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BUSINESS MODEL 10

Partially subsidized composting at district level

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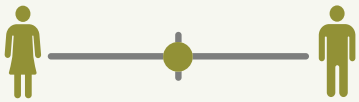
A. Key characteristics

Model name	Partially subsidized composting at district level
Waste stream	Municipal solid waste (MSW) and fecal sludge
Value-added waste products	Regular compost, enriched compost, non-degradable recyclables, treated wastewater
Geography	Medium to large urban areas with large quantities of MSW, land availability and access to inexpensive labor
Scale of production	Small to medium, processes about 10–75 tons of MSW/day
Supporting cases in this book	Mbale, Uganda; Balangoda and Matara, Sri Lanka
Objective of entity	Cost-recovery [X]; For profit [ ]; Social enterprise [X]
Investment cost range	On average USD 250,000–370,000 depending on scale
Organization type	Public
Socio-economic impact	Disposal cost savings, new jobs, provision of compost and super compost to plantation farmers, treated water and cleaner environment
Gender equity	Model is fairly gender neutral; where women are engaged in waste segregation, they may earn additional income from sale of recyclables 

B. Business value chain

This business model can be initiated by a public entity or through a public-private partnership. The primary goal of the entity is to reduce open-dumping practices (maintain a clean city) and the quantity of waste landfilled, and resulting greenhouse gas emissions through the conversion of MSW and FS into compost. With investments justified based on the net positive environmental and socio-economic benefits, the municipality and/or government authorities often provide the capital investments (land, infrastructure, equipment, others) for the set-up of the compost plants as well as committing to providing continuous support for plant operation and maintenance. The publicly-run waste processing enterprise is often engaged across the entire value chain, i.e. involved in waste collection, segregation, processing, marketing and distribution of the compost. At the input side of the value chain, the public entity–municipality oftentimes owns the city's waste and thus has unlimited access to raw materials (MSW) and does not compete with any other company for the resources input. Collaborations with research institutes are recommended for the adoption of appropriate waste processing and compost production technologies.

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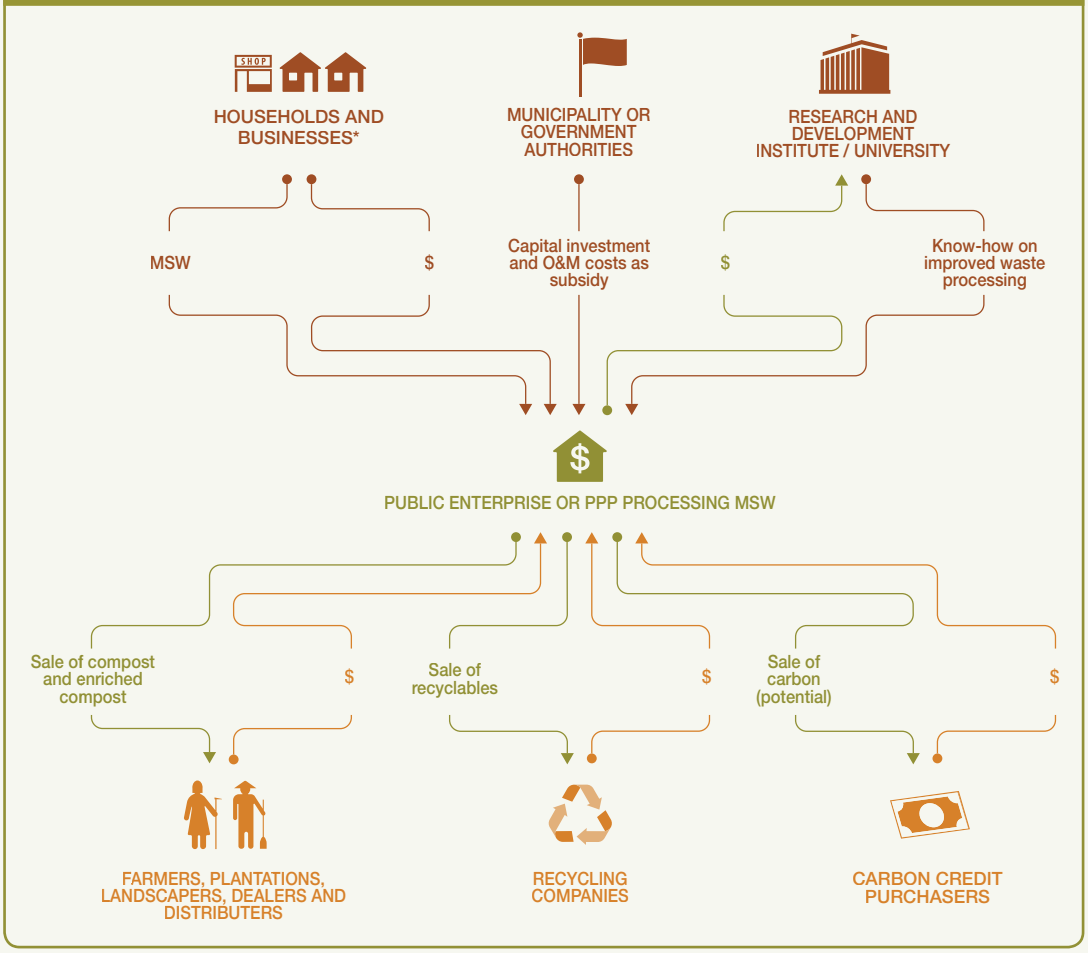
This business model has the potential to transition from being subsidy-dependent to full cost-recovery and even profit-making. The efficient allocation of resources and engagement in activities where the business entity has a comparative advantage is critical for sustainability; and innovative partnerships are notable in having an important role to play in this regard. Opportunities for making profits can entice private entities to partner with the public entity and bring win-win outcomes for the stakeholders. In this regard, private sector financing becomes accessible and their strong capacities in product branding and marketing can be tapped into (Kaza et al., 2016). The public entity can sell the compost directly to agricultural producers through a segmented pricing approach to gain more revenue. However, distribution agents and agro-input suppliers/dealers are an efficient channel for accessing the fertilizer market especially if the public entity lacks capacity in marketing and distribution. The option of developing different formulations of compost tailored for specific crops, the sale of non-degradables such as plastics and metals to recycling firms and sale of carbon credits are alternative avenues to generate additional revenue, minimizing subsidy dependency and opportunity to move the model from cost-recovery to profit-maximization (Figure 131).

FIGURE 131. VALUE CHAIN SCHEMATIC – PARTIALLY SUBSIDIZED COMPOSTING AT DISTRICT LEVEL



Note: * Under a PPP it is optional if the public or private partner collects the waste.

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C. Business model

The business model described here (Figure 132) presumes operation under a public entity with partial subsidies for governmental entities. The model has three value propositions: a) provide improved waste management services to households; b) increase access to environmentally sustainable organic fertilizer to agricultural producers at competitive market prices; and c) provide recycling companies with increased options for purchasing recyclables at competitive prices. Strategic partnership with governmental organizations assure access to capital investments but also recurrent financing for operations and maintenance (Kaza et al., 2016). The provision of waste collection services generates significant revenue for the public entity, received via government payments but also the waste tax they are able to charge to institutions and businesses who fail to segregate their waste. The latter can tremendously reduce segregation costs and speed up the entire compost production process which implies less operational costs and more benefits.

The production of organic fertilizers from MSW and FS imply that farmers have access to fertilizer options. The public entity can sell directly to the end-users and also utilize agricultural extension systems, input suppliers, private dealers or even existing chemical fertilizer distribution channels via partnerships. Implementing a segmented pricing approach, by charging a lower price for bulk sales and market price for retail purchases can increase revenue. By advocating for government incentives similar to those for chemical fertilizers, the compost can be sold to local farmers and farmer organizations at partially subsidized rates through government agencies and agricultural departments to gain a larger share of the fertilizer market. Also, value addition to the compost via fortification and pelletization and branding of the product could be instrumental for greater market penetration and revenue generation. A partnership with a research and development (R&D) institute becomes crucial as the public entity is able to tap into their research capacity to develop competitive compost products for a competitive fertilizer market. As a part of its marketing strategy and to expand its customer base, the public entity can give all its first-time customers free compost samples so that the farmers can see first-hand increased yields on their own farms. This can be instrumental in increasing its market share. An additional source of revenue is from the sale of recyclables which can be purchased from locals and sold directly to recycling companies at higher prices. For efficiency, the public entity can set-up decentralized waste resource centres where informal workers bring and sell the segregated recyclables to them. This value proposition in particular extends the model to be inclusive and provides indirect employment (income) to people that would otherwise be unemployed.

This model, although subsidy-dependent, generates significant environmental and socio-economic benefits that justify governmental support. Reduced open-dumping and burning of waste implies decreased GHG emissions and human exposure to untreated waste. The conversion of MSW and FS to compost is an avenue to improve soil productivity and agricultural yields, but also reduces waste disposal costs, GHG emissions from landfills and chemical fertilizer production. Opportunities to transition the model to financial independence is crucial in view of shrinking municipal budget allocations for waste management.

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FIGURE 132. BUSINESS MODEL CANVAS – PARTIALLY SUBSIDIZED COMPOSTING AT DISTRICT LEVEL

KEY PARTNERS

- Municipality, city council
- Local university/ R&D institute
- Agro-dealers
- Waste resource centre

KEY ACTIVITIES

- Waste collection and segregation
- Production and sale of compost
- Shredding and pelletization
- Purchase and resale of recyclables

KEY RESOURCES

- Machinery
- Land and labor
- MSW
- Permit (composting and environmental impact assessment)
- Waste resource centres

VALUE PROPOSITIONS

- Provision of improved waste management services to households
- Farmers have increased access to alternative fertilizer products at a competitive price
- Recycling companies have access to recyclables products at an affordable price

CUSTOMER RELATIONSHIPS

- Waste collection through direct contact
- Personal help at direct sales
- Direct relationship

CHANNELS

- Direct
- Direct sales, word-of-mouth
- Direct sale

CUSTOMER SEGMENTS

- Households, commercial entities
- Agricultural producers (smallholder farmers, plantations, landscaping companies, local/ national agricultural departments)
- Recycling companies

COST STRUCTURE

- Capital investment costs (including receiving tanks, sedimentation tank, plastic and polythene pelletizer, water treatment facility and drying bed)
- Operation and maintenance costs (machinery, infrastructure, labor)
- Quality monitoring fee payment
- Cost of buying recyclables

REVENUE STREAMS

- Waste collection funds from government
- Waste tax from commercial entities that do not segregate waste
- Waste collection fees from commercial entities
- Government subsidy (partial)
- Sales of compost and other recyclables

SOCIAL AND ENVIRONMENTAL COSTS

- Possible pollution of water bodies from leachate
- Potential health and occupational safety risks to workers failing to wear protective gear
- Potential risk to the public where compost and segregation activities are in close proximity to neighbourhoods

SOCIAL AND ENVIRONMENTAL BENEFITS

- Reduced existing waste management costs
- Creation of job opportunities
- Reduction of environmental pollution from untreated waste
- Reduced human exposure to untreated waste
- Improved yield returns

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D. Alternate scenarios

In the generic business model described above, a public entity converts MSW and FS to an organic fertilizer for sale to agricultural producers, provides waste collection services to households and resells recyclables at higher prices to commercial firms. This business model can incorporate alternative scenarios to enhance revenue generation and overall sustainability by: i) increasing its scale of operation (large scale) via a public-private partnership, and ii) revenue generation from carbon credits under the CDM.

Scenario I: Large-scale operation as a public-private partnership

Public entities can benefit from economies of scale to further reduce disposal costs and generate significant revenue through composting at a larger scale. This however requires increased capital investments for infrastructure as well as funds to cover operational and maintenance costs. Whilst municipalities are generally able to cover O&M costs, new capital investments can overstretch their budgets. Additionally, publicly-managed compost facilities often show inefficiencies in product innovation and marketing. Many of these shortcomings can be addressed by the business-oriented private sector seeking profits. Tapping into private sector capital and their capacity for management and innovation via public-private partnerships is essential for considerations of scaling-up and transitioning to full-cost recovery models. Public-private partnerships (PPPs) are a well-established means of providing infrastructure and services that public entities have neither the resources nor expertise to supply alone. Under the model described here, a PPP can become a win-win protocol where the public sector gets the opportunity to improve waste management services (waste collection, transportation and proper treatment or disposal) with collaborations from the private sector, while the private sector is given the opportunity to bring a waste business into existence as a profitable endeavour.

For large-scale composting operations, a suitable PPP arrangement could be where: a) the public sector constructs the infrastructure and provides the capital cost for equipment for composting; and b) private sector brings in operational capital and suitable management skills to operate the facility. Under the agreement, the private entity pays a monthly service fee to the public entity for using the already set-up composting infrastructure such as land, machines, composting facility. The public entity in turn collects the waste and pays tipping fees to the private entity for disposal and processing of the municipal solid waste. Under the management contract, the private business entity bears the cost of operation and maintenance. The PPP can establish satellite compost stations to produce compost at vintage points closer to local markets, to minimize transportation costs both for waste collection for the public entity and distribution of compost for the private business entity. This will allow them to sell compost at a flat rate exclusive of transport charges, while traders/retailers can add transportation cost and their own price mark-up to the final sale prices. In addition to compost, recyclables and fuel pellets can be sold to recycling companies and businesses, respectively to increase their revenues and achieve full-cost recovery/profits.

While the potential opportunities of the PPP model are increasingly clear, PPP contracts can be relatively more complicated than conventional procurement contracts. This is because oftentimes all possible contingencies that could arise in long-term contractual relationships are not anticipated beforehand. The sustainability of the model will thus depend on concessions and incentives such as (i) tax assignment and grants for segregation; (ii) advertisement rights for segregation at collection centres; (iii) unit cost payment for collection and transport; (iv) making land available for disposal; (v) buy-back of composting; (vi) tax holidays and other incentives; and (vii) carbon credits, being clearly outlined and agreed upon (ADB, 2011).

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Scenario II: Carbon credits

The PPP model fits best where capital and management skills of a private entity can help fill capacity gaps of the public entity. Yet full-cost recovery in the PPP model may still remain elusive at least during the initial years, where economies of scale are not fully realized, and compost prices are still higher than that of subsidized chemical fertilizers. The sale of carbon credits can represent an alternative revenue stream, especially for PPP entities who are still unable to achieve financial break-even and dependent on government financial support. This business model typically requires partnerships/ engagements with the local government, national environmental management authorities, private entities and international partners. The application process for carbon credit sale can be lengthy and costly; and in view of volatile market prices, the net return should be taken into account prior to investing in the process.

E. Potential risks and mitigation

The business model presented here was designed and optimized based on the analysis of different case studies (see previous sections). In designing this optimized business model, risks related to safety, local acceptance by the community and business attractiveness for investors were assessed.

Market risks: Risks in the input market are very low as the public entity typically owns the city's waste or is granted exclusive rights by governmental authorities. On the output side, the main risk relates to competition in the 'larger' fertilizer market.

Competition risks: Competition as noted under 'market risks' stem from price distortions in the output market where the compost products compete with often subsidized chemical fertilizers. Product innovation to increase compost nutrient levels, branding via certification, free samples and field trials can help mitigate the negative effects of competition. Satellite composting stations in vantage points and close to its key customers can improve market penetration.

Technology performance risks: The composting technology traditionally used is windrow composting. Depending on the scale, components of the process (e.g. waste segregation) can be mechanized for efficiency. This however implies increased energy requirements which can be costly and if there are energy shortages represent a key challenge for performance. Additionally, the need for advanced-skilled labor represent increased operational costs. On the other hand, if more labor-intensive processes are used, then labor availability (including skills set) and related costs have to be taken into account.

Political and regulatory risks: It is important to note however that policies and regulations differ from country to country and so whilst reuse of fecal sludge may be permissible in Sri Lanka, it may not be allowed elsewhere. Thus, it is important that national and local guidelines and policies are adhered to. Specific to this model, there are low regulatory risks as the public entity will only engage in resource recovery initiatives that are permissible by law as they are financed by public funds. Thus, the plants' practices are very likely to follow the outlined national/local guidelines and policies on waste management activities, and compost product safety.

Social equity related risks: Consideration of the set-up of decentralized waste resource centres for recyclables may offer informal workers the opportunity to sell the segregated recyclables they collect to the plant. This value proposition in particular extends the model to be inclusive and provides indirect employment (income) to people that would otherwise be unemployed. On the other hand, however, improved waste collection, segregation and recycling may limit informal workers access to waste value chain and invariably, income.

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Safety, environmental and health risks: The compost product should meet the minimum nutrient level requirements outlined in the respective national/local guidelines via regular quality monitoring. There are potential health risks to different actors along both the sanitation and agricutural value chains, associated with the collection, treatment, processing and use of human excreta (Table 35). In particular, workers that collect the fecal sludge and composted materials and consumers of food products grown with waste-based compost are the groups with the highest level of risk. The provision of protective gear for chamber-empyting operations should be mandatory. From the consumer perspective, microbial testing should be a routine measure for quality assurance of the compost product. Additionally, farmers must be trained on the appropriate application methods for the waste-based fertilizer products. Recommendations of national agriculture agencies must also be implemented in tandem, in association with agricultural extension agents.

TABLE 35. POTENTIAL HEALTH AND ENVIRONMENTAL RISKS AND SUGGESTED MITIGATION MEASURES FOR BUSINESS MODEL 10

RISK GROUP	EXPOSURE					REMARKS
	DIRECT CONTACT	AIR/DUST	INSECTS	WATER/ SOIL	FOOD	
Worker						Risk of sharp objects in MSW and fecal contamination Potential risk of dust, noise and chemical compost contaminants
Farmer/user						
Community						
Consumer						
Mitigation Measures						

Key ☐ NOT APPLICABLE ▒ LOW RISK ▒ MEDIUM RISK ■ HIGH RISK

F. Business performance

The model ranks highest on scalability and replicability as it has a strong potential for implementation in medium and large cities (Figure 133). Depending on the scale of operations, adaptation to the technology and market development may be required. This model is ranked high on environmental and social impact partly due to the large quantities of waste collected and processed which results in reduced indiscriminate waste disposal, reduced human exposure to untreated waste, reduced GHG emissions from landfills and the opportunity for job creation. The inherent dependence on government for financial support makes the model rank very low on profitability. Although generally geared only towards partial cost recovery, the model has potential to transition into full-cost recovery and even profit-making under public-private partnership agreements. The low ranking of the innovation criteria is mainly attributable to the simplicity of the technologies.

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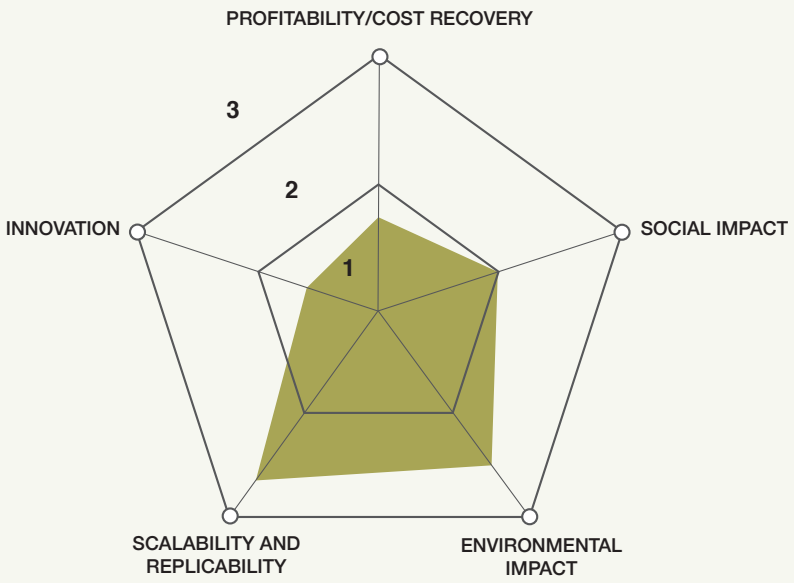
FIGURE 133. RANKING RESULTS FOR PARTIALLY SUBSIDIZED COMPOSTING AT DISTRICT LEVEL BUSINESS MODEL



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8. BUSINESS MODELS ON SUBSIDY-FREE COMMUNITY-BASED COMPOSTING

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Introduction

Towns and cities across the developing world continue to face the challenge of managing municipal solid waste (MSW). For smaller towns, the relatively easier availability of land for disposal of MSW and lower costs of transporting the waste to landfills oftentimes represent disincentives for MSW-based composting. However, many of these towns are rapidly transitioning into cities in view of exponential population growth and urbanization; and with limited public funds to support waste management infrastructure and services, there is a dire need to identify and adopt sustainable waste management measures that can handle the significant quantities of waste being generated.

Large-scale centralized composting whilst able to process big quantities of waste at a time tends to be highly mechanized and thus require hefty investments for advanced machineries, significant operation and maintenance costs and a high degree of specialized skills to operate and maintain the plants. Additionally, transportation costs can be substantial as all the waste needs to be transported to disposal facilities often located far from the city. The quality of compost tends to be poor due to the large quantities of unseparated waste with high risks of contamination. Thus, revenue generated from compost sales is often insufficient to cover the capital, operation and maintenance costs. With increasingly shrinking municipal budget for waste management, a large percentage of these compost plants have reached the end of their life cycle or in dire need of upgrade and maintenance. Sustainable funding mechanisms thus become a major factor in the success of national strategies for municipal solid management programs.

Decentralized composting systems offer several advantages over centralized large-scale systems and are increasingly been observed, particularly for secondary cities and small towns, and even large cities where the local government can allocate land. Adopting a labor-intensive, cheap and low technological approach, the business does not require a large capital investment (except for land purchase) or state-of the art machinery, which removes one of the major constraints for business start-ups especially in the developing world context. The decentralised composting approach reduces transportation costs and makes use of low cost technologies based on manual labor and ensures that waste is well-sorted before it is composted. This minimizes many of the problems and difficulties that have led to the failure of large centralized composting plants in the past. There is great potential for the upscaling of this model due to its simplicity. However, poor management and incentives to entities operating the decentralized units often results in poor quality compost (low market demand) and misappropriation of funds, which invariably causes the plant to fail. Studies have shown that whilst most decentralized composting businesses have a non-profit seeking model, these constraints limit cost-recovery and additional public funding is oftentimes required to bridge the financial gap.

Business models with inherently sustainable funding mechanisms (i.e. profit-making model), such as a **subsidy-free community-based** composting initiative, are necessary. As an example, a cooperative model approach to decentralized composting creates a greater incentive for community participation. There is a higher probability of success as benefiting communities are involved in waste collection, separation and composting, plant management and ownership. The sustainability of this model is grounded in strong partnerships and the assured benefits (profit-sharing) accruing to each partner. Voluntary participation via membership fee payments are indicative of the commitment of members and thus ensure success of the enterprise. Municipalities have an incentive to support communities in finding composting sites, developing a proper system for waste collection and disposal of residues, and providing land and funds for construction of composting plants as these initiatives alleviate them of the burden of solid waste management.

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In this chapter, we present the business model and a case example that show the concept of subsidy-free community-based composting, and the notable potential it offers by organizing communities into a *cooperative.* The presented case study shows that subsidy-free community-based composting offers a solution for turning waste into wealth, but requires investments in social capital to organize and mobilize the communities.