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Scenarios of Waste and Resource Management: for Cities in India and Elsewhere

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SCENARIOS OF WASTE AND RESOURCE MANAGEMENT: FOR CITIES IN INDIA AND ELSEWHERE

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Abbreviations

BIS   Department for Business, Innovation & Skills

BMUB   Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (Germany)

CWG   Collaborative Working Group on Solid Waste Management in Low- and Middle-Income Countries

DFID   Department for International Development

GIZ   German Federal Enterprise for International Cooperation

HSC   Horizon Scanning Centre

NGO   non-governmental organisation

NIUA   National Institute of Urban Affairs

SEWA   Self Employed Women's Association

TERI   The Energy and Resources Institute

Acknowledgements

Abstract

Rising prosperity around the globe – welcome and overdue in many respects – has certain undesirable consequences. It leads to an increase in the demand for raw materials, putting pressure on our limited natural resources. At the same time, due to dominant linear economic models of make-use-throw, increasing prosperity also leads to generation of waste. Rising quantities of waste are a global challenge. The challenge manifests itself most visibly in large cities around the world but is more acutely felt in developing countries. With unplanned urbanisation and large numbers of urban poor, waste is a management challenge for local governments constrained by limited finances and capacities. However, it is an economic opportunity for the urban poor in the informal sector. In developing countries, waste management provides jobs for 1–2 per cent of the population, mostly the urban poor. Evidence suggests that the informal sector not only supports local government in waste management but also saves substantial amounts of natural resources through efficient recycling. However, city governments often prefer to contract big companies to collect and process waste.

Dealing effectively with rapidly increasing amounts of waste is a complex management challenge. Environmental, business, political and social considerations play a role. This report suggests a framework for working through these complexities by focusing on two critical and interconnected questions. First, is waste conceived of as a burden to be got rid of or a resource for generating income and employment? Second, is the waste/resource managed by actively engaging the urban informal sector or tolerating the informal sector merely on the margin? The latter is a burning issue for cities with many poor people. The report identifies four future scenarios of this complex waste/resource management landscape using tools from Foresight methods and political economy analysis. We also identify the dynamics within and across the four scenarios. Although the four scenarios developed in the report represent stylised constructs, they were developed in a participatory workshop and represent stakeholders' views about their current problems and future ambitions. At the same time, they represent political choices that would influence the development of a particular approach of waste/resource management in a city. Our results have implications for enhancing understanding of the policy choices that can be made today to influence waste/resource management in the future. The methods and results also offer insights into future research on waste/resource management.

1 Introduction

The welcome and overdue increase in prosperity for an increasing number of people throughout the developing world has an undesirable consequence. The demand for natural resources increases to such an extent that it puts pressures on the boundaries of our planet. Two different pathways may emerge from these pressures. On the one hand, they could seriously hinder development outcomes and adversely affect the communities and countries which are dependent on natural resources. On this pathway, economic and social outcomes would be adversely affected and push populations into conflict, misery and poverty. On the other hand, such pressures also provide new opportunities for societies to embark upon fundamentally transformational pathways for growth and development. On this pathway, development outcomes might lead societies into finding means to confront the challenges, and at the same time meet (or influence) the demands due to the rising aspirations. While the first pathway results from 'business as usual' and inaction, the second pathway needs active engagement on transformational thinking between business, environmental non-governmental organisations (NGOs) and government.

A particular emerging area that examines such transformational thinking is the move from a throwaway economy to a circular economy. According to a joint report by the Ellen MacArthur Foundation and the World Economic Forum:

> A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse and return to the biosphere, and aims for the elimination of waste through the superior design of materials, products, systems and business models. (World Economic Forum 2014)

A key element of a circular economy is bringing resources embedded in products back into the production process through repair, reuse and recycling. The ultimate aim is to have a circular system that eliminates waste and brings the embedded resources and energy in end-of-life products back into production and consumption processes.

However, the reality in most countries around the world is markedly different. The dominant model is still a linear make-use-throw production process generating ever more waste globally. According to estimates made by the World Bank (Hoornweg and Bhada-Tata 2012), from 2012 to 2025, global urban solid waste generation will rise by 70 per cent. The challenges due to the rising quantities of waste as well as the associated costs of waste management are especially acute in developing and emerging economies. The World Bank report also estimates that waste generation will double in the next 20 years in lower-income and lower middle-income countries. The costs of solid waste management will rise most steeply in low-income countries (more than a fivefold increase) and lower middle-income countries (more than a fourfold increase) (Hoornweg and Bhada-Tata 2012).

Due to the high density of population and higher than average per capita incomes (compared to national averages), urban settlements in low-income and lower middle-income countries are major centres of consumption (of goods and services) and, as a result, major generators of waste. At the same time, the infrastructure of the cities and the capacities of city governments are severely constrained due to lack of finances, skills and knowledge (Scheinberg, Wilson and Rodic 2010). As a result, cities in developing countries around the world find it increasingly difficult to cope with the generated waste. For instance, a large urban agglomeration like Delhi (India) generates approximately 10,000 tonnes of solid waste from households every day (Hoornweg and Bhada-Tata 2012). Delhi is no exception. It is

estimated that with expanding urban populations as well as increasing incomes, per capita waste generation will rise by almost 50 per cent over the next decade in East Asia and the Pacific (including China) and the South Asia region (including India) (Hoornweg and Bhada-Tata 2012). Also, due to changing consumption patterns, the composition of the waste stream is changing over time with newer product categories (such as electronics) becoming part of the waste management challenge. Consequently, the value of natural and material resources – embedded in products and, as a result, in waste – is also rising.

There are two associated waste management challenges. First, the primary concern for city managers as well as local populations is the burgeoning amount of waste, which is not only an environment and health hazard but, more immediately, is also a visible hygiene and cleanliness challenge. The most prominent expression of this comes from India's new prime minister, Narendra Modi, who has given a rallying call to the cities for a *Swachh Bharat*, a clean India, which is imminently driven by the need to get the rubbish away from the eyes and encourage cleanliness of cities. Second, with the changing composition of the waste stream, the quality and value of the embedded resources is also rising. This reinforces the need for resource recovery because with the rising commodity prices and scarcity of certain materials, recycling is increasingly becoming a much more profitable enterprise.

Dealing with waste effectively is a complex management challenge. There are multiple actors with diverse objectives, various technologies with uncertain impacts, and widely divergent management approaches. Understanding the complex interplay between the actors and their objectives and how they play out under different approaches (and technologies) is critical for designing and implementing effective interventions. In this paper we develop an analytical framework that allows us to put order into the complex waste management challenge. The framework is developed by focusing on two critical dimensions. First, is waste conceived of as a burden to be got rid of or as a resource for generating income and employment? Second, is the waste/resource managed by actively engaging the urban informal sector or tolerating the informal sector merely on the margin? The latter is a burning issue for cities with many poor people.

Related to and reinforced by the complexity is the uncertainty about the potential future trajectories of waste management. The rapid evolution of technologies and narratives as well as the relationships between multiple actors do not lend themselves to straightforward characterisation through standard methods of forecasting based on econometric methods. Resolving complexity and uncertainty by making simplifying assumptions would make such exercises highly stylised and might not capture the range of the potential future scenarios. Consequently, we use tools from Foresight methodology to characterise potential scenarios for the future of waste management in large cities with emerging economies (Foresight HSC 2009).

Foresight methods have been used extensively in the context of international development. Although Foresight methods do not provide exact predictions of the future, they are useful to characterise potential scenarios of situations that can be influenced by multiple actors and multiple uncertainties. Another notable advantage of using Foresight methods, especially in the context of international development, is the involvement of stakeholders in developing alternative scenarios (Bingley 2014). We combine Foresight methodology with an actor-based political economy analysis to identify alliances that coalesce around the dominant narratives embedded in each scenario (Schmitz 2012). Political economy analysis allows us to identify the alliances that can drive progress within scenarios and also identify pathways between scenarios. Our approach allows us to characterise alternative waste/resource management scenarios with varying degrees of participation of the urban informal sector. The approach also allows us to make better sense of the political choices made by city governments.

We believe that the proposed analytical framework can be used for characterising waste management in cities where the informal sector plays a significant role in this waste management. The resulting scenarios, although developed in a workshop in India, are relevant for most developing countries that are struggling to deal with rising quantities of waste. By situating the urban informal sector centrally in the framework, the subsequent analysis provides insights into the benefits and costs of engaging with the informal sector in future pathways of waste/resource management.

The rest of the report is organised as follows. The next section describes the methodology used. We outline the steps of the Foresight methods used in the paper as well as the steps in the political economy analysis. In Section 3, we characterise the future scenarios as they emerged from a participatory Foresight process. The intra- and inter-scenario dynamics are discussed in Section 4 and we conclude with a section on recommendations.

2   Methodology

The research is based on a review of the secondary literature and on in-depth discussion with experts to arrive at the alternative scenarios for waste/resource management in urban agglomerations. We analyse the forces shaping these scenarios and the development policy implications using tools available under the rubric of Foresight methods. The alternative scenarios were developed and discussed during a workshop organised in Delhi in October 2014. The participants of the workshop included experts from the environment, resource, waste management, urban and informality sectors. We now describe the elements of the methodology in more detail.

2.1   Foresight methods

The overall research was structured along the following four stages of Foresight (horizon scanning) methods (Foresight HSC 2009):

- **Scoping:** As a first step, we developed a scoping note that specified the key research question and identified the target group. The overall research question was: *Who will drive the transformation from a waste management perspective to an inclusive resource management perspective in urban areas of developing economies?* The key target group for the research was city-level policymakers. The other key target group was the stakeholders who work with the policymakers and advise or influence their thinking on waste management. This group included those working with and for the informal sector, including NGOs and other civil society groups, waste management consultants and the media.
- **Ordering:** As a next step, based on secondary research, we identified the drivers for waste management in developing countries. This step allowed us to identify the two critical dimensions in relation to the research question. The first dimension is the continuum between waste and resource management. The two ends of the waste-resource management continuum can be described thus: when all waste is dumped into a landfill and nothing is recovered, the value of waste is close to zero. On the other hand, if all the embedded resources (materials and energy) are recovered from the waste, the value of waste is enhanced and it is described as a resource in the proposed framework. The second dimension is the continuum between working with the informal sector and working against the informal sector. These combinations of the two dimensions were used to create the four scenarios. The process of identifying the two dimensions and defining the alternative scenarios is outlined in Section 2.2.
- **Implications:** The participants of the workshop in Delhi characterised the actors, infrastructure and governance elements of the four scenarios. The participants developed the four scenarios in a pre-specified structure.
- **Integrating futures:** The insights from the stages outlined were used to develop recommendations that would provide strategic direction to decision-makers currently working on waste/resource management.

2.2   Organising future scenarios

The existing literature on waste management can broadly be classified along two dimensions. On the one hand, the literature focuses on the environmentally and economically sound management of waste. There is a large and growing emphasis on the resource value of waste due to rising concerns about resource security and scarcity (Le Courtois 2012). This concern is also reflected in policy documents of the European Union (European Commission 2011), member states such as Germany (BMUB 2012) and the United Kingdom (BIS and Defra 2012) as well as rising powers such as China (Government

of China 2008). This strand of literature focuses on waste as a potential source of materials and energy, which can ease some of the constraints imposed by the concerns related to security and scarcity. There is widespread agreement in the literature on the resource potential of waste.

However, as mentioned previously, converting waste into a resource requires substantial investments in infrastructure. Local governments in developed as well as developing countries are struggling to find the financial resources to make the transition from waste management to resource management. This struggle is much more pronounced in developing and emerging economies because of the rapid rise in waste generation as well as the lack of finance to make adequate investments in infrastructure and capacities (Coad 2005). Due to these challenges, a critical uncertainty is whether the cities would be able to make a transition from waste management to resource management. The horizontal axis in Figure 2.1 captures this uncertainty by making a distinction between waste management and resource management. The distinction is best understood using the fundamental economic notion of value. The value of waste is enhanced when it is properly segregated and all the embedded resources are extracted. The analogy to the mining of materials is apt here. Although a country might have huge stocks of a material, say copper ore, the value of the ore increases only after the copper is extracted from the ore. Similarly, a city might generate large quantities of waste, but the resources recovered would depend on a series of processes beginning with segregation and ending with recycling/recovery of valuable materials. The genesis of the term 'urban mining', for resource management, is related to the analogy with mining. Experiences from urban agglomerations around the world suggest that certain cities are closer to the waste management part of the continuum while others are closer to the resource management part of the continuum.

On the other hand, the existing literature and policy documents also focus on the social aspects of waste management. This includes two aspects: first, the awareness and engagement of citizens; second, the involvement of the informal sector. This aspect is central for this study. Addressing it means confronting a seeming contradiction. On the one hand, there is total uncertainty about the future role of the informal sector in resource management. On the other hand, we know for certain that the informal sector plays a big role in current waste management (Schindler, Demaria and Pandit 2012). The informal waste sector, especially vibrant in low- and middle-income countries, plays an important role in waste management (CWG-GIZ 2010; Scheinberg et al. 2010). It recovers much larger amounts of waste than the formal sector. These actors, despite their marginalised position and their simple equipment, often recover up to one-third of the waste in a self-financing way (Gunsilius et al. 2011). In India, for instance, most of the waste (resource) management sector is informal, with up to 90 per cent of the recycling being organised in the informal sector (Sharholy et al. 2008). The widespread informal sector provides multiple job opportunities for the urban poor through labour-intensive processes of collection, manual segregation, and dismantling of waste (Agarwal et al. 2002). The informal sector, in spite of its informality, is well organised. Also, the services provided are efficient as well as convenient – two necessary characteristics of waste management systems globally.

We explore the role of the informal sector in these alternative scenarios along the continuum 'working with the informal sector' to 'working against the informal sector'. Would the informal sector be marginalised or would its involvement be promoted to potentially accelerate the transition from a waste management to a resource management perspective? Recent developments in waste management in India suggest an uncertain future of the informal sector (Gidwani and Reddy 2011; Chaturvedi and Gidwani 2011). While certain local governments have engaged and worked closely with informal sector actors, others have either chosen to ignore them or actively worked against them in favour of large private companies (Cavé 2012). The vertical axis in Figure 2.1 captures this uncertainty in the role of the informal sector.

The combination of the two critical uncertainties identified gives us the four future scenarios in Figure 2.1:

Figure 2.1   Potential scenarios of the way forward
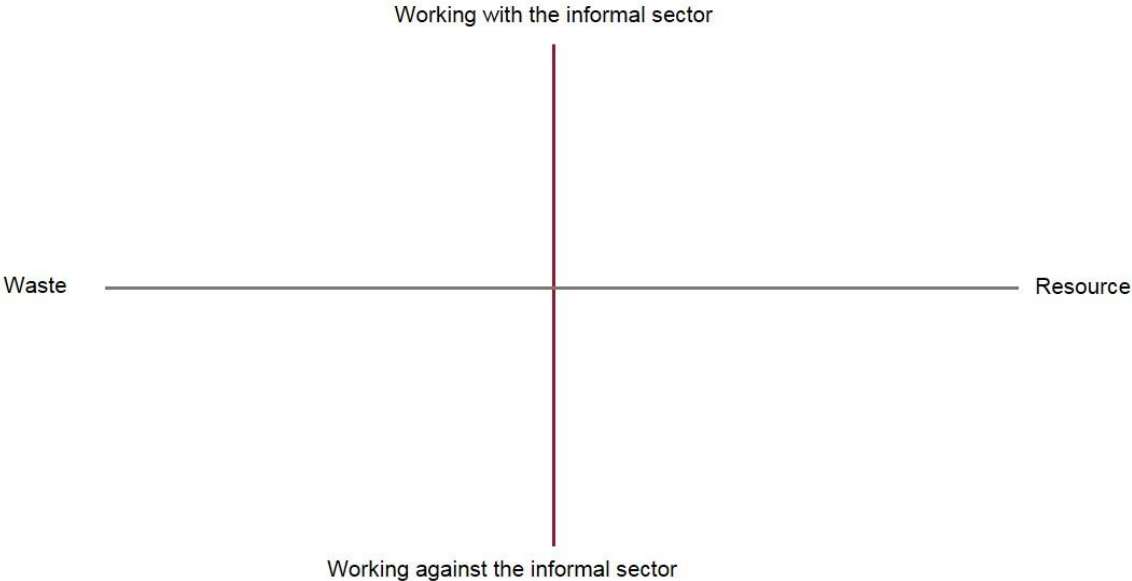
Source: Authors' own.

It is critical to note that working against the informal sector does not imply that the informal sector ceases to exist. The continuum captures the nuances of existing and potential future scenarios where the informal private sector works alongside the formal private sector and the local government. Towards the 'working with the informal sector' end of the vertical axis, the local government is inclined to work in partnership with the informal sector, while towards the 'working against the informal sector' end, it actively marginalises the informal sector.

2.3   The workshop

The workshop, organised in Delhi, involved the participation of city managers, members of civil society, the private sector and a bilateral technical cooperation agency (see Annex 1 for the list of participants). The aim of the workshop was to develop the scenarios along the dimensions outlined through a participatory approach. In the plenary session, the participants discussed the drivers for waste management in a developing country context. The participants were randomly split into four groups. Each group was assigned one of the four scenarios and was provided with a structure to describe that scenario. The structure was provided to ensure that the same dimensions would be covered. A common structure would enable comparisons across the different scenarios.

The standard structure was built upon three key aspects of waste/resource management. The first aspect related to the description of actors and their roles in the scenario. The key actors for waste management at the level of a city are the local government, private waste management companies, the informal sector, manufacturers whose products contribute to waste at the end of useful life, and environmental NGOs. The groups identified the role of each of these actors in the scenario assigned to them. The second aspect related to the description of the sources of finance and the resulting infrastructure. It is critical to understand who finances waste/resource management to capture the diversity of sources of funds, the economic efficiency and the resulting infrastructure in each scenario. The third aspect related to description of the capacities and governance structures in each scenario. The actors who are critical to waste/resource management have varying capacities that

shape the scenarios in particular ways. Also, the governance structures vary across the different scenarios creating possibilities for conflict and cooperation among the actors. Each group presented the scenario in the plenary session. The groups then debated the strengths and weaknesses of the four scenarios and also discussed the most desirable scenario.

2.4   Actor objective matrix

The scenario description below adds another dimension that the workshop participants did not address directly. This relates to identifying and summarising the objectives of the actors in each scenario. Based on the scenario descriptions developed by the workshop participants, the objectives of the key actors are distilled. Identifying objectives that align is crucial to recognise the alliances that coalesce around the embedded narratives in each scenario. Also, the identification of actors whose objectives align allows us to detect relationships that are critical to make the scenario stable. If these critical relationships unravel, then it is likely that the scenario might transform into one of the other scenarios or might lead to a completely new scenario. In the following scenario descriptions, the matrix set out in Table 2.1 is used to summarise the actors and their objectives.

Table 2.1   Actor objective matrix

Actor objective	Local government	Waste management company	Informal sector	Product manufacturers	Environmental NGOs
Clean city					
Health					
Resource value of waste					
Jobs					
Competitiveness					

Source: Authors' own.

It is clear from Table 2.1 that the actors involved in waste management would have several, and different, objectives. Even if actors have the same objectives, their priorities (rankings of the objectives) might differ. However, the critical part is to identify where and when actors whose priorities might be markedly different would come together and form alliances. For instance, the local government's highest priority is often a clean city. It could, however, ally with actors whose priorities might be markedly different from its own as long as there is alignment over other objectives. For instance, the informal sector's highest priority is protection of their jobs and livelihoods. The local government would form an alliance with the informal sector if, in addition to a clean city, it is also concerned about jobs in the local economy. However, if it is not concerned about employment, but only about the resource value of waste, it might ally with the private formal sector whose top priority is likely to be the resource value of waste.

This explanation suggests that in political economy analysis, it is essential to pin down the core objectives because this is critical to identify and group actors whose objectives align, although the reasons for the alignment of objectives might vary. In what follows, we use this notion of alignment of objectives to understand the stability properties of the scenarios as well as to characterise the intra- and inter-scenario dynamics.

3 The four scenarios

As mentioned, the two critical dimensions defining future scenarios in this framework are the levels of engagement with the informal sector and the transition from a waste management to a resource management narrative. These two dimensions, and the resulting four scenarios, are illustrated in Figure 3.1.

Figure 3.1 Potential scenarios with names

Working with the informal sector

'Revolutionary Margin'   'Green Transformations'

Waste ———————————————————————————— Resource

'State of Nature'   'Techno-Nirvana'

Working against the informal sector
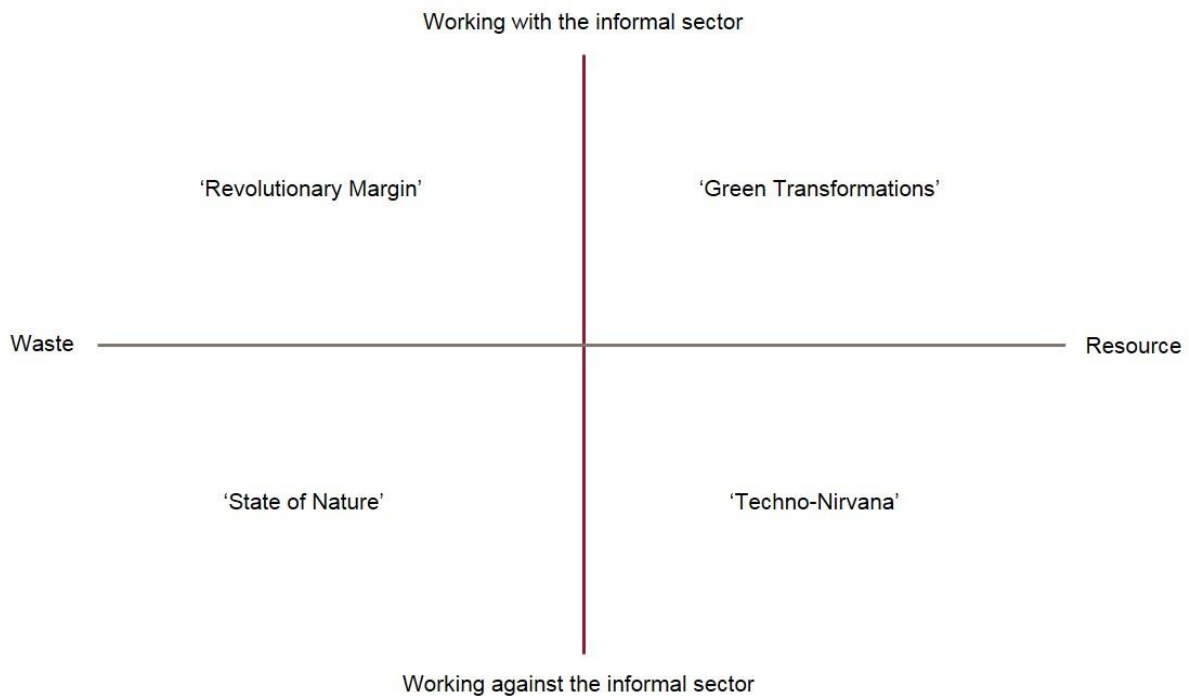
Source: Author's own.

We now describe each of the four scenarios *seriatim*.

3.1 Scenario 1: State of Nature

3.1.1 Actors and roles

This scenario characterises the future of business as usual in many urban agglomerations throughout the developing world. As one of the workshop participants involved in developing this scenario noted, 'This is the worst possible future.' Working against the informal sector, however, does not mean that the informal sector does not exist. On the contrary, the informal sector exists, collecting and segregating waste, but its activities are outside the ambit of the legal framework. It might even be harassed by the local authorities. Waste is segregated at source by the households but only in those categories that have a market in the informal sector. The reduction and reuse of waste is also facilitated through the informal sector as evidenced by the widespread and vibrant markets for repair and second-hand goods.[1]

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[1] In this sense, the informal sector and households co-produce a resource management narrative even within this scenario. However, this is not the dominant narrative.

As society considers waste as a problem that needs 'management', there is no source segregation of valuable materials embedded in the waste handed over to the city government (beyond the recyclables which have a market in the informal sector). The un-sorted waste is collected from households by the city government staff or private companies that have been contracted by the city governments. However, because of the limited capacities of the city governments, not all the household waste gets collected. As a result there is widespread open dumping of waste resulting in 'mini' landfills around the city. Also, waste is openly burnt due to the odour from widespread dumps and lack of scientific disposal mechanisms. The waste collected from households is either deposited at the secondary collection points or sent directly to transfer stations. The waste from the secondary collection points and transfer stations is then transported to the landfills. The informal sector further segregates the waste at secondary waste dumps or at the landfill, essentially 'cherry-picking' the valuable material out of waste.

Figure 3.2   State of Nature as discussed in the workshop

Source: Authors' own.

Waste management, led by the public sector, is supported by a complex landscape of private actors both in the informal and formal sectors. The public sector, represented by the city governments, is supported by the formal private sector in providing collection services and operation of infrastructure through contractual agreements referred to as 'public–private partnerships'. There is limited engagement of the manufacturers whose products (or the packaging of those products) lead to waste. The dominant narrative relies on typical linear

models of make-use-throw and concepts of a circular economy are not invoked. Also, policy instruments such as extended producer responsibility are neither understood nor applied.

3.1.2 Infrastructure and finance

As the dominant narrative is of 'managing' the waste, there are no material recovery facilities to extract the highest possible value out of waste. The waste collected from households is either deposited at the secondary collection points or directly sent to transfer stations. The landfills are not engineered sanitary landfills but centralised dumping grounds, which are open to animals as well as human beings. In most cases, there is limited energy recovery at the landfill or through incinerators. However, incinerators are considered as an option for recovering energy. The major constraint in establishing large incinerators is financial because the city governments have limited access to resources for setting up capital-intensive infrastructure.

Most solid waste management is financed through taxes collected on property from the general budget; there is limited cost recovery through collection charges because they are not considered politically feasible. The budget, overly reliant on property taxes, needs to be supported by subsidies from the state and central government to meet the costs of solid waste management. Further, the municipal budgets do not have a clear estimation of the overall costs of solid waste management in the city. Most noticeably, the costs associated with capacity development of staff as well as operation and maintenance of infrastructure are overlooked.

3.1.3 Capacities and governance

Due to the lack of enabling policies and understanding of life cycle thinking on waste management, there are limited incentives for the private sector to develop innovative technologies for waste management locally. As a result, most of the innovative technologies are imported and there is overwhelming reliance on 'external' technical expertise and transfer of 'solutions' that have worked in other, mostly developed country, contexts. The development of 'local' grassroots innovation mostly happens in the informal sector, which can make a business out of the recyclable materials. However, because of the informality of businesses, there is little attention to environmental health and safety norms.

The informal sector is considered a part of the problem. Although there is widespread acknowledgement that the informal sector is providing services that reduce the burden on the local government, there is no recognition of this contribution. The local government works exclusively with the formal private sector without making effort to include the informal sector in the waste management system. However, because of the widespread networks and capacities for innovation in the informal sector, the informal sector continues to provide and manage services. This co-existence of the informal and formal sector leads to conflicts at various levels. At the policy level, environmental NGOs tend to align themselves with the informal sector and facilitate the organisation process of the disparate informal groups. This alliance lobbies the government, mostly unsuccessfully, for better recognition and rights for the informal sector. This conflicts with the interests of the contractors in the formal sector who have been hired by the city governments to provide certain services. These companies lobby the government to strengthen rules that further marginalise the informal sector. At the operational level, the conflict also manifests itself in gaining access to waste. The recyclables, which are usually handled by the informal sector, are also now coveted by the formal private sector because the revenues from the sale of recyclables can subsidise their operations. Such conflict may take place at the secondary collection points or even at the landfill with the formal players restricting access for the informal sector.

3.1.4 Actors and objectives

We summarise the objectives of each of the key actors in Table 3.1.

It is clear from Table 3.1 that there are limited possibilities of alliance between different interests and actors because of limited alignments in their objectives or even a shared vision of a waste management system in the city. The overlapping interest among the formal waste management company and informal sector is the resource value of waste. However, this interest is based on the contested access to the waste between the two actors and consequently not tenable. The alliance between the environmental NGOs and the informal sector is based on the interest in preserving jobs in the informal sector. However, saving these jobs is not a priority of local government and also conflicts with the competitiveness of the large waste management companies.

Table 3.1   Actor objective matrix: State of Nature

Actor objective	Local government	Waste management company	Informal sector	Product manufacturers	Environmental NGOs
Clean city	x				
Health					
Resource value of waste		x	x		
Jobs			x		x
Competitiveness		x	x	x	

Source: Authors' own.

3.2   Scenario 2: Revolutionary Margin

3.2.1 Actors and roles
In this scenario, the local government works in partnership with the informal sector but the dominant narrative is one of waste management rather than resource management. One of the participants involved in developing this scenario noted that 'This is the most pragmatic scenario in the Indian context. The move to a resource management perspective is not likely to happen in the foreseeable future in India and involving the informal sector seems to be a natural way of dealing with waste.' The partnership between the local government and the informal sector is premised, most critically, on the ability of the informal sector to get organised as a collective body.[2] This collective, through its advocacy and lobbying, is able to negotiate with the local government to mainstream the informal sector in the provision of waste management services. However, the focus of this collective is on the rights and safety of the informal sector, not the resource value of waste.

As a result of the bargaining power of the collective, the informal sector is now considered an ally of the local government and works within the legal ambit. This relationship is mostly based on the relative bargaining powers of the local government and the collective.[3] It does not necessarily recognise the informal sector as an efficient provider of waste management services and this has implications for the wider economy as well as the environment.

The informal sector, supported and recognised by the local government, provides door-to-door waste collection services. The segregation of household waste is also done by the

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[2] This collective could take the shape of a cooperative, union or a society. Such structures have existed in different contexts in cities like Delhi, Pune and Ahmedabad in India. Similar experiments have also been successful in Thailand, Argentina and Brazil among other countries.

[3] We say 'mostly' because in certain cases, the leadership of the local government would be driven by the economic and social background of the waste picker and would engage with them because of concerns of inclusive urban development, and not because of the bargaining strength of the collective. However, even if this were the case, such recognition is based on the active engagement of the collective with the leadership and an outcome of sustained advocacy.

informal sector. Due to their better organisational abilities, the collectives of informal sector workers might be able to influence policy interventions on source segregation of waste from households. However, the overriding concern is not the resource potential of waste but the dignity and health of waste pickers. As a result, waste might now be segregated into hazardous and non-hazardous waste because of the occupational health and safety aspects.[4] Similar to the State of Nature scenario, there is limited focus on resource recovery. Cherry-picking of valuable resources within the overall waste stream is widespread. Waste is transported from the generators and deposited at the secondary collection points and transfer stations. The waste then gets transported to the landfill. The informal sector is not present at the secondary collection points, transfer stations or the landfill because this is negotiated with the local government. Due to the outreach and network of informal sector workers, most of the waste gets collected from households and other establishments. There is limited open dumping or burning of waste as a result. Only in limited areas, due to lack of awareness there is sporadic open dumping and burning of waste. The local government is supported by formal waste management companies for managing the non-recyclable fraction of the waste as well as for recovering energy from the waste dumped at the landfill. Compared with the State of Nature scenario, waste is managed in a more inclusive way but environmental – circular economy – thinking has little traction.

Figure 3.3   Revolutionary Margin as discussed in the workshop

Source: Authors' own.

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[4] Nappies and sanitary pads are categories of waste which organised waste pickers have argued need to be disposed of in a hygienic manner and not dumped in with household waste.

3.2.2 Infrastructure and finance

The infrastructure and finance in this scenario are similar to the State of Nature scenario because the dominant narrative in this scenario is also of waste management. There is, however, a crucial distinction. The organised informal sector collective is able to access a majority of the recyclable fraction of the waste because of its network and exclusive collection contracts with the local government. This enables the collective to bargain for better prices with recyclers in the formal sector. Also, due to economies of scale as well as forward linkages with large formal recyclers, the collective is able to invest in material sorting and recovery facilities to facilitate transactions with large formal buyers. This has unintended consequences for the formal waste management companies. The mainstreamed informal sector is able to take away most of the recyclable material from the waste stream. The remaining waste therefore has relatively low levels of material resources and energy embedded in it. As a result, incinerators need further subsidies from the local government to be made viable.

3.2.3 Capacities and governance

The informal sector has a major *voice* in this scenario. Negotiated agreements with the local government have substantial implications for their livelihoods and working conditions. The collective is able to gain recognition within local government for the informal sector and also influences policy as an advocacy organisation. However, as the focus is on the rights of the waste pickers and their livelihoods, there is limited attention paid to recovering all the resources embedded in the waste. Materials which traditionally do not have a market or technologies available in the informal sector are not recycled. Due to the rapidly evolving nature of waste streams and complexity of product composition, this becomes a substantial fraction of overall waste generated. As a result, with time, there is a large fraction of waste which does not get recycled. This situation challenges the relationship between the collective and the local government and creates a space for formal technology-driven companies with solutions for recycling the complex waste stream. The conflict between the private informal and formal sectors reappears. However, in this case, the formal private sector has to contend with the organised informal sector, the collective. The evolution of this scenario would depend crucially on the relative influencing capabilities of the formal and the informal sector and the local government's receptiveness to one over the other.

3.2.4 Actors and objectives

We summarise the objectives of each of the key actors in Table 3.2.

Table 3.2   Actor objective matrix: Revolutionary Margin

Actor objective	Local government	Waste management company	Informal sector	Product manufacturers	Environmental NGOs
Clean city	x				
Health			x		
Resource value of waste		x	x		
Jobs	x		x		x
Competitiveness		x	x	x	

Source: Authors' own.

There are two differences between this scenario and the State of Nature scenario. The first difference is driven by the interest of local government in working with the informal sector. This implies that saving jobs is one of the priorities of local government and drives the mainstreaming of the informal sector. The second difference is the informal sector's focus on

better working conditions (captured in our framework by a concern for the health of the workers). The alliance between the informal sector and environmental NGOs finds the support of local government, which is willing to work with the informal sector. This enables the partnership of the informal sector and local government to provide waste management services to the city through their network. The partnership also enables the organisation of the informal sector in a collective which has a (limited) co-benefit to the local environment through reduced open dumping and burning of waste.

3.3   Scenario 3: Techno-Nirvana

Figure 3.4   Techno-Nirvana as discussed in the workshop

Source: Authors' own.

3.3.1 Actors and roles
In this scenario, the dominant narrative is of recovering the maximum value from the waste through innovative and capital-intensive technology. The local government collaborates with formal private sector actors to recover the value out of waste and introduces technology-based interventions for resource management. It has contractual agreements, through

public–private partnerships, with large waste management companies for the entire waste value chain – from collection, material and energy recovery to the final disposal of residues. Households segregate waste at source in multiple categories. Door-to-door collection is organised by the formal private sector through motorised pick-up vehicles. Large centralised material recovery facilities are established to segregate the recyclables and to compost the organic parts of the waste. The non-recyclable and inorganic parts are sent for energy recovery in large capital-intensive incinerators.

The informal waste sector is marginalised.[5] It continues to provide services to households for the trading of recyclables. However, this role is restricted and actively discouraged by the local government. The large private waste management companies actively lobby against the role of the informal sector because monopolistic access to all waste is a contractual agreement with the local government. As the dominant narrative is one of resource management, manufacturers whose products turn into waste at the end of useful life are also engaged with the local government and waste management companies to develop innovative solutions. The informal reuse and repair industry suffers because extended producer responsibility is interpreted to extend the property rights of the producer to the entire life cycle of the product. The waste picked up from households goes directly either to material recovery or to recycling facilities and either gets crushed for recovery of material or burnt in incinerators.

3.3.2 Infrastructure and finance

The infrastructure for waste management is highly capital-intensive and mechanised. The material recovery facilities use machines to separate the various types of recyclables – glass, paper, plastic, ferrous and non-ferrous metals. The composting plant uses large digesters (aerobic or anaerobic) to convert the organic parts to compost. The energy recovery facility is also highly mechanised and large scale. All this infrastructure is developed at a cost to the local government, which passes on these costs to the waste generators – households, commercial establishments and non-commercial organisations. At the same time, the costs of pollution control and monitoring the infrastructure also go up. As a result, the cost of waste management increases manifold. A large part of the rise in costs is due to the internalisation of the externalities which are present in the State of Nature scenario. However, the focus on centralised infrastructure as compared to decentralised solutions as well as not utilising the existing strengths of the informal sector also has an impact of raising costs. For instance, it is well documented that the informal sector uses low carbon modes of transport, does manual sorting as compared to mechanised sorting, and is a better enabler of reuse or repair as compared to large recycling infrastructure in developing countries. These services are provided by large private companies at a higher cost. Financial intermediaries also play a big role by providing support to innovative entrepreneurs or large waste management companies to set up the infrastructure for waste management.

3.3.3 Capacities and governance

The driver for this scenario is the local government and its partnership with the formal private sector. The local government works closely with formal waste management companies for resource management. There are detailed regulations that govern the partnership between the private sector and the government. These regulations and norms create entry barriers for small informal sector companies as prospective providers of waste management services. As a result, the informal sector is disenfranchised and remains, at best, a fringe actor. The technocentric approach also provides opportunities for imported and best-available technologies. The market for waste management technologies opens up to international

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[5] A radical interpretation of the scenario was that 'working against the informal sector' might imply that local government then employs all the informal sector workers, thus completely eliminating the informal sector. We do not focus on this interpretation while describing the scenario.

service providers and contractors. Associated with this approach is the emerging role of international consultants and technical experts who provide state-of-the-art support to the local government. Local government capacities are strengthened in terms of contract management as well as technologies for waste management. However, the capacities required for monitoring infrastructure such as waste incinerators is lacking. These capacities evolve over long periods of time and there are conflicts between environmental groups and local government over the impacts of the infrastructure on the local environment. As one of the workshop participants noted, 'This scenario might be symptomatic of a false change – everything would be formal and technically sound on the surface but the informal sector would continue to exist and handle the waste in the background.'

3.3.4 Actors and objectives

We summarise the objectives of each of the key actors in Table 3.3.

Table 3.3   Actor objective matrix: Techno-Nirvana

Actor objective	Local government	Waste management company	Informal sector	Product manufacturers	Environmental NGOs
Clean city	x				x
Health	x				x
Resource value of waste	x	x	x	x	
Jobs			x		x
Competitiveness		x	x	x	

Source: Authors' own.

As the dominant narrative is one of resource management through technocentric solutions, there is a natural alliance between local government, waste management companies and product manufacturers. The informal sector, which is also interested in the resources, however, is marginalised because generating employment is not a priority of local government. This is consistent with the outcome in the State of Nature scenario, and shows how crucial local government is in recognising the key role that the informal sector plays in resource/waste management. In the absence of this support, the alliance between the large waste management companies, the product manufacturers and local government restricts the economic role of the informal sector. This has additional costs as mentioned previously – the cost of waste management goes up and the repair and reuse industry, which is largely informal in most cities, also reduces in size and scope. In this scenario, 2Rs of the 3R principle – reduce and reuse – that rank higher on the waste management hierarchy than recycling are adversely affected by the marginalisation of the informal sector.[6]

3.4   Scenario 4: Green Transformations

3.4.1 Actors and roles

In this scenario, the dominant narrative is one of inclusive resource management. This is achieved by mainstreaming the informal sector as a key player in effective implementation of a 3R strategy in partnership with local government. The group involved in developing this scenario seemed the most excited because they believed this scenario would eliminate waste and generate employment for poor people. As one of the participants noted, 'The

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[6] In waste management, 3R stands for Reduce, Reuse and Recycle. In the waste management hierarchy, an ordering of waste management solutions in terms of their environmental impacts ranks reduction and reuse above recycling of waste.

collaboration between the local government, product manufacturers and the informal sector would lead to a zero-waste city.' The waste is source segregated by the generator into several categories collected by the informal sector – paper and plastic, glass, hazardous and bio-medical waste, electronic and organic waste. The door-to-door collection is managed by the collective of informal sector workers, giving jobs in collection to thousands of people. Collection is monitored and the collected material is transferred to decentralised material-sorting facilities located throughout the city. The material is sorted and composted in decentralised facilities that are managed by the collective in partnership with NGOs and technology start-ups. Local government operates a state-of-the-art landfill where the residues are disposed. There is vibrant discussion on developing a zero-waste city and developing instruments (financial and regulatory) that make landfilling of recyclables and energy-rich materials prohibitively expensive for the waste disposer. There is limited support for the setting up of incinerators but in the absence of adequate monitoring capacities and infrastructure for pollution control, incinerators are not considered viable for a developing country context.

Figure 3.5   Green Transformations as discussed in the workshop
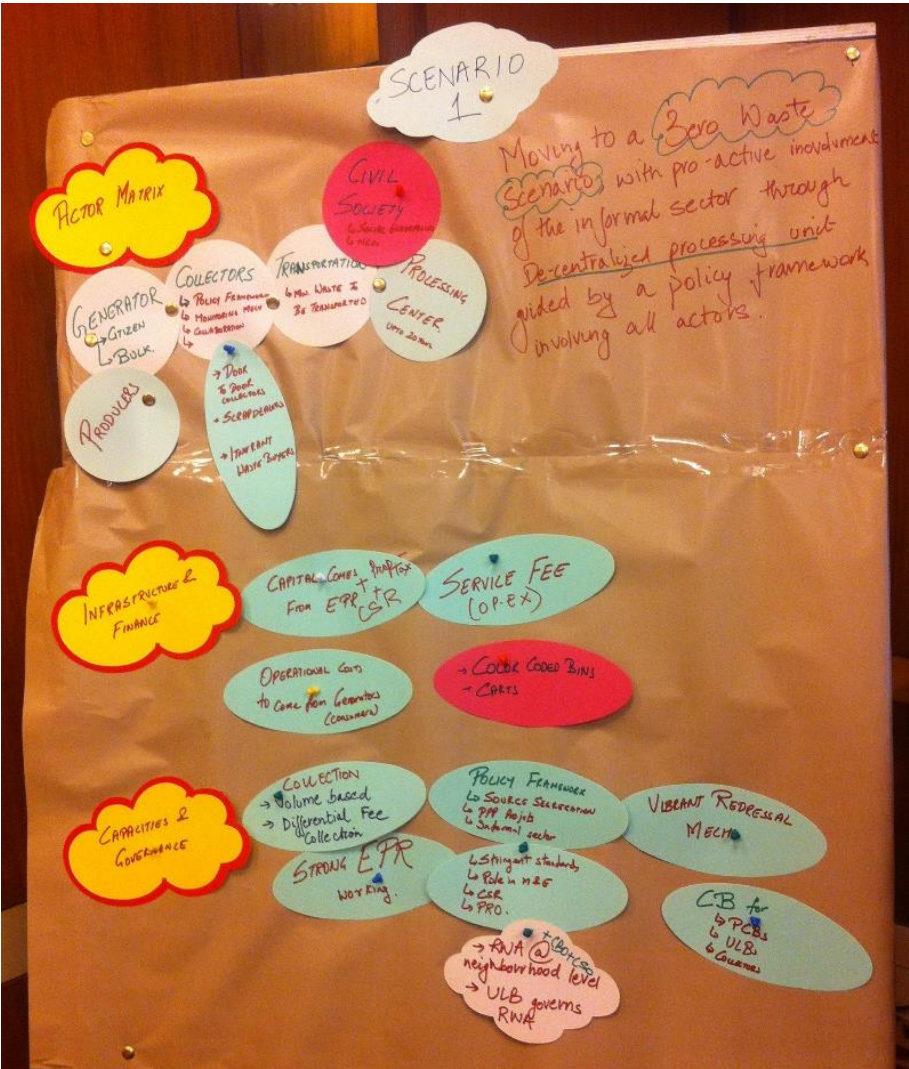
Source: Authors' own.

The informal sector is the accelerator of the Green Transformations scenario with the support of local government. The repair and reuse industry is actively promoted and works in close partnership with the product manufacturers. The informal sector becomes a crucial link in the

value chain of large manufacturers. Manufacturers also work with the informal collectives to set up take-back programmes for end-of-life products. The end-of-life products are examined for their reuse potential and sold back in the market after being refurbished with warranties offered by the original manufacturers. The collective, local government and manufacturers together implement extended producer responsibility-based models for waste management.

3.4.2 Infrastructure and finance

The infrastructure in this scenario, in stark contrast to the Techno-Nirvana scenario, is distributed and decentralised, giving agency to waste generators as well as the small informal sector actors in resource management. There are hundreds of material-sorting facilities for a city the size of Mumbai, Delhi or Bangalore. The material-sorting centres also have decentralised composting facilities. The informal waste pickers bring the waste to these collection centres from the source and get paid wages by local government and have additional sources of income through the sale of the recyclables. The local repair and reuse industry is recognised and promoted by local government as part of the overall resource management strategy. In certain cases, the repair and refurbishment markets are actively promoted by the local government through incentives such as provision of space for weekly markets selling second-hand and repaired goods. The markets also have the participation of the manufacturers who work with the collectives to set up authorised repair and refurbishment facilities. The infrastructure is financed partly by the user charges and partly through advanced recycling fees charged by the manufacturers to fulfil extended producer responsibility. The landfill is operated by local government in partnership with formal private sector actors. The waste reaching the landfill is the lowest among all four scenarios because of the reduction of waste through reuse and repair by the active informal sector. Also, due to segregation of waste and separation of the recyclables at source, the recyclable part of the waste does not reach the landfill.

3.4.3 Capacities and governance

The partnership between the informal sector and local government is premised on the recognition of the informal sector as an economically efficient and environmentally sound implementer of a 3R strategy. However, this recognition is contingent on the formation of a collective of waste pickers similar to the Revolutionary Margin scenario. The collective allows the local government to deal with representatives of the informal sector and also engage on issues related to 3R, which is a priority of the local government. The collective, distinct from the Revolutionary Margin scenario, actively highlights the role of the informal sector in recovering the maximum resources out of waste. It also campaigns about the effectiveness of the informal sector in developing reuse and repair markets, which are critical for resource efficiency and which rank higher in the waste management hierarchy as compared to recycling. The collective also critically assesses the role of incineration and landfilling in partnership with environmental NGOs highlighting the challenges of monitoring emissions from incinerators in a developing country context.

The local government seeks partnership with the informal collective because it values the resource-saving potential of the skills, networks and decentralised infrastructure that results from this partnership. Also, local government values the jobs that could be created from partnership with the informal sector. At the same time, bringing the informal sector within the ambit of rules and regulations would enable local government to enforce the use of environmentally sound and occupational health and safety-compliant processes. This process would be facilitated by offering simplified regimes of taxation to those informal sector enterprises who are members of the collective. As compared to the Techno-Nirvana scenario, this taxation would provide (limited) additional revenues but also promote the

reduction, reuse and recycling of waste by the informal sector.[7] Also, the partnership between the local government and the collective would raise the living and working standards in the informal sector.

The conflict between the formal and informal sector is minimal in this scenario because the formal sector benefits from the informal sector's participation in the value chain. However, such participation needs active intervention from the local government and other policy enablers to ensure that the materials do not leak back into unregulated markets. This is in the interest of both the manufacturers, formal recyclers as well as the informal collective.

3.4.4 Actors and objectives
We summarise the objectives of each of the key actors in Table 3.4.

Table 3.4   Actor objective matrix: Green Transformations

Actor objective	Local government	Waste management company	Informal sector	Product manufacturers	Environmental NGOs
Clean city	x				x
Health	x		x		x
Resource value of waste	x	x	x	x	
Jobs	x		x	x	x
Competitiveness		x	x	x	

Source: Authors' own.

This scenario has multiple alliances driving the dominant narrative of inclusive resource management. The two key priorities are the resource value of waste, and jobs. The local government, waste management companies, the informal sector and product manufacturers all have the priority of getting the maximum resource out of waste. At the same time, the local government, informal sector, product manufacturers as well as environmental NGOs are members of a potential alliance concerned about jobs in the informal sector. Each have their own reason for saving these jobs – for instance, the product manufacturers see the informal sector as a key resource for sourcing the used products back to them for re-manufacturing or refurbishment. The local government values the efficiency of collection as well as the low cost associated with the informal processes, enabling them to achieve their main goal of having a clean city at the lowest possible cost. At the same time, the higher collection, repair and reuse allows the informal sector as well as the city to recover the most out of waste.

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[7] Taxation was not discussed explicitly during the workshop but the mainstreaming of the informal sector and engagement with the local government would not be possible until the informal collective agrees to a certain degree of formalisation. Such a formalisation process could be facilitated through the introduction of simplified regimes of taxation.

4 Scenario dynamics

The four scenarios described are plausible futures in most developing countries where the informal sector plays a role in waste management. Each of the scenarios outlined has a logic driven by the actors involved and their objectives. It is clear that certain scenarios are inclusive of the informal sector by design while others are not. However, our scenarios highlight that the only way the informal sector can flourish, and accelerate the transition from waste management to resource management, is through the active support of the other actors, especially local government. Such support does not entail subsidisation of the informal sector. On the contrary, the support might result in additional revenue generation through the extension of simplified regimes of taxation. At the same time, the scenarios highlight that the inclusion of the informal sector has other beneficial impacts that support the transition from a waste management to a resource management perspective.

In this section, we compare the intra-scenario dynamics based on a comparative analysis of the four scenarios. We also characterise inter-scenario dynamics focusing on two transitions of interest. The first, which we call upward dynamic, relates to the move towards the Green Transformations scenario. The second, which we call downward dynamic, refers to the slide towards the State of Nature scenario.

4.1 Intra-scenario dynamics

The informal sector has the knowledge and networks that will enable proper collection and segregation of the waste (Cointreau, Gopalan and Coad 2012). However, this can only happen at scale and with maximum economic efficiency if the informal sector has the mandate from local government as in the Green Transformations and Revolutionary Margin scenarios. However, a comparison of Green Transformations and Revolutionary Margin also suggests that the inclusion of the informal sector will not automatically enable the transition from waste management to resource management. The alignment of interests of the different stakeholders in a particular direction is critical to enable this transition. The Green Transformations scenario achieves this objective through the alignment of objectives between local government and the informal sector collective, as well as the product manufacturers. Second, the informal sector has limitations in recycling certain parts of the waste, especially because of the changing composition of the waste stream and a rising proportion of complicated materials in the waste chain. In these cases, the informal sector can be a partner of formal waste management companies that have the finance and expertise to develop technologies. The informal sector can source the material to the formal waste management companies for some of these waste parts (Chaturvedi, Arora and Kilguss 2011).

The role of the local government is extremely critical in fostering and shaping these partnerships. For instance, the Green Transformations scenario highlights this local government role. In other cases, the local government's inaction or the support of the formal sector creates conflict between the informal and formal private sector much like the Techno-Nirvana and State of Nature scenarios. Analysis of the scenarios suggests that the inclusion of the informal sector is important because the results are not only inclusive in process but also because they are inclusive in outcomes. For instance, this is brought out through a comparison of the Green Transformations and Techno-Nirvana scenarios. As compared to the Techno-Nirvana scenario, the Green Transformations scenario achieves the transition from waste management to resource management at a lower cost because of the

participation of the informal sector.[8] Also, the employment generated because of the decentralised infrastructure in the Green Transformations scenario would be much larger as compared to the Techno-Nirvana case. The observations made indicate that the inclusion of the informal sector would facilitate and, in certain cases, accelerate the transition from a waste management to a resource management perspective.

4.2   Inter-scenario dynamics

To characterise inter-scenario dynamics, it is critical to understand what makes a scenario stable. In our framework, the stability of a scenario depends on the alignment of objectives of the involved stakeholders. The two scenarios on the waste management part of the x-axis – Revolutionary Margin and State of Nature – are relatively fragile because they are based on limited alignment of objectives across different actors. These limited alignments of objectives do not allow for the development of alliances that make a particular scenario stable. For instance, the actor objective matrix of the Revolutionary Margin scenario suggests that it is a relatively tenuous scenario. The instability of Revolutionary Margin is driven by the fact that it is contingent on the alignment of a single objective – jobs in the informal sector – between the informal sector and local government. In the case of the State of Nature scenario, because there are hardly any alignments of interest, it is relatively straightforward to infer that external influences (a crisis, an international or national policy) that change the objectives of the actors could also transform the scenario to any of the other scenarios. The two scenarios on the resource management part of the x-axis – Techno-Nirvana and Green Transformations – however, are relatively stable because they are based on alignment of multiple objectives across different actors.

4.2.1   Upward dynamic: transition to Green Transformations

A comparison of the actor objective matrix of State of Nature and Green Transformations suggests that the transition from State of Nature to Green Transformations would require widespread changes in the objectives of the involved stakeholders along both dimensions of the framework. A change in the objectives could be driven by policy at the national level or a change in the economy. For instance, if the national government recognises the role of the informal sector, then local government might be forced to work in partnership with informal sector collectives. At the same time, a rise in prices of raw materials (either through changes in taxation or global commodity prices) would incentivise the local government as well as product manufacturers to get the most value from waste at the least possible cost. This would provide further impetus to forging partnerships with the informal sector and facilitate the move towards the Green Transformations scenario. The important point to note is that due to lack of alignment of objectives across the stakeholder groups and relative fragility of the State of Nature scenario, there would be limited resistance to and relatively large gains to be made from such a transition.

The move from Revolutionary Margin to Green Transformations would require a change in objectives of the stakeholders along the waste/resource management dimension of the framework. As mentioned, this could happen through a relative increase in the price of raw materials because of rising demand or changes in tax policies. As the local government is already inclined to work in partnership with the informal sector, the relative increase in the price of raw materials would strengthen this drive. Also, the mainstreamed informal sector would benefit from such a rise in prices and seek to improve its processes of repair, reuse and recycle. The product manufacturers would also seek partnerships with the informal sector to recover the maximum value from waste. The transition would be supported by the alliance of the informal sector as well as local government and would face limited resistance from other actors as they are likely to benefit from the transition. A potential challenge could

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[8] There is case-specific material on how the informal sector saves resources for urban local bodies. Also, there is evidence to suggest that the informal sector is more efficient and implements certain processes at a fraction of the cost of the formal sector.

emerge from formal recyclers. But as compared to Revolutionary Margin, even they would benefit from access to more waste as well as higher material prices.[9]

The move from Techno-Nirvana to Green Transformations would require changes in objectives of stakeholders along the working with/working against the informal sector dimension. This could potentially be achieved through a change in national policies or advocacy efforts by environmental NGOs for enhanced participation of the informal sector. However, given the relatively marginalised position of the informal sector in the Techno-Nirvana scenario as well as the entrenched alliances of interests, such a transition would be difficult to achieve. As mentioned, the Techno-Nirvana scenario is relatively stable due to the multiple alignments of interests. The transition to Green Transformations would not only need support through policy interventions enabling the inclusion of the informal sector but also realignment of interests so that incumbent alliances do not block such a transition. This would require consistent advocacy by the informal sector and environmental NGOs as well as local government. In our assessment, this would be the most challenging and unlikely upward dynamic.

The discussion above also suggests that if either State of Nature or Revolutionary Margin transit to Techno-Nirvana, there would be strong resistance and limited possibilities for a subsequent transition to Green Transformations. The reason is linked to inherent stability of Techno-Nirvana as a scenario due to the multiple alignment of objectives and interests. For instance, the technological lock-ins due to the investment in energy from waste as well as large recycling plants would be a strong deterrent to transition from Techno-Nirvana. The transition to Green Transformations would be possible if there are norm-shifts in favour of the inclusion of the informal sector. However, as mentioned, such a norm-shift would also face resistance depending on the entrenched interests of the actors involved.[10]

4.2.2 Downward dynamic: slide towards State of Nature

Due to exogenous shocks or changes in the policy environment, there are possibilities of a downward dynamic as well. However, as in the case of the upward dynamic, the exogenous shocks and changes in policy environment would lead to the downward dynamic relatively easily in scenarios that are inherently unstable as compared to relatively stable scenarios. This is a reflection of the resistance to change of the alliance of entrenched interests. As mentioned, Techno-Nirvana and Green Transformations are relatively stable scenarios and, as a result, would not easily slide towards State of Nature.

The same cannot be said about Revolutionary Margin. A policy change at the national level in favour of formal private sector participation could trigger the slide from Revolutionary Margin to State of Nature through a change in the objectives of the local government. A corollary of our argument regarding the incremental change from State of Nature to Green Transformations is the potential staged slide from Green Transformations to State of Nature. Such a slide would be initiated by a move from Green Transformations to Revolutionary Margin. The slide from Green Transformations to Revolutionary Margin could be triggered by a global reduction in material prices due to the discovery of additional stocks of, or substitute materials for, resources for consumption and production. The subsequent slide from Revolutionary Margin to State of Nature has been described previously.

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[9] A combined reading of the transition from State of Nature and Revolutionary Margin to Green Transformations suggests another pathway for the transition from State of Nature to Green Transformations. The pathway would entail a transition from State of Nature to Revolutionary Margin and then a subsequent transition to Green Transformations. This pathway suggests a more incremental approach to changes in policy levers that could drive the move from State of Nature to Green Transformations.

[10] The analysis of the scenario dynamics focuses exclusively on the material politics based on the objectives of the involved actors. However, similar alignment of interests could happen in the discursive arena forcing a change in the objectives of the involved actors. We presume that the objectives of the actor already reflect the norms in the society. However, a more elaborate scenario dynamics would allow for alignment of objectives in both material and discursive arenas.

5   Conclusions and recommendations

We have outlined potential future scenarios of waste/resource management in a developing country context. The scenarios have been developed through inputs received from experts on waste/resource management. The four scenarios – while stylised constructs – are informed by observing what goes on in the real world and listening to what stakeholders say about their current problems and ambitions for the future. The scenarios describe radically different futures and would be influenced by factors such as economic growth, prices in commodity markets, consumption patterns, waste treatment technologies and policy. Above all, the scenarios represent political choices. Based on the scenarios and political economy analysis, multiple recommendations and insights emerge. We focus on recommendations for policymakers and insights for further research.

5.1   Recommendations for policymakers

The support for the use of Foresight methods as a tool for policy development came out strongly in the discussions during the workshop. The participants underscored that uncertainty about the future should be reflected in the policies being drafted today. Also, policymaking needs to be adaptive to emerging realities. In that sense, the policymaking process would have multiple feedback loops rather than follow linear stages of formulation, implementation and monitoring. These feedback loops and the resulting adaptive nature of policymaking becomes even more critical in policy arenas such as waste management with multiple actors who have radically different and conflicting objectives that influence, and are affected by, the policy.

The workshop participants highlighted that the participatory process through which scenarios were developed could be used in policy design processes by local government as well as at other levels of policymaking. Multi-stakeholder representation in the development of each scenario brought out explicitly the potential for alignment and conflicts of objectives that underpins most policy design processes. By opening up the policy design process, policymakers and policy influencers would benefit from dialogues that could influence policy design and implementation in complex and uncertain ways. The Foresight methods, by developing shared visions through scenario development of a distant future, also create the space for open dialogue. This is especially critical in policy spaces that are occupied and dominated by special interest groups. By the cognitive delinking of the immediate reality and focusing on the future, the possibilities for an open dialogue are facilitated and enhanced.

The analysis highlights that inclusion of the informal sector is critical to make the transition from waste management to resource management in cities with a large population of urban poor. Working in partnership with the informal sector makes the transition inclusive in both process and outcomes. The analysis of the scenarios suggests that by working with the informal sector today, local government could accelerate the future transition from waste management to inclusive resource management. However, this acceleration would be contingent on the active hand-holding and engagement of local government. In the absence of such active engagement, it is likely that there would be conflict between the informal and formal private sector. Also, depending on the level of support provided by local government, the informal sector could emerge as an accelerator of the transition from waste to resource management in developing economies.

Our analysis further suggests that the transition from waste management to resource management would be possible only through the development of alliances of actors with divergent objectives and priorities. The role of actors with convening power, such as local government, would be critical in the formation of alliances that could drive the transition from

waste management to inclusive resource management. Through active engagement and policy signals, local government can forge such alliances and enable the transition from waste to resource management. At the same time, local government could drive the formation of alliances that work actively against the informal sector. The centrality of local government in facilitating the participation of the informal sector is indicative of the fact that political economy analysis is a critical first step for the design of any intervention in waste management. A broad understanding of local politics, policies, actors and interests is essential before any policies are proposed and reforms attempted. Contrary to the recommendations of most government policy documents (especially in India), raising awareness and finding private sector suppliers of appropriate technologies cannot be the only focus of local government responsible for waste management.

5.2 Insights for further research

Our analysis suggests that a joined-up approach that brings together insights from fields of environment science and engineering, social protection, business studies and political economy analysis is critical for the development of any meaningful intervention in waste management. All the scenarios have been characterised using insights from the different fields. Such an approach is critical because it also suggests that policymaking that does not take these different perspectives into account would not be able to successfully overcome the multi-faceted challenges posed by waste. By not incorporating the relevant insights from these various fields, the emerging outcomes and policy recommendations would be inadequate and sub-optimal by design.

Methodologically, our approach suggests an innovative categorisation that could put order into a complicated situation. By focusing on two critical dimensions of waste management in developing countries, we are able to characterise future scenarios in an analytically tractable manner. This characterisation also allows us to make comparisons across the scenarios. Also, the actor objective matrix allows us to understand the intra- and inter-scenario dynamics. Further research could build upon such an analytical framework. An integrated framework that brings the two elements of the methodological approach together – the scenario analysis and actor objective matrix – could be used for a range of other policy initiatives beyond waste management.

Our research, as well as case work from informal sector participation in waste management, suggests that mainstreaming the informal sector is economically efficient and financially beneficial for local government. It reduces the costs of waste management as well as the need for large-scale investments in infrastructure. The obvious questions therefore are: why is this economically efficient solution not widely embraced? Why are cities not rapidly progressing in this direction? Our analysis of the actor objective matrix suggests the use of political economy approaches to understand who drives (and obstructs) the adoption of economically efficient solutions. We believe further research is required to answer these questions precisely using comparative analysis of successful and failed attempts at mainstreaming the informal sector in waste management. However, the overarching implication of our analysis is that tools of comparative political economy could be used more widely to understand who drives (and blocks) the move from a socially and economically sub-optimal outcome to an optimal outcome.

Annex 1   List of workshop participants

The Future of Resource Management in Urban India, Roundtable, Delhi, 28 October 2014

	Name	Position	Organisation
NGOs			
1	Bharati Chaturvedi	Director	Chintan
2	Wilma Rodriguez	Head	Saahas
3	Francesco Obino	Research Advisor	Chintan
4	Gautam Mehra	Consultant	Chintan
5	Dr K Vijayalakshmi	Vice President	Development Alternatives
6	Vaishali Porey	Deputy Manager	Development Alternatives
7	Vandana Saini	Deputy Manager	Development Alternatives
8	Saksham Nijhawan	Deputy Manager	Development Alternatives
9	Yamini Parikh		SEWA
10	Priti Mahesh	Senior Programme Manager	Toxics Link
Research institutions			
1	Shilpi Kapur	Fellow	TERI
2	Shyamla Mani	Professor	National Institute of Urban Affairs (NIUA)
3	Jai Kishan Malik	Research Associate	TERI
4	Alun Rhydderch	Founder	School of International Futures
5	Ashish Chaturvedi	Fellow	Institute of Development Studies
Municipalities			
1	Shri Prashant Pandaya	Deputy Director	Ahmedabad Municipal Corporation
2	Pradeep Khandelwal	Chief Executive	East Delhi Municipal Corporation
Donors			
1	Prabhjot Sodhi	Country Programme Manager	UNDP
2	Abhijeet Banerjee	Chief Economist	GIZ
3	Vaishali Nandan	Senior Advisor	GIZ
4	Manjeet Saluja	Technical Advisor	GIZ
5	Dr Dieter Mutz	Director (Indo Ferman Environment)	GIZ
6	Priyanka Porwal	Tech Expert	GIZ
7	Daniela Boos	Intern	GIZ
8	Karan Mehrishi	Economist	GIZ
9	Dr Rachna Arora	Senior Technical Advisor	GIZ
10	Titiksha	Technical Advisor	GIZ
11	Koyel Kumar Mandal	Advisor	GIZ
Private sector – consultant, recycler (informal and formal), product manufacturer			
1	Pradeep Dadlani	Director	SYCOM
2	Mohammad Sabir	Director	Green E-Waste
3	Pravin Mallick	Environment Manager South Asia	Tetrapak
4	Shalu Pathak	Head – Business Operations	Hanjer Biotech
5	Mathias Laschke	Director	E-recycle
6	Dr Lakshmi Raghupathy	Consultant	Expert and consultant on waste management

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