal waste management. However, they remain to be the most secluded, employing the most marginalized population of the city (Sembiring & Nitivattananon, 2010). Municipal government, national government, formal private sector, informal private sector, household/ service users, external donor agencies, NGOs and CBOs are regarded as main participants in the municipal solid waste management in Global South (Schübeler et al., 1996; Van de Klundert & Lardinois, 1995). Municipal governments are widely regarded as a key actor in municipal solid waste management (Ahmed & Ali, 2006; Baud, Post, & Furedy, 2006). Municipalities are also discussed in terms of their limited capacities for solid waste management and emergence of informal waste sector (Aparcana, 2017; Millington & Lawhon, 2019). Some studies discuss the roles played by private sector and NGOs (Chaturvedi et al., 2015). Literature on the informal sector, especially from Latin America have discussed the inclusion of the sector into the formal system with a successful

transformation into inclusive local waste management systems (Dias, 2016; Fergutz et al., 2011; Gutberlet, 2009; Medina, 2000).

It can be said that in case of urban Nepal, this kind of study on informal sector is missing. Informal sector in Nepal has been largely seen from the perspective of, health risks, e-waste recovery potential and poverty (Black et al., 2019; Parajuly, Thapa, Cimpan, & Wenzel, 2018; Pathak & Mainali, 2018; Sapkota et al., 2020). Adequate attention has not been paid to the role of the sector in attaining solid waste governance including the nature of their relationship with state and linkage with other actors. As such current literature on role and relationship of the informal sector in solid waste management in Nepal is far from adequate and this study aims to fill this void.

6.2 Informal Sector in Solid Waste Management

There is increasing consensus among all stakeholders and experts that the informal sector in general, and the informal recycling sector in particular, should not and, in fact, cannot be ignored while attempting to improve waste and resource management systems in developing countries (Agamuthu, 2010; Chaturvedi & Gidwani, 2011; Dias & Alves, 2008; Gutberlet, 2009; Scheinberg, 2011, 2012). This becomes important, especially in developing countries' municipalities where formal waste service providers are unable to provide waste collection services to all households. At the same time if they can provide full coverage there is no guarantee that the waste will be recycled or treated in an environmentally friendly manner before final disposal. Usually, only half of the population in developing and transition economies are provided with steady and satisfactory waste services (Gunsilius, Chaturvedi, & Scheinberg, 2011a).

The focus of this dissertation is on informal waste workers involved in informal valorization in Kathmandu metropolitan. Since informal waste workers are made up of two categories; one who contribute to the cleaning of the environment by collecting, transporting and disposing of waste from the source and those who utilize waste as a resource by segregating recyclables to be sold for profit, the latter are often called scavengers (Nas & Jaffe, 2004). This study is concerned with the latter ones that deal with the recyclables for income.

Informal waste workers play a vital role in waste management that cannot easily be taken up by the formal waste management system in developing economies. It has been demonstrated largely in literature where in the absence of formal waste services the informal sector come in to provide the services as demonstrated in Indian cities like New Delhi and Noida (Chaturvedi

et al., 2015; Schindler & Kishore, 2015). Over the time these informal service providers become an integral part of all stages of waste management. This brings in the informal solid waste sector where they start becoming involved in day-to-day waste collection, sorting, and trading. This thesis follows the given definition of informal solid waste sector, individuals or enterprises who are involved in private sector recycling and waste management activities which are not sponsored, financed, recognized, supported, organized or acknowledged by the formal solid waste authorities, or which operate in violation of or in competition with formal authorities (Scheinberg et al., 2010b).

According to the definition, informal waste sector and recycling workers and businesses can be registered and pay taxes too, but they lack recognition and status within the solid waste sector even when their contribution in valorization has been widely discussed (Dias & Alves, 2008). This does not take into consideration the criminal activities and informal activities carried out by illegal immigrants (Velis et al., 2012). Since the 1990s there have been a range of studies about integration of the informal sector into formal recycling and solid waste management system in developing countries, such that an integrated solid waste system can be established (Scheinberg et al., 2010b; Van de Klundert & Anschutz, 1999; Velis et al., 2012; Wilson et al., 2013). Various studies have pointed towards the fact that informal sector is affected by wide range of aspects while states adopt different strategies or not to deal with informal waste sector (Chen, 2005; Gutberlet, 2016; Medina, 1997, 2000, 2005). However, investing in informal waste sector is critical as their contribution to the waste sector keeps evolving with time.

Unfortunately, there are limited studies on the informal sector and their role in solid waste management in Kathmandu. Though studies about the role of informal sector in Ghana, Ethiopia, Nigeria, Brazil, Columbia, Peru, India, and Egypt have been abundant (Amuzu, 2018; Baudouin, Bjerkli, Habtemariam, & Chekole, 2010; Fahmi, 2005; Fergutz et al., 2011; Navarrete-Hernández & Navarrete-Hernández, 2018; Nzeadibe, 2009).

The study provides a special interest on waste pickers in transfer stations, scrap centers, landfill sites and itinerant waste buyers. In addition, interviews were carried out with scrap dealers (*kawad*) who are the informal entrepreneurs of waste. These waste pickers are interested in non-organic waste materials like metals, plastic, paper, clothes etc. This sector consists of individuals, co-operatives, families, and micro-enterprises that are involved in extracting resources from the waste stream. Especially on recycling form of valorization where materials carrying value are subject to collecting separately/ identifying, sorting, processing, storing and trading into global industrial value chain (Scheinberg et al., 2010b).

6.3 Informal Sector in Solid Waste Management of Kathmandu

Kathmandu is one of the fastest urbanizing cities in South Asia. The annual rate of urbanization in Kathmandu metropolitan is 4 percent (UN-Habitat, 2017). This urbanization is largely supported by rural urban migration. This type of migrant rural population in developing countries is characterized by low-income and low qualification (Medina, 2000). It has created a situation in the city where these migrant population resort to informal waste picking as a survival activity. It has resulted in the development of informal waste recovery activities, as well as abundance of inexpensive labor carry out those activities adds value to it (Medina, 1997). For the study waste workers are classified as informal if they are not working under the metropolitan and private companies. These informal waste workers are itinerant waste buyers moving around in the city to buy clean reusable and recyclable materials from households and commercial establishments, waste pickers at transfer station of private companies, waste pickers in landfill site and waste pickers/cleaners at scrap dealers *Kawad*. In the study, 36 informal waste workers falling within the category above and 4 scrap dealers were interviewed. Content analysis was done to analyze these interviews in combination to field observation that comprised photos, videos, and detailed field notes.

As the recycling trade hierarchy consists of individual waste pickers (or family type units) at the lowermost levels, then to small and medium-sized recycling enterprises (SMEs), craftsmen and middlemen, brokers/ contractors, wholesalers and manufacturing industries (Scheinberg, 2011). These are individuals or family type unit at the lowermost level in recycling trade hierarchy. When these materials climb up the recycling chain their value also increases (ibid). They enter into this mostly through their friends and family members who are already working as waste picker. Thus, informal waste picking becomes an entry point for migrant workers. At the same time these waste pickers face numerous hazards and difficulties regularly as they are in daily contact with garbage, they are usually associated with dirtiness, disease, and perceived as a nuisance to the society, a symbol of backwardness, and even as criminals (Medina, 2000). However, the informal sector has been regarded as more active and effective in waste valorization than formal sector in low and middle income countries (Gunsilius et al., 2011a).

6.3.1 Marginal position of the informal waste workers

In Kathmandu, informal waste workers (IWW) are found manually sorting recyclables in various points. They work in different parts of the city in transfer stations, scrap dealers (*kawad*) and landfill site or as itinerant waste buyers going house to house.

In the absence of source segregation and sorting equipment the process of segregation carried out by these workers was found to be highly efficient. There are both men and women who work as informal waste workers in Kathmandu (Ručevska et al., 2019). *Somebody's trash is somebody's source of living*, this saying fits perfectly to these informal waste workers. They reduce the burden off the municipalities by reducing the waste ending up in landfills, in turn increasing the life of landfills. The service that the informal sector provides is usually not accounted for and the social, economic, and environmental contributions remain mostly unrecognized by responsible authorities and communities. It is reported that on average they save local authorities around 20 percent or more of what they would otherwise spend on the collection and final disposal of these materials (Wilson et al., 2006).

Marginal position of informal sector in municipal solid waste management of Kathmandu is manifested in different ways. Contribution made by the informal sector in recovery of materials from municipal solid waste and its eventual impact in reduction of environmental risk and depletion of natural resources cannot be denied. But the reluctance of local government as well as the national government in Nepal to acknowledge them as the single largest contributor to recycling and recovery of materials is also a reality. Itinerant waste workers and informal waste workers manage approximately 10 percent of total MSW in KMC itself and 15 percent in wider Kathmandu valley region (Bhattarai, 2003; Dangi, Schoenberger, et al., 2015). It is estimated that the economic value of the recovered materials by informal sector is USD 18 million in Kathmandu Valley which comprises Kathmandu, Lalitpur and Bhaktapur metropolises (Pathak & Mainali, 2018). Through the interviews it was revealed that economic value of informal waste recovery is high, metropolitan does not recognize it and its intentions to do so is not reflected in its policies either. The work of informal waste sector has increased the life span of landfill for the metropolitan though they seem to fail to address it. Also, resources recovered helps by providing raw materials at lower cost to the industries and also helps towards environment protection as it reduces extraction of nascent raw materials.

Availability of information and data is important to know about the contribution informal sector makes in waste management chain. But maintenance of data on informal sector is rare in developing countries where they are regarded people working in the lowest level and often

discriminated. In Kathmandu, metropolitan, data and information about informal waste sector is not maintained by the metropolitan itself though their presence is acknowledged in unofficial conversations and dialogues.

“I know there are a large number of people involved in waste recycling activities in the city, they are people who are doing it for living. From the metropolitan we cannot support them, we have no mechanism to do so but I know that there are international organizations and non-government organizations collaborating to help them” (Executive Director Kathmandu Metropolitan, August 15, 2019).

Though the concept of ‘informality’ is often synonymous with poverty, slums, and stigmatized work, it is suggested that the regime itself proceeds through systems of “deregulation, ambiguity, and exception (Roy, 2009, p. 76). Roy goes further to implore the concept of informality arguing that the practice of people with authority and power such as planners and decisions makers are interwoven with practices of informality in the quest of modernization (ibid). This longing for modernity in urban areas has exacerbated the threat to livelihood of the marginalized people in cities of Global South. One such example is of the forceful demolition and eviction of one of the oldest squatter settlement in Kathmandu by the metropolitan and armed police force which resulted into violent clashes between the settlers and police (Brooks, 2016). This attempt was made by the local authorities in the name of managing the informal settlements and relocating them. However, it was counterproductive resulting into the loss of homes for the settlers and violent crackdown. Similarly, in the study through the interviews with waste workers it was revealed that they felt that are regarded as someone low in the society. While from the interviews with scrap dealers and transfer station supervisors it was revealed that these activities are seen as nuisance by the residents and face the threat of being opposed sooner or later (Personal Communication, Field supervisor transfer station private waste management company, September 9, 2019). This kind of opposition towards waste activities in combination with government’s aim to achieve a modernized waste management project poses a threat to the livelihood of informal waste workers and their further marginalization in Kathmandu.

6.4 Relationship between Informal Sector and Authorities

Relationship between actors in waste is widely discussed in literature (Ahmed & Ali, 2006; Nzeadibe, 2009; Oteng-Ababio, 2012). Government approaches/ perception towards informal actor is a common area of scholarship in global south (Medina, 2000; Wilson et al., 2006). At the same time private formal actors have been viewed with skepticism for failing to provide them facilitative framework to thrive (Oteng-Ababio, 2012). The relationship between actors could play a vital role to address solid waste management issues in the global south. Relationship between the actors can be positive, negative or no relationship at all. Absence of relationship is a common scenario between government actors and informal sector (Aparcana, 2017). Nevertheless, the perception of government towards informal sector activities also varies depending upon the country, most common opinion towards them being negative which is reflected in their legal environment including the national policies (ibid). There have been instances in Jordan and Algeria where informal recyclers are arrested or fined, making the relationship between formal and informal sector full of mistrust and competition (Scheinberg & Savain, 2015). Despite the attitude of rejection and mistrust countries have started to recognize that they need to resolve the municipal solid waste management issues; and resolving those issues are not possible without changing their attitude of indifference to informal sector into stimulation (Baudouin et al., 2010; Medina, 2000; Wilson et al., 2006). Since, there is an increasing consensus among stakeholders and experts in waste that informal sector in general should not be ignored in an attempt to improve waste management and recovery system in developing countries' context (Agamuthu, 2010; Dias & Alves, 2008; Scheinberg, 2011). The section below will discuss in detail about the relationship between the informal sector and authorities.

6.5 The Informal Waste Sector amidst Neglect and Avoidance in Kathmandu

6.5.1 Current waste flow through the informal sector

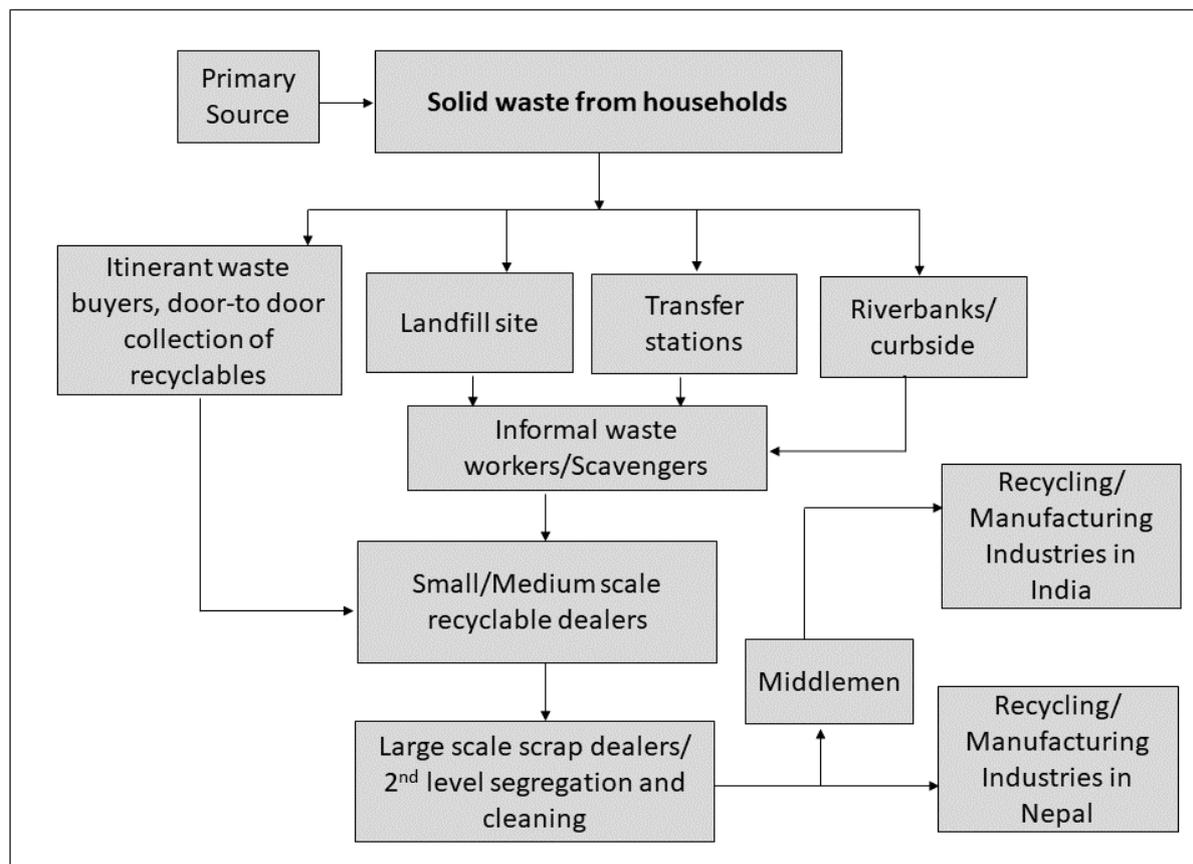


Figure 51: Flow of recyclables through informal sector in KMC (Own compilation based on fieldwork, 2019)

Waste is regarded as a transversal theme, inviting problems like flooding, decline in water quality, vector of diseases generating public health issues. This makes it a topic of exclusion, while giving people who work in waste specifically the waste workers a sense of further neglect (Gutberlet, 2009). As compared to other sector, management approaches and techniques employed by Kathmandu metropolitan to manage solid waste have been largely inadequate to match the increasing demand. In addition, municipality has not been able to utilize its resources to the fullest for solid waste management. The city is still waiting for an integrated solid waste management project which the government has been planning to enter under public private partnership for last eight years.

The current system of waste collection and disposal is regarded highly unsafe with social, environmental, and economic costs. It is largely dependent on human resources and devoid of necessary infrastructure. The current landfill site (Sisdole Landfill Site) is no longer a landfill

site but just a dumping site as it is way beyond its mandated date. Residents near the site have been complaining about health hazards inflicted on them and their cattle due to unmanaged waste disposal (Environment Department 2019). Also, the issue of high level of air, ground and surface water contamination have been raised by the locals residing near landfill site time and again. Furthermore, locals have been staging protest demanding the government to take over their land in the current market price (Times, 2019 accessed via <https://thehimalayantimes.com/kathmandu/irate-locals-obstruct-garbage-vehicles-at-sisdol-landfill-site>). Still, informal waste workers continue to dive into the landfill site daily to sort out recyclables from the disposed waste. Their activities include door to door collection of recyclables, waste picking at different transfer stations, riverbanks and finally bringing it to scrap dealers. Though their contribution to waste sector is widely acknowledged in research their reality on ground remains parlous in Nepal.

Based on interviews conducted with informal waste workers for the study it was found that there are around 500 people segregating the waste in landfill site alone. Though, there is no official estimate about how many waste workers are there in each of the transfer stations and segregation site, scrap dealers (*kawad*) and traders in the city. It is difficult to pinpoint how many scrap dealers operate in Kathmandu since there exists no official data about scrap dealers. According to the latest data from Office of the Company Registrar of Nepal there are 152 registered scrap dealers in Nepal (Ručevska et al., 2019). Whereas a study that was carried out in Kathmandu valley revealed there were 178 scrap shops officially registered in the valley (Luitel & Khanal, 2010). Similarly, a report in 2014 by Practical Action estimated that there are 10,000-15,000 informal waste pickers and 700-800 waste/scrap dealers in Kathmandu valley (Practical Action, 2014).

At the same time there is an ethnic dimension to waste picking work as well, 31 among the 32 waste pickers in landfill site, transfer station and scrap centers interviewed for the study came from Tamang and Limbu caste group from the eastern hills and mountains of Nepal whereas all 4 itinerant waste buyers were of Indian origin. Waste pickers in transfer stations, landfill site, at scrap centers and itinerant waste buyers were found to be vertically directly or indirectly linked to the recycling industry in Nepal or India. They are associated through the scrap dealers who employ them or through the dealers who buy recyclables from them.

Figure 51 above illustrates the flow of recyclables through informal waste sector in Kathmandu. It can be seen in the figure above that, informal practice of waste collection, segregation, cleaning, and recycling appears to be highly organized where each actor has a designated job to perform. Firstly, household waste collected by private companies come to

transfer station or to an open area where the segregation process by informal waste workers take place manually. Similarly, waste collected by metropolitan that reaches the landfill site are picked by waste workers at the landfill site and are brought to the city and sold to small scale scrap dealers based on the market price. Also, recyclable materials collected from households by itinerant waste buyers are sold to medium and large-scale waste buyers/traders. After that, these segregated recycled materials are cleaned and processed further by another set of informal workers before reaching to recycling industry in Nepal and India. It also shows the presence of middlemen that help in the transportation of recyclables from Nepal to recycling industries in India, as it is an illegal practice banned by the governments on both sides.

Similarly, the *fig 52* below demonstrates a pyramid like structure where waste pickers are situated at the bottom forming the foundation of informal recycling sector in Kathmandu. Then comes the itinerant waste buyers or *kawadiwalas* who buy the recyclables directly from the households and small businesses and sell it to small or medium scale scrap dealers. Then at the next level are the small and medium scale scrap dealers who buy recyclables from the informal waste pickers and itinerant waste buyers. Though the amount of waste dealt by these scrap dealers were not directly measured in the study. Based on the interviews they were classified small, medium, and large depending on the size of their operation and whether they deal directly with waste pickers or with the recycling industries. These small and medium scale scrap dealers/centers further sort out the recyclables into specific categories such as plastics (LDPE, HDPE, PET/PETE), glasses (white, green blue and brown), metals (iron, aluminum, cooper), rubber, paper and clothes etc. and sell it to specific large scale scrap dealers. The large-scale scrap dealers who buy recyclables from the small/medium scale dealers and sell it to recycling industries. In case of Kathmandu recyclables stay in Nepal when there are industries that can absorb them and the recyclables travel to India, when there are no industries to absorb them, or the recyclables are generated beyond the capacity of existing industries to utilize it fully (e.g., all types of glasses end up in India, as there is no recycling industry for glasses in Nepal).

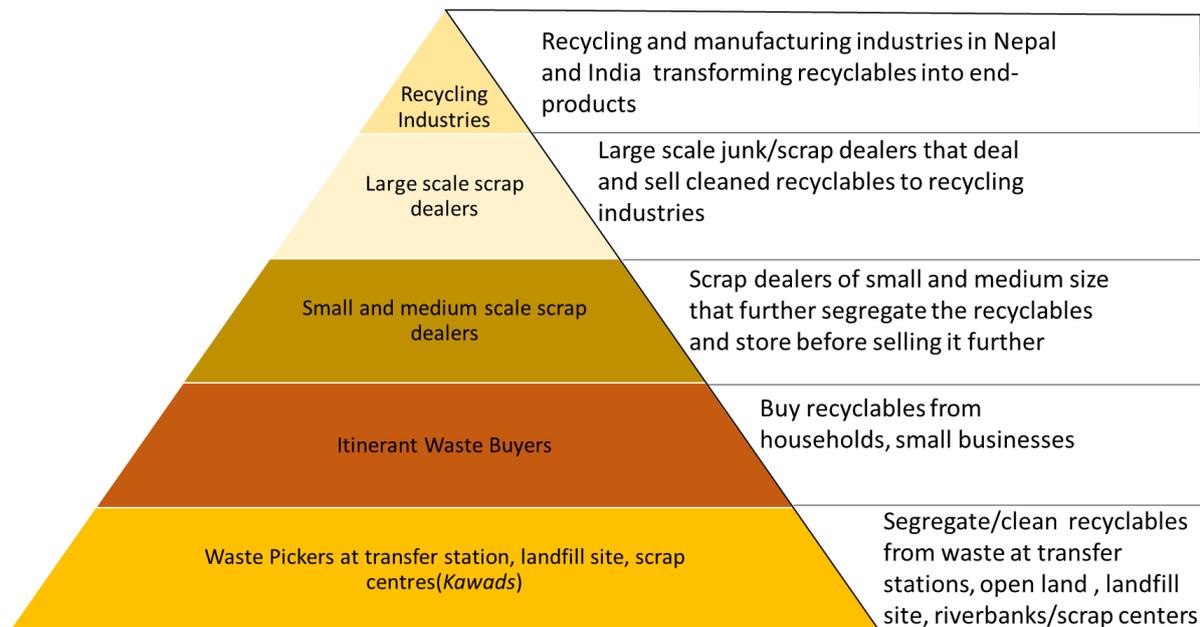


Figure 52: Hierarchy of actors in informal waste sector (Own compilation based on fieldwork, 2019)

From the *fig 52* above it becomes clear that informal waste sector is not homogeneous, it is composed of actors at various hierarchies. This heterogeneity of the sector is one important aspect that needs to be considered when designing integration approach.

It has to be understood that waste workers in the city though lie at the bottom of the hierarchy are the force that supply raw materials into the recycling chain nationally and across the border. In this scenario, traditional development approaches that focus on waste workers as poor people that need help can be detrimental and obstruct the social and economic transformation of waste workers. Traditional development oriented approach falling short of its promises for informal waste workers have been well documented through instances from South Africa (Samson, 2020). In Kathmandu where the waste landscape is already diverse composed of metropolitan, private sector and informal sector, heterogeneity of the informal sector further complicates the situation. This demands for a careful design of municipal waste systems that consider the actors' knowledge and understanding of solid waste and built on the partnership between them.

6.5.2 Income generation of informal waste pickers

In the study, informal waste workers and itinerant waste buyers and waste contractors/scrap dealers were interviewed. They were selected randomly from different transfer stations and scrap dealers of the city. Working conditions of these waste workers, types of waste they segregate, their interaction with the local authorities were investigated in the study. Also, waste

contractors/ scrap wholesalers were interviewed to get an overview of the link between the wholesalers and recycling market, their relations with authorities, private companies, and their ways of dealing with informal waste workers and itinerant waste buyers. Income of informal waste workers in transfer stations, landfill site and sorting center were varied, some materials were more preferred by the waste workers to sort out from the waste pile than others. Income of informal waste workers in transfer stations, and landfill site and the sorting center were varied. The table below describes different kinds of waste sorted by the waste pickers and the varied income of different waste pickers at different stages.

Transfer stations	Kawad /Scrap Centre	Landfill Site
¹⁵ NRs 2 per kg for hard plastic like HDPE, LDPE, PET/PETE NRs. 1.5 per kg polythene NRs 1 per kg old clothes OR NRs 3 per kg for all kinds of waste flat rate	NRs. 450 per day (Female) NRs 500 per day (Male) NRs 350 or 400 per day, when the waste workers are new	No fixed daily amount. 1500-1600 Kg of waste brought back at the end of the month to scrap dealers to be sold based on market rate of raw materials
NRs. 17,000 per month	NRs 100 for each 60 pieces of glass bottle cleaned	Price based on the current market rate of each recyclable material

Table 9: Recyclables picked by waste workers and rates (Own compilation based on fieldwork, 2019).

From the interviews with waste workers and field observation it was revealed that informal waste workers in Kathmandu are sorting recyclables at minimum rate to provide raw materials for the formal sector. Scrap dealers are interested in paying the workers based on per kg rather than monthly wage rate. This type of arrangement provides the waste workers opportunity to maximize their income. On average a waste worker sorted 200 kg of recyclables per day at a transfer station. Waste workers at landfill site get paid when they sell the recyclables brought back from the landfill site to scrap dealers, average per kg rate for recyclables brought from the landfill fluctuated between Rs 12 to Rs 13. Meanwhile, at scrap centers payments were based on the daily wage rate, while it also varied based on being male, female, old and new

¹⁵ 1 US Dollars is equals to 118 Nepali Rupees (NRs)

waste segregator. For glass bottles that are already segregated, cleaning is carried out manually by these workers on the above given fixed rate.

It was revealed during the field observation that informal recovery system for recyclables is particularly efficient as these waste pickers receive money based on the number of different materials they segregate in a day, which in turn is based on the price of that material in scrap market. As the payment is based on the number of materials, these workers segregate recyclables out of the mixed waste as fast as possible only with little break during the day, segregating recyclables takes up to 12 hours a day.

Based on the field observation and interviews it can be stated that the informal waste workers in Kathmandu work to supply materials at cheap rate to fulfill the demand for nascent resources to the industries in Nepal and neighboring India. While the waste workers get a fixed minimum rate, scrap dealers have much higher income as they operate at the higher level than waste workers. As the quality of the materials usually much higher than the material that was thrown into the municipal waste stream Also the price of materials increases as it gets cleaned up and approaches nearer to recycling industries.

Though the scrap dealers were reluctant to reveal their income and profit from the business, they made statements like *“Income is good, I can pay the waste workers for the materials also make profit and pay taxes based on it annually”* (Scrap dealer, Personal Communication, September 9, 2019). When it comes to the income of waste workers, their income is reasonably lower than the national average. In the fiscal year 2019/20 per capita national income stood at USD 1085 i.e. (NRs. 126,018) (Ministry of Finance, 2020) whereas on average a waste worker with experience in waste picking earn USD 150 i.e. (NRs. 17,000). It shows that economically waste workers in Kathmandu remain to be at the lowest level in the recycling chain, working long hours and harsh conditions.

6.5.3 Between informal acknowledgement and legalization attempts of authorities

Despite the important role of these informal workers in handling solid waste in Kathmandu, the prevailing attitude of local authorities towards them have been of indifference. Although, their presence is widely visible to public eye, the tendency has been to ignore/avoid them. The state has an attitude of disregard towards informal waste operators¹⁶ and waste workers. No sound policy mechanism has been developed and directed towards supporting their activities nor any positive attempts to integrate them. Rather the approach has been to regulate the

¹⁶ Informal waste operators in the thesis specifically denote the scrap dealers.

informal operators for the sake of taxes, one example of this attitude is, government made it mandatory for scrap dealers, plastic collection centers and recycling factories to mandatorily register under value added tax (VAT) system. While the government actors put an argument that this is to bring everyone under the tax regime of the state (Former environment section head KMC, personal communication, September 1, 2019). Recycling sector operators are dissatisfied with this decision arguing that they are already registered under permanent account number (PAN) and paying taxes. This decision of the government is rather negative for the recycling sector as it will cut the margin of profit for these dealers eventually leading to lesser per kg payment to informal waste workers (Recycling association secretary personal communication, August 22, 2019). Due to this reason, recycling sector operators had decided to put a halt to picking up segregated waste from the market to disobey government's decision. It was still questionable whether all the recycling sector operators are paying taxes based on their income to the Inland Revenue Office of government of Nepal. As it was speculated by government officials during interviews that many of the dealers are paying taxes based on the profit they show at the end of the fiscal year. They usually show their annual profit in such a way that fall under the 10 percent annual tax payment scheme, so that they can pay minimum possible amount as tax.

During the interviews metropolitan officials mentioned the contribution of informal sector in material recovery but not about the government plans to acknowledge them and collaborate with them. The contribution they make to waste management comes time and again in informal conversations but have not been given enough importance by local authorities to be addressed. One of the officials responsible for supervising the field staff of metropolitan even talked about the presence of four informal waste pickers in their transfer station. *"We have four informal waste segregators operating within the transfer station, we let them pick recyclables from here, and they help us in small jobs like cleaning waste transportation vehicles, changing vehicle tires. If we had hired people specifically for these small jobs, we easily have to pay NRs. 100,000 per month as a salary. But this way we get our small jobs in transfer station done, and these people also earn by selling the segregated recyclables from the station"* (Field operation supervisor KMC, personal communication, August 8, 2019).

The statement above depicts local government's attitude where informal sector and its presence is acknowledged when needed but accepting them as a mainstream contributor to the waste chain of the city is not an agenda for metropolitan. The metropolitan aims to enter into an integrated solid waste management project with a private company. There has been an ongoing agreement between the metropolitan and a private company to enter public private partnership

under build-operate-transfer (BOT) modality through the mediation of Investment board of Nepal. The project aims to establish a system where most of the waste is recycled, leaving only 20 percent or less into the landfill. Moreover, the project aims to manage all the formal and informal waste workers of the metropolitan. But doing a final agreement and signing a project development agreement appears to be far fruit, as this has been going on since 2011 without coming to a conclusion (*more about the project in chapter 7*).

Informal sector operators, which are broadly categorized into scrap dealers of small, medium, and large scale, try to avoid any contact with the city officials. They prefer to operate separately due to lack of trust on local authorities. These informal operators are also skeptical to provide information about their work fearing that it will reveal information to their rival traders. During the field work it was difficult to get access to them directly, so they were contacted through waste management company employees who maintain relations with these traders. Even after meeting it was difficult to obtain information about their activities and operations. Most of the operators in recycling sector wanted to keep their work activities secret and gave a sense of distrust towards outsiders. It surfaced during the interviews that they are reluctant to disclose about the exact amount of recyclable picked, cleaned, or dealt with daily as they fear it would reveal their profit. As competition among the traders seem to be fierce to make maximum profit from the recyclables. Also, they were startled that an outsider could be a government official inspecting the PAN registration of their businesses. It was also arduous to find out which recyclable material is sold to which wholesaler and eventually to which factories in Nepal and India. Transactions of recycle materials are done based on personal relations, word of mouth and ongoing norms. The sense of distrust of informal waste operators towards government emanated from the fact that government has only been interested in levying taxes and creating bureaucratic hassles for their businesses. (Recycling association secretary personal communication, August 22, 2019). The stance of government has been legalization of the informal waste sector which is regarded common policy approach of developing country government, similar instances were seen in Latin America in the 2000s (Aparcana, 2017). At the same time, it can be said that this attempt of legalization has rather exacerbated into a sense of neglect towards the informal waste sector activity. A situation where activities and contribution of the informal waste sector to waste management is ignored, but priority is given to bring them under the tax regime by considering them as entrepreneurs of waste. While there are currently no favorable policies and regulations at national level in place that support the inclusion of informal waste sector. Government has committed to formalizing informal economy with strong social protection schemes through its national urban development

strategy and commitment to SDGs, especially reflected in SDG 9. However, based on the field work it can be concluded that the efforts to formalize informal economy as a whole through VAT scheme has been counterproductive in Kathmandu. The *fig 53* shows that both the informal sector and municipal authorities run parallel to each other. Municipality is oriented towards collection and waste disposal and the informal sector segregates the recyclables for income. Collaborative interaction between the two actors were not observed. Currently, the relationship between the authorities and the informal sector is unclear and uncertain.

There exists some research and projects carried out by international non-government agencies on informal sector in Kathmandu Valley. At the top of the list being Practical Action’s PRISM project, Phase Nepal’s report together with *Medecins Du Monde* on health status of informal segregators and more recently Gender and Waste Nexus report published by United Nations Environment Program. These reports provide information about the current scenario and status of waste workers and can be used as a reference by policymakers and businesses. But with no interest from the local government itself to address the waste issues and waiting for the takeover by much hyped integrated solid waste management project, a joint venture between government of Nepal and Finnish company; these documents has a little role to play in addressing the informal waste sector at policy level.

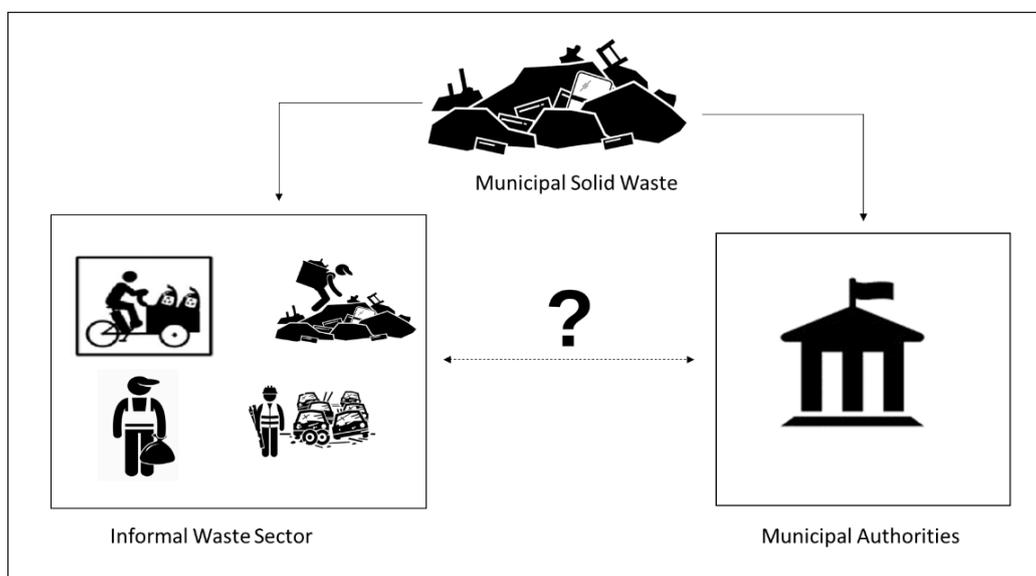


Figure 53: Uncertain relationship between informal waste sector and authorities (Author, 2020)

6.6 Social Perception towards Waste Work and Informal Waste Workers

As, Duneier and Carter, put forward in the book *Sidewalk* about the bustling informal economy in New York's neighbourhoods, "not only do the vendors and scavengers, often un-housed, abide by codes and norms; but mostly their presence on the street enhances the social order" (Duneier & Carter, 1999, p. 43). Informal waste pickers and recyclers have become an intrinsic part of the city. They give value to products that have been discarded by the majority of the city population. In developing countries, they are visible around the city collecting recyclables from different spots. Such that denying the existence of informal waste sector in the city has become difficult for the authorities. Waste workers in the informal recycling sector struggle due to social and economic exclusion. Furthermore, dealing with garbage further reiterates the widespread perception of social stigma against this population (Moore, 2012). A sense of prejudice and a negative attitude towards informal sector were mentioned by authors like (Medina, 2000) and (Wilson et al., 2006). As the informal sector is associated with waste and waste is seen as something that is a risk to environment and public health, this subjective perception is reflected in a stance of neglect towards them (Drackner, 2005).

Public perception and attitude towards the informal sector waste workers have been negative. The pejorative perceptions towards them have led to their marginalization. This has further steered their limited access to assets, social exclusion, low-level organization and lack of advocacy; insecurity of livelihoods and lack of political power (Nzeadibe & Anyadike, 2012, p. 11). In developing countries public policies and public perceptions about informal waste workers are still based on misconceptions that largely ignore their contribution to the environment, to public health, and to urban economies (Dias, 2016, p. 387). Harassment and exploitation by officials, middlemen and societal detest towards waste workers has been largely documented in literature (Medina, 2000; Wilson et al., 2006). Also, it is rare that citizens appreciate their work, or they have partners at the political and legal levels who work for their interests (Gunsilius et al., 2011a). Furthermore, this sense of social exclusion varied depending on which stage of value change of recyclables they belong to, informal waste workers in Palestine, Tunisia and Morocco found themselves rejected when they worked as a waste picker as opposed to when they were an individual professional recycler (Scheinberg & Savain, 2015). Marginal position of the informal waste workers and stigma from the larger society is associated to their low-income and unhealthy working conditions that perpetuate social and economic exclusion (Gutberlet, 2015). Meanwhile, in Kathmandu, stigma was, in general, associated to waste work, more dominantly for those who collect, segregate and transport

waste, irrespective of their formal or informal status. However, the situation was found to be grimmer for informal waste workers who dive into the waste throughout the city for sorting out recyclables. The issue of poor societal perception towards informal waste workers were reflected during the interviews, waste workers on a daily basis felt that people see them as someone low in the society (Personal Communication Informal Waste Worker, September 5, 2019). Negative self-perception and lack of self-confidence among informal waste workers ascribed by unhealthy working conditions and low education status has been aforementioned through examples from Indonesia, Jamaica, and Brazil (Nas & Jaffe, 2004). They had little understanding of the contribution they were making to the waste sector. Few waste workers responded to receiving safety training, protection materials and health check-up from NGOs and by PRISM project at some point. But these safety materials were provided few years back and currently these waste workers were working either without any safety materials or with some cap and gloves they could get hold of from the scrap itself. While some waste workers had received stationery materials for their school going kids for 2-3 years through a local NGO but are not receiving it anymore. Talking about the access of waste workers to capital and assets, almost all the informal waste workers in the study did not have access to bank accounts. Few waste workers included in the study were involved in a cooperative managed by waste workers themselves where they kept the money saved from their monthly income. Waste workers in transfer stations, scrap dealers and itinerant waste buyers all were working based on word-of-mouth agreement with the person running the transfer station and scrap centres and their payments were in cash (daily, quarterly, or monthly) based on their needs.

“When I told my neighbour that I do the job of waste segregation, I felt their way of seeing me had changed. They see me as someone low, but I am just earning a living I must do this as I have no education. Earlier I worked as a mason, it was a hard labour work, and I am getting old, so I came to waste picking work. Here I must come at 9am and leave at 5pm, payment is based on per day (NRs. 400) for me. I must be here every day otherwise I lose the money for the day” (Waste worker transfer station, personal communication, August 27, 2019).

Buddhimaya Tamang

Gender: Female

Age: 50 years

Kavre district

“Working as a waste picker in Sisdole Landfill site is not for everyone. I reach the site around 4 am in the morning and work till 2pm. There it is everyday struggle to find recyclables in the site. I have been sorting waste in the landfill for last eight years. There are around 500 people segregating waste with me. It’s a tough job, at my age it is even harder to get inside there and sort waste.

During the blockages caused by strike of locals and accidents by waste vehicles I cannot reach the site, then I cannot sort waste for days. This stops me from earning my livelihood, I just have to wait till the blockage is opened.

One of my friends died here, she was hit by a dozer while sorting waste in the landfill site. There is no safety there, it’s full of threats. At the same time there is a lot of competition to pick waste amongst all the risks. I face discrimination from waste workers from municipality and companies, also those police officers on duty there, talk bad to me. They treat us as we have no value here. But still, I prefer to work in the landfill as it provides me freedom in timing, working at scrap centres is restricting for me.”

Figure 54: Waste worker’s point of view (Based on personal communication with a waste worker from the landfill site during the field study in 2019)

Informal waste workers in the study felt that society’s perception towards them has been bad. People are indifferent towards them as they work in waste segregation. Waste workers feel that people see them differently when they say they work in waste. Though waste workers are both male and female, waste picking at transfer station and *kawad* there was dominance of female waste pickers/workers. Similar was the scenario in landfill site where it was mostly filled with female waste pickers segregating the recyclables. While itinerant waste buyers and scrap dealers were all men. (Field Observation, June-September, 2019). Men are more dominant in the waste sector, especially at high decision-making levels in both the public and private sectors, with women tending to occupy the lower paid supporting positions (Ručevska et al., 2019). Similar was the scenario discovered during the interviews, as more women were found to be involved as waste pickers in informal waste sector of Kathmandu.

6.6.1 Caste dimension of waste management in Nepal

Hindu caste system had played a significant role in shaping the occupation in Nepal. Traditionally, people coming from *Pode* and *Chyame* castes from ethnic Newar community were regarded as waste workers (Former head environment section KMC, personal communication, September 1, 2019). Lower castes like *Pode*, *Chyame*, *Kullu* and *Harahuru* were regarded as untouchables (*achhut*) and worked as sweepers (*kuchikaars*) in Kathmandu (Pandey, 2004). This assignment of waste work to these castes was also mentioned in civil code called *Muluki Ain 1854* of Nepal and abided by the citizen. Handling of waste by certain caste group has been an emblematic feature of the caste system in Nepal. This mentality of associating waste work with caste system still appeared to have a stronghold in Kathmandu.

“People prefer not to associate themselves with waste work in general. Being associated to waste work still carries some social stigma where they could be regarded as lower than others in the society” (Field in charge private waste management company, July 22, 2019).

“We do not have enough waste workers in our company to go around and collect waste, people would rather go abroad and work in Arab countries in extreme weather conditions for the same amount of money than work as a waste collector here” (Owner private waste management company, personal communication, August 11, 2019).

The statement above represents a scenario where people are ready to suffer doing labor work in harsh climatic and living conditions abroad as it demonstrates a sense of prestige of being abroad. At the same time, they do not want to work in a job that pays equally in their country as it is associated with waste. Since ethnicity and caste plays a principal role in shaping occupations and Hindu values of purity and impurity which is still entrenched in the minds of people thus, they avoid getting associated with waste. Though caste-based discrimination in Nepal was officially abolished through new country codes of 1963 and the Constitution of Nepal 1990 declared an end to all forms of social discrimination with an explicit mentions towards protection of Dalits *untouchables* and marginalized groups (Wagle, 2017). Similar cases were seen in neighboring India where waste picking is traditionally associated with untouchability, impurity, being Dalit or low caste (Gill, 2009). The caste and gender dimension of waste is also reflected in lack of human resources/waste workers in metropolitan itself. Metropolitan is working with half the human resources than it requires at ground level which includes sweepers and waste collectors.

“Metropolitan is lacking human resources who do the actual street sweeping and waste collecting which is an integral part of waste management in the city at lowest level, people

want to get into government job, so they get appointed as sweepers in metropolitan using political influence but never go to work as a sweeper but just want to have the perks of government job” (Former head environment section KMC, personal communication, September 1, 2019).

This points towards the issue that though waste management in Kathmandu metropolitan is labor-intensive in nature, in reality, the city is lacking human resources who want to take up waste work as a job. Also, during the field visits to the metropolitan office, similar things were observed. Sweepers who were predominantly women would gather in field supervisor/inspector’s office. There they are obliged to sign in the daily attendance record after finishing up their daily sweeping job. During visits to the metropolitan office, it was apparent that the sweepers had discussions with the supervisor about doing their assigned job in a daily basis and not wasting their time in working hours. While some of them were reluctant to go their assigned sweeping areas showing various health issues, to the extent that the supervisor had to tell them to leave the job, as there will be many people interested in having this government job. Moreover, these municipal sweepers, mostly female were working with the most basic equipment like manual brooms and wheelbarrow to sweep and collect dirt from different parts of the city. Their work is more important in the inner parts of the city with narrow alleys where large electric brooms cannot enter, and residents have to rely on manual sweeping for the cleanliness of their area. Also waste collectors who are primarily male, load waste manually into the waste vehicle from the accumulated area using spade which requires hard labor and have negative impact on their health. But these practices of waste collection are ongoing for years in the city and still, minimum attention is given to negative impact of these practices on the health of waste workers employed by both metropolitan and private companies (Field Observation, August 20-23, 2019). The substantial role played by gender, race and caste in case of solid waste management in Asia and Africa has been pointed out by scholars (Beall, 1997; Dias & Samson, 2016).

Similarly, in Kathmandu, the social and cultural association of waste with gender and caste has further complicated the understanding of solid waste management in the city. At the same time, it demands for a closer consideration of the intersection between religion, caste and gender in waste that is further exacerbated by the rapid urbanization, rural-urban migration and weak governance of the city. Waste management policies and informal waste pickers integration programs that were designed without taking into account these aspects rather resulted into further deterioration of the situation for example in South Africa (Samson & Hurt, 2003).

6.7 Recyclables' Market in Nepal

Presently the most sorted after material in recycling centres were found to be plastics (polythene, polypropylene, PET/PETE, LDPE, HDPE, and PVC), glasses (white and green), aluminium cans, paper, iron, clothes, batteries, and other metals. Out of all the materials paper and iron is fully recycled and utilized in Nepal, all others get transported fully or some percentage of it to India. A study estimated that Nepal recycles or reuses roughly 53 percent of its scrap waste, but this occurs mostly through the informal sector (Luitel & Khanal, 2010). Also, a large amount of scrap is exported to India through various channels that are both legal and illegal through which large amount of money escapes out of the economy. In turn, the country buys finished plastic products from India paying high import tariff. In addition, there are no specific policies and regulations that prevent the illegal import and export of waste. Though Nepal along with India has ratified Basel Convention, but this alone cannot halt traders from transboundary movement of materials; national policy with regulatory mechanism to control these activities is necessary. But Nepal is lacking a clear national policy regulation and appropriate institutional set up to control the movement of waste resources between borders. As India is also a signatory of Basel convention, it has increased restrictions on transboundary movement of plastic waste citing it as hazardous waste since April 2018 it has made the waste traders to find more illegal ways to send waste across the border. (Recycling association member, personal communication, August 22, 2019).

Though there are plastic, paper, metal, and rubber recycling industries in Nepal, they are not enough to completely absorb all the materials. And all kinds of glass recycling are still not possible in Nepal, it has to be sent to India. Nepal itself is lacking large-scale industries that can recycle all kinds of plastics and glasses which makes up a large part of this illegal material transportation (Recycling association member, personal communication, August 22, 2019).

“In the current scenario we produce 100, 000 tons of plastic each month out of which 30 percent gets recovered in Nepal itself. While 70 percent goes to India informally at NRs. 16 per kg” (President SWMA, personal communication, August 19, 2019).

“As of fiscal year, 2076/2077 government of Nepal levied a VAT of 13 percent on scrap materials, this brought all the scrap dealers to protest. People are involved in this informal waste business since its profitable; if they have to start paying taxes on it, they will not pick up the scrap from the dumps as it is not profitable anymore. In addition, a lot of informal waste pickers will lose their work and source of income” (Recycling association secretary, personal communication, August 22, 2019).

Above statement reflects a situation where waste is a lucrative business for scrap dealers if they can skip the tax system of the government and pay minimum to the waste pickers increasing their profit margin. When they must pay taxes their profit margin decreases.

During the field work for the study, it came to the knowledge that government had just implemented its rule to levy 13 percent VAT on scrap materials through the budget speech for the FY 2076/77 (2019/2020). But scrap dealers/contractors were protesting this government decision by not picking up scrap from the waste dumps and households (Recycling association member, personal communication, August 22, 2019). This in one hand raises the probability of increased volume of waste in landfill and negatively affect the livelihood of informal waste pickers. On the other hand, it highlights the fact that scrap waste is a lucrative business, both government and informal recyclers want a share of it. The world prices for scrap has been rising steadily leading to a change of the slogan from *waste to wealth* in 1990s to *waste is wealth* in this millennium.(Chaturvedi & Gidwani, 2010). This has made taxation of urban scrap waste a worthwhile attempt to generate revenue for governments.

Interview with an entrepreneur who has been dealing with scrap plastic waste since last 15 years had an estimation based on the experience about the amount of recyclable. *“There is no official data but according to my knowledge, 20 percent of plastic waste from Kathmandu Valley gets recycled within Nepal and rest 80 percent travels to India. From Kathmandu Valley we send 100, 0000 -150, 0000 kg of plastic waste as raw material to India of which Kathmandu Metropolitan alone contributes 400,000-500,000 kg”* (Recycling association member, personal communication, August 22, 2019).

There is a huge ambiguity in Kathmandu about actual amount of scrap waste that is recovered from the waste stream within and outside the country. Creating a loop in the economy through which numerous resources escapes the country. It is a situation created due to government’s inability to provide a clear working plan to attain 3R in all the municipalities of Nepal. It has plans to promote and mandate 3R at household and community level and construct necessary infrastructure for the management and processing of waste at local and regional level in its urban development strategy (2017-2030), national five-year plan (2019/20-2023/24).

But the local government already struggle in their budget with most of its resources being used for administrative costs and waste collection activities (Waste expert, personal communication, September 8, 2019). Also, government has not been able to incentivize private sector to resource recovery using appropriate technology in all municipalities of Nepal. Leading to a gap which has brought in the informal sector to recover resources from waste using labor-intensive techniques.

At the same time, from the field interviews it became apparent that informal waste business is lucrative for scrap dealers and a way to make ends meet for the waste workers/pickers. As there exists no value chain analysis of the ongoing waste trade. Transactions happening between waste pickers, middlemen and scrap dealers (small, medium to large scale) are maintained manually in books at times and at times they are done based on word of mouth. Most of the time the billing process is deplorable even for large transactions creating a gap for tax evasions. Also, due to the profitability of the business waste trade system being carried out by syndicates has been pointed out (Ručevska et al., 2019).

The field study revealed that waste management is an important economic sector that provides livelihood opportunities for individuals at all levels including waste company managers to informal waster pickers on the ground. Additionally, there is a high interest among small and medium scale investors to get involved in waste trade due to its high turnover. But as the materials get exported out of the country the opportunity to generate revenue is ceased. Furthermore, large-scale, and big businesses do not invest in waste materials recycling as waste traditionally and culturally is tied to being a low caste job and getting involved in waste business can “*tarnish the prestige*”. This kind of mentality has also hindered in making material recovery business formal and attract investment. Turning these informal businesses into large formal business can have positive impacts on the economy even help in developing better ways to recover materials. But it also raises concerns about its impact on ongoing informal activities and the large labor resources it sustains.

6.8 Organization and Dis-Organization of Informal Waste Sector

The informal waste sector in the city is not officially organized as a group supporting solid waste management of the city. For the scrap dealers the lack of organization is associated with their lack of interest in being organized. During the interview it came out that scrap dealers both small and medium-sized are not interested in participating in any association.

“I want to do my business, do not want to pay VAT that government has levied now, I already pay taxes for the profit I earn during the year, it is enough for the size of business I have. I would like the government to leave me alone” (Scrap dealer, personal communication, July 25, 2019). While informal waste workers continue to work unrecognized in the city, to earn their livelihood, without the acknowledgement of their contribution and facing social stigma. Literature has given self-organization of informal waste workers utter importance for their inclusion in formal waste management system. In some parts of the world the informal waste

sector, especially waste pickers have been able to organize themselves and achieve their goal of being integrated into the formal waste management system. For example, in Belo Horizonte, Brazil, Pune India and Bogota, Colombia (Dias, 2016; Fergutz et al., 2011). At the same time, efforts from government to accommodate the informal sector with investment from donor agencies and non-government organizations can be valuable (Dias, 2016). In case of Kathmandu, informal waste workers were found to be not organized into member-based organizations. They performed the waste segregation and cleaning activities and get paid based on the prevailing market rate for the products or a daily wage based on where they segregate waste. During the interviews it came up that some workers were promised more daily wage but paid less in reality by the *Kawads* they work for.

In these scenarios, self-organization of waste workers can be useful to put forward their demands for the payment. Though it was revealed that almost all the waste workers came into this work was through their friends and family members who were already involved in informal waste segregation. This kind of relation till now has allowed them to seek help from each other when issues arise with the scrap dealers (*Kawads*). Their support system till now has been their personal relations with other waste workers and sometimes support received through NGOs working to support informal waste workers. However, it cannot be denied that though the waste workers are not organized as a group, there exists some level of organization within the sector. The interviews with waste workers revealed that they have developed a level of specialization based on which recyclable material they segregate and clean. At the same time, they have a specific buyer to whom they sell the materials brought from the landfill. Itinerant waste buyers also sell the recyclables they bought from households to a specific scrap dealer with whom they maintained relations. Also, the scrap dealers reported to have a specific buyer to whom they sell the recyclable material though it's not a formal written agreement.

6.8.1 Co-operatives and formalization approaches for informal waste workers

Waste workers organized into co-operatives and associations have been successful to integrate themselves into formal waste management arrangement. Successful formalization of informal sector has occurred through initiatives of NGOs or municipalities itself in cities of Brazil, Colombia, Peru, India and Philippines (Gunsilius, 2011b; Wilson et al., 2012).

Similarly, formalization of waste workers through organizing them in CBOs (Community Based Organizations) or MSEs (Micro- and Small Enterprises) have been promoted in some countries for example in Lima, Peru. In Lima MSE based model was initiated where women ran the enterprises that collected waste and recyclable materials (Baud et al., 2001).

Nevertheless, the sustainability of these approaches has also been questioned due to concerns over timely payment to waste workers by the municipality (ibid). Another approach for the formalization of waste workers is based on adopting informal waste-workers as workers for the formal waste management sector either by local government or private sector. This approach has been classified as traditional that sees informal workers as poor people who need help to get out of poverty. It tends to ignore the significance of informal waste workers for waste management and tries to improve their condition without addressing the social and political factors that influence the situation (Scheinberg, Anschütz, & van de Klundert, 2006).

6.8.2 Experiences of formalization, situation in Kathmandu and prospects for integration of informal sector

As per, International Solid Waste Association that successful integration of informal waste sector provides a win-win solution for attaining an integrated and sustainable waste management system (International Solid Waste Association, 2012). Though the attitude of indifference towards the informal sector has been prevalent, there are examples from governments that have acknowledged the positive contribution of the informal sector and have considered its inclusion in formal waste management systems. In Brazil, national solid waste policy recognizes informal recyclers as vital in municipal solid waste management, including the recycling associations and co-operatives. In Bogota, Columbia recognition of waste pickers came after the judicial fight of their organizations, while in Lima recognition of waste pickers came after the adoption of recycler's law (Rateau & Tovar, 2019). Struggle of waste pickers for their inclusivity have manifested in form of mass mobilization, building up strategic alliances at local, national, and international level. This is to achieve integrative policy and legislation such that they are recognized for their work and secure a livelihood (Dias & Alves, 2008).

Nevertheless, success of informal sector, waste pickers/ recyclers in achieving inclusivity and recognition relies on social, historical, urban, and political factors in the given context (Dias, 2016; Dias & Alves, 2008; Wende et al., 2020). Cities like Belo Horizonte, Brazil; Bogotá, Colombia; and Pune, India are considered to be the most progressive in terms of integrating waste pickers into their urban plans (Dias, 2016). In Brazil, the initiative was carried out by local waste pickers cooperative which eventually played a vital role in establishing a new formal recycling system in which informal waste pickers and recyclers are included as formal partners together with municipal authorities (Dias & Alves, 2008). Meanwhile, in Columbia, the recognition of informal waste pickers as mentioned earlier came because of litigation fought

by Bogota Waste Pickers Association (Dias, 2016). Similarly, in India, waste pickers union formed the country's first member managed and owned waste picker cooperative. This made the municipal corporation to engage and go for contractual agreement with city's informal waste workers (ibid).

All these successes in integration of waste pickers are attributed to their ability to organize themselves. In these cases, organizations of waste pickers made it possible, to represent waste workers' interest with concerned local authorities. Also, state activeness to respond to the demands of informal workers, this created a way for creating policies that favour the waste pickers at the same time addressing the social, environmental, and economic concerns (Dias, 2016; Gerdes & Gunsilius, 2010). While co-production policy recommendations have produced positive results in establishing integrated solid waste management systems in different cities around the world through strong state support for waste pickers organizations, this was currently absent in Kathmandu. Thus, it has been widely discussed that integration and formalization can only be a success when informal waste workers can organize themselves. Also, when considering the integration of informal waste sector, it is necessary to take into account that waste pickers are a heterogeneous group of people. Viewing everyone with the same lens can be detrimental as it was revealed through the interviews with female waste workers, *"I do not like to work at scrap centre (Kawad) as it is a lot of working hours, I prefer to go to landfill site and segregate, its more freedom there for me"* (Informal waste worker at landfill site, personal communication, September 5, 2019).

"I like to work in scrap centre (Kawad), though my freedom is less here but it is not risky as the landfill site and I have kids at home" (Informal waste worker in a scrap centre, personal communication, September 6, 2019).

These statements reflect that even within the informal waste workers the views about where to work varied depending on their sense of security, freedom, and earnings. At scrap centres women were bound to come every day seven days a week to segregate and clean specific type of waste and get paid for the daily attendance. Whereas at the landfill site these waste workers could segregate from the dump, the risks of getting hit by large vehicles existed however they could also stop their work at any time of the day, when they felt it was enough recyclables for today. The itinerant waste buyers participating in the study were found to be independent buyers of recyclables from households with preferences to whom they want to sell those recyclables. Also, in the interviews it came up that around 16 women IWW that participated in the study were involved in a co-operative established through the help of PRISM project, a project implemented by Practical Action through the support of European Union. This co-

operative named Sanyukta Sarsafaai Jagaran (SASAJA) was established by the waste workers through the impetus from the project with an aim to facilitate savings and provide loans to each other at a very low-interest rate. There are around 812 members in this cooperative and among them 500 are actively working as informal waste workers.

“For this co-operative, PRISM project helped us, they provided us savings mobilization training and some seed money. Due to this, we started to save money every month and bring it to our co-operative. Now if someone among us need emergency money we provide loan. This has, habituated us to save money” (Informal waste worker, personal communication August 28, 2019).

“Due to this co-operative, we can now gather at the end of each month of Nepali calendar month and bring our savings to deposit. This has also become a way for us to come together to meet each other who we cannot meet regularly due to work” (Informal waste worker, personal communication, August 28, 2019).

“My life has changed since I started to work as an accountant for this co-operative. I worked as an informal waste worker for 11 years, first in the landfill site then in a transfer station. I was working as a waste worker till 2012. During that time, I was looked down upon by people in the society as if I was doing something wrong. As an IWW, you face exploitation not just from the municipal staff but also from the police, especially if you are picking up waste in landfill site. They used to verbally abuse us by offensive names” (Former informal waste worker, personal communication, August 26, 2019).

These statements capture the difficulties of being a waste worker and the positive aspect of a cooperative run by waste workers themselves. The idea of saving and credit at low-interest rate has attracted informal waste workers, who face financial insecurities daily. The presence of a cooperative has provided a platform for the waste workers to meet and share their experiences at work. Though, the co-operative is small as compared to the number of waste workers in the city and has limited members, the presence of one has given them a sense of positivity that there exists an organization that can work towards benefitting them. Meanwhile, interviews revealed that remaining waste workers participating in the study had no idea about the presence of a cooperative in the city neither were involved in any other kind of association. Waste workers in Kathmandu were found to be unorganized without any systematized supporting mechanism. When problems related to accidents and inadequate payment arose, they seek support from each other based on personal relations. At the same time, they expressed their interest in being associated with some organization that could help them to deal with the challenges they face in their work. However, except for some occasional support from NGOs

providing health check-ups, stationery material for kids, informal waste workers of Kathmandu lacked support. In the context of Kathmandu current need of formation of waste workers' organizations in form of associations and co-operatives were seen. In addition, authors have given importance to several factors like policy and legal arrangement; financial instruments; institutional and organizational arrangements; social acceptance and technical interventions as common actions for the successful formalization of informal sector. Comparing to the different characteristics of informal waste worker system given by Nas and Jaffe as shown in (*fig 10 in chapter 2*), based on the four aspects such as organization level (Low Medium and High), socio-political context (repression, neglect, collusion and stimulation), socio-cultural differentiation restricted to (low social status or extended to ethnicity) and modern technology (appropriate and inappropriate for the context) (Nas & Jaffe, 2004), following can be said about the informal sector of Kathmandu.

The socio-political context in Kathmandu reveals that informal waste sector especially the waste workers are facing disregard from the authorities. Modern technology though regarded as a way to solve waste problems can face challenges in developing countries due to their incompatibility to the local conditions and nature of the waste produced, Similar, case was seen in Nepal where there have been past failures to establish a system with modern technology with engineering-based solutions (*see chapter 4*). In addition, from the analysis of social perception towards the informal waste workers it is revealed that they are ascribed to or have self-acquired low social status. Though the study considered limited number of informal waste workers, they were alleged to be of low social status. While the level of organization of waste workers into micro-enterprises and co-operatives were found to be low, except for the presence of one women co-operative. From all these four aspects it can be said that informal waste workers of Kathmandu lag with at least two of the basic factors relevant in determining the level of success of an informal waste picking has in integrating into formal system as specified by Nas and Jaffe i.e., their level of organization is low and socio-political context of neglect doesn't support for their successful formal integration.

From this it can be said that in Kathmandu for the success of informal waste system to be integrated, a higher level of organization combined with stimulating government policies towards the sector is needed. In addition, the type of intervention is also relevant in shaping the success of an informal recycling system into formal system. In some cases, positive intervention from the government can be beneficial while in others non-government organizations and community-based organizations may have a better hold on ground and can make constructive changes. In case of Kathmandu, non-government organizations and social

enterprises were found to be more connected to the waste workers with the potential to provide support for progressive changes for the sector.

Meanwhile, it is important to contemplate the fallacies associated community-based approach or NGO led approach. There are evidences from Mumbai where NGOs acted differently to the needs of upper, middle-class citizens in comparison to the needs of slum dwellers that promoted a managerial vision of participation and dual standards of citizenship (Zérah, 2009, p. 853). While community based approach in solid waste management in poor areas of South Africa became a way to access voluntary cleaning work as opposed to provision of well-functioning waste services by state and private companies in richer areas (Dias & Samson, 2016).

6.9 Chapter Conclusion

This chapter addressed the role played by informal sector in solid waste management of Kathmandu. This sector plays a critical role in solid waste management of the city, where the formal recovery system ceases to exist. The informal waste recycling sector is highly organized in sorting materials and has been operating parallel to the formal system. Informal waste sector in Kathmandu provides raw materials to the formal industries utilizing plastic, metals, clothes, and glasses. There exists informal-formal linkage in terms of material supply in Kathmandu. The sector is linked to the formal sector, through the provision of raw materials through scrap dealers or through middlemen to large recycling and manufacturing industries. These recovery activities lack acknowledgement from the government though they were found to make positive contributions through reducing the quantity of recyclables ending up in landfill and further collecting recyclables from landfill. This act of informal sector has been documented by various studies from different parts of the world for having positive environmental and public health impact. Despite their efforts in the solid waste sector, informal sector's relation with authorities have been strained. Meanwhile, there are no sound policies and incentives specifically directed at supporting and integrating their activities into the formal system. Nepal has labor laws in place and ratified a handful of international conventions for labor standard that could support these informal waste workers, but there have not been attempts by authorities in this direction. At the same time there is absence of organization from the side of informal waste workers, though there have been attempts by social enterprises to register and regulate itinerant waste buyers but the scope of it has been limited.

Meanwhile, informal sector operators try to avoid contact with local authorities owing to lack of trust and fear that they will start levying unnecessary taxes on them. The local government

is perceived as only interested in imposing new or increased taxes on their business. These informal operators prefer to keep the quantity of recyclables traded a secret from outsiders with a specific fear towards government impositions. This has created an environment of mistrust among informal operators towards local government, perceiving them as someone creating obstacles in their businesses. Informal waste workers' relation with private waste management companies and scrap dealers is based on their supply of cheap labor force to extract recyclables from waste. NGOs and social enterprises are positively engaging with informal waste workers; however, sustainability of their activities is hindered by the inaction of local government.

Thus, it can be concluded in line with the legalist approach on informal sector, informal waste operators avoid legalizing themselves due to the bureaucratic hassles. At the same time, the role of government authorities has been minimal towards the sector that has translated into an approach of neglect where neither the benefits nor the hazards faced by informal waste sector especially by the waste workers are taken into consideration.

7 Existing Partnership between Actors in Waste and its Contribution in Addressing Waste Issues

“Solid waste management, complete waste collection coverage is proposed for urban areas. The strategies include focus on community-led waste segregation and collection; public-private partnership in waste collection and management; adopting sanitary landfill sites as a transitional strategy with the aim of promoting and mandating 3R (reduce, reuse, recycle) at household/community level; and establishing dedicated and capacitated SWM unit in all municipalities (National Urban Development Strategy 2017-2032)” (MoUD, 2017).

This chapter focuses on the existing partnerships between the actors in waste and discusses its role in addressing solid waste issues of the city. The municipality is a pivotal actor for solid waste management in terms of legal authority that is vested on them; nevertheless, there are a range of actors actively participating in waste management of the city. The results point towards inadequacies of current arrangement based on word of mouth between private companies and metropolitan. Furthermore, municipal authorities’ hesitance to partner with active private sector and informal actors and grouping all the actors under the same category of being informal were identified. The chapter identifies, partnerships inclusive of all actors active in waste management as a steppingstone to address waste issues and a move away from symbolic form of governance in waste.

7.1 Partnership a way forward for Integrated Solid Waste Management?

Privatization of urban services through contracting out the service provision to large scale private actors has been a way to deal with public sector inadequacies in service provision. Literature suggests partnership as a way to end solid waste problems in developing countries. Increasing financial capital of solid waste management through human, social, physical and public infrastructure is possible through partnership (Sembiring & Nitivattananon, 2010).

Partnership among stakeholders of waste management is regarded as a key to address waste issues (Velis et al., 2012). However, partnership between actors in waste is a complicated process, as poorly designed attempts for partnership may actually deteriorate the situation by fostering inefficiency and corruption (Ahmed & Ali, 2004).

In integrated solid waste management framework partnership between actors is included in inclusivity of user and service providers in waste. Inclusivity of actors other than local government is important particularly in case where local authorities lack capacity to provide services to everyone equally. The governance dimension of integrated solid waste management framework demands for partnership between actors through inclusivity of user and provider. While the framework opts for bringing in all the stakeholders in planning, consultation and implementation process of solid waste activities, realities in developing country context can vary. Literature on partnership between actors is rich in providing evidence of need for and success of public-private partnerships for waste management (Ahmed & Ali, 2004; Baud et al., 2001; Rathi, 2006). At the same time, a line of literature on partnership focuses on inclusion of informal waste picker associations and co-operatives for inclusive solid waste management (Fergutz et al., 2011; Gutberlet, 2015). Authors have criticized the corporate market oriented way to deal with waste, with emergence of “new waste governance regime” the focus has been on bringing in private actors and mechanized interventions over already existing knowledge and skills of informal waste sector and its actors (Gidwani & Corwin, 2017).

In line with this thought, this dissertation investigates what kind of partnership already exists among the actors before concluding about the role played by partnership and potential contribution it can make in solid waste governance. In this thesis partnership in solid waste management is defined as to include local authorities, private waste management companies, the informal sector, non-government organizations, social enterprises, and households. Considering that the quality of life in solid waste management can be improved by strengthening the partnership or alliance (Baud et al., 2001).

For the understanding of existing partnership between actors in solid waste management the dissertation studied the guidelines set by local government, solid waste management act, rule, and national urban development strategy as a baseline. In addition, metropolitan level plan for the fiscal year 2019/20-2020/21 was used as a starting point. As these documents laid out who are to be considered as partners in solid waste management, how the partnership process should be carried out to get the best possible results. These documents define the official standards for partnership between government and non-government actors for urban services including solid waste management. The *table 10* below shows solid waste management acts/regulations that pave a way for public private partnership for solid waste management. Local Governance Act and Local Government Operation Act that support partnership between local and provincial governments with private sector for waste and sanitation services. National Urban Development Strategy and Kathmandu metropolitan's program for the fiscal year 2020/21 promotes private sector and non-government organization's involvement in waste management. Similarly, Public-Private Partnership Act and Public-Private Partnership and Investment Act provides basis for private sector involvement for waste infrastructure development.

Solid Waste Management Act 2011	Solid Waste Management Rules 2013	Local Government Operation Act 2017	Local Self Governance Act 1999	National Urban Development Strategy 2017	KMC fiscal year 2020/21 plans and program	Public Private Partnership Policy 2015	Public Private Partnership and Investment Act 2019
Local Body may forge a partnership with the private sector, community, and non-governmental body or organizations	Solid waste management work can be done by local body in partnership with the private sector, community and nongovernmental Organizations or agency	Coordination, collaboration, and partnerships with private and non-governmental sectors for management of waste produced from sanitation Municipality may operate and manage any plan or project in joint investment of the Government of Nepal or provincial government or in public-private partnership.	In formulating plans and service programs of the Municipality, the Municipality shall maintain coordination with governmental, non-governmental and donor agencies implementing different services and development programs	Promote public-private partnership in waste collection and management	Promotion of community based, private, and non-government organization in the metropolitan that are active in solid waste processing, recycle and reuse	Private Sector Investment in the Construction and Operation of Infrastructure to ensure public access to infrastructure and Services Private capital for infrastructure development innovative Technology, skills and service delivery	Provides a basis for waste infrastructure development under public private partnership model

Table 10: Official acts and policy guideline for public-private partnership (Own compilation)

Then, the research considered level of partnership and collaboration between different actors in waste that included households, private companies, NGOs, social enterprises, informal waste workers and metropolitan. The focus here is on informal waste pickers as they are the lowest segment of informal recycling sector and subject to various discriminations. These actors' level of involvement in different stages of waste management were assessed against the official standards for partnership and collaboration. Partnership between actors in the city can be outright public while some can be more hidden and only revealed when inquired about, thus partnership between actors were assessed to bring forth existing partnerships and lack of it between actors. The way partnership between actors should be carried out and proceeded is established in acts and laws whereas the way it is practiced on ground can be gauged. The municipality is the body with authority to forge partnership for work related to solid waste management with private sector, community, and non-government organizations. It has a critical role to play in establishing a partnership as well as promoting public awareness through partnership with community.

The study reveals that, actors such as private companies, non-government organizations, communities and informal sector actors in Kathmandu have molded partnerships with each other. Municipality itself has not been partnering officially with actors present in the city but there have been unofficial partnerships between metropolitan and private companies to deal with the waste of the city. In all the acts, strategies and policies mentioned in *table 10* above

local body i.e., the metropolitan is regarded as the major body who has the authority to initiate partnership with other actors/stakeholders for waste management and other sanitation services. While the official rules and regulations on solid waste promote non-government organizations and community-based organizations there are no mentions of informal actors and partnering with them. Also act and government policy on public-partnership promote private actors with technical expertise to be involved as partners in waste management. In the further sections this thesis investigates government's idea of mechanized solid waste management in the city, its changing waste governance mechanisms, existing partnerships, and perspectives of actors on partnership.

7.2 Private Waste Management Companies in Kathmandu as Informal Partners

Literature has mentioned participation of private sector waste management companies in waste management can reduce the burden on local bodies (Chaturvedi et al., 2015). In Kathmandu metropolitan private waste management companies are one of the major contributors to solid waste management of the city. Currently, there are seventy small and big waste management companies operating in Kathmandu metropolitan (President SWMA, personal communication, August 19, 2019). Out of these, sixty-two companies are officially registered at Solid Waste Management Association (SWMA) of Nepal. These companies are primarily focused on collecting waste from households and businesses and their ways to deal with waste is dumping into the landfill. Private companies have mushroomed in the city their number in Kathmandu metropolitan has increased by ten folds, from seven to eight companies in 2006 to around seventy private companies in 2019.

“Waste management in Kathmandu has become a lucrative business, anyone can start a waste business with a small investment on tricycle and capture a neighborhood to start collecting waste and charge money from households” (Former official SWMTSC, personal communication, August 6, 2019).

Private companies that are present in the city are regarded as formal actors for this dissertation though some level of informality exists among them. Through interviews with the private companies, it was revealed that no private company is actually operating with a legal authority from the metropolitan to work in waste management of the city. These companies derive their formality from the formal registration under Companies Act of Nepal 2006 as private company and pay taxes based on their profit. As per the interviews, the major source of income for the private companies is the service fee charged for waste collection from households and

businesses. As per the companies, waste business is good, earning is going well in the sector. Since government has not mandated a fix amount of money that these companies can charge waste producers, they are charging money based on their understanding, without any scientific basis. While the household surveys carried out among the households served by private companies revealed that, these fees range from NRs. 250 to NRs. 450 per month based mostly on the comparison of household size and waste amount with their neighbors. Though there is no scientific method to base the waste fee upon. It was revealed that waste fees to households are based on mutual understanding.

“Our contract with households is based on word of mouth. First, we make them members and then only we provide waste services. We charge member fees and waste services fee to households; we provide a membership card and receipt after payment every month. We aim to make as many members as possible and increase our clientele” (Owner private waste management company, personal communication, August 11, 2019).

Furthermore, during the household survey, it was revealed that a larger number of households served by the private companies are willing to pay for improved waste management services as opposed to those served by the metropolitan. The *figure 55* below shows the willingness of households to pay for waste services. It shows that more than 80 percent of the households receiving services by private companies are willing to pay for the waste services, as compared to only around 45 percent of the households willing to pay for waste services receiving services by the metropolitan.

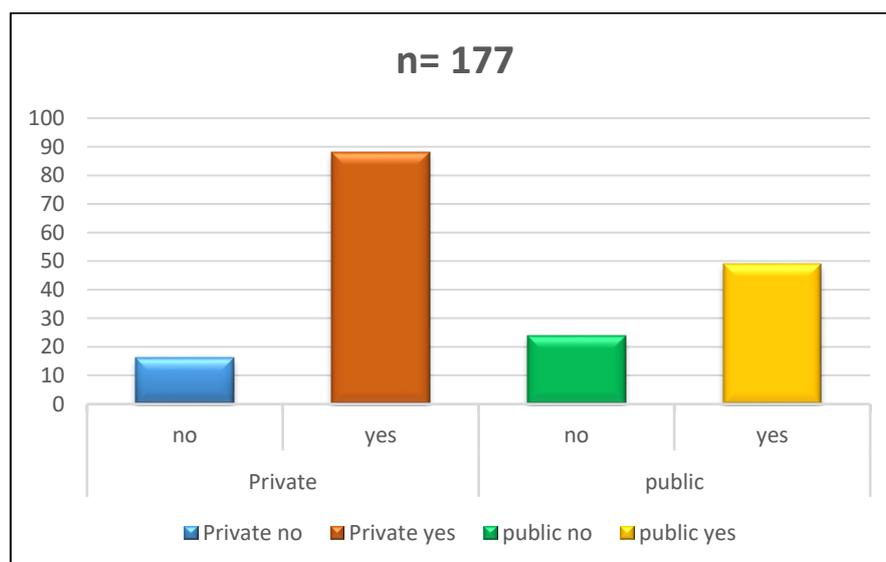


Figure 55: Households' willingness to pay for the waste services (Source Author, 2019)

The difference in opinion in terms of payment can be due to the reason that private households already pay for the waste services, and their responses reflected that they question the local government's ability to provide services in their area. While households served by public are less willing to pay for the waste services. Households responding to we should not be paying for the services pointed towards reasons like, *"it is the responsibility of the metropolitan to provide the waste management services without additional charges, but our government is not responsible for anything and not reliable at all, so we are currently bound to pay private companies for waste services"* (Excerpt from household survey, Ward 16).

"I feel that we are paying exuberant amount of money to private companies for waste services as there is no regulation to control them. If our government was not so corrupt and responsible towards public, we should not be paying at all for waste services" (Excerpt from household Survey, Ward 32).

These statements above capture issues like public perception that local government is the responsible body to provide waste services and lack of public trust on government and inability of the government to regulate activities of private companies. At the same time, when it comes to overall willingness to pay for services, 137 out of 177 households were positive, which also shows that comparatively more people are willing to pay for improved waste services. Households being consumers of waste services and producers of waste, their willingness to pay for services is essential for designing waste policies and facilities. Nonetheless, there is a lack of uniformity in terms of payment for waste services, where households in some wards get free of cost waste services and others have to pay on a monthly basis.

The field study revealed that private companies have been able to apprehend the public need for waste services and make a business out of it. They fill in the gap left by local government by providing waste services, but there is no mechanism to monitor and regulate their activities. The existence of a web of private waste management companies in Kathmandu emerged from two sources which were revealed in the household survey. There are no door-to-door household waste collection services by metropolitan in outer ward areas of the city, making households directly come in contact to private companies for waste services. Also, it revealed that households are willing to pay for the waste services as they want waste to be gone from their vicinity. This was later confirmed in the interviews with private waste companies that the metropolitan cannot cover all areas, so these companies started to expand in different parts of the city since a decade: *"Government itself doesn't have enough resources and ask us to help them to collect waste from different parts of the city during the time of large events, we also*

agree to help because they are the local government, and we have to keep good relations with them” (President SWMA, personal communication, August 19, 2019).

Thus, it can be summarized that private waste management companies are not regarded as formal partners by the local government. However, these private companies are actively providing waste services to the public as local government fails to do so. Though a bunch of regulations and policies in Nepal recommend forging partnership with the private sector, non-government organizations and community-based organizations, but this has not been prioritized by the municipality. A large number of private companies have mushroomed in the city as waste collection and disposal has become a lucrative business due to public willingness to pay for the waste services and they are willing to stay in this profitable “solid waste management business”.

7.3 Private Sector in Solid Waste Management of Kathmandu, Past and Present

“Private companies existing in Kathmandu are not our formal partners for solid waste management, they have no legal binding partnership and authority, so we can say they are formal since they pay taxes but informal because of their relation to government” (Head environment section, personal communication, August 20, 2019).

“These companies do not fully reveal the profit they make, no one is there to keep track of their income and public is paying a lot more than required” (Former official SWMTSC, personal communication, August 6, 2019).

“Till 2006, there were only 5-6 private companies, but suddenly, they started to mushroom in the city as waste became a lucrative job. People in the city started to be willing to pay for waste services as they wanted waste to go away from their immediate contact, for companies it became an opportunity to earn” (Former head environment section KMC, personal communication, September 1, 2019).

This reveals a situation where the metropolitan which is the local government responsible for keeping an eye on all the private companies including regulating the user fee has turned a blind eye on the prevailing conditions. A comprehensive study done by JICA on solid waste situation of larger Kathmandu valley in 2005 came to the conclusion that, “most private organizations in Kathmandu are working on their own or under some kind of verbal understanding with the municipalities.”(Nippon Koei Co. & Yachiyo Engineering Co., 2005, pp. 4-3). Similar situation of private companies and non-government organizations was discovered by the study. Interviews with private companies revealed that these companies are working in a situation

where there is lack of certainty that they will exist after the conclusion of the public private partnership between government and a transnational company. This has created a situation where these companies are functioning with a lot of uncertainty about their future and distrust for the metropolitan, but function on a day-to-day basis based on their personal relations with metropolitan officials. Looking back at the history of involvement of private sector in waste management of Kathmandu Metropolitan, waste has always been the responsibility of people themselves and later of the local government since the establishment of *Safai Adda* (Sanitary Office in 1919). This office was later renamed as Municipality office in 1931 (Former head environment section KMC, personal communication, September 1, 2019).

Involvement of the private sector in waste was mainly in the form of non-government organizations raising awareness campaigns and trainings to school children, public and women's group. It was only later in 2001/02 four NGOs were given contract for waste collection and sweeping in some areas of the city by then mayor P.L. Singh with a payment at a rate of NRs. 14,000 per km per month. To attract foreign investment in waste through non-government organizations, but this contract was not renewed beyond two years. Since then, there has not been any official contract by the local government to the private sector. NGOs were involved in waste management sector out of their donor influence and interest. While in 2006 government brought the regulation that only private companies can work in waste collection in the city. This made it mandatory for most of the NGOs working in waste to register themselves as private waste management companies. Thus, a condition arose where most of the companies are registered officially as profit making private company under Companies Act of Nepal 2006 but without a legal contract from the local government to work in waste management as mandated by Local Self Governance Act 1999 and Solid Waste Management Act 2011. This has created an ambiguous situation where the government is not acknowledging their existence officially by providing a legal binding contract but also not outright rejecting their contribution and work in collecting the waste from the city. At the same time, there is no government body to regulate and monitor the activities of private companies.

“The attitude of the metropolitan makes us think that not objecting or being silent must be supporting us” (President SWMA, August 19, 2019).

“The inability of local government and private companies to come into a formal contract with each other has created a space for informal negotiations and practices to run the waste management system of the city” (Waste expert, personal communication, September 8, 2019).

“Most of the companies that are operating today in the city were initially working as non-government organization till 2060 B.S. But after that government brought a decree that only

private companies can collect waste from the city and generate income, such that all of them changed to private companies and private companies started to mushroom in the city. Before we only had six non-government organizations operating in the city” (President SWMA, August 19, 2019).

These statements above capture the perceptions of private companies on their current situation in the city. Official government documents in Nepal demand for awarding private sector or community sector organizations with waste management responsibility through tender. In case of service charge, it is recommended to be fixed by local body/ metropolitan or any organization prescribed by the local body and waste management service charge should be based on quantity, weight, and nature of solid waste. In Kathmandu, practices by metropolitan and private companies are non-compliance to standards put forward by the official standards.

7.4 Alliances between Waste Actors

7.4.1 Non-government organizations, private companies, and households

In the context of Kathmandu, it was identified during the fieldwork that various partnerships between actors exist. These alliances are made by actors to deal with the waste management issues of the city. Households’ importance as primary waste handlers, waste generators and waste service users cannot be denied. Private companies and NGOs in the metropolitan were found to be collaborating with each other to impart waste segregation and composting training to households, *see fig 56*. In the household survey, 26 out of 104 households that were served by private companies were found to have received trainings through the collaboration of NGO and private companies. Though the private companies have no legal contract from the municipality to provide solid waste collection and disposal services to households they have their own modes of operation at local level, these are not stipulated in waste management by-law. Private companies in turn contact NGOs working for solid waste management and environment for conducting segregation and composting trainings. However, these activities were being carried out at a smaller scale as compared to the number of households covered by these companies in each ward.

7.4.2 Municipality, community-based organizations, and households

In the study it was found that metropolitan’s community development section was partnering with women’s group in the four wards served by the metropolitan *see fig 56*. Women’s group in two wards surveyed in the study were actively receiving waste segregation and composting

trainings from the metropolitan. It was found that the strategy of community development section of metropolitan was to engage with the households through the women's group. As already mentioned, in the previous chapter women are regarded as responsible person for waste in the household. During the survey it was found that 49 out of 73 households served by the metropolitan had received trainings and segregation material from the metropolitan. These activities from the metropolitan were however, confined within the four wards of the metropolitan where its waste services were provided.

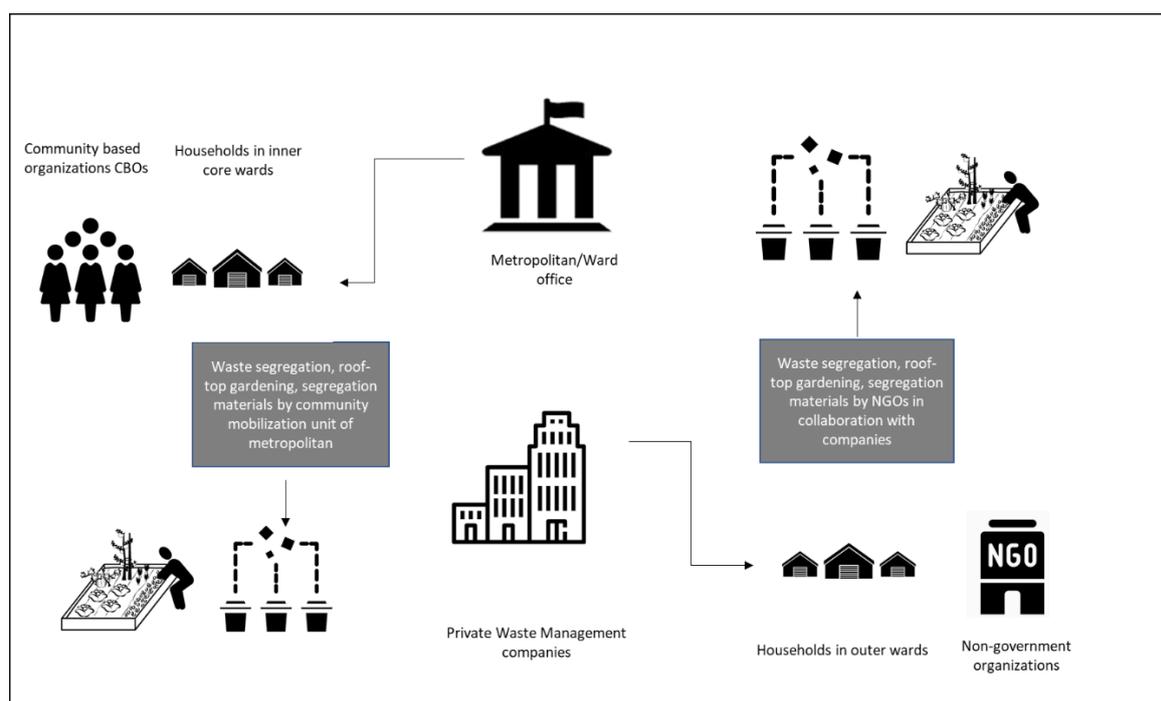


Figure 56: Actors engagement with households in Kathmandu (Own compilation based on fieldwork, 2019)

7.4.3 Private companies, social enterprises, and informal sector

The field study revealed that private companies in Kathmandu partner with informal waste sector to reduce the amount of recyclables from their transfer stations. Private companies collaborate with scrap dealers who bring in informal waste workers to sort the waste; this way they get paid by the scrap dealers for providing access to waste and their transportation costs are also reduced. This kind of partnership is beneficial for both private companies and scrap dealers, while informal waste workers also get access to waste and income. In interviews, it was discovered that these partnerships are based on word-of-mouth agreements where these

actors come together for their benefit which in turn has a positive impact on the solid waste situation of the city.

Social enterprises are also partnering with itinerant waste buyers to regulate them. These enterprises are trying to bring the activities of itinerant waste workers into light and register them and the amount of waste they trade. But these initiatives have not become widespread and remain confined to some areas of the city. Thus, it can be concluded that actors in the city have established partnerships to address the major concern of waste segregation at source, i.e., at household level. These collaborations have emerged spontaneously and deviates from the partnership standards and guidelines set up by the regulations. These partnerships in the city were found occurring sparsely. When inquired it was revealed that private companies in the city are interested in partnering with the metropolitan, same was the case with NGOs, while informal sector operators were reluctant about this. Whereas metropolitan had other plans about partnering with private sector, *discussed thoroughly in the section below*. It concludes that not all the partnerships that have emerged in the city are with a direct aim of improving solid waste situation of the city, some are driven by motive of profit making which in turn helps in addressing waste issues.

7.5 Public-Private Partnership to deal with Solid Waste Management

Public-Private Partnership (PPP) has been regarded as an answer to solid waste problems in developing countries through injecting technology and capital into the system. As local governments in developing countries face a range of challenges. These challenges being excessive staff with no expertise or inadequate staff, outdated equipment, cumbersome procurement procedures, inflexible work schedules, limitations on management changes, inadequate supervision, conflicts due to a large number of worker unions, logistical and technological challenge organizational shortcomings and lack of community consultation/participation. (dos Muchangos, Tokai, & Hanashima, 2015; Oteng-Ababio, 2010). To deal with these challenges governments align towards including private sector as a partner in waste management. While studies show that most of the cities that have entered in agreement with private sector have either shown mixed results or no significant improvements at all though the initial idea was to provide effective, efficient services (Stoker, 1998). Many developing countries that entered PPP arrangements, have not resulted in the expected success in SWM but challenges (Chaturvedi et al., 2015). As adaptation of PPP does not always guarantee success as there is a need to pay attention to nitty-gritty details including openness,

transparency, and sufficient stakeholder engagement (Yeboah-Assiamah, Asamoah, & Kyeremeh, 2017).

In case of Nepal, there are a bunch of binding documents, as shown in *table 9* that recommend for public-private partnership in urban services, including waste. Solid Waste Management Act and Rule, specifically lay out the basis for public private partnership in solid waste management.

“Without obtaining a license from the local body nobody is allowed to carry out activities related to solid waste management. This license is to be awarded through competition, calling tender, and selecting a manager and warding the management function” (Nepal Law Commission, 2011, p. 11). These guidelines from solid waste management act of Nepal points toward awarding the license to one manager for solid waste management of the city. An integrated solid waste management project has been envisaged in Kathmandu since 2011 by then Ministry of Local Development which is presently renamed as Ministry of Foreign Affairs and General Administration with the aim to formalize waste management of the city. A global tender for public private partnership was opened in the same year for private companies to bid, and eventually a private company named Nepwaste with Finnish investment was selected. Metropolitan in co-ordination with Nepal Investment Board has been trying to conclude the global tender with a transnational company since 2066 B.S. With this partnership the metropolitan aims to hand over the solid waste management work of the metropolitan to a transnational company. The goal is to establish a modernized and integrated solid waste management system in the city.

An initial project development agreement (PDA) was signed between the Investment Board of Nepal and a private company named Nepwaste with Finnish investment. The idea behind the project has been to go for public private partnership and establish an integrated solid waste management project in Kathmandu in a build operate and transfer modality (Waste expert personal communication, September 17, 2019). However, a final project agreement had not been signed during the course of field study and negotiations were still in process. As pointed out in the detailed project report the company had not started its work of waste collection, segregation and dealing with degradable waste. Major reason for this delay has been the bureaucratic hurdles, court cases against the process, lack of clarity about responsibilities between the private company and municipality (Senior officer private waste management company, personal communication, August 1, 2019). Whereas some pointed out that the municipality aims for a golden handshake where it wants its 1006 employees to be managed by the company, these are the employees at the lowest level involved in collected, transporting,

and dumping waste. Kathmandu metropolitan wants the private company to ensure job security of these employees, including depositing salary of these employees in bank and later giving them voluntary retirement after serving for some time. While the private company says that these kinds of pre-conditions were not mentioned initially in the agreement, thus delaying the handing over of the solid waste management project (Senior officer private waste management company, personal communication, August 1, 2019).

Waste experts point out reasons like lack of expertise in the private company to handle the waste issue since they have no experience of working in waste management, with time the company has not upgraded itself to deal with the increasing waste quantity of the city, also both sides want their issues to be put forward asking for a win-win situation halting the whole process (Waste expert, personal communication, September 8, 2019).

Meanwhile, municipal officials were hopeful that the ongoing negotiation process will conclude soon, but they blamed the transnational company for the delayed process and not abiding to initial agreement. Whereas private waste management companies active in the city were skeptical about the public-private partnership, demanded a clear direction from the metropolitan what they should do when the large transnational company starts that waste management work. This has created a situation of anxiety among private companies.

“We have invested a lot of time and capital for solid waste management of the city, now when another company is going to take over, we either want our assets to be bought by this new company with foreign investment or include us in the waste management system of the city with them” (Owner private waste management company, personal communication, August 11, 2019).

“The company to whom waste management responsibilities of the city is given is not experienced working in waste, looking at the current development it seems they are themselves confused if they want to take up the responsibility. Government wants to bypass private companies who have more than a decade long experience of working in waste in Kathmandu and hand it over to such a new company. In my view the responsibility of waste should not be given to an external company through bidding process, waste here is related to society and culture so it should be managed by someone who has experience in waste” (Chief operation officer private waste management company, personal communication, July 20, 2019).

In addition to the grievances of private companies about the ongoing public private partnership, waste experts also doubted the authenticity and willingness of the transnational company to start the waste work in Nepal.

“When the transnational company submitted the detailed project report, they promised a lot of things, but now they are saying all of it cannot be fulfilled this includes important aspects like waste segregation and management of hazardous waste. The issue of acceptance of existing human resources of the metropolitan and technical resources into the new proposed project still persists, in this scenario I feel government’s aim to go for a public private partnership through global tender is going to be unsuccessful” (Waste expert, personal communication, September 8, 2019). Considering these situations, fear of failure looms over prospective public-private partnership in Kathmandu metropolitan. Most of the private companies included in the study were worried about their future and were dissatisfied with the way the process was proceeding. At the same time in the interviews, it came up that inclusion of informal waste sector into the partnership has not been a major issue of discussion in the whole process. Though in the agreement signed between the Investment Board of Nepal and Nepwaste Company, the company regarded as the project developer is supposed to manage formal and informal workers associated with solid waste in Kathmandu within three months after signing the PDA and the financial closure of the project should be completed within nine months after the PDA is signed, with possible extension facility (Himalayan News Service, 2018). The issue of ignorance of informal sector is extensively highlighted in literature, in public-private partnership the focus is on dominant public–private arrangements, ignoring ‘unplanned’ informal actors and community-based organizations (Post et al., 2003). This often results in preferences to large-scale technocratic solutions to waste problem (Baud et al., 2001). Municipal officials on the other hand were hopeful that the partnership will succeed even without the informal sector, as their emphasis was towards getting rid of the waste responsibility due to resource deficiency. Inclusion of informal sector was not mentioned as a priority in conversation with municipal officials during the interviews with officials from the metropolitan.

Though, through the interviews it came up that actors like private waste management companies and informal waste sector are to be accumulated into the integrated solid waste management plan of the city. Both sides, the government and transnational company when signing the initial project development agreement agreed upon accommodating human resources involved in both formal and informal private sector but in the current scenario no-one is clear about how it will proceed and will the waste problem of the city be solved through this agreement. This raises questions about the place of informal waste workers in state envisaged, privatized and modern integrated waste systems. These approaches are termed

integrated waste management without considering the reality of waste work and livelihoods attached to it.

7.6 Potential for Recognizing Informal Sector as Partner in Waste

The significance of informal sector has been long recognized, especially after the economic crisis in 1997 (Sembiring & Nitivattananon, 2010). It was reported that almost 2 percent of the population in Asia and Latin America were involved in informal sector of solid waste management in the 1980s to early 1990s (Calvo, Moreno, Ramos, & Zamorano, 2007).

Considerable contribution of informal sector to solid waste management has been noted in Global South. In the North waste recycling is associated to good practice whereas in the south it remains as something practiced by poor residents making minimum for living (Fergutz et al., 2011). In Kathmandu metropolitan as well, informal sector is responsible for waste recovery and recycling activities. From the interviews with informal waste workers, it was disclosed that waste recovery and recycling is carried out by rural-urban migrants for minimum wage. Literature points out that the informal sector in developing countries are involved in waste collection and recycling activities (Wilson et al., 2006).

In case of Kathmandu, informal sector in form of itinerant waste buyers is involved in collection of recyclable materials from households, commonly known as *Kawadiwalas* and informal waste pickers are involved in recovering recyclables from different parts of the city including landfill site. These activities are non-formal in nature making it difficult to quantify their contribution to the economy. There is no official data about how much is recovered by the informal sector and how many people are involved in the sector, although there are various research providing an estimate of number of people and amount recovered. There are around 15,000 waste workers in Kathmandu (Practical Action, 2014) valley recovering 25-30 percent of recyclables (President SWMA, personal communication, August 19, 2019).

At the same time collection of recyclable materials by informal sector is not recognized as resource recovery and authorities cannot see the benefits and contributions of this sector to environment, public health, and sustainability (Gutberlet, 2009). As is the case in Kathmandu metropolitan where contribution of informal sector is mentioned in informal conversations but when it comes to recognizing them, officials linger behind.

7.7 Perception towards Waste a barrier for Partnership in Solid Waste Management

7.7.1 Clashing interests of waste actors and integrated solid waste management

Cooperation between the informal sector and the formal sector can be part of the solution in SWM. Studies suggested, in line with decentralization and reducing the role of public authorities in providing services and infrastructure, integrating the informal sector as privatization of a part of the services in SWM can be a way (Zia, Devadas, & Shukla, 2008). Similar findings were also proposed by (Ojeda-Benitez et al., 2002) in Mexicali, Mexico, (Baudouin et al., 2010) in Ethiopia and (Samson, 2009) in South Africa. However, attitude of local authorities is of major concern when it comes to partnership with informal sector in Kathmandu. Though the contribution made by informal sector is made evident through the material flow in the city as presented in *figure 51 in chapter 6*, perception of authorities towards them follows a negative connotation. There appears to be a gap between the interests of local government and the informal waste recycling sector. The local government is keen in adopting a modern solid waste system in the city where informal waste recycling sector's place is uncertain. From the interviews with the scrap dealers, itinerant waste buyers and waste workers carried out during the study from the period of July 2019 -September 2019 it can be summarized that these informal waste sector actors had no idea about the new plans of the local administration to hand over waste management responsibility to a transnational company.

Informal waste sector actors remain unaware of the plans of the authorities. The interest of informal sector operators lies in earning profit from waste which indirectly contributes to city cleanliness and longevity of landfill. While private companies' attitude towards informal sector cannot be claimed to be negative, but informal sector serves to increase income for these companies by sorting out recyclables from the collected waste at minimal price. While sorting out recyclables from the waste is a source of living for the informal waste pickers. At the same time it cannot be denied that waste recycling companies and middlemen could oppose the formalization of informal waste work as formalization might mean increased cost of raw materials for them (Nyachhyon, 2010). Thus, each actor in the city has their agenda to be involved in waste. Whereas interests of the actors engaged in informal recycling sector are not taken into consideration, and they had not been consulted when new plans were being made. It appeared that government is concerned about taxing the informal waste sector but not in including them as partners in waste, quoting them as illegal. The negative attitude of authorities and decision makers for partnering with informal sector still seems to be a major hurdle in Kathmandu. Continued notion of authorities towards the informal sector as nuisance,

considering them illegal and imposing impediments in form of increased taxes on recyclables act as barrier for entering successful relation with informal sector.

This can be attributed to the fact that there is lack of comprehensive and scientific study on the latest condition of resource recovery contributing a substantial amount to the economy and future potential of recovery activities for Kathmandu metropolitan and the larger Kathmandu valley (Pathak & Mainali, 2018). Similar cases had been detected in other parts of the world with no reliable data about the informal sector available at national/ state/city level with only few studies done by private organizations (Agarwal, Chaudhary, & Singh, 2015; Ahmed & Ali, 2006). This has created a disparity in moving forward in understanding the implications of the informal sector to the economy, society, and environment such that future partnerships can be achieved.

During, the study it became clear that the central government aims to bring an ISWM project in Kathmandu metropolitan, this plan seems unrealistic when seen in relation to the attitude of Kathmandu metropolitan, towards the active private companies and the informal sector. There exists a gap in interests of the metropolitan/city administration, transnational private company that intends to take over the waste responsibility, local private companies and actors operating within informal sector. The interest of the metropolitan is in having a modern, clean, and smart solid waste management system in the city at a broader level. But at the same time, it has not been able to resolve the matters related to its staff accommodation into the new ISWM project, accommodation of existing local private companies, its resources, and the informal waste recycling sector. Private companies and informal sector have main interests in earning profit from waste. While the attraction of private companies remains in collecting waste from households to earn profit, the informal sector earns from recycling the waste. Meanwhile, private companies have organized themselves into an association named solid waste management association (SWMA) so that their collective voice can be heard by the metropolitan. Their association has been active in holding talks with the metropolitan and to ensure about their future in the city.

Currently, solid waste management in Kathmandu is messy, that does not adhere to waste management acts and regulations. Solid waste is collected from households collectively by metropolitan and private companies and recycled by informal sector though there is no binding partnership between these actors to do so. Each actor has its interest to be involved in waste management process. The role of households in Kathmandu as generators of solid waste tends to be ignored, both in their role as the first handlers of waste and users of waste services. Meanwhile, non-government organizations and social enterprises partner with private

companies and informal sector based on their motivation to contribute towards circular economy without much impetus from the local government.

Though, inclusivity of service users and providers through partnership is deemed as one of the prerequisites of governance aspect of integrated solid waste management systems, reality in Kathmandu seems different. The metropolitan aims to achieve an integrated waste management without considering the current realities of the city which intensifies the likelihood of it failing.

7.7.2 Lack of acknowledgement of informal sector an integral part of public-private partnership project anticipated in Kathmandu

Public-private partnership offers opportunities for operational efficiency and cost-effectiveness. The role of the private sector will be more important for complex tasks such as the operation of landfill sites, as municipalities are less experienced in these areas (Asian Bank, 2013). Though recognition of informal waste sector is believed to support its institutionalization there exists barriers to achieve this. Previous studies have cited reasons like solid waste work is regarded as a dirty and low status with some prejudice associated against them. Moreover, informal waste workers often belong to disadvantaged and minority ethnic and social groups which increases the bias towards them (Ručevska et al., 2019).

At the same time, resentment towards official recognition of informal waste work by people at higher level of formal and informal waste management hierarchy has also been pointed out. Also, in Nepal informal activities are associated with health hazards, which became evident during the field interviews with the waste workers, respondents referred to deaths of fellow waste pickers during segregation at landfill (Buddhimaya Tamang, Informal Waste Worker, Personal Communication, September 6, 2019). Similarly, health issues like skin disorders and asthma were also mentioned by interviewed waste workers. (Mayalu Tamang, Informal Waste Worker, Personal Communication, August 28, 2019). In waste management literature particular attention has been given to informal recycling over the years. There has been increased voice to acknowledge the informal sector as a partner in waste such that more jobs can be created in waste. At the same time this can also improve waste services (Medina, 2007; Mitlin, 2008; Samson, 2009; Wilson et al., 2006). It has been argued that if partnerships with the informal recycling sector are to be successful, there is a need to provide incentives, such as easy access to registration, lower taxes, micro-credit, and training (Medina, 2007). Though these suggestions are desired and promise to improve waste management in cities around the world, cases where municipalities have not been able to attain successful partnerships with informal sector are abundant in the literature (Baud et al., 2001; Baudouin et al., 2010; Bhuiyan, 2010;

Post et al., 2003). There have been instances from South Africa where informal waste pickers have been denied access to municipal landfill sites (Samson, 2009).

During the interviews with waste pickers, it was disclosed that waste pickers were denied access to pick recyclables from the transfer station of the metropolitan four years ago by the officials (Maya Tamang, Former Informal Waste Picker, Personal Communication, August 28, 2019). Since, then they have not been able to enter metropolitan's transfer station to pick waste. Other waste pickers revealed they faced mistreatment from the police and metropolitan drivers and waste loaders at the landfill site. They were times when they were chased away by the security personnel at from the site (Mayalu Tamang, Informal waste worker, personal communication, August 28, 2019). Thus, the study aims to bring into light informal sector's contribution, the diversity within and their daily workings such that possibilities for inclusive and equitable solid waste governance and practice can be advocated.

7.8 Chapter Conclusion

Inclusivity of users and providers of waste services through participation is central to solid waste governance as per integrated sustainable waste management framework (Wilson et al., 2013). It has already been established that local government cannot deliver solid waste management services isolated from other actors, active participation of all actors present in the everyday waste management is required (ibid). Integrated solid waste management is based on good waste governance, whereby the main goal is to improve the management of solid waste with an aim to reuse and recycle solid waste in partnership with non-state actors (UN-Habitat & Programme, 2010). This is particularly important in case of developing country where waste governance includes a range of formal and informal actors who may be active in waste management of the city but are not recognized as partners by the legal mechanism. The case of Kathmandu highlights that there exist partnerships between multiple actors present in everyday waste management of the city. These partnerships between actors are not binding in nature but are functioning well at community level. Private companies, non-government organizations, community-based organizations, social enterprises, and the informal sector have potential to enrich the solid waste management deficiencies of Kathmandu in partnership with the metropolitan. In the current scenario, these potentials have not been utilized due to local government's reliance on central government for the ongoing public private partnership process with a technocratic understanding of the waste problem that is believed to be solved solely through transnational corporation and technology procurement. This overlooks the

reality that solid waste landscape of Kathmandu is heterogeneous with active public and private actors. Though navigating the diverse actors, their interests, and manifestations of societal perception towards waste work and creating inclusive partnership mechanism can be a challenge but public private partnerships motivated by corporate ideas have proven to be not a solution. The rolling back of the local government to hand over the waste responsibility to new private sector for service delivery brings forth the risk of displacing the already existing private sector actors and actors in informal sector. Rather a revision and reorganization of relationships between the numerous actors active in the city is necessitated. The understanding of informal waste work as backward, traditional, and unorganized needs to be challenged and their contribution should be rather taken into account such that waste planning and policy making can move past symbolic forms of participation and inclusion.

8 Towards an Integrated Sustainable Solid Waste Management in Kathmandu

This chapter synthesizes the major empirical findings of the dissertation. It revisits the theoretical aspects, i.e., governance aspect of integrated solid waste management framework and approaches to informal sector and insights from empirical findings such that it can be contextualized in developing countries. This dissertation looked at the problem of debilitated solid waste management situation in the context of rapidly urbanizing Kathmandu. This situation is exacerbated due to intensive and unplanned urban development in the city. Meanwhile, technical, end-of-pipe approach have been adopted by the concerned authorities to address these issues and are supplemented by soft solutions like plastic bans. These solutions have failed to address the root cause behind the existing waste problems. This dissertation considers the problem from the governance aspect with a considerable focus on the informal sector. This chapter begins by stating the limitations of the study, challenges that are faced at local level, then by recalling the main research question this dissertation sought to answer and the theoretical, conceptual, methodological contributions made by the study.

8.1 Limitations of the Study

This section briefly looks back at the limitations of the study that arose while answering the research questions. These limitations were put forth by the adopted research approach.

8.1.1 Problem of generalizability

The study adopted a single case study approach where Kathmandu metropolitan's crippling solid waste management situation against the backdrop of rapid urbanization was selected as a topic of interest. The single case of Kathmandu was analyzed for the dissertation which raises the question of generalizability of the results. As the study is focused on a particular area looking into the solid waste situation of a specific context; thus, generalizability is not an intention here. Also, the study is not based on theory testing rather on analyzing a specific situation and generating results for similar circumstances faced by cities in Global South. However, the explorative character of this dissertation provides the advantage that it can aid similar research carried out in other cities.

8.1.2 Data availability and access

Though Kathmandu is a metropolitan city and capital of Nepal, there is a dearth of recent and reliable data related to solid waste management, such that older data was used as a base data for the study. Another concern with data was poor record keeping and documentation practice by the local government. Information about waste collection schedules, routes of vehicles, sweepers and drivers of the metropolitan were poorly managed, written on white board of metropolitan office which were changed every day manually. While available information related to waste infrastructure and resources were only available in paper version from the metropolitan through the field work. At the same time reluctance of government offices were a barrier and it consumed considerable amount of time in getting access to information during the fieldwork. Nevertheless, the field work was composed of individual in-depth interviews, household surveys and direct field observation combined with field notes and pictures that facilitated in filling the gap of data availability.

8.1.3 Exclusion of actors from the study

In the study ministries and international aid organizations were excluded. This is identified as a methodological limitation of the study. One of the reasons for doing so is aid organizations though in the past were directly involved and were an integral part of day-to-day waste management process of Kathmandu are currently not doing so. Though they could potentially have been a good source of information to account for the past failures in solid waste management of the city. However, a large part of this information was already gathered directly from waste experts on the ground; thus, aid organizations were therefore not contacted for the study. Furthermore, ministries at central level, Ministry of Federal Affairs and General Administration and Ministry of Urban Development were also not contacted for the study. One major reason for this is that they are not directly involved in the day-to-day waste management process of the city. These actors fell into the initial interest group for the research but considering the time limitations and their current ambiguous involvement in waste management they were not included. Though later geotechnical and civil engineers hired by Ministry of Urban Development for the construction of a new landfill site were contacted for phone interview. This was done due to the reason that in 2020 the waste situation in Kathmandu deteriorated. Due to corona pandemic induced lockdown waste was not picked from the households and streets and at the same time landfill site was blocked by locals due to the fear of contamination for weeks. This made city streets piled up with heaps of garbage and

authorities were criticized for their incapacity. Thus, it became necessary to inquire about current progress in construction of the new landfill site of Kathmandu which was supposed to be completed in October 2019 as mentioned during the fieldwork during the summer of the same year.

8.1.4 Establishing a sufficient sample size for the household survey

The study aimed at understanding the solid waste management process of the city and households are the prime waste generators. The way they handle the waste, their perceptions and practices play a vital role. Thus, households served by both private and public service providers were purposively contacted for the study. Wards where Kathmandu metropolitan was implementing the source segregation pilot project were selected purposively for household survey, whereas wards served by private companies were selected based on their longstanding history of being the earliest private waste companies in the city. Key informant interviews and field observation were helpful in this case to figure out the initial set of households for the survey. Later these households provided information about others as they were involved in the same women's group or community-user groups. Though the initial aim was to carry out a survey among 200 households but as the saturation of data was observed after 182 survey interviews, the household survey was concluded. As the households started to repeat similar ways of dealing with waste, challenges faced, views on service provider and opinions about improving waste situation in their area. Nevertheless, a random sampling of households in Kathmandu metropolitan would have been more illustrative of the situation; but due to the limitation of initial available data combined with the time constraint purposive sampling along with snowballing was used for defining number of households (n). However, still in the end 182 household interviews helped to provide a clearer picture of the waste management situation at waste generation stage in Kathmandu.

8.2 Research Contributions

With the empirically grounded research, the study has contributed to advance conceptual, methodological, theoretical debates and inform policy in the field of urban solid waste governance. The study includes processes and actors from both formal and informal arena as contributors to the solid waste management of an urban area to open up discussions on inclusion of actors across all spectrums in waste management and waste as urban infrastructure. Though literature from other parts of the world, especially from Latin America and Africa have

identified actors across various scales as contributors in solid waste; literature from Nepal has struggled with it and this study has addressed this gap. The conceptual contribution made by this dissertation is the use of combination of governance aspect of integrated solid waste management and government approaches to informal sector to interrogate the way governance can address waste management issues. Governance and approaches to informal sector previously had not been used together to examine solid waste management, which this study has attempted. Theoretically, the study has elaborated the understanding of solid waste governance by adopting the governance dimension of integrated waste management framework and approaches to informal waste sector such as dualists, structuralists, legalists, voluntarists, and co-production. Drawing its theoretical basis from relevant literature pertaining to solid waste governance in global south, the study finally proposes a contextualized framework that includes everyday waste process, role of informal waste actors, and partnerships between actors. This way it has contributed to an ongoing debate on how integrated solid waste management can be achieved in its truest sense in cities of the global south. This study therefore provides a good conceptual and methodological approach from which countries can reflect upon their situation and address waste issues. As the main argument in this thesis is directed towards the need for the shift from government to governance considering the existence of informal sector in waste management.

In the section below I point out the challenges faced at the local level that are also rooted in the shortcomings at central level that needs to be immediately addressed for attaining an integrated solid waste governance in the city.

8.2.1 Governance and informal sector a prospect in addressing urban waste issues and attaining integrated solid waste management

Globally, there has been a shift in the focus in waste studies from management of waste-to-waste reduction, reuse and recycle, integration of formal and informal actors with an eventual aim of attaining circular waste economy (Anschütz, IJgosse, & Scheinberg, 2004; Schübeler et al., 1996; Shekdar, 2009). Since municipality is still a legal authority responsible for waste management, planning at municipal level plays a crucial role in addressing waste issues of the city; through the reform and implementation of waste management acts and regulations waste management challenges can be dealt with. But municipal authorities in developing country context face challenges related to municipal capacity and willingness to address these issues and existence of a range of formal and informal actors to fill in this void (Ezeah & Roberts, 2014; Guerrero et al., 2013). The governance aspect of the integrated system looks into a fixed

set of soft indicators to achieve good waste governance (Wilson et al., 2013). Whereas realities of waste management in the context of developing countries are not as straightforward as mentioned by the framework. There is a need to get a deeper understanding of process activities, roles, and relationships between actors on the ground. In this study, governance aspect of integrated sustainable waste management framework is explored together with government approaches to informal sector in waste. The governance aspect is explored as a steppingstone such that multiple actors present in the waste and their contributions to address waste issues can be brought forward. The governance dimension of integrated waste management system is regarded as a norm in discussion of solid waste management in developing countries (Wilson et al., 2015; Wilson et al., 2013). Also, informal sector undoubtedly has been a vital contributor to waste sector in developing world, their role and relation with the formal waste sector and government's attitude to informal waste sector has been debatable and requires more in-depth understanding to tackle with waste issues.

Then, it further explores into body of literature on waste aimed to address solid waste management issues of global south considering governance (Ahmed & Ali, 2004; Davies, 2009; Marshall & Farahbakhsh, 2013; Wilson et al., 2013) and informal waste sector (Bjerkli, 2013; Dias, 2016; Gutberlet, 2015; Medina, 2008). Here, the particular focus has been on the solid waste management process in a fast-urbanizing city of global south consisting of a range of actors, formal and informal practices, relations and engagement or non-engagement with formal government structure.

Through the exploration of solid waste management process at ground level in its everyday complexities this thesis reveals that there exists a range of challenges in Kathmandu before an integrated sustainable solid waste management can be achieved. Here one major challenge identified was lack of capacity at local level which coincides with previous research that concluded, local authorities in developing country context lack organization and leadership capacities and knowledge (Guerrero et al., 2013). Further, it is aggravated by the mismatch between perceived government structure of decentralization and practices on the ground. In addition, there are further challenges that are elaborated in the section below.

8.2.2 Low capacity of local government:

Local government, municipality is entitled with legal responsibility of waste management also they are the main bodies who are delegated with civil responsibilities that brings them in direct contact with public. However, Kathmandu metropolitan even after being one of the wealthiest local government in the country in terms of its source revenue demonstrate low financial,

technical, and human resource capacities in solid waste management (*see chapter 5*). Kathmandu metropolitan still relies largely on the central government for financial resources through fiscal transfer. Metropolitan has a separate SWM section and constitutes more than half of total municipal staff, but most of these staffs are waste sweepers and drivers working for waste collection and disposal. Furthermore, from the interviews it was revealed that appointments and transfer of officials in environment department are political appointments that lack transparency and pose the threat of selection of incompetent officials. Also, equipment in the municipality in the absence of technical expertise lack maintenance and are in a non-functioning state (*see chapter 5*). Therefore, low capacity of the local government is a major hindrance to achieve solid waste governance in the city.

8.2.3 Differences in aimed decentralization vs. achieved decentralization

Decentralization of power has been promoted in Nepal since LSGA act 1999, further expanded after federalism in 2015 and promulgation of local government operations act 2017. Despite the formal and structural changes implemented due to decentralization, old methods of exercising power were found to be persisting in Kathmandu. Though provincial level government were created, central government body supporting the metropolitan was dissolved, and more powers were given to local government; practices in solid waste management in Kathmandu are still driven by former ways of exercising power where metropolitan is highly reliant on central government for planning and budget (*see chapter 5*). The municipality is reliant on the Ministry of Urban Development for infrastructure and planning related matter and Ministry of Federal Affairs and General Administration for administrative and governance matters. In addition, provincial level governments are currently docile such that local governments are accountable to line ministries at central level. Therefore, there is a need for implementation of decentralization process and policies on ground, such solid waste governance can be achieved in Kathmandu.

8.2.4 Consideration of formal and informal actors

There is a presence of range of formal and informal actors in solid waste management in Kathmandu. Though the line between the formal and informal actors in private sphere is ambiguous, informal waste sector dealing with the recycling activities remain unrecognized for their contribution in addressing waste issues. The role played by informal sector in the recycling and addressing waste issues is unaccounted for. A framework addressing the role of these informal actors in waste management provides an opportunity to bring forth these actors.

8.2.5 Prioritization of waste as urban infrastructure

Provision of infrastructure is essential for a well-functioning waste system. However, it has been agreed that countries in Global South struggle due to absence of appropriate urban infrastructure. This may include inability to maintain available infrastructure due to dearth of finances or failure to develop waste infrastructure in the first place. In the context of Nepal urban services vary substantially across the municipalities, though Kathmandu metropolitan is the core to Nepal's urbanization it lags in development of waste as urban infrastructure. In Kathmandu though waste has been mentioned as a priority sub sector in national urban development strategy limited attention is given to develop it as an essential urban infrastructure. Authorities' tendency towards waste management was found to be of crisis management rather than development of sustainable solutions to manage waste. The current landfill site is used by the metropolitan as a mere dumping site. In the ongoing construction of the new landfill site in Banchare Danda there is no provision for a waste treatment plant though it was envisioned in the initial plan. The initial plan included a biological treatment plant, sorting facility for recyclable materials and a composting plant, whereas in reality the focus is on finishing the construction of a dumping area to solve the current crisis of waste disposal. In this scenario, focus needs to be on a governance framework that highlights the importance of development of waste as an urban infrastructure.

8.2.6 Households and their practices

Households are primary stakeholders in solid waste management of a city, the generators, handlers, and receivers of waste services. Their level of awareness and attitude towards waste has an impact on the entire system. Households way of storage, separation, recycling activities, demand for waste services, willingness to pay, opposition to citing of waste facilities, all of these play a role in success and failure of solid waste management system (Henry et al., 2006; Schübeler et al., 1996; Zurbrugg, 2003). From the case of Kathmandu, it was revealed that though households are crucial for waste management, they have received limited attention from the side of service providers. A framework realizing the importance of everyday practices of households and role of partnering with the households considering them core to source segregation is desirable to deal with solid waste management.

8.2.7 Perception towards waste and informal sector

Working with waste is associated with social stigma in parts of the world that includes Arab world and Latin America (Moore, 2012; Wilson, 2007). Similar case was discovered in

Kathmandu where waste work is regarded as something shameful and done by so-called low caste people. In addition, informal waste work and workers face exclusion from the authorities. A framework acknowledging the role played by the sector in recycling and necessity of cooperation between formal and informal sector can be a part of the solution.

8.2.8 Partnerships and lack of thereof

The quality of solid waste management can be improved by strengthening the partnership or alliance (Baud et al., 2001). At the same time it has been widely accepted that large-scale public private partnerships often result into more exclusionary institutions (Sembiring & Nitivattananon, 2010). The case of Kathmandu also shows that central government's aim of entering public private partnership with transnational corporation poses a danger of exclusion of currently active actors in waste. Whereas existing partnerships in the city can be called informal alliances formed by actors to address the waste problem and realize their interests from waste. Private companies strive for building partnership with local government, informal recyclers have resisted taxation, while informal waste workers remain ignored. Building partnerships between existing actors and recognizing their contribution to waste can act as a precondition for establishing an integrated waste management system and pave a path for inclusive waste planning process.

8.2.9 Inclusive approach to urban waste governance

Inclusion as a concept has been a popular in development discourse and urban planning, it prioritizes "opportunity, empowerment and security for people and places on the peripheries of global economies and societies" including the activation of capacities (Porter & Craig, 2004, p. 387). However, it cannot be denied that inclusive governance discourse has not always resulted into inclusive cities. Inclusion in some cases have manifested into more divided cities with dominance of private sector interests.

Empirical studies from Indian cities have highlighted that symbolic inclusion in urban planning have rather resulted in various forms of exclusion of already marginalized citizens through large scale revitalization, development projects and privatization of urban services that are legitimized through token participation and inclusion (Desai, 2018; Roy, 2005). It has been already established that informal waste workers in Kathmandu face threats to their livelihood as solid waste governance in the city prioritizes private sector technical intervention. Urban planning document mentions about being inclusive of informal sector without providing a clear guideline for doing so. Scholars, have long promoted engagements between municipalities and

grassroots organizations with the aim of organizing workers and providing work opportunities and access to waste (Baud et al., 2001). Literature on waste workers highlight the way local and international partnerships in combination with policy interventions have helped in integration of waste pickers into formal municipal waste systems (Dias, 2016; Samson, 2009). The concept of inclusion in municipal solid waste management policy and planning is yet to appear though formalizing the urban informal sector has surfaced in urban development strategy of Nepal 2017.

Here the call is for the integration and recognition of informal waste sector into the current waste management as a major contributor. However, in doing so the heterogeneity that exists within the informal waste sector is to be considered. The interests and realities of scrap dealers, itinerant waste buyers and waste pickers are different in Kathmandu metropolitan. The everyday waste experiences of waste pickers are different than that of a scrap dealer, especially in the context of Nepal where caste and gender dimension are also associated with waste see *section 6.6*. In order to integrate the informal sector such that an inclusive waste governance can be achieved, navigating the current structures within the informal waste sector, their relations with authorities and organizing the waste workers is of utter importance. The pursuit of inclusive waste governance demands for a move beyond symbolic expression of inclusion. A recognition of environmental, social, and economic benefits of the informal waste sector with the prospect for the better livelihood opportunities for the waste workers is the current need.

8.2.10 Smart inclusive urban planning and development

The current urban development scenario of Kathmandu revealed that urban infrastructure in the city has not kept pace with the rapid urbanization, same applies for solid waste management. To cope up with this rapid urbanization the concept of smart city has been introduced in Nepal. National Planning Commission of Nepal in the year 2016 developed a concept paper on smart cities, with an aim to develop disaster resilient, eco-friendly and people centric cities. However, exploration of the current waste reality reveals that waste management in the city needs a revival and re-education to be smart and inclusive.

Considering the current level of urban development, solid waste management process in Kathmandu is carried out by both formal and informal actors. Yet the government's ambition of modernized and integrated waste management system endangers the existence of the informal sector. This leads to concerns about the exclusion of the existing knowledge and experience of the informal waste sector. This calls for the inclusivity to be understood at the

planning and policy level as informal sector being equally important as the formal sector. The idea of inclusive urban planning has been put forward as a way to deal with the exclusion faced by urban informal sector. Scholars have supported this idea of applying principles of inclusive urban planning for inclusive and greener economies (Brown & McGranahan, 2016). “As long as informal workers are not recognized as economic actors and not integrated into economic and urban planning, they remain outside the protective support but within the retributive arm of government” (Dimova & Nordman, 2014, p. 391).

The study found out that formal and informal waste sector in Kathmandu run parallel to each other, in this scenario at planning level considering the support required for the sector and provision of space to carry out recycling related activities needs to be understood and incorporated. At the same time the interconnections between the economic and spatial informality that happens in cities needs to be understood and dealt with (Brown & McGranahan, 2016). For example, many informal working spaces in Kathmandu such as scrap centers served as living spaces for the itinerant waste buyers, matters such as this is to be considered when designing strategies to collaborate with informal sector. *Fig 57* below shows the informal settlements that were visited during the fieldwork in 2019, these settlements served as place of habitation for the informal waste workers as well. This points towards the fact that informal waste workers also face the challenges faced by informal settlement residents, for example prone to natural disasters like floods induced by monsoon. In this case planning needs to recognize that spatial informality in the city is linked with economic informality that happens within informal waste sector and addressing both issues go hand in hand.

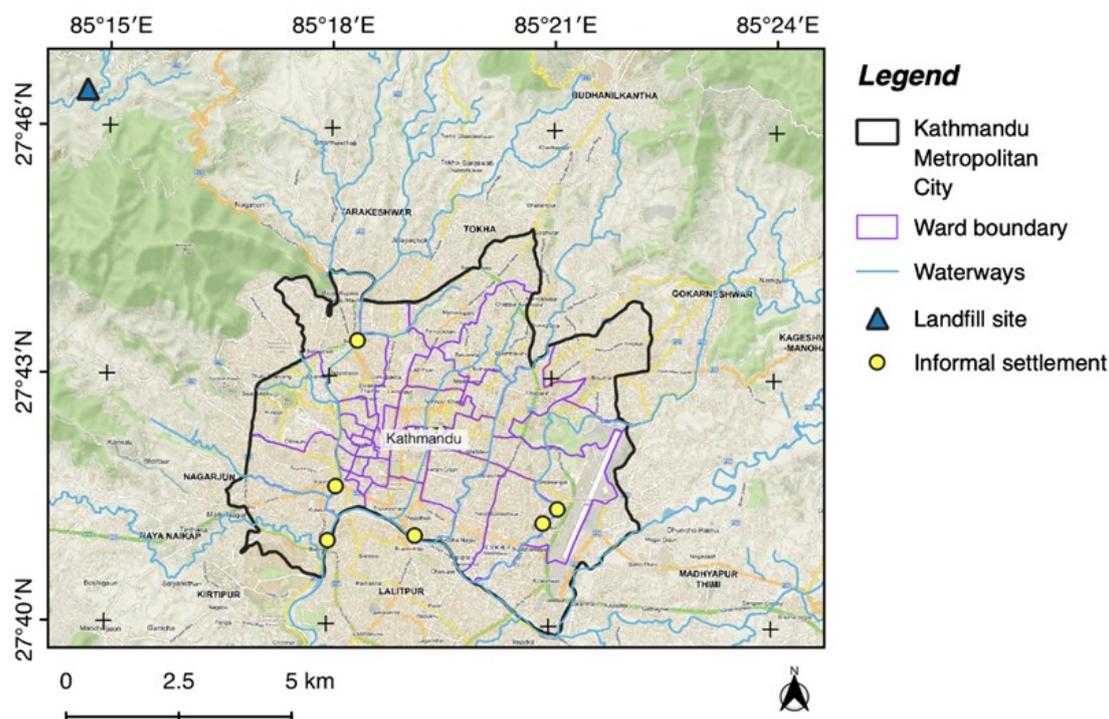


Figure 57: Informal settlements visited during fieldwork (Author, 2021; Geodata: Openstreet contributors)

For inclusive urban planning and waste system, data and information related to the informal sector, quality and quantity of materials collected and sorted, their values and necessary resources in terms of sorting space and facilities needs to be contemplated. This study has tried in that direction to address the importance and contribution of the informal sector for solid waste management, their realities, and experiences in waste and a forward for a more inclusive policy approach towards the sector. This kind of integrated solid waste management approach based on the context will not only address for the inclusive waste system but also contribute to the smart city aim of Kathmandu.

In conclusion, a need to revisit the governance dimension of integrated solid waste management is seen. Waste governance accentuating the current processes and roles and responsibilities of local actors is necessitated. Additionally, a need to change government approach towards informal waste sector is seen. However, rather than adopting a predefined framework there is a need to contextualize solid waste governance according to the local needs. This dissertation follows this line and brings together governance, current urban development scenario and approaches to informal sector acknowledging the local solid waste management process, role of informal actors, their relationships, and partnerships with other actors. The case of Kathmandu is used, and its empirical findings are discussed in the section below.

8.3 Answering the Research Questions

How does governance facilitate to understand and address the solid waste management situation in Kathmandu?

The core research question was translated into key research objective to understand and address the worsening solid waste situation of Kathmandu from governance perspective such that an integrated sustainable solid waste management approach can be suggested at the end of the dissertation. Objectives of the research were achieved through relevant literature and using appropriate research methodology. This section synthesizes the empirical findings from Chapters 4, 5, 6 and 7 to answer research questions. The overarching research question that this study aimed to answer was:

How does governance facilitate to understand and address the solid waste management situation in Kathmandu?

With this main research question solid waste governance and various approaches to informal sector was taken as a starting point to address how multiple actors formal and informal contribute to address solid waste management issues of the city. In the light of this three sub research questions were formulated:

1. What is the current solid waste management process and how does it acquaint governance?
2. What is the role of informal sector in solid waste management and what is their relationship with other waste actors?
3. What are the existing partnerships between the actors and how can it contribute to address the waste concerns?

To answer the above research questions, rapidly urbanizing and one of the fastest growing urban centers of South Asia, city of Kathmandu was selected. Data was collected from documents, key-informant interviews, and household surveys. The key findings are discussed below.

8.3.1 Solid Waste Management Process in Kathmandu Metropolitan

Municipal waste in the global south is managed by a range of actors which can be characterized alongside a continuous spectrum of formal and informal practices (Guibrunet, 2019). Municipal solid waste (household solid waste) management process in the context of Global South cities is complex and intertwined in nature. There exists a complex network of actors in

waste governance this includes residents, waste companies, local government and bureaucrats, waste pickers, scrap dealers, non-government organizations, social enterprises, and waste experts. Presence of these wide array of actors also bring forward their understanding of waste problem and ways to deal with those problems.

Literature has indicated that varied waste systems exist in cities of the Global South. It shows waste systems can be run completely by informal sector with limited local government involvement (Katusiimeh et al., 2013; Medina, 2005) or by private companies partnering with local government (Post & Baud, 2003) or by grass root level organizations initiating the processes together with households (Henry et al., 2006; Rathi, 2006). This points that everyday waste governance takes place in co-existence of formal and informal actors and their practices. They are entrenched in social, economic, and cultural practices and influenced by acts regulations, actors and market on waste systems are undeniable.

Solid waste management process in Kathmandu metropolitan reflects that its way more convoluted than what governance dimension of integrated sustainable waste management framework (ISWM) conceptualizes (Henry et al., 2006; Rathi, 2006; Van de Klundert et al., 2001; Wilson et al., 2015). Since realities of cities are different, aiming to attain the indicators as prescribed by the framework can deteriorate the situation further. In Kathmandu governance dimension of integrated sustainable waste management framework is a far cry. Waste management process in the city indicated formal and informal running parallel to each other with gaps in the formal system. These observations are discussed thoroughly below.

8.3.1.1 Municipal responsibility of waste management

As per the constitution of Nepal, every citizen has the right to clean and healthy environment and its state's responsibility to formulate policy for environment protection and promote public awareness towards it (Constituent Assembly, 2015). Though waste management is not directly mentioned in the constitution, inference to clean environment and protection of environment by the state is given emphasis. While there are a bunch of acts that directly put metropolitan and local government as the body responsible for solid waste management process and planning. Through the information provided by the metropolitan, it came up that the city has an annual range of activities for solid waste management which is under its wider policy to make Kathmandu a cultural metropolitan. This shows that solid waste management is still not considered as a priority and urban infrastructure issue by the metropolitan.

In 1999, Local Self-Governance Act provided power and responsibility to local government, later Local Self-Governance Act 2017 was introduced providing more powers to the local

government but, devolution and delegation of power has not progressed in Kathmandu. The municipality still relies on national plan made by national planning commission for environment and waste management. The municipality looks up to planning commission for waste management plan and Ministry of Urban Development for waste related infrastructure development. The municipality currently is lacking long-term planning and adequate revenue generation making it directly reliant on central government for solid waste management. At the same time dissolution of an autonomous government body SWMTSC has created ambiguity for the local government about where to seek for technical support in the dearth of their own technical capacity. The results reveal that Kathmandu metropolitan is far away from official mandated responsibilities it needs to perform as a local body. This deviation from official process, poses challenge in realizing good waste governance qualities as prescribed by ISWM framework, as municipality itself is unable to follow its prescribed functions.

8.3.1.2 Changing government structure and the waste management process

Another issue that was observed in Kathmandu metropolitan is of changing government structure but retaining old environment policies and waste management acts.

Most of the existing policy frameworks for environment and waste were designed in Nepal targeting the millennium development goals, and they are not reformulated in response to SDGs and changing waste situation of the city. Also, Nepal adopted the new constitution in 2015 and changed into federal government structure but reorganization of environment and waste policies has not happened according to the new constitution. As discussed in chapter 4 most of the environment and solid waste management acts were formulated based on the unitary government structure and has not been modified since.

While the responsibilities on local governments have increased considerably since the new government structure, local government/ municipality has not fully been able to adapt to the change and take over the new increased responsibilities provided to them by the new constitution and local governance act. Kathmandu metropolitan particularly is now vested with responsibility to establish its waste management plans and collaborate with stakeholders for waste management. Following this changed structure central government dissolved the autonomous government body solid waste management technical support center (SWMTSC) such that metropolitan now has enough powers to carry out all solid waste management related activities by itself. However, analysis of the existing waste management acts and regulations as well as exploring the ground reality reveals that the municipality has not been able to abide by those regulations. The municipality as the primary body responsible for planning,

implementing, and monitoring solid waste management to a large extent is dissociated and decapitated from the solid waste management process of the city.

Thus, summarizing the answer to the first question it is stated that waste management process in Kathmandu is carried out by a gamut of actors. Waste management planning and everyday process is far away from the official process as stated in solid waste management act and rules. This kind of transverse processes in the provision of basic urban services like solid waste management in cities of Global South pose a challenge in realizing solid waste governance, as local governments are far removed from their stipulated functions, also it creates challenges in realizing solid waste governance.

8.3.1.3 Metropolitan and recognition of an array of actors in waste management

This study identifies a range of actors that are active in solid waste management of Kathmandu metropolitan. The Municipality does not consider actors currently active in waste management as its formal partner. Nevertheless, there are actors that are active in waste management and contribute to addressing waste management issues of the city.

This study in line with other literature on solid waste management (Van de Klundert et al., 2001; Wilson et al., 2013) identifies a group of actors in addition to the metropolitan. Also, consideration of perceptions, interests and roles of all actors involved is regarded important to improve the effectiveness of solid waste management (Zurbrügg, Caniato, & Vaccari, 2014). These actors are households, private waste management companies, waste pickers, itinerant waste buyers, scrap dealers, non-government organizations, social enterprises, and waste experts. *Chapter 6* discussed the relationship between the formal and informal actors in waste and its influences on waste management of the city.

In Kathmandu, municipality is deemed as sole formal actor responsible for waste management, though the study revealed that it fails to fully comply with this responsibility. Private companies, covering large part of waste management activities of the city are regarded informal, as they are not the official partners with the metropolitan. These private companies derive their formal status from their registration as profit making companies under the mandated law. While waste pickers, itinerant waste buyers, and scrap dealers are actors who come under the category of informal waste sector. Households on the other hand are primary waste generators and the way they handle waste affects the whole waste management process. Most of the household waste in the city is managed by private companies and the municipality only manages household waste from smaller sections of the city, *see Chapter 5*. However, households and the way they handle waste is not given priority by service providers of

Kathmandu. The municipality and private companies engage with households as a part of their waste segregation awareness campaign, but its practice on ground was found to be limited. Waste segregation at source by households was limited to the time when there is an ongoing segregation project or where households personally preferred to segregate waste. The municipality failed to successfully implement source segregation of waste in its coverage wards due to lack of co-ordination between metropolitan and responsible wards, whilst private companies prioritize collection of mixed waste and disposal to landfill site as this is more cost-effective for them.

Non-government organizations, waste experts and social enterprises are other set actors that are active in addressing waste management issues of the city. Attempts are made by non-government organizations to aware households on source segregation, informal waste pickers about health hazards and safety measures while waste picking. Social enterprises have tried to systematize the activities of itinerant waste buyers by registering them and waste experts have attempted to inform local government about the need to reduce, reuse, and recycle and shift from landfilling. However, these actors do not have a direct decision-making role in solid waste management of the city; participation and recommendations of these stakeholders for municipal solid waste management have been one-sided. Their activities have received limited consideration from the government which raises the question of their sustainability.

Meanwhile, local government has only limited capacity to provide waste services in the city pointing towards inability of current vertical government framework to deal with the waste issues of the city. In this scenario, inclusivity of the existing actors who are contributing to deal with the waste issues can be crucial in achieving inclusive waste governance in Kathmandu metropolitan. Thus, a brief description of second part of research question one, is that current waste management process in Kathmandu is far removed from the official regulations and decoupled from the development of physical infrastructure that prioritizes solid waste management as urban infrastructure. The current vertical government framework in Kathmandu creates gaps and a need for exploring horizontal solid waste governance to address urban solid waste management issues.

8.3.2 Role of Informal Sector and relationship with other waste actors

Solid waste governance of Kathmandu reveals that it is composed of multiplicity of actors. Integrated sustainable waste management framework along with other literature on solid waste management recognizes the presence of a wide array of actors (Henry et al., 2006; McDougall et al., 2001; Schübeler et al., 1996; Van de Klundert et al., 2001; Wilson et al., 2012; Wilson

et al., 2013). The case of Kathmandu recognizes that informal waste sector is the core to recycling of solid waste in the city. Formal waste segregation and recycling activities are limited in Kathmandu. Informal segregation and recycling contribute to employing a significant number of rural urban migrants and recovering approximately 30 percent of recyclables from total solid waste. Formal data about the number of people employed in the informal waste sector and contribution made by it to the national economy is unaccounted for. Literature has pointed to neglecting the presence and potential impact of the informal sector developed around waste collection and recycling in cities is a typical issue of developing world (Medina, 2007, 2008). For the city's solid waste governance to be integrated it is recommended to recognize the role played by the informal sector in recycling.

Informal waste workers such as itinerant waste buyers are directly in contact with households. Households come in contact to these buyers for selling recyclables, but other informal sector actors like scrap dealers and waste workers are not in contact with the households.

On the other hand, informal sector actors especially scrap dealers and waste workers engage with private waste companies to get hold of recyclables. In this engagement the main aim is to maximize the profit through recyclables. Actors like social enterprises and non-government organizations have positively engaged with the informal sector. Social enterprises in the city have attempted to standardize the informal waste work, but the scale of their attempt has been limited as compared to the size of the informal waste sector. Similarly, non-government organizations are involved in addressing the social and health issues faced by waste workers, *see chapter 6*. Attempts by social enterprises and non-government organizations in a path to support the informal sector are based on private initiative. These efforts without supplementary support from local authorities face the challenge of being temporary.

8.3.2.1 Informal waste sector practices sustaining the formal waste system

In this thesis informal waste sector was specifically classified as waste actor out of the regulatory framework of the government. However, the study revealed the interdependencies between the formal and informal waste practice. This corroborated with researchers that support the idea that informal activities not only competes with the formal but formal and informal sector activities complement each other, making urban waste management system a modernized mixture of formal and informal practices (Scheinberg, Spies, Simpson, & Mol, 2011). *Chapter 6* of this thesis revealed the interrelationships between the formal and informal sector, especially the contribution of informal sector with raw materials for recycling industry in Nepal and India. At the same time, private waste companies that are registered taxpayers

that hire employees on a legal contract basis are not regarded as formal waste partners of the metropolitan. In Kathmandu, the boundary between the formal and informal waste was found to be blurry, the informal sector practices fill in the gaps in resource recovery and recycling caused by state failure to respond. While the authorities fail to acknowledge this contribution. This echoes with the perspective of researchers who mention that informal waste economies are integrated into local as well as global recycling trade (Grant & Oteng-Ababio, 2012).

8.3.2.2 Informal waste workers and organization

The informal waste sector in Kathmandu metropolitan is already facing disparity from the authorities. Particularly, informal waste workers and itinerant waste buyers who are at the bottom of the informal waste sector hierarchy. These two actors in informal sector reap waste as a livelihood while providing the essential service of waste segregation for recycling. Waste workers and itinerant waste buyers in Kathmandu still remain unorganized and scattered. Success stories of inclusion of waste pickers to achieve an inclusive urban solid waste management system reveal that they have pursued a number of strategies to attain inclusivity. These approaches are mass mobilization, forging strategic alliances at local national and international levels, struggle for integrative policy and legislation to get acknowledgement and secure a living (Dias, 2016). They have organized themselves in the form of membership-based organizations such as co-operatives, associations, unions, community-based organizations, and microenterprises (Dias & Alves, 2008). In case of Kathmandu except for one co-operative with 500 members, established to financially support female informal waste pickers there are no other associations. Similar is the case with itinerant waste pickers, except for an initiative by a social enterprise named *Khalisisi*, to register the interested itinerant waste buyers.

The role of organizing waste pickers to further their demands for integration into formal solid waste systems is critical and this has been proved through success stories from cities like Belo Horizonte, Pune, and Bogota (Dias, 2016). Meanwhile, organization of waste pickers alone is not enough but state receptivity towards the demands of waste workers is also needed to shape an inclusive waste system. Current waste management acts and regulations has not given informal sector a space. Though national urban development strategy, 2015-2030 in line with national urban policy 2006 had set out an approach to emphasize and recognize urban informal sector, but activities have not been carried out in this direction. Municipalities were made responsible for activities like capacity building, provision of space and time for informal sector activities and carry out thorough poverty mapping, but the stance of municipality has been to overlook informal waste sector. Similarly, organizing, which has been regarded as critical for

waste pickers to attain a position in laws and policies has not been achieved in Kathmandu. This dissertation highlighted that waste picking is crucial for urban poor and these waste workers make pertinent contributions to city economy. Social perception and government policies are still based on fallacies that ignore their contribution to environment and economy. Thus, a summarized answer to research question two is that informal sector's contribution to recycling activities is crucial for solid waste management process of the city and achieving the recycling rate as per the state's commitment to SDG 12. However, the sector faces challenges posed by the current government policy of regulation without inclusion measures and wider social perception associated to waste work. At the same time this is opposed to the commitment made under SDG 9 of formalizing informal economy, SDG 11 of making cities inclusive and national urban development strategy of government of Nepal of formalization with social protection schemes. Though attempts are made in this line by the social enterprises and non-government organizations to support informal waste pickers and itinerant waste buyers, this one-sided support faces challenge as there are no existing policies and backing from the local government in this line.

8.3.3 Existing partnerships between the actors and potential for partnerships

The case of Kathmandu reveals that there is no official partnership between public and private actors to address solid waste management issues of the city. Though literature suggests that in recent times the role of state has shifted to being an “enabler” a coordinating agency working with varied forms of partnerships, all intended at urban and regional development (Baud et al., 2001). Private actors in the city have forged partnerships at smaller scale for mutual benefit, and they remain unrecognized by the authorities. As literature points out partnerships and alliances are viewed as instruments for more effective local governance and are widely promoted, but in the context of developing countries they have emerged particularly in local environmental management (ibid). Similar, is the situation in Kathmandu where partnerships have emerged between private actors and informal actors to address the solid waste recycling issues, contradictory to the acts and policies. These partnerships between private formal and informal actors are focused primarily on reuse, recycling, and waste recovery activities in the system. Private companies, waste pickers, itinerant buyers, small, medium, and large-scale recyclers of waste materials carry out their activities in co-operation and partnership with each other. At the same time, it is worthwhile to recognize that these partnerships have emerged mainly in reaction to the lack of effective public sector service provision, waste segregation and recycling activities.

It was discovered in Kathmandu that the central government and metropolitan prefers to link up with large transnational corporation and reluctant to partner with existing private waste management companies, despite their current expertise in removal of solid waste from households. Public private partnership for modern integrated solid waste management associated with large capital investments and infrastructure development as imagined by the central government together with local government reveals the risk of dissatisfied existing actors and further diminishing solid waste management situation. A positive intervention from local government would be required to forge a legal partnership with existing actors to make them officially responsible towards the public.

8.3.3.1 Positive intervention and supporting role of local government for partnering with informal waste sector

There are enough examples from cities around the Globe that there is no single solution that can address all the social, environmental, cultural, and financial aspects of solid waste problem, especially when it comes to informal sector inclusion, improvement of their living and working conditions as well as the productivity. However, higher level of local government support, based on co-production policies have been successful in improving the sustainable performance of waste-pickers in collection, segregation rates, salaries and working conditions (Navarrete-Hernández & Navarrete-Hernández, 2018). In case of Kathmandu, local government and its policies have not had a positive role to play for informal waste picking. Current initiative of public –private partnership is suggested to adopt an approach of informal-private –public sector partnership. The study unraveled the inadequacies of source segregation programs, lack of investment in waste sector, bureaucratic hurdles, and no organization of waste workers as inhibitors for increasing the potential of the informal sector. These shortcomings have been addressed in other parts of the world through strong organizations such as waste workers association backed by policy support. In addition, co-production based initiatives such as segregated door-to door waste collection, provision of land and sorting and storing facilities for informal waste sector have produced positive and sustainable outcomes (Fergutz et al., 2011). The case of Kathmandu attempts to highlight that current relations between formal and informal sector has gaps that can be dealt by adopting co-production-based policy approach. However, it has to be contemplated that this approach can fail to produce expected results when the current legalist approach of the authorities are masked by co-production policy mentions in legal documents.

8.3.3.2 Garnering community participation for source segregation of waste

Community participation has been advocated largely in developing countries for municipal solid waste management. There have been success stories of community participation as well as studies advocating community-based approaches for municipal solid waste management, citing them crucial for municipal solid waste management (Ahmed & Ali, 2006; Kironde & Yhdego, 1997; Ogu, 2000).

In case of Kathmandu, it was found out that around fifteen women's group were active in each of the two wards surveyed in the study, likewise at least one community consumer welfare group was active in each of the other two wards served by private company. It was revealed that the municipality's community development section has attempted to mobilize women's group for source segregation of waste through trainings and segregation material distribution. Whereas private companies have utilized the presence of consumer groups in their areas to provide waste segregation training and awareness. It was already mentioned in *chapter 5*, that the gender dimension of waste and women being the primary target of these community-based programs. Nevertheless, these efforts have been limited to trainings and segregation bucket distribution. Service providers had not involved the community in the design of these programs such that community needs, and ideas can be incorporated. Failure of metropolitan's waste segregation pilot project as mentioned in *chapter 5* is one example of it. Involvement of the community from the planning phase to implementation and monitoring is suggested for integrated waste governance in Kathmandu. To achieve a well-functioning and context-based governance for an integrated sustainable waste management there is a need to realize that current solid waste management process in the city is carried out by a wide range of actors and their engagements. These are actors from both formal and informal arena.

Thus, a summarized answer to the research question three is that there are partnerships between actors that have emerged at grassroots level to deal with the immediate waste problems of the city. However, government's aim over the last eight years have been to enter public private partnership with transnational company boycotting the existing actors. Also, authorities approach towards waste over the years have been traditional, with a focus on finding end-of-pipe solutions that focus on collection, transport, and disposal. This kind of approach has totally ignored the potential for partnership with informal sector that is comparatively highly organized system of recyclables segregation for reuse and recycling. Also, building binding legal partnership with the existing actors like private waste management companies, non-government organizations have been overlooked in the metropolitan. Binding partnership with

these actors can support in making them more accountable to the public, at the same time help in filling the existing resource gap at the municipal level.

Keeping all the empirical findings in mind recommendations are made in the next chapter for improving urban solid waste management in Kathmandu. These recommendations are directed towards strengthening solid waste governance in the context of rapidly urbanizing Kathmandu. As this is a critical issue for urban planners and policymakers, the recommendations are for the actors who were identified as contributors to solid waste management, namely metropolitan, private companies, households, informal waste workers, NGOs, and social enterprises. Recommendations are also made for the planners, architects, and waste experts at state level since they still play a part in solid waste management of the city.

9 Recommendations and Conclusion

This chapter puts forth recommendations drawn from the empirical findings to strengthen solid waste governance and urban planning in Kathmandu metropolitan. These recommendations are directed towards actors that are at the policy making level and to actors involved in daily waste management and urbanization process. While making the recommendations ground realities of the context are kept in mind. Also, conclusion from the thesis is drawn and potential topics for further research in solid waste management and rapid urban development from the author's perspective is laid out.

9.1 Recommendations for Central-Government Authorities

The focus of the study was on solid waste governance at the local level but the influence of state-level authority in solid waste management is prevalent as decentralization has not been completely achieved in Kathmandu. Thus, the following recommendations address to Ministry of Urban Development the apex body at the state level within which the Department of Urban Development and Building Construction (DUDBC) and Kathmandu Valley Development Authority (KVDA) lies. This becomes particularly important given that provincial governments are not actively involved in solid waste management in Kathmandu.

Understanding the need for decentralization of local and provincial governments

Urbanization in Nepal is the highest in South Asia, especially in Kathmandu metropolitan which is the heart of this urbanization. Meanwhile, the local authority is limited in its capacity to address the changes brought by this growth. Decentralization is viewed as a solution to deal with urban development disparities. While the current scenario shows that decentralization, as imagined, differs from what is practiced. Metropolitan is still reliant on the central government's plan for solid waste management. In the current scenario, top priority in Nepal should be to create an enabling environment for local government to take charge of their responsibilities under the new constitution and local government operations act. There seems to be a situation of ambiguity in terms of powers, functional responsibilities, and regulatory roles at the local level; thus, it is recommended for a thorough transfer of power. This dissertation makes a recommendation for decentralization of roles and responsibilities to the municipal authority which is now condensed at the state-level authority.

Waste management policies for different categories of waste at state level

The current solid waste management act and rules in Nepal encompasses all kind of wastes that includes domestic waste, industrial waste, chemical waste, and health waste. This categorization of hazardous and non-hazardous waste together does not consider the distinct environmental and public health impacts. It is recommended to have a separate policy for municipal household waste, industrial waste, and health institutions waste such that each kind of waste receives preferred treatment. Meanwhile, these policies are available at national level, authorities need to develop similar regulations at provincial level in cooperation with local level. These regulations and guidelines must address the specific, economic, demographic, and geographical needs of the state. Considering that the level of urban development is varying in Nepal. In this process, the newly formed provincial government can get support from federal government.

Developing solid waste management as urban infrastructure

Despite the need for better solid waste management services and infrastructure for the city, solid waste management is not prioritized as basic urban infrastructure. Currently, the Ministry of Urban Development is responsible for infrastructure development related to waste management for the municipality, without substantial involvement of the provincial government. Waste management facilities are needed to be developed like other urban infrastructures such as water supply, power, roads, airports, and housing. For this, federal and provincial government ought to commit to developing waste management facilities with necessary collaboration with the local level government.

Inclusion of informal waste sector

Informal sector's role in solid waste management is overlooked by the solid waste management acts and regulations. These activities are not considered by the local government as well. In official documents of the metropolitan the existence of informal waste sector, let alone its contribution towards circular waste economy remains invisible. This study has explored the role and relationships of the sector pointing the need for a further engagement between grassroots level organization with informal sector and a need for facilitation from the local and federal government. This study calls for a systematic inclusion of informal waste work into waste management system. Though legalization has been regarded as a way to do so in Kathmandu, which has failed to produce results. However, examples from Bangalore, India;

Blagoevgrad, Bulgaria; Dar es Salaam, Tanzania and Bamako, Mali reveal that collaboration between authorities and informal waste workers can take many forms and can be sustainable solution to waste problem as well, without the precondition of formalization.

Also, this study acknowledges the matters related to working conditions of informal waste workers. Hazards involved in waste work and formulation of workplace health and safety guidelines is recommended in Kathmandu. This is important to be considered such that while recognizing the financial and environmental benefits of the sector to the formal system, the health hazards associated with the work need not be overshadowed.

Improvement of current waste infrastructure as urban infrastructure by the urban planning and architecture section at central level

The *fig 58* and *59* shows transfer stations, scrap centers and dumping points in Kathmandu that were visited during the field work in 2019. The transfer stations and scrap centers in Kathmandu currently were found be situated in the middle of dense residential and commercial areas, with poor working conditions for waste workers. While dumping points/point-based collection areas were based on services providers' waste collection vehicle routes. These dumping points are usually open areas where waste is discarded by public, later to be collected by service provider. These areas pose a threat to the public health and environment when waste is not collected by the service provider due to a number of reasons mentioned in *chapter 5*.

While transfer stations pose similar risks to environment and public health. The structures have faced public opposition due to the foul smell and disturbances caused by it. Similarly, scrap centers were also found to be situated in densely populated areas of the city. In the context of Kathmandu, where land availability is a major concern, it is recommended to adopt measures that can help in the modification of the existing transfer stations and scrap centers, making them more viable to public eye, resolving the odor issue and making them safer for the informal waste workers. Also, installing waste containers for organic and inorganic waste based on the public practicability rather than open dumping points is considered as a better option for the city. Here urban planners and architects at Ministry of Urban Development can contribute to make these places for acceptable to the community, with safer working conditions and without threatening the livelihood of waste workers.

At the same time, it raises the question about policy making and urban planning that is happening in the city without considering the messy reality of urban spaces such as scrap centers and transfer stations. These spaces are important for everyday waste management and also for attaining government's aim of certain recycling and reuse percentage by 2030.

However, the planning and governance mechanism doesn't seem to respond to the fact that these sites are crucial and addressing the inequalities that happen in these sites can be a one step towards dealing with the issue.

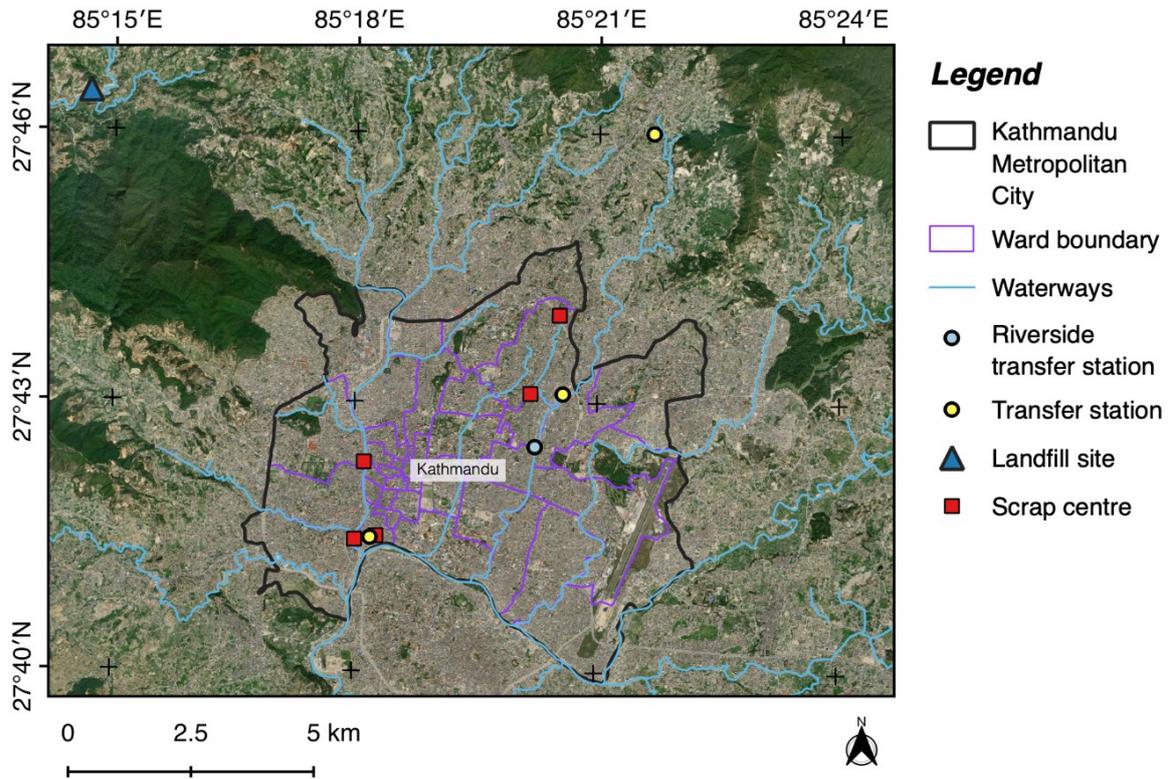


Figure 58: Transfer stations and scrap centres visited during the field work (Source Author, 2021, Geodata: Google Earth, 2021)

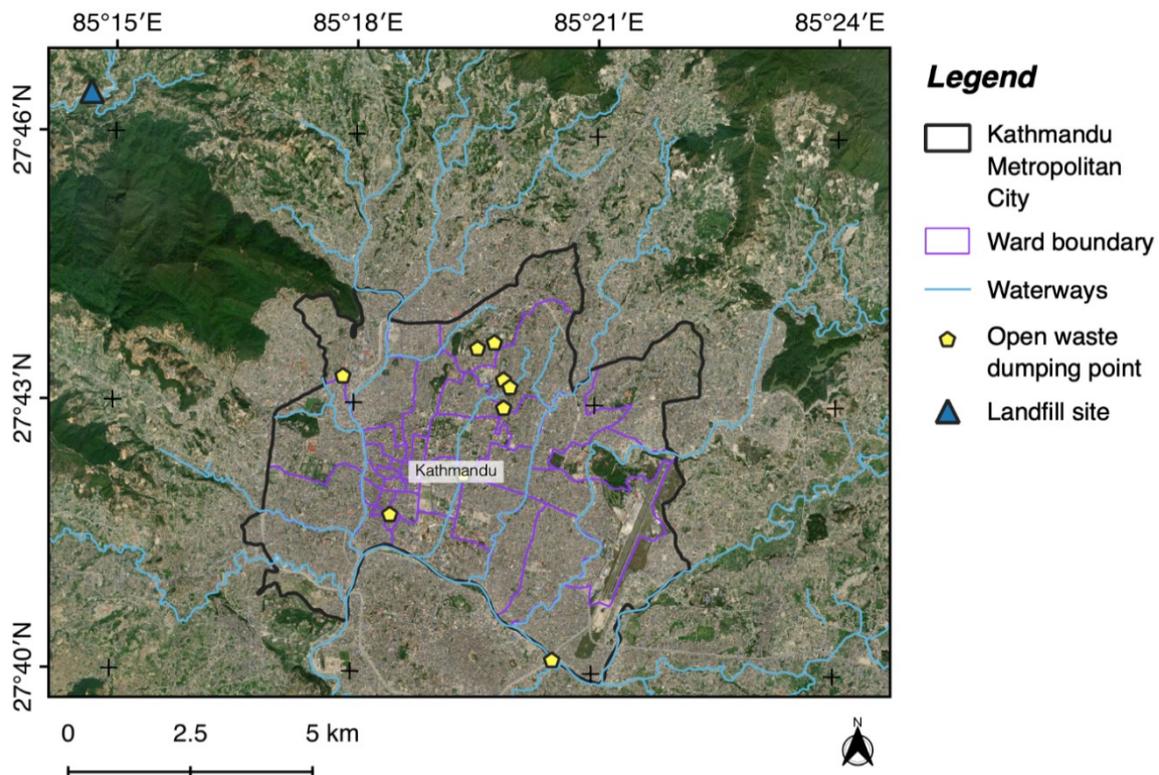


Figure 59: Open dumping points in different parts of Kathmandu metropolitan visited during the study (Source Author, 2021, Geodata: Google Earth, 2021)

Capacity building of local government

The local self-government operation act and solid waste management act both have mandated local government/municipalities to carry out municipal solid waste management responsibilities. Meanwhile, municipalities face a shortage of financial, technical, and human resources required to manage solid waste. Developing municipal capacity is essential, for this, a dedicated municipal solid waste unit (MSW) constituting of staff qualified to deal with municipal solid waste is suggested. There existed a technical support unit an autonomous government body to provide technical assistance to local bodies but post-adoption of the new constitution in 2015 the center was eliminated. This demanded an extended role of local bodies in delivering waste services and developing waste infrastructure. To achieve this, there is a need to strengthen local bodies in terms of planning, waste collection, processing, treatment, and disposal, for which the federal government can provide support through the establishment of a technical support unit.

Cooperation and collaboration between government bodies

Through the study, it was unveiled that lack of coordination and collaboration between government bodies is one of the reasons for delayed infrastructure development in solid waste management e.g., landfill site construction. Government bodies at the federal level are unclear about their roles and responsibilities in the new federal system. At the same time, inadequate communication about current progresses between these bodies added to the problem. There is a need for developing a better communication mechanism and a flow of information to the local bodies as well. So, that, everyone is informed about the current progress and act accordingly. Currently, the municipality was misinformed about the progress at the landfill site and the Department of Urban Development and Building Construction (DUDBC) failed to properly disseminate the information related to causes for delay in construction of the landfill site. This started a situation of blame game between the parties. A clear information flow between the involved bodies is suggested to prevent future misunderstandings.

Enabling local government through local governance

This study recommends a shift from a centralized top-down governance structure to an inclusive bottom-up governance structure. The current local government structure is highly reliant on central level planning; thus, it is recommended to capacitate local bodies to strengthen the shift towards horizontal, bottom-up governance. To achieve this, implementation of current laws that facilitate local bodies to act on local planning is needed. At the same time maintaining a check and balance mechanism for local bodies is recommended through monitoring and reviewing their plans and activities, since decentralization does not mean state pulling out but facilitating the local planning and implementation process in combination with monitoring and evaluation.

Promotion of investment in waste recycling and recovery

It was highlighted through the study that waste recovery and recycling business is not seeing large scale investments. In this case, government policy to promote waste recovery and recycling as a lucrative business through strategies such as with reduced excise and customs duty on waste recovery equipment such as bailing machine and mobile chippers can be helpful. Informal waste sector operators that are currently sending off a large part of recyclable glass to India can benefit through importing machinery that can turn all kind of glasses into cullet. Also furnaces for melting large amount of glasses can be brought such that the current illegal trading of recyclable glasses to neighboring India can be halted.

9.2 Recommendations for Kathmandu Metropolitan

Kathmandu metropolitan is responsible to provide a substantial number of public services for the city residents, solid waste management is one of them. The local body such as the metropolitan is provided with responsibilities to maintain a clean and healthy environment through sustainable solid waste management. However, Kathmandu metropolitan has failed to carry out these responsibilities due to its limited capacity and evolving nature of decentralization. Thus, recommendations are made for the metropolitan to attain bottom-up governance in solid waste along with the identification of actors falling outside the official framework. In addition, the recommendation here is also to connect research, local knowledge of various actors with solid waste challenges of the city.

Data availability, update, and management

The case of Kathmandu reflects that the city lacks updated data on solid waste management. The last updated data on the status of solid waste management in municipalities of Nepal was published in 2013 by the Asian Development Bank. This data has been regarded as baseline data though it has been outweighed by rate of urbanization of Kathmandu. Current solid waste acts and regulations mandate local government to generate and disseminate data on solid waste management. This data includes waste generation, composition, quantity, collection coverage and disposal practices. The metropolitan currently has no mechanism to maintain the day-to-day scientific data on solid waste. Maintenance of scientific data on solid waste from generation to disposal stage is essential for the formulation of improved regulations. Information on organic and inorganic content in waste generated by households, amount of recyclables like plastics, paper, glass and metals and organic waste is necessary to make suitable regulations. At the same time data about waste composition is useful in planning waste infrastructure for Kathmandu city. Furthermore, maintenance of accurate data on amount of waste daily collected from the city can be useful in planning appropriate waste vehicles for the transportation, cost of fuel for the transportation and make an optimal waste budget for the metropolitan. Currently, in Kathmandu metropolitan there is no account of revenue generated through waste from the private waste companies; maintenance of data on amount of waste collected by them and fixing a waste fee margin for households and institutions can help in determining revenue generated through waste by these companies.

Moreover, maintenance, and availability of thorough data on solid waste namely, organic, and inorganic waste, collection rate, disposal practices, recycled waste can be useful for comparing

performances of municipalities and a way to improve their performances by addressing the problems. Thus, it is recommended to have a solid waste management information system at the local level, such that local levels can maintain updated data on solid waste. The data provided by the local level can be used as operational data for both provincial and national level government.

Measure to get household waste data and generate revenue

The thesis revealed that accurate information related to amount of household waste in Kathmandu metropolitan is lacking. Waste storing practices of the households were not uniform ranging from plastic bags to large metal containers. While failure to uniformly distribute and monitor the use of segregation bins were also revealed See *chapter 5*. As the free distribution of segregation bins could not produce desired results, municipality and private companies as the waste service providers can sell especially designed waste bags to their service seekers. Collecting waste only when households purchase these especially designed trash bags, the service providers can estimate the total volume of waste based on the number of trash bags sold in their area.

The study revealed that metropolitan is not levying fees on households for the waste collection services, whereas it was discovered from the household survey that households are willing to pay for waste services and also want regular services from the providers. Metropolitan's environment department can capitalize on this and generate income from waste, this in turn can be used to improve its services, train the employees at the lowest level (sweepers, collectors) and provide them with better working equipment.

Public engagement for better waste practices

Government authorities aim to attain integrated solid waste management in Kathmandu. One of the essential prerequisites to solid waste governance and integrated waste system is source segregation of waste. In Kathmandu metropolitan, it was found that source segregation of waste at the household level had not been achieved. Households' segregation practices were based on personal preference and immediate government pilot projects but were not a norm in the city. The municipality, NGOs, and private companies have made attempts to establish a habit of source segregation of waste but have failed eventually. This was largely due to a lack of public awareness and education about the connection between their behavior and environmental damage; lack of monitoring of their practices by service providers and public reluctance/ mistrust on municipal projects for source segregation. In this scenario, the

municipality is recommended to go beyond disseminating information to public but mandating source segregation of waste. Public awareness and education about the importance of segregation for recycling tied with periodic monitoring of source segregation practices can be the first step towards integrated solid waste management. This can be carried out mostly through training and empowering women's group and community user groups that were active in the wards. Also selling recyclables to itinerant waste buyers was found to be a common practice in the metropolitan. The household survey revealed that 131 households out of 176 responding households already selling recyclables to itinerant waste buyers. It shows that households are ready to segregate when economic incentive is attached to it, thus collaboration with itinerant waste buyers can be an option. Service providers in the city can collaborate with itinerant waste buyers to standardize the segregation of recyclables from households, this also requires recognition of the informal sector and their reach to the public and waste.

Engagement with wards

In Kathmandu metropolitan, wards are the basic administrative unit constituting of locally elected representatives. This dissertation revealed that wards perform a supporting role to metropolitan for waste management in the city. Moreover, they are in direct contact with public for activities like birth, marriage, and death registration. In this case, their proximity to residents can be utilized in creating public awareness related to solid waste management, identifying malpractices in waste management and supplement metropolitan with information needed to develop waste management plans.

Engagement with active NGOs and community groups

The inclusivity of actors is critical in achieving solid waste governance for an eventual integrated solid waste management system. Here engagement with NGOs and community and women's group active in waste management and environment is recommended. Moreover, initiating projects with these actors through wards can help to tackle the dearth of human resources that metropolitan is facing. The presence of active women's group in the inner core wards of the metropolitan can be thoroughly utilized to develop projects that influence local waste practices and instill good habits among the public. Meanwhile, collaboration with active NGOs to generate waste data and waste maps to establish a waste information system can be helpful to develop locally viable waste management projects.

Recognition and integration of informal waste sector

This dissertation demonstrated that solid waste recycling in the city is carried out by informal actors in the absence of a formal recycling system. Thus, the informal sector's role in waste management value chain by reducing the amount of waste ending up in landfill is undeniable. The current waste management act and rules are first of its kind, directly addressing solid waste management and most important till date. They emphasize for the recycling of waste and adoption of 3R principle. However, they do not acknowledge the informal recycling and right to livelihood through urban waste for the informal sector. It has led to a situation where the informal sector awaits recognition for the contribution made to urban waste management. The mention of informal sector in urban development strategy 2015-2030 for inclusive urban development through social protection schemes for informal sector cannot outplay the weight put on by the waste management act and rules that work as a law for municipal solid waste management. In this case, it is recommended that SWM acts /rules to encourage local government to recognize informal sector that can lead to eventual integration. Also, the current labor act cannot address occupational health and safety for all types of workplaces, especially for informal waste workers. Thus, it is recommended to work together with the federal government to formulate and implement occupational health and safety guidelines applicable to all workplaces in order to provide safety and a better working environment for waste workers.

Local government actively pursuing integration of informal waste sector

In addition to the recognition of importance of informal actors in recycling another important step in their integration can be favoring informal sector organizations. One of the main reasons for scrap dealers to not organize was found to be bureaucratic hurdles in this case simplifying the bureaucratic process can be helpful. In addition, to deal with the issue of land availability for scrap centers reserving space through development plans for recycling facilities, storage of materials and processing activities can support the sector. For this local government needs to put designation of space for recycling and related activities as one of the agendas under its priority sector namely inclusive cities such that it is reflected in the local level short/midterm plan. Non-government organization and social enterprises in Kathmandu were found to be directly involved with informal waste workers. These NGOs and social enterprises can also be important players in integration of informal sector. Local government can create a conducive environment for partnership with NGOs and social enterprises such that the hands-on

experience of these organizations can be shared with the local government that can support official decision-making process and future projects intended towards informal sector.

Informal waste workers' access to waste

The decision of the central government to shift towards a modern integrated solid waste system poses a threat to the livelihood of the informal waste workers operating in Kathmandu. With this system, a private company will have a hold over waste this creates hurdles for the waste workers to get access to recyclables. These waste workers already work in extremely hazardous and unsafe conditions. This raises the question of how waste can be made accessible to the waste workers and their working environment safe. Nepal being an active member of global sustainable development goals aims to emerge as an inclusive and equitable country. One of the SDG goals (11) it aims to achieve is making cities and human settlement inclusive, safe, and resilient and sustainable cities. Keeping this in mind it is recommended that instead of detaching the informal from the formal waste system in Kathmandu, they should be integrated into the waste system through measures such as organizing waste workers into co-operatives or associations such that inclusive urban development structures can be shaped. Also, providing access to waste, protective equipment, health care facilities and education materials for their children can support in improving the working and living conditions of waste workers.

Formal collaboration with active private companies

A large share of municipal solid waste management in Kathmandu is carried out by private waste management companies. They are operating in the city without a formal agreement with the metropolitan. These companies are catering for the waste management needs of a rapidly urbanizing city, covering 28 out of 32 wards of the metropolitan. However, they are not recognized by the local government as formal partners for waste management. Solid waste management act/rules acknowledge that local government can collaborate with the private sector following a legal procedure, but this has not happened in the city. Here, the municipality is recommended to forge a formal agreement with active private waste management companies. This can help both parties to consolidate their resources and move towards more inclusive solid waste governance.

Training and capacity building of municipal employees working on the ground level

Training and capacity building is a common practice for the higher and mid-level employees of Kathmandu metropolitan. In the field observation, it was noted that ground level employees

in the metropolitan still work with archaic equipment to sweep the streets and collect waste. Street sweepers (*kuchickars, naikes*) and supervisors who deal with municipal waste daily are devoid of training. The metropolitan relies on street sweeping and waste collection activities of these workers to keep the city clean, but there is no scope for their skill development, provision of better tools for them. Training and capacity building is targeted for higher-level positions, but the dispersion of knowledge and skills is necessary for the lower-level workers too, especially in the current situation when the municipality is functioning with half of the ground level staffs than required.

At the same time, this dissertation pointed out that municipal staff face challenges in mobilizing field level workers like *kuchikars* and *naikes* (sweepers and their supervisors in local language) in the lack of monitoring and evaluation mechanism. In this scenario, providing training, assessing the needs of staffs at these levels can be helpful to carry out their functions effectively and ensure the city cleanliness.

Another major issue related with waste management in Kathmandu is association of waste work to low social status and caste system that is still prevalent in Nepal. Attitudinal changes with regards to intersections between occupation, class, and caste is of utter importance so that waste jobs can be more attractive. One starting point in this direction is advertisements in local television and radio which mentions that all caste-based discriminations are abolished in the country, it is a criminal offence to do so. Sensitizing public about the importance of segregation and the contribution of waste workers in this is necessary. Promotion of waste work as a dignifying job together with promotion of organization of waste workers is recommended in Kathmandu.

9.3 Recommendations for Private Companies

Private companies are identified in this thesis as one of the most active constituents of solid waste governance in Kathmandu. They have a stronghold in most wards of the metropolitan. Based on the findings of the study following recommendations are made.

Maintenance of waste database and maps

Currently, private companies are collecting waste based on the membership of households. Waste collection routes are based on waste vehicle driver and collectors' familiarity with the area. There is no scientific method followed to plan a route of collection. Also, data about service seeking households, monthly payment for waste is stored manually by each area

coordinator of the company. Thus, it is recommended for the private companies to develop waste collection maps using GIS-based information such that most efficient waste collection routes, number of households involved can be generated. While waste weighing mechanism or uniform-sized container provision from the private companies to store waste can be helpful for the companies to keep data about amount of waste generated each day. Similarly, waste fees can be charged based on the amount of waste rather than the current practice where every household is charged the same fees, so that households are motivated to reduce or sustainably utilize whenever possible the amount of waste generated.

Another challenge encountered in Kathmandu was indiscriminate disposal and burning practices of public that not only has adverse impact on public health but also on the environment. Local government has official plans to fine the litterbugs as per solid waste management rules. However, it is recommended to promote good solid waste management practices by households as something beneficial for the whole society by the service providers. This kind of habit can be promoted by awarding the existing grass root level organizations like women's group and community user groups with prize for being the cleanest community. This can instigate a sense of reward towards cleanliness and motivate them to keep an eye on litterbugs, haphazard waste burners and promote cleanliness.

Collaboration with existing NGO and social enterprises

There are initiatives by local NGOs to instruct community groups on source segregation and waste reduction at source, through segregation and roof-top gardening training programs. Meanwhile, a local NGO named Clean-up Nepal together with a donor agency has developed a mobile app to report haphazard waste burning and disposal in three wards of the city. Private company like NEPCEMAC that cover larger part of the city can collaborate with NGO like Clean-up Nepal to further elaborate waste data. This way both sides can share their knowledge to create a common waste database for the metropolitan.

Reaching out to households for waste segregation at source

From this dissertation, it was identified that private waste management companies in Kathmandu are focused on waste collection and disposal to landfill. Waste reduction at source, and segregation is limited to personal choice. It is recommended for these private companies to capitalize on the stronghold they have in the residential areas of the city to promote source segregation and collection of pre-segregated waste. Segregated waste collection in combination with timely monitoring by the waste collectors is recommended Monitoring by the waste

collectors of both private companies and metropolitan can be useful in this case, as it was found by this study that these collectors had built a rapport with communities where they collect waste. They can utilize their relationship with households to urge them to segregate waste and carry out time to time monitoring of the segregated waste from households. In doing so, these waste collectors themselves need training and awareness by their employers i.e., metropolitan, and private companies about the importance of good waste practices, its benefits and how they can contribute towards this. Also, a system of reward for the households that segregate waste and make compost from their organic waste can be a motive to continue segregation habit among households. Also, households that face space constraint for compost making should be considered in such a highly urbanized area like Kathmandu. These activities can eventually lead to the recovery of better segregated and high-quality recyclables from the waste stream in later stages of the waste management process.

9.4 Recommendations for Informal Sector Operators and Workers

Organization of Informal Sector

As identified in the dissertation, the informal sector is a major contributor to recycling in Kathmandu, but they remain unrecognized by the authorities. In this case, it is recommended for the informal waste sector to organize themselves so that their collective voice is heard.

Informal waste workers and itinerant waste buyers

These workers sometimes called scavengers are waste segregators at lowest level. They are vulnerable to all kinds of occupational health risks and hazards at transfer stations, scrap centers and the landfill site. This research could only find out one organization composed of informal waste workers, a co-operative of female informal waste workers (*Samyukta Safai Jagaran*) consisting of 500 members. A large part of the waste workers which is assumed to be around 15,000 in the city remains unorganized. Thus, it is recommended for informal waste workers to organize themselves into co-operatives or associations so that their collective voices can be heard. For this an initial financial and technical support from the local NGOs and social enterprises working for the informal waste workers can play a positive role. Currently, in Kathmandu there are NGOs such as Phase Nepal and social enterprise like Khalisisi that support informal waste workers and itinerant waste buyers. It is suggested for the non-government organizations to invest in encouraging the unifying the waste pickers. Specifically, to establish member-based organizations and strengthening it. There have been successful examples from Peru, Brazil, and Philippines where informal waste workers have been

organized into associations through the impetus of NGOs and municipalities. Organization of informal waste workers into membership-based organizations/co-operatives or associations with supporting policies and enforcement of these policies is helpful in their integration for an inclusive local waste management system.

Organization for inclusive policymaking and waste systems

At the planning level, informal waste sector has no say in Nepal. Though large part of recyclables from formal system ends up in informal waste sector, government support has not been seen for this sector. In this scenario organization of informal waste sector, especially informal waste workers into co-operatives have potential to participate in shaping solid waste management policies. There have been instances of success where the informal sector has become an integral part of solid waste policy in Brazil, India, and Peru. Also, this can provide them to access to adequate infrastructure for waste recycling facilities and reduced health hazards at workplace.

Small and medium scale scrap dealers

Other set actors in informal waste sector identified by this thesis are small and medium scale scrap dealers. These are the direct buyers of recyclables from informal waste workers and itinerant waste buyers. Though there is no scientific data on the total number of scrap dealers in the city. These dealers have an umbrella organization called *Nepal Kawad Byapar Byabasahi Sangh*, but it was discovered that not all the scrap dealers are associated with the organization. The involvement of all the scrap dealers in an umbrella organization is identified as a way to acquire data about the number of recyclables and scrap dealers involved in the city. Incentives for scrap dealers to be involved in an association is necessary in Kathmandu. Currently it was found that the scrap dealers are reluctant to be involved in an association as they do not see any benefit for the business by linking themselves to any organization.

Large-Scale Scrap Dealers

Their businesses are run by the materials that they buy from small and medium scale scrap dealers. Due to inability to utilize all the recyclables especially plastics within the country, most of the recyclable plastic ends up illegally in India. It was discovered that lack of enough infrastructure in Nepal, mostly due to lack of large-scale investment in waste is the main reason behind it. In this case, it is recommended for large-scale scrap dealers to form a coalition with active small-medium scale recycling businesses to utilize the recyclables within the country. Without large-scale investments, small scale investments suitable for the country could be a better alternative. Thus, it is recommended for the government both at the federal and provincial level to create an environment of investment in the country; where investors are

secure that they will get a return eventually. For this, one of the most important issue that Nepal's government need to assure is political stability in the country. At the same time, waste is regarded as a dirty business, so promotion of investment in the waste business as something good for the society and environment needs to be promoted at all levels.

9.5 Recommendations for Households in Kathmandu

Households in Kathmandu metropolitan play a critical role in solid waste management through waste segregation practices. This thesis brought forward that households' waste management practices such as segregation of waste at source though regarded as a crucial step has received limited attention from the service providers.

Modifying the waste consumption and storage practices

A large number of households in Kathmandu did not practice source segregation of waste, these practices were limited to personal choices of having a roof-top garden or kitchen garden. Although trainings were provided by metropolitan and private companies to households to some extent, success of these trainings would depend on households proactively implementing it in their day-to-day practices in the long run. Adoption of source segregation by households as a norm would put pressure on the service providers as well to find alternatives for their habit of collecting mixed waste. At the same time in the current scenario where the focus is on buying-consuming and throwing, a gradual change of public habits in terms of buying and consumption plays an important role in the waste management process. The change of public habit is a gradual process, public service television advertisements by popular local actors showing segregation of waste, careful dumping and no open burning as the best practice can help in public awareness and education. There has been a successful case of collection of segregated waste from households in *Nagarjun* municipality adjacent to Kathmandu metropolitan. (See section 5.4). Similar, can be achieved in Kathmandu however considering the size and population density of the city, it will take considerable amount of time to implement a behaviour change in public and investment from the side of service provider. This can be supplemented by activities such as distribution of leaflets with pictorial depictions to households on a regular basis by their service providers about the ill effects of non-segregated waste on the environment, water bodies and the poor conditions at the landfill site.

Need of pro-active community level organizations

Public participation is of utter importance to meet the challenge of keeping the city clean and liveable. Most preferred way to garner community participation is through education and awareness campaigns to enhance the public education about reduce, reuse, and recycle. Major concern in Kathmandu metropolitan has been public littering and indiscriminate burning; an attitude of throwing and burning mixed waste in open public places is rampant. It is recommended in the metropolitan to have community level organizations that are proactive to educate public which can help to deal with this problem. At the same time there were community user groups and women's group active in the metropolitan that focused on source segregation; an active involvement is also recommended for awareness on public littering, waste burning and catching the litterbugs.

9.6 Recommendations for Urban Planners, Architects and Waste Experts

From the study it was demonstrated that the planning for waste management is limited to waste infrastructure siting and construction in Kathmandu. Planners, architects at the state and local level along with the waste experts through their holistic view can contribute to the interdisciplinary issue of solid waste management in Kathmandu. Their know-how of the complexity of waste management can help in planning from the beginning i.e., when material extraction and production process take place rather than finding disposal solutions at the end. This will not only make the whole process of production and consumption sustainable but also contribute to the authorities' aim of attaining an integrated system. Urban planners have great potential to contribute to sustainable waste planning both in research and in practice. Especially planners at the ministry and metropolitan level can co-ordinate and utilize their expertise in regional demographics, land use and zoning to identify the way material flows through an urban area and contribute to design community specific waste policy. For example, with the knowledge about the population density and composition of waste in the region, planners can decide on the optimal type and size of vehicle to be used for the waste collection in the different residential areas of the metropolitan. Furthermore, the metropolitan is designating fixed number of municipal waste workers in each ward of the city as discussed in *chapter 5*. With the help of planners at the local level and the information on areas with highest waste generation, waste staffs can be assigned according to the need of the area.

Also, the current focus of authorities at ministry level in Kathmandu has been on constructing a large-scale landfill site to solve the immediate waste disposal problems of the city. Though

recycling plant was envisaged earlier, the immediate focus has been to complete the site and making it disposal ready for the whole Kathmandu valley. Urban planners and architects present at the central and local level can influence on infrastructure planning for facilities like transfer stations and placement of waste disposal bins.

The study revealed that transfer station of the metropolitan is open and spreads foul smell which creates a nuisance for the nearby residents, leading to a situation of series of complaints *see chapter 5*. Similarly transfer stations of private companies were either open areas covered by zinc roof sheets on all sides or open areas by the river side. In these facilities all kinds of mixed waste were hauled onto the ground to be segregated by waste pickers and further loaded again to be transported *see fig 60 and 61*. The first step here is bringing in waste segregated into organic and inorganic category to the transfer station, measures to attain this are discussed in previous sections.

While planners and architects can contribute on the siting of transfer stations in areas that least affect the environment and public health e.g., on grey field land. Also, attention needs to be paid on the design part of these stations such that waste amount can be noted, compartment for inorganic and organic waste is made, safety measures for all workers are considered and no noise and smell escape the structure. *Fig 62* below shows a conceptual diagram of a transfer station with enclosed facility to transfer organic and inorganic waste. Along with facilities for composting the organic waste and refreshment for the waste workers. The site has separate entrance and exit for waste vehicles with weighing scales to weigh the amount of waste that enters the transfer station and leaves for the landfill after being segregation. Parking area for the transfer vehicles also an enclosed area for all kinds of hazardous waste is shown in the diagram. As it was found out during the study, household waste came mixed with hazardous wastes such as fluorescent lights, paints, batteries, and electronics like old CRT monitors.



Figure 60: Transfer station of a private company made of zinc roof sheets (Own photo)



Figure 61: Open transfer station of a private company (Own photo)

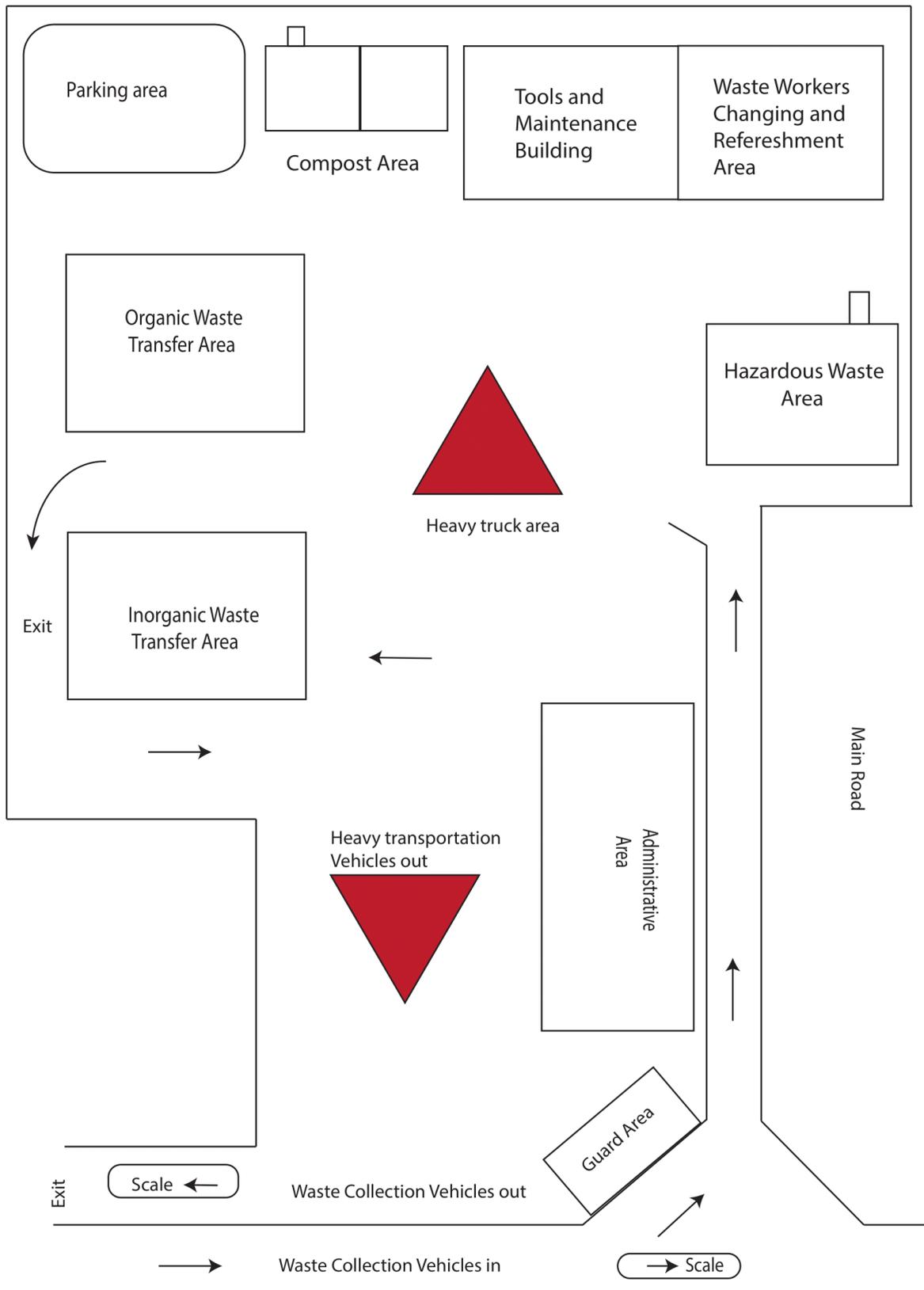


Figure 62: Conceptual diagram for a transfer station (Author, 2021)

In Kathmandu metropolitan open waste dumping points were found in different parts of the city. However, closed bins for organic and inorganic waste were rarely spotted unless it was installed by business owners through a private initiative. While in residential areas waste bins in community areas were absent and most haphazardly thrown waste were PET bottles and plastic wrappers from food packages. In this scenario drop off sites for recyclables in both in residential areas and main streets can help in controlling rampant waste throwing habits of pedestrians.

Through the campaign clean city Kathmandu, the metropolitan office in partnership with a private firm installed 60 smart bins powered by solar energy that shows the temperature, air pollution level and organic and inorganic waste disposal boxes numerous major streets of the city. However, these installations were not helpful to tackle the problem of random waste dumping as the waste disposal side was too and not visible to the public eye rather it was seen more as a digital display of temperature and pollution level (See *fig 63 and 64*)

Reports such as “*Kathmandu Metropolitan City spent millions on smart dustbins. No one is using them*” (Ojha, 2019a); “*Expensive 'Smart' bins unable to rid Capital of roadside trash*” (Dhungana, 2019), were published on the local daily’s to show that these installations were not serving their purpose. To avoid these scenarios in future, strategically placing waste segregation bins that can easily made in Nepal visible to public eye with pictures and with Nepali language description of what to throw where can help to deal with this issue. *Fig 65* shows waste bins designed and launched by a social enterprise *Doko Recyclers* active in Kathmandu. It is recommended for the metropolitan and central level planners to team up with such enterprise to support the local initiative as well as find cost-effective solution for the waste problem of the city.



Figure 63: Smart bin from temperature and air quality display side (myrepublica.nagariknetwork.com/mycity/news/here-s-why-smart-dustbin-is-really-smart, May 19, 2019)



Figure 64: Smart bin from the waste disposal side (myrepublica.nagariknetwork.com/mycity/news/here-s-why-smart-dustbin-is-really-smart, May 19, 2019)



Figure 65: Sample waste bins with pictorial depiction and Nepali language description (Acquired during field work from Doko Recyclers, September 2019)

The study discovered that infrastructure development for solid waste management in Kathmandu has been traditionally engineering oriented, local context-based infrastructure has been neglected as a means and mechanism to navigate circular economic policies that are aimed by the government through SDG by 2030. Planners in this scenario can estimate the local infrastructure need of the changing demographics and local capacities and contribute to long term waste management planning in line with circular economy policies, realizing that waste is an interdisciplinary issue requiring coordination of all sectors. At the same time addressing the immediate societal needs and catering the most vulnerable population is essential.

GIS-based tools for effective waste management

Currently, waste collection and transportation services in Kathmandu are not based on spatial modelling techniques and geographic information systems (GIS). Waste collection and transportation by the metropolitan and private companies in Kathmandu are organized erratically without a scientific basis (*see chapter 5*). Whereas collection and transportation take away a large part of municipal budget in this scenario, replacing the current methods with GIS

routing can be an optimal idea. This way they can minimize their distance, collection time which in turn will be economically and environmentally beneficial.

Currently, households in Kathmandu metropolitan have complaints about irregular collection and service providers struggle with unsuitable lanes for the waste vehicles to enter, with the use of GIS, service providers can figure out the best routing of their vehicles, designation of vehicles based on the population density and road network. Meanwhile, an optimal place for point-based roadside collection can also be designated through the technology. Some of the most important things that needs to be taken into consideration when designating waste collection point is the accessibility of from households, type of container that is compatible with the waste collection vehicles of service providers. Also, public health, safety and environment needs to be considered. In addition, convenience of the containers for residents to use it properly i.e., appropriate height of the container is essential, as past experiences show improper size of the waste containers hindered public to properly dispose waste. In addition, global positioning system (GPS) based route optimization for waste transportation vehicles can be an effective option. GPS based position control in combination with GIS optimization can help the waste vehicles to find the optimal route as well as deal with the road blockage that the drivers face at the landfill site. GPS in waste vehicles can help in making estimation about the waste pick-up time and the route such that households do not throw the waste haphazardly, an issue found out through the household survey.

Thus, the point- based roadside collection as such should be designed in an effective manner done by the architects and planners keeping all the above points in mind. This can save the time, distance, and fuel costs for the service providers, help in the reduction of yearly budget on collection and transport. Also, in the long run public served by private companies do not have to suffer from a yearly increase in waste collection costs that they currently bear.

9.7 Conclusion

Considering the aim of the study to understand and address the debilitated solid waste management situation from governance standpoint; this dissertation started by establishing the phenomenon of rapid urbanization and unfolding the problem of solid waste management in a fast-urbanizing city of Global South. It focuses on the gaps in the existing government framework to address the burgeoning solid waste management issues in Kathmandu metropolitan, the capital of Nepal. With the growing urban population and limited capacity at municipal level and dormant state level government, local government faces the challenge of

inadequate human and technical resources to address the solid waste management problem. A shift of power to the local bodies is mandated as per the constitution of Nepal and self-governance acts, however municipal government is still highly reliant on central government for the resources and infrastructure development for solid waste. To address this deficit at municipal level, a solid waste governance with the engagement of all actors is envisaged in this dissertation. This dissertation used the governance aspect of integrated solid waste management as a useful entry point; however, it recognizes that applying the governance aspect as put forward by integrated solid waste management framework faces challenges posed by the local process and practice of waste management, multiple actors (formal and informal), their roles, recognition, non-recognition of their contribution and engagements and lack of it with each other.

Contextualizing solid waste governance in Kathmandu puts forward that solid waste management in the city is filled with everyday complexities, active roles played by both formal and informal actors, with varying aim for involvement in solid waste management and levels of engagement with each other. The case illustrates that solid waste governance is shaped at local level beyond the written acts and regulations. Private actors play major role in collection of solid waste from the city and informal waste sector are the major contributors to recycling. As both are regarded informal by the authorities, from this perspective informal waste work forms an integral part of the formal waste management and operations. Also, the research attempted to provide a context-based knowledge of the relations between formal and informal actors and role partnerships can have in waste management system. There exists gap in solid waste management envisioned in acts and regulations and in daily practices of the actors. In this scenario, tackling these gaps mainly through considering households as primary actors i.e., both generators and managers of waste is identified as a first step for achieving waste governance. Also, acknowledging the contribution of the informal waste sector for the functioning of the formal waste system can be another step towards waste governance in the city. In addition, the study calls to understand informal waste sector and waste workers as actors that sustain the waste system and has the labour capacity to support in achieving commitments made as per SDGs 6, 11 and 12. However, they have been dismissed by authorities as low-level workers, this narrowed view is inhibiting the contribution they can make in transitioning Kathmandu into an inclusive city.

This research suggests a reconceptualization of the current solid waste management approach and designing policies for a more integrated system accounting the local realities of the city. Here government approaches to informal sector provided a basis to analyse the current reality

of the informal sector. Here the call is for a shift from the structuralist approach oriented towards the need by the state to regulate the informal waste sector and the legalist approach that reverberates in the government policies to legalize informal waste sector for taxes. Rather an approach of co-production where informal waste sector is regarded as an integral part of city's waste management and are capable to contribute as partners in waste is desired. It further stresses on careful design of strategies for inclusion of the informal sector into the municipal system and into the local urban space underscoring its embeddedness into the everyday waste management practices of the city. For a rapid urbanizing capital city like Kathmandu, the primary recommendation is to acknowledge the informal waste management process happening parallel to the formal process. Acknowledging these processes will lead to the manifold of actors and their role in waste management. While the government approach towards informal waste sector was found to have detrimental effect on recycling activities, rather an approach that recognises the presence and contribution of informal sector in the city can be a steppingstone for formulation of consolidative waste policies resulting in inclusive waste governance in practice.

9.8 Further Research Avenues

This dissertation highlighted some research agendas which can be further investigated. The role of informal waste sector in municipal waste management of Kathmandu was documented. However, the findings of a case do not inform us about the full scale of such phenomena or its presence in other parts of rapidly urbanizing cities of the Global South. Also, quantification of the income of the informal waste sector is still limited due to data unavailability. Further, work in this direction can provide a better incentive for the authorities to address the informal waste sector and move forward in their integration. This research looked into the relationship between the informal and formal waste actors of the city, however more research is needed in this line for attaining inclusivity in waste management in rapidly growing cities.

In addition, this research focused on the governance aspect of integrated solid waste management framework in combination with theoretical approaches to informal sector and provided a brief overview of the physical dimension of ISWM framework as both aspects are intertwined. Further research addressing the physical aspects and more concrete architectural solution are especially necessary in the context of Global South to enrich the empirical basis that supplement the policy making for infrastructure for integrated waste management. In addition, the research dived into the cultural and social aspect of waste management in

Kathmandu. It looked into the gender and caste dimension's intersection with solid waste in Kathmandu, however further research on intersection between gender, caste, waste and urban development planning and practices will shed light on the barriers inclusion attempts face which can thwart inclusive solid waste management programs in cities with similar circumstances.

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ANNEX

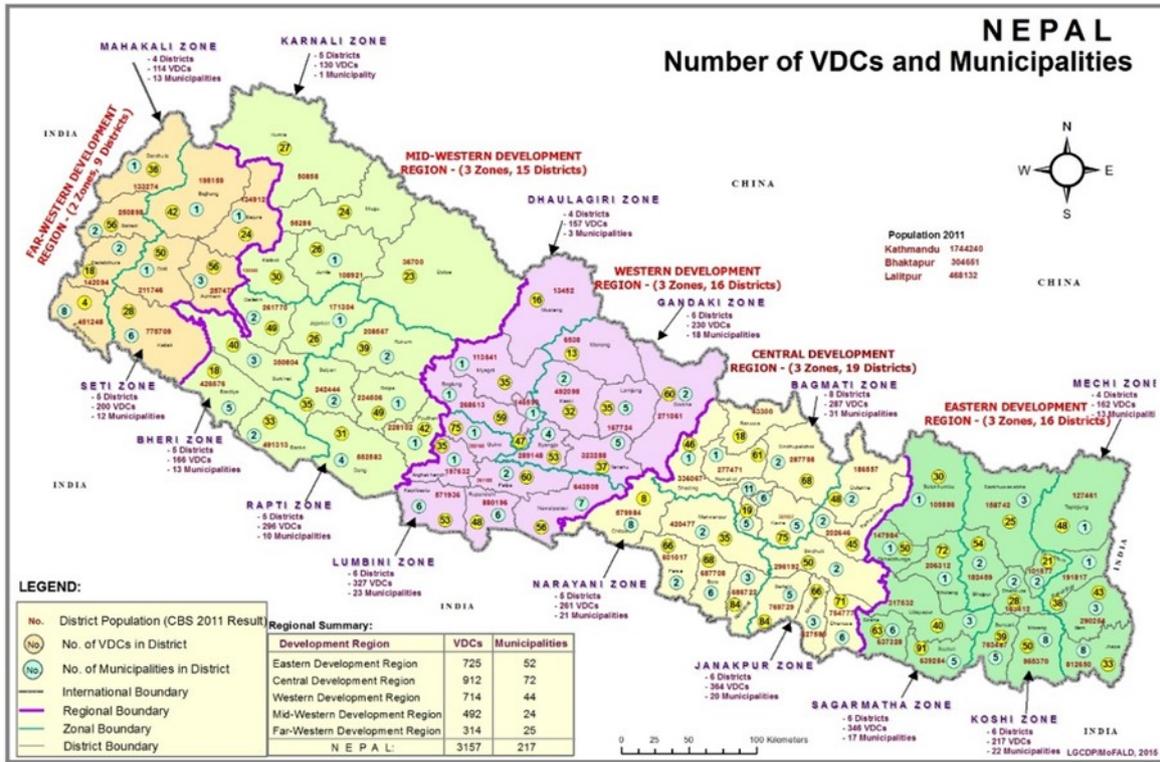


Figure 66: Administrative division of federal Nepal (MoUD, 2017)



Figure 67: Biomethanation plant supported by European Union in Kathmandu metropolitan's transfer station (Own photo)



Figure 68: Informal waste pickers at a transfer station of a private company (Own photo)



Figure 69: Household waste collection vehicle used in ward surveyed in the study (Own photo)



Figure 70: Tricycle used for household waste collection in the metropolitan (Own photo)

Consent form for participation in survey and interview

Urban Governance, Urbanization and Informal Sector: A Case of Solid Waste Management in Kathmandu Metropolitan City

I agree to participate in a research study conducted by Nikita Sharma from Technische Universität Dresden and Leibniz Institute for Ecological Urban and Regional Development in Dresden Germany.

I have received enough information about this research work and understand my role in it. The purpose of my participation as an interviewee in this research and the future processing of my personal data has been explained to me and are clear.

The interview will take place for 90- 120 mins. We do not anticipate that there are any risks associated with your participation, but you have the right to stop the interview or withdraw from the research at any time.

Thank you for agreeing to be interviewed as part of the above research project.

As a part of Ethical procedures for academic research undertake require that interviewees explicitly agree to being interviewed and how the information contained in their interview will be used. This consent form is necessary for us to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. Would you therefore read the accompanying information sheet and then sign this form to certify that you approve the following.

- the interview will be recorded, and a transcript will be produced
- the transcript of the interview will be analyzed by name of the researcher as a doctoral candidate
- access to the interview transcript will be limited to the researcher and academic colleagues and researchers with whom he might collaborate as part of the research process
- any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed
- the actual recording will be kept

Participant's Signature _____

Date _____

Researcher's Signature _____

Date _____

Interview and Survey Questionnaires

	Interview Guide	Waste Management Experts	
	Duration	Place	
	Name		
	Gender	M	F
	Designation		
	Job History		
2	What are your perspectives on the current waste management situation of Kathmandu Metropolitan City?		
3	What do you think are the reasons behind the persistence of the metropolitan on Landfilling?		
4	Why has the metropolitan not been able to attain formal collaboration with private sector in solid waste management		

6	What are your views on partnership between public sector (municipality) and private non-government organizations for solid waste management in the city?
7	Are the experts and academics like you invited for consultation during the planning of waste management programs of the city?
8	Do you think the informal sector has a significant contribution to make in SWM of the city?

9	What do you think should be implemented to the solid waste management system of the city to improve it?
10	Where do you think the local government is lacking when it comes to dealing with the issues of SWM?
	Comments/ Remarks Contact: n.sharma@dlgs.ioer.de

Household Questionnaire Survey (Kathmandu) Ward Number:						
	Respondent Number					
	Gender	M	F			
1.	How long have you lived here?	Less than 5 years		More than five years		
2.	How many people live in your house	Four	Less than four	More than four		
3.	What is the highest level of education attained by you?	Primary	Secondary	Tertiary (University)	No formal education	
4.	Items in your household waste	Food Waste (Organic)		Plastics	Paper and Paper Products	Others (Specify)

5.	Where do you store the waste generated at your home?	In a container mixing everything	Different container Organic and inorganic waste		Others (polythene bags/sacks)	
6.	What is the type of waste collection service available to your household?	Door to door collection (Manually using wheelbarrow)	Truck or tripper visit	Roadside collection	Communal Container	
7.	How is the waste segregated by you collected by the service provider	All at the same time mixed	Organic/ Inorganic different days	You have no idea		
8.	Frequency of the waste collection service in your area	Daily	Every Two days	Weekly	Fortnight	
9.	Do you know the waste collection service provider in your ward	Service Provider Public (Metropolitan)	Service Provider Private (NGOs/CBOs,Private Company)			
10.		Amount in Rupees	Monthly			

	How much do you pay for the waste collection services on a monthly basis or is it free of cost?	200	Less than 200	More than 200	
11.	If you use roadside spot or communal container for waste disposal, how far is it from the houses (dis/meters)approx .	Close	Far	Very Far	
12.	Is the waste picked from the roadside communal container regularly?	Yes	No		
13.		Strike of workers collecting waste	Blockage at the landfill site by locals	Inefficiency from your provider (Public/Private)	

	If no what might be the reasons, you think?					
14.	What do you do with the waste when it's not collected on schedule?	Throw it on the streets	Dumping on field and open areas	River Side Dumping	Burning off the waste	Others Specify
15.	Are you willing to pay for the waste collection and disposal services	Yes	No			
16.	Do you think everyone households, institutions and businesses should pay for the waste collection and disposal services?	Yes	No			
17.	If No, who should pay for the services and who should not be	Households	Institutions	Commercial Businesses		

	paying? (write should pay or should not)					
18.	Are you satisfied by your current service provider, by their collection services as compared to the cost you pay?	Very Satisfied (1)	Somewhat Satisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat dissatisfied (4)	Very dissatisfied (5)
19.	What do you think of the door to door, roadside, trucks and communal waste collection services? Which one you prefer?	Door to door (manually)	Trucks/ Tripper	Communal Container	Roadside Collection	
20.	How will you describe the general waste situation in your ward?	Excellent (1)	Above Average (2)	Average (3)	Below Average (4)	Poor (5)

21.	Do you sell your paper, plastic, electronic wastes, and glass waste to itinerant buyers?	Yes	No			
22.	If yes, what do you sell most often?	Plastics	Paper	Glasses	Electric Waste	Others
23.	Have you received any orientation program from the metropolitan city office, NGOs, or CBOs about the process/ importance of segregation of waste?	Yes	No			
24.	If yes, was it useful?	Yes	No			
25.		yes	No			

	Are you implementing segregation practices after the orientation?					
26.	Did you use to practice segregation practices earlier?	yes	No			
27	If yes when?	1-2 yrs ago	5 yrs ago	More than 5 yrs ago		
28	Do you know where the waste goes after it gets collected from your houses?	Yes	No			
29	How often your neighborhood or ward cleaned?	Daily	Every Two Days	Weekly	Fortnight	Monthly
30	Are you satisfied with the cleanliness of your neighborhood?	Very Satisfied (1)	Somewhat Satisfied (2)	Neither satisfied nor dissatisfied(3)		Somewhat dissatisfied (4)
						Dissatisfied (5)

31	In your view how can waste collection and disposal services improved in your ward?	
32	Do you feel responsible for your waste or you think it is the responsibility of the government?	
33	What are your views on waste segregation at household level? Would you practice it if proper materials and training is provided? /Or it is too time consuming for you?	
34	Remarks from the surveyor	

Interview Guide with municipal Officials of Metropolitan office: Environment Section, Field Staff and Ward									
	Date	Place:			Duration:				
	Name:								
	Gender	M	F						
	Designation of the officer	Environment Engineer		Section Officer			Ground Staff	Others	
	Job History								
1	What role does the environment section of the metropolitan play in solid waste management of the city?								
2	Could you describe the waste management situation of the city?								
	a. Amount of Waste generated in a day								
	b. Per Capita waste generation								
	c. Increase in solid waste generation (rate)								
	d. Waste Collection Rate								
3	Has there been a recent study of the waste situation of the capital? If not what could be the reasons								
4	Can you briefly describe the arrangements for collection of solid waste in the city?								

		Methods of collection	Frequency of collection	Service Provider	
	Residential Areas				
	Commercial Areas /Tourist Areas				
	Inner City Areas				
5	What are arrangements for disposal of solid waste in the city?				
6	Social Political and Environmental issues related to current landfill site?				
7	Reasons behind the persistence to dispose off the waste at landfill site?				
8	Are there any other measures being followed for solid waste management in the city (source segregation, reuse, recycle and composting)?				
9	Are you able to cover all 32 wards of the city? If not, who are serving all the wards?				
10					

	Does the metropolitan charge for the waste collection services? If yes how much				
11	Are there areas which are not covered at all when it comes to SWM services?				
12	What influences the metropolitan not to serve some areas and serve some?				
13	Which other institutions are involved formally in the waste management system of the city?				
14	What do you think are the barriers for the metropolitan to shift from this disposal mode to more sustainable practices of waste management?				
15	What is a major issue currently for solid waste management in the city? Elaborate	Inadequate collection services	Lack of sanitary disposal site	Lack of public awareness	Elaborated Answer:
		Inability to follow the by-laws	Issue of resource deficiency	Lack of qualified resource personnel in waste sector	
16	How is the Solid Waste Management Technical Support Centre helping you? How do you define the relationship/co-operation with them?				

17	Is the metropolitan collaborating with NGOs and private sector organizations for SWM?	
18	Do you have some agreement and contract with these actors in terms of division of roles and responsibilities for waste management? If not why?	
19	How is the metropolitan dealing with the informal waste collectors present in the city?	
20	How often do you meet with the other actors involved in SWM of the city? Where, how and discuss what issues?	
21	Where does the largest proportion of municipal budget get invested in (collection, transportation and disposal)	
22	What role does informal actors active in SWM play in KMC?	
23	Does the metropolitan have plans to recognize and include informal sector as a partner in SWM in near future?	
24	Any donor or foreign support in waste management recent years?	

25	How are your staff organized and trained in waste management activities?					
26	What will be the focus and future program of the metropolitan to improve solid waste management in the city?					
27	Is it possible to obtain copies of the annual report, plans, and strategies, research conducted, annual budget, etc. of solid waste in Kathmandu?					
28.	Do you know where the waste goes after it gets collected from your houses?					
		Yes	No			
29.	How often your neighborhood or ward cleaned?	Daily	Every Two Days	Weekly	Fortnight	Monthly
30.	Are you satisfied with the cleanliness of your neighborhood?	Very Satisfied (1)	Somewhat Satisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat dissatisfied (4)	Dissatisfied (5)
31.	In your view how can waste collection and disposal services improved in your ward?					

32.	Do you feel responsible for your waste or you think it is the responsibility of the government?	
33.	What are your views on waste segregation at household level? Would you practice it if proper materials and training is provided? /Or it is too time consuming for you?	
34.	Remarks from the surveyor	

Interview Guide Urban Governance Urbanization and Informal Sector in Nepal: A Case of Solid Waste Management in Kathmandu		
Non-Government Organizations working for SWM in the city		
	Duration	Place
	Name	
	Gender	M F
	Designation	
	Job History	
1	Since when your organization is involved in waste management sector of the city?	
2	What are the activities related to solid waste management that your organization is involved in?	
3	If you are involved in waste collection activities, which areas?	

4	If you are involved in segregation, transfer or disposal could you elaborate which areas and how do you carry it out?
5	How much do you charge for the collection services? If involved
6	Are you partnering with the metropolitan and any other NGOs working in the sector? Did you obtain license from metropolitan for SWM activities?

7	If yes how is your relationship with your partners? Especially with the Metropolitan city?
8	If you do not have any co-operation with KMC, how are you functioning on a day-to-day basis for SWM activities?
9	Which areas are catered by your organization for SWM? In terms of wards which wards?
10	How is your relationship with the informal sector, do you collaborate with them in SWM activities?
11	Do you think the informal sector has a significant contribution to make in SWM of the city?

12	How is your organization financing SWM related activities?
13	What are the waste management projects currently run by your organization?
14	How do you think the governmental approach to solid waste management in Kathmandu has changed? In terms of policies and programs
15	What do you think should be implemented to the solid waste management system of the city to improve it?

16	Where do you think the local government is lacking when it comes to dealing with the issues of SWM?

Contact: n. sharma.dlgs.ioer.de

Interview Guide Informal Waste Collectors/workers				
	Duration		Place	
	Name			
	Gender			
	Age			
	Where do you come from?		Nepal	India Others
1	How long have you been involved in this activity? In years			
2	How did you enter this activity? What attracted you for this activity?			
3	Are you the only one in your family involved in this work or there are others too?			
4	How many hours per day you work and how many days a week?			
5	Where do you mostly collect the waste items from?			

	Transfer station of KMC	Riverbanks/ open dumping areas	Others
6	To whom do you sell these products that you collect?		
7	What do you prefer collecting the most that gives you more money when selling?		
8	How do you get paid for the work		
	Instantly/Daily	Weekly basis	every 15 days
			Monthly
9	Is this your major source of income or you have any other job?		
10	Can you name some of the major troubles/problems that you face in your work?		

11	Have you received any kind of safety trainings with regards to your job?				
	<table border="1"> <tr> <td>Yes</td> <td>No</td> </tr> </table>	Yes	No		
Yes	No				
12	If yes by whom?				
	<table border="1"> <tr> <td>KMC</td> <td>NGOs</td> <td>CBOs</td> <td>Others</td> </tr> </table>	KMC	NGOs	CBOs	Others
KMC	NGOs	CBOs	Others		
13	Do you face any hindrances from the side of metropolitan, NGOs or others in your activities?				
14	What kind of support /help have you received from KMC or any other organizations?				
15	What kind of support you expect from the metropolitan to improve your activities?				
16	How is your relationship with the NGOs working in SWM, if there is any?				
17	Do you have an umbrella organization under which all of you work?				

18	If yes? Who are they and how do they support you?
19	If not, how are you all organizing yourselves collectively?
20	Would you prefer to be work for the municipality or NGOs/CBOs rather than working independently?
21	What are your future plans, do you plan to continue working as a waste collector or move to something else?
Contact: n.sharma@dlgs.ioer.de	

Interview Guide Scrap dealers			
	Duration	Place	
	Name		
	Gender		
	Age		
	Where do you come from?	Nepal	India Others
1	How long have you been involved in this activity? In years		
2	How did you enter this activity? What attracted you for this activity?		
3	Can you describe your work? Do you like your work or not?		
4	How would you describe the status of business these days? What has changed from earlier times?		
5	Who are you co-operating with, to whom do you sell these products that you buy from the households?		

6	How is your relationship with the wholesalers? (Contract based OR Verbal)
7	Is this your major source of income or you have any other job?
8	What are the major problems that your business is facing these days?
9	Are you recognized by the metropolitan office for your activities, or you are on your own?
10	Can you name the items based on your preferences for buying from the households? And why?

11	Do you face any hindrances from the side of metropolitan, NGOs or Private sector in your business activities?
12	What kind of support you expect from the metropolitan to improve your activities?
13	How is your relationship with the NGOs working in SWM, do you collaborate?
14	Do you have an umbrella organization under which all of you work?
15	If yes? Who are they and how do they support you?
16	If not, how are you all organizing yourselves?

17	What kind of support would be better in order to organize yourselves? (by NGOs, Wholesalers or any other organization)
18	What are your future plans, do you plan to continue working as a waste buyer or move to something else?
Contact: n.sharma@dlgs.ioer.de	

Interview Guide: Private Waste Companies			
	Duration		
	Place		
	Name		
	Gender		
	Age		
	Designation in the office		
1	What has been your employment history?		
2	When did the company start?		
3	Is the company fully local or has foreign investment/ support of some kind?		
4	What is the reason for you to get involved in the waste management business?		
5	Do you work on your own or have contract with the metropolitan city or any other local government body (e.g., Nepal Investment Board)?		

6	If yes how long has been the contract going? How long will it last?
7	If no, what are reasons for it?
8	What was the procedure to get the contract with the metropolitan? Transparent, Fair, Time Consuming?
9	What exactly is your company doing in terms of SWM? Collection, segregation, disposal, recycle, reuse?
10	Which areas in the city do you cover in your SWM activity? (HH, commercial institutions, industries)

11	How do you charge your clients for the services you provide?
12	If involved in collection, how do you collect the waste? (Use of equipment, human resources etc.)
13	If involved in disposal, where do you dispose the waste?
14	Are you involved in making compost from the organic waste? Can you elaborate how are you carrying it out?
15	Do you have staffs in your organizations that have been trained to work in SWM technologies? How are you training them?
16	Are you also collaborating with the NGOs, Waste Wholesale Buyers or any other actors in SWM?

17	If yes what kind of collaboration do you have with this actor?
18	If not, why?
19	What is the major source of finances for your organization?
20	What are the future plans of your organization to increase profit?
Contact: n.sharma@dlgs.ioer.de	

Interview Guide for Officials from Solid Waste Management Technical Support Centre (SWMTSC)				
	Date	Place:		Duration:
	Name:			
	Gender	M	F	
	Designation of the officer			
	Job History			
1	SWMTSC is the body responsible to provide support to metropolitan, in what way are you doing that?			
2	The news of public halting the waste disposal at landfill site is common, how is the center working to solve this issue?			
3	Can you provide an overview about the research on solid waste management done by the center in recent years?			
4	What do you think we do not have appropriate data about solid waste in the city?			
5	In your view what are reasons Kathmandu metropolitan still has not been able to get into public private partnership(ppp) for SWM			

6	What are the programs that center has for capacity development of the metropolitan?	
7	Where does SWMTSC generate its budget from?	
8	How are you designating the annual budget for the municipality for solid waste management?	
9	Does SWMTSC recognize the existence and contribution of informal actors in SWM?	
10	What plans/ programs does the SWMTSC suggest for the metropolitan to collaborate with informal actors?	
11	What is the future strategy of the center such that a sustainable solid waste management system could be achieved?	

12	Which aspect do you think; technical, environmental, Financial, social-economic, institutional, policy-legal needs more attention in KTM?	
13	Would it be possible to obtain the copies of annual report, plans and research reports about solid waste in Kathmandu?	
Contact: n.sharma@dlgs.ioer.de		

Details of the respondents

S.N.	Name of the respondent	Organization	Position	Method and Language of Interview
1	Hari Bahadur Shrestha	Kathmandu Metropolitan	Head of Environment Section	Notes/ Nepali
2	Saraswati Pokhrel	Kathmandu Metropolitan	Executive Director	Notes/ Nepali
3	Nisha Koirala	Kathmandu Metropolitan	Environment Engineer	Notes/ Nepali
4	Purna Chandra Bhatta	Kathmandu Metropolitan	Field Supervisor	Notes/ Nepali
5	Babu Poda	Kathmandu Metropolitan	Field Worker/Driver	Notes/ Nepali
6	Sanu Maiya Maharjan	Kathmandu Metropolitan	Community Development Officer	Notes/ Nepali
7	Laxmi Prasad Ghimire	NEPCEMAC	Senior Officer/Chief Documentation Office	Audio/ Nepali
8	Surendra Parajuli	NEPCEMAC	Field Supervisor	Audio/ Nepali
9	Sudip Thapa	NEPCEMAC	Field Supervisor	Notes/Nepali
10	Dipedra Oli	Former SWMTSC	Legal Advisor	Audio/ Nepali
11	Dr. Sumitra Amatya	Former SWMTSC	Executive Director	Audio/Nepali
12	Dr Dinesh Manandhar		Waste Expert/ Consultant	Notes /Nepali
13	Dr. Dhundi Raj Pathak		Waste Expert/ Consultant	Notes /Nepali
14	Nabin Bikash Maharjan	Blue Waste to Value	Chief Executive Officer	Audio/ Notes/ Nepali

15	Ashish Khanal	Blue Waste to Value	Manager	Notes/ Nepali
16	Amod Karmacharya	Clean up Nepal	Executive Director	Audio/ Nepali
17	Nuchhe Devi	Kathmandu Metropolitan	Ward Member	Notes /Nepali
18	Shobha Maharjan	Kathmandu Metropolitan	Ward Member	Notes /Nepali
19	Dhurba Acharya	SWMA	President	Notes /Nepali
20	Rabin Man Shrestha	Kathmandu Metropolitan	Former head of environment section	Notes /Nepali
21	Shilshila Acharya	Himalayan Climate Initiative	Chief Executive Officer	Notes /Nepali
22	Rasika Karki	Khalisisi	Admin Officer	Notes /Nepali
23	Raghavendra Mahato	Doko Recyclers	Co-Founder	Notes /Nepali
24	Binod Upreti	Recycling material dealers	Plastic recycling association	Notes /Nepali
25	Milan Duwal	Recycling material dealers	Plastic recycling association	Notes /Nepali
26	Stuti Sharma	Doko Recyclers	Communications and Advocacy Officer	Audio/ Nepali
27	Sulav Moktan	Waste Concern	Founder	Notes /Nepali
28	Sri Krishna Dhama	Waste Concern	Field Supervisor	Notes /Nepali
29	Sugamber Yadav	Consultant MoUD	Consultant/ Geotechnical Engineer	Notes/Nepali Phone Interview
30	Mabin Dahal		Geotechnical Engineer	Notes/Nepali Phone Interview
31	Sujit Kumar Yadav		Consultant/ Civil Engineer	Notes/Nepali Phone Interview

		Site	Method and language of interview
Indra Kumar Rai	Scrap Dealer		Notes /Nepali
Rabin Rai	Scrap Dealer		Notes /Nepali
Mayalu Tamang	Informal waste worker	Landfill site	Notes /Nepali
Yam Bahadur Saru	Informal waste worker	Kawad and waste dumps	Notes /Nepali
Phul Bahadur Tamang	Informal waste worker	Transfer station	Notes /Nepali
Nischan Thing	Informal waste worker	Transfer station	Notes /Nepali
Tanka Tamang	Informal waste worker	Transfer station	Notes /Nepali
Maya Tamang	Former Informal waste worker	Co-operative SASAJA staff	Notes /Nepali
Kanchi Tamang	Informal waste worker	Kawad	Notes /Nepali
Lal Kumar	Informal waste worker	Kawad and waste dumps	Notes /Nepali
Renu Tamang	Informal waste worker	Kawad	Notes /Nepali
Laxmi Tamang	Informal waste worker	Kawad	Notes /Nepali
Thulimaya Tamang	Informal waste worker	Kawad	Notes /Nepali
Samjhana Yonzan	Informal waste worker	Landfill site	Notes /Nepali
Thulimaya Moktan	Informal waste worker	Kawad	Notes /Nepali
Rajmaya Lama	Informal waste worker	Kawad	Notes /Nepali
Buddha Singh Tamang	Informal waste worker	Transfer station/ Kawad	Notes /Nepali
Maili Niu	Informal waste worker	Kawad	Notes /Nepali
Buddhimaya Tamang	Informal waste worker	Landfill site	Notes /Nepali
Pinku Devi	Informal waste worker	Transfer station/Landfill	Notes /Nepali

Ram Maya	Informal waste worker	Kawad	Notes /Nepali
Kanchi Tamang	Informal waste worker	Landfill site	Notes /Nepali
Buddhimaya Jimba	Informal waste worker	Transfer Station	Notes /Nepali
Shanti Tamang	Informal waste worker	Transfer Station	Notes /Nepali
Devi Maya	Informal waste worker	Transfer station	Notes /Nepali
Sarita Thing	Informal waste worker	Transfer station	Notes /Nepali
Junu Rai	Informal waste worker	Transfer station	Notes /Nepali
Bishnu Rai	Informal waste worker	Transfer station	Notes /Nepali
Sangita Magar	Informal waste worker	Transfer station	Notes /Nepali
Tilak	Informal waste worker	Transfer station	Notes /Nepali
Lalita Limbu	Informal waste worker	Transfer station	Notes /Nepali
Nisha Tamang	Informal waste worker	Transfer station	Notes /Nepali
Kumar Yadav	Itinerant waste buyer	Kawad	Notes /Nepali
Ravi	Itinerant waste buyer	Kawad	Notes /Nepali
Ila Limbu	Informal waste worker	Transfer station	Notes /Nepali
Sabina Tamang	Informal waste worker	Transfer station	Notes /Nepali
Rahul	Informal waste worker	Transfer station	Notes /Nepali
Anwar	Itinerant waste buyer	Transfer station	Notes /Nepali
Prakash	Itinerant waste buyer	Transfer station	Notes /Nepali
Balaram	Scrap Dealer		Notes /Nepali
Ram Bilas	Scrap Dealer		Notes /Nepali