BUSINESS MODEL 12

Large-scale composting for revenue generation

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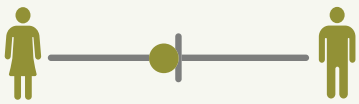
A. Key characteristics

Model name	Large-scale composting for revenue generation
Waste stream	Municipal solid waste (MSW), minor percentage of agro-waste
Value-added waste product	Recovered soil nutrients in the form of compost from MSW to address dual challenge of soil nutrient depletion and waste management
Geography	Any urban centre, assuming availability of land for plant construction
Scale of production	Medium to large scale; minimum plant size processes 60–100 tons of MSW per day, with a maximum size of 1,500 tons per day
Supporting cases in this book	Delhi, Ludhiana, Karnataka in India; Dhaka, Bangladesh
Objective of entity	Cost-recovery [ ]; For profit [X]; Social enterprise [X]
Investment cost range	USD 415,000–1.5 million depending on technology used and pay-back period of 2 to 7 years
Organization type	Public, private, public-private partnership, or social enterprise/entity
Socio-economic impact	Environmental benefits from reduced nutrient release into soils and waterbodies from reduced chemical fertilizer use, reduced GHG emissions via reduced production of chemical fertilizers and landfill emissions, reduced human exposure to untreated waste, improved waste management services, cost savings to municipalities from reduced land acreage for landfills and disposal costs
Gender equity	Employment generation for the urban poor, including women. Technology-wise no particular (dis)advantage for any gender 

B. Business value chain

This business model rests on the notion that there is great potential for addressing the dual challenge of waste management and to some extent nutrient soil depletion via the recovery of nutrients from municipal solid waste (MSW) in large urban areas of developing countries. It is important to note that although the former may be the main driving force given the widening service gap between provision of waste management services and municipalities' budgets and infrastructural capacities an equally important driver is the increasing need for environmentally friendly and cost-effective fertilizer alternatives for agricultural producers. Thus, the opportunity of increased cost savings from reduced transportation costs and landfills as well as revenue generation and even profit making explicitly represents opportunities for different entities to engage in compost production from MSW.

A myriad number of constellations based on different scales of production, technologies, business strategies, partnerships, financing, among other factors, exist for this model. This business model

can be initiated by a public, private entity, public-private partnership or a social enterprise to provide sustainable solutions for urban waste management issues and produce value-added products and services that generate significant benefits to several actors in both the sanitation and agricultural value chains. The goal of profit maximization via increased revenue generation drives the business strategies that the entities institute which is hinged on: a) portfolio diversification (multiple-revenue stream approach); and b) strategic partnerships.

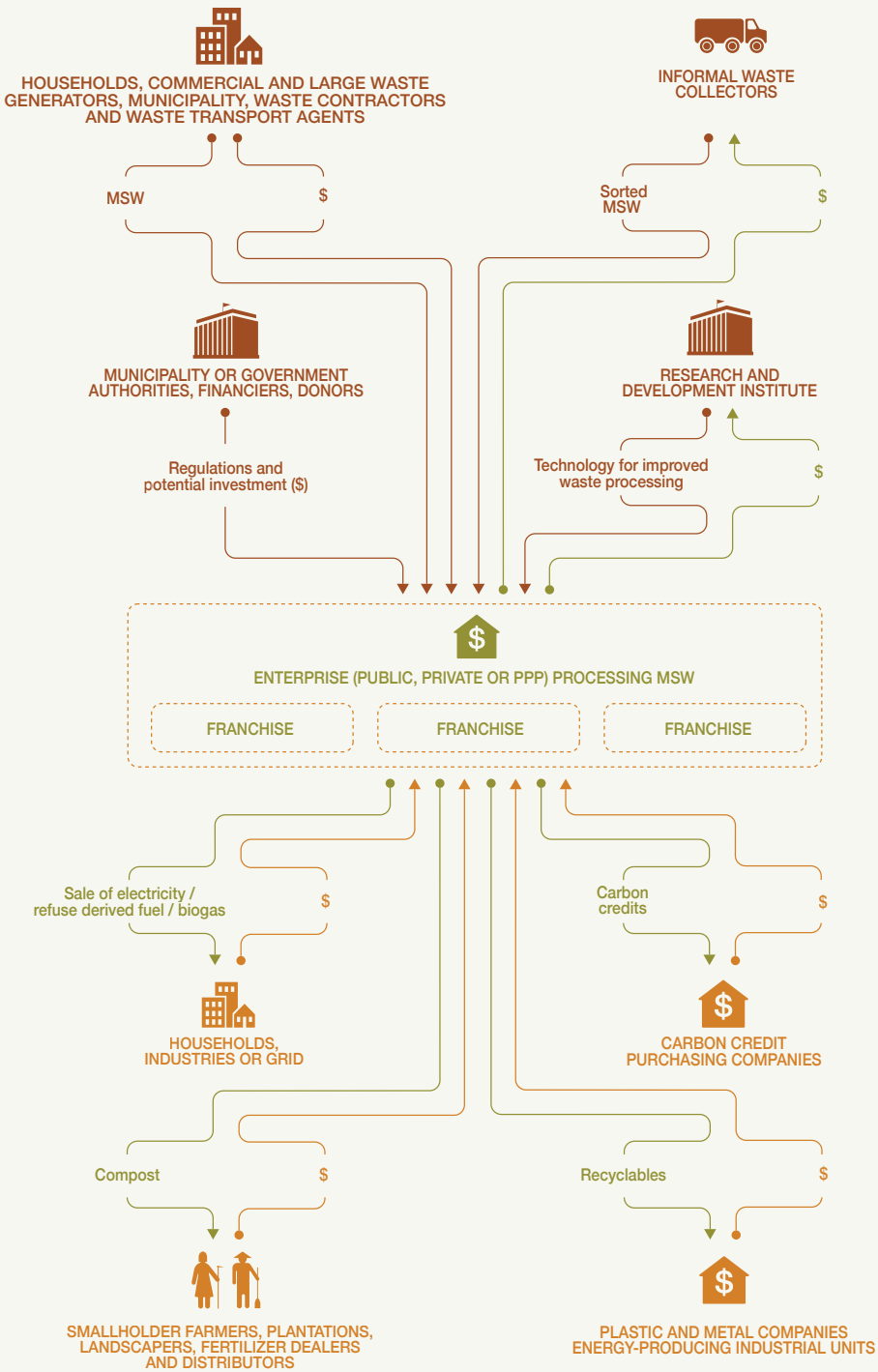
Whilst the core business centres on provision of waste management services and fertilizer alternatives to agricultural producers and generates revenue from: a) waste collection fees charged to the municipality, households or commercial entities; b) sales of organic fertilizer products; c) sales of recyclables; by leveraging its scale, additional revenue streams that can be tapped into are sale of energy (electricity, biogas) and carbon credits. Businesses can also implement a franchise-based approach to increase their revenue streams and capture additional markets. A typical arrangement can include the following: a) the franchiser provides training on technology and management for compost production on a (discounted) fee basis; b) the franchisee sells the compost to the parent company who (can further add-value to the compost) markets and distributes the compost through its established distribution networks or those of its partners. Profits are shared between the franchiser and franchisee depending on agreed percentages outlined in contractual agreements.

Large-scale operations, whether through centralized or decentralized systems, offer the opportunity to capture benefits from economies of scale. Large-scale operations using efficient technologies along the entire compost production process can reduce production costs. This implies that the business can charge lower prices for the compost product and significantly increasing their market share and additionally gain access to new markets, such as the carbon credit market which has scale requirements. Additionally, efficient energy production whether for internal use to reduce production costs or for sale typically occurs at a larger-scale. Especially in the latter case, businesses can only connect to the grid if they are able to supply a certain wattage of electricity.

Strategic partnerships on different levels with the local government, private enterprises and community-based organizations to optimize the allocation of resources and activities, reduce risk associated with high capital investments, establish an assured market for their product, among others, will be imperative for the sustainability of the model, particularly given the multiple elements (activities) of the business. Central to this business model is the enterprise initiating and implementing the model for better waste management and revenue generation, as shown in a generic value chain schematic (Figure 162). Depending on the organizational structure of the model, the ownership, financing and operation of the enterprise transforming MSW to compost can take different forms. For example, management models can include: a) municipally owned – municipally operated; b) municipally owned – privately operated; and c) privately owned – privately operated. This often translates to the mode of financing of the initiative which can be through private equity, government or donor grants or a combination of these (Kaza et al., 2016).

Particularly for PPP initiatives (for example, in the cases of ILFS-Okhla and A2Z Infrastructure Limited-Ludhiana in India), the public entity typically provides the capital investment and outsources the overall management of the plant – to include sales and marketing of the compost products to the private entity. Additionally, from a private entity's perspective, partnership with government authorities in relevant sectors provides easy access to the city's waste streams and the often well-established fertilizer marketing and distribution networks. The former implies that there is no competition from other entities in terms of input supply, ensuring continuous and unlimited access to the waste, whilst the latter increases market access for the compost products. On another front, contracting-out some of the waste collection

FIGURE 162. VALUE CHAIN SCHEMATIC – LARGE-SCALE COMPOSTING FOR REVENUE GENERATION



activities to informal waste collectors brings an inclusive element to a 'for-profit' model. This not only improves the livelihoods of landfill ragpickers by ushering them into mainstream jobs but it can allow the business to efficiently cover slum areas where poor road infrastructure make them less accessible.

C. Business model

The business model is hinged on a multiple-revenue stream approach which results in three value propositions: a) provision of sustainable and affordable waste management services to communities and businesses; b) increased supply of environmentally-friendly fertilizer alternatives to agricultural producers at affordable prices; and c) provision of recyclables to energy-producing industrial units at competitive market prices. The business model described here presumes the operation for a standalone private enterprise (Figure 163).

The provision of waste management services (i.e. waste collection) from households, commercial entities, institutions at a fee, can generate significant income. The business will however require a sound partnership agreement with the local authorities or municipality to ensure exclusive rights to the city's waste. The business additionally produces organic fertilizer products from MSW and minimally agro-waste. The main customer segments are agricultural producers who can be reached via direct sales or partner dealer networks. Given the large scale of operation, a secure market is needed for the compost. In that regard, the business has to consider innovative marketing and distribution strategies as well as product development. Strategies to be considered include: a) **partnerships** with government, agriculture departments and agro-industries, to take advantage the often well-established fertilizer distribution networks; b) **market segmentation** – different prices are charged to different customer segments to capture a larger share of the consumer surplus; c) **production innovation –** increase the accessibility and usability of compost via pelletization (as the bulky nature of compost often acts as a barrier to the transportation of the product to markets, increasing the distribution costs, which are borne by the end-users) and nutrient fortification to boost compost fertilizer value. For the latter strategy, partnership with a research institute is crucial to ensure continued product and process innovation.

This business model can also derive additional revenue from recovered non-degradable materials including high density plastics and metals that could be sold directly to the plastic and metal companies and the remaining solid materials to energy producing industrial firms for refused derived fuel (RDF). This business model adds two new stakeholders – inorganic material clients such as plastic manufacturing and energy producing commercial units using RDF, and informal waste collectors, adding value through collection and sorting of these materials, while also generating employment for these informal sectors workers including women. For large-scale operations, waste segregation into biodegradable and non-biodegradable portions is mainly a mechanized process but some level of sorting can be done by rag pickers. This model does not only improve the livelihoods of rag pickers (via assured and increased earning) but it increases coverage of slum areas where poor road infrastructure makes them inaccessible for mechanized operations. The demand for inorganic materials including refused derived fuel and plastics/metals is growing and collection costs could easily be covered through household fees. Wastes of particle size greater than 50mm can be sorted, shredded, packaged and sold partly to electricity units as well as cement, tile manufacturing and brick units. A portion of the remaining RDF material can be sold and the remaining quantities burnt to generate electricity for the business' internal use.

Alternate scenarios

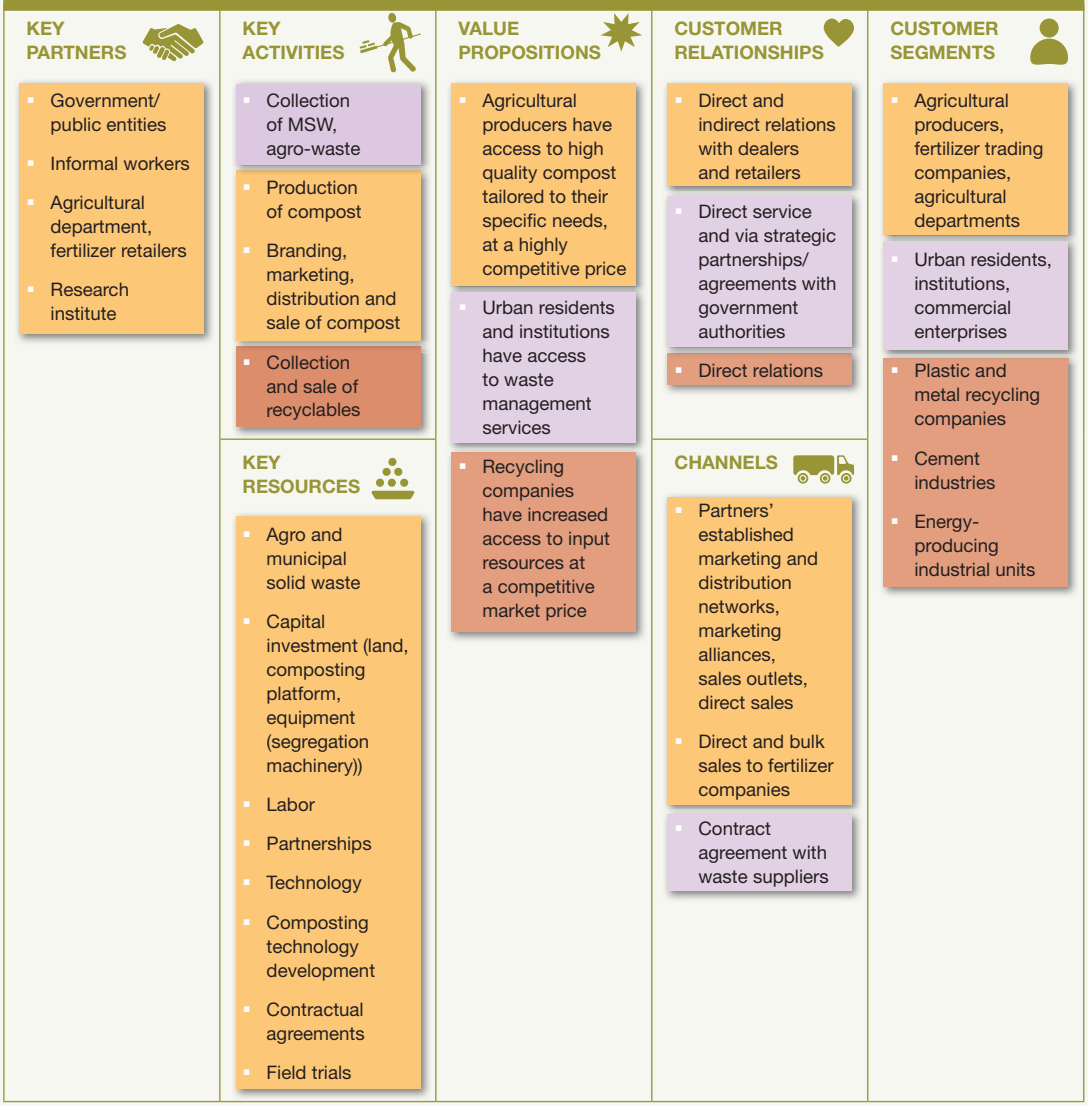
The generic business model described above is to produce compost from MSW for agricultural purposes and provide waste management services. The business can be modelled along three

different scenarios to include: a) a franchise system; b) energy (biogas and/or electricity) generation for internal use or sale to the grid; c) large-scale operations for carbon credits under the CDM.

Scenario I: Commercial establishment for composting through consultancy services and franchising royalties

This business model (Figure 164 on page 440) builds on the generic model described above. The business sets up a franchising system to its compost production component of the business to further increase its market access (in terms of provision of waste management services to communities and organic fertilizers to agricultural producers) and revenue. The multi-revenue approach adopted by the business will support its transition from a cost-recovery model to one of profit generation. In addition to

FIGURE 163. BUSINESS MODEL CANVAS – LARGE-SCALE COMPOSTING FOR REVENUE GENERATION



COST STRUCTURE

- Capital investment costs (land, infrastructure, equipment)
- Operation and maintenance costs (labor, R&D, marketing and distribution costs, administrative costs)
- Financing costs (interest on borrowed funds)
- Payment of shared revenues (if any)

REVENUE STREAMS

- Sale of compost products
- Service fees from households, institutions, commercial establishments
- Sale of recyclables
- Government assistance (if any) for compost programs under sustainable agriculture programs

SOCIAL & ENVIRONMENTAL COSTS

- Possible health risk to workers if appropriate protective gear is not used during production processes, especially when handling the raw waste
- Possible water and soil contamination if leachate from the compost production is not captured and treated appropriately

SOCIAL & ENVIRONMENTAL BENEFITS

- Reduced existing waste management costs
- Reduced human exposure to untreated waste
- Reduction of greenhouse gas emissions
- Reduced acreage for landfills
- Improved environmental health
- Enhanced soil fertility and productivity from increased use of organic fertilizers for agricultural production
- Capacity development of local farmers
- Significant job creation for the poor without any gender discrimination

earning revenue from waste management service fees, sale of organic compost and fertilizer products and sale of inorganic recyclables, they can earn franchising royalties from their franchise network operating across different locations that provide waste management products and services. Depending on if the business is a public, private, PPP or social entity, the incremental revenue (if representative of a surplus) can be reinvested in technology innovation and new marketing strategies to further improve production efficiencies and dependence on partners' distribution networks, respectively. The franchise system also creates a greater opportunity for the parent business to enter into a CDM program. This is because the parent business may only be able to meet the scale of operation requirements for carbon credits sale upon inclusion of the franchisees' operations. The incorporation of a franchising system additionally builds inclusivity into the original business model as smaller-scale enterprises (such as CBOs) gain access into the waste management sector and generate jobs/income for individuals that would otherwise be unemployed. The parent business can further earn revenue via consultancy fees charged for the design and commissioning of waste management projects for townships and commercial clients, and the training of agricultural graduates and professionals in the field of waste management and compost production.

Scenario II: Energy generation and carbon credit sales

With the inherent large scale of operations (or derived from aggregate scale of franchises, the parent enterprise can efficiently produce energy for its own onsite use or enter into a partnership with the state electricity board and sell any surplus energy to the national grid. The business' ability to tap into the energy market is highly dependent on its scale given the minimum wattage requirements for electricity sale to the national grid. Cost-savings from use of internally-produced energy imply decreased production costs, and along with the sale of electricity increased revenue generation. This model can maximize resource recovery from municipal solid waste, diversify its portfolio beyond compost production, mitigating risk associated with seasonal compost demand and marketing, and

FIGURE 164. BUSINESS MODEL CANVAS – LARGE-SCALE COMPOSTING FOR REVENUE GENERATION WITH FRANCHISING SYSTEM

KEY PARTNERS

- Government/ public entities
- Informal workers
- Agricultural department, fertilizer retailers
- Research institute

KEY ACTIVITIES

- Collection of MSW, agro-waste
- Production of compost
- Branding, marketing, distribution and sale of compost
- Collection and sale of recyclables
- Provision of consultancy and design services for turn-key waste management projects and franchisees operations
- Marketing and distribution support to franchisees facilities

KEY RESOURCES

- Agro and municipal solid waste,
- Capital investment (land, composting platform, equipment)
- Labor
- Partnerships
- Technology
- Composting technology development
- Field trials
- Contractual agreements (including franchising contracts)

VALUE PROPOSITIONS

- Agricultural producers have access to high quality compost tailored to their specific needs, at a highly competitive price
- Urban residents and institutions have access to waste management services
- Recycling companies have increased access to input resources at a competitive market price
- Increased creation of business operations for communities via franchises

CUSTOMER RELATIONSHIPS

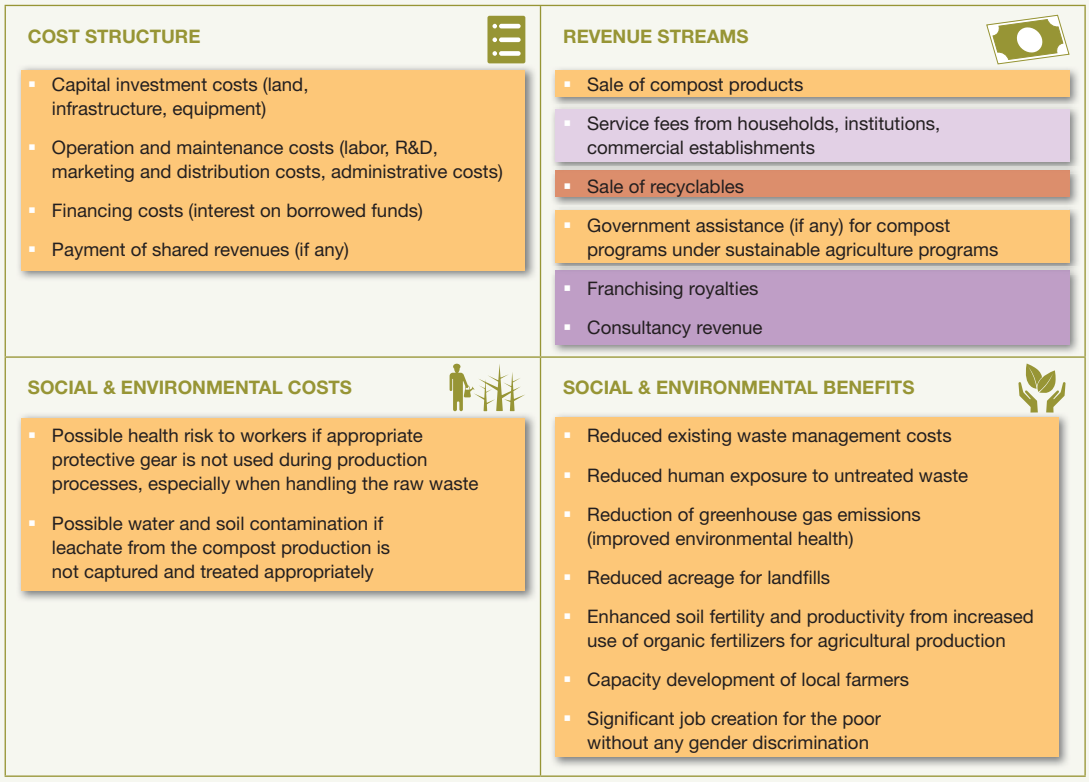
- Direct and indirect relations with dealers and retailers
- Direct service and via strategic partnerships/ agreements with government authorities
- Direct relations
- Formal franchisee agreements

CHANNELS

- Partners' established marketing and distribution networks, sales outlets, direct sales
- Direct and bulk sales to fertilizer companies
- Contract agreement with waste suppliers
- Direct sale
- Open bidding, call for tenders

CUSTOMER SEGMENTS

- Agricultural producers, fertilizer trading companies, agricultural departments
- Urban residents, institutions, commercial enterprises
- Plastic and metal recycling companies
- Cement industries
- Energy-producing industrial units
- Clients of franchise network



allow entry into the energy market. There is a great potential to improve the financial viability of the model from energy generation as there is generally a significant and growing demand for electricity in developing countries. Additionally, there are increasing opportunities for waste-to-energy entities to fill this gap based on the anticipated rapid rural electrification program; foreseeable increasing trend in electricity prices; structural and legal feasibility for private sector involvement (structural unbundling of the power sector, vertically integrated monopoly and privatization of the generation and distribution); a lesser vertically integrated market; and supportive renewable energy policies among others. It is noted however that particularly in developing countries, electricity producers are currently price takers and restricted to the price ceiling set by the state-owned transmission entity (limited negotiation ability – monopolistic market). Thus, the level of market concentration and market prices will determine whether investments in plant upgrades and equipment for energy production is worthwhile. The opportunity for waste-generated electricity can only materialize if the price offered in power purchase agreements (PPA) can substantially cover production costs and generate a net profit. The generation of energy, in addition to providing cost savings from internal use and generating sales revenues, can be accounted for carbon credit sales.

The business entity can also be registered as a CDM (Clean Development Mechanism) project to earn additional revenue from carbon credit sales to UNFCCC Annex I defined countries[1]. The composting of municipal solid waste offers opportunities for earning carbon credits through two main pathways: a) avoided GHG emissions from landfills; and b) reduced GHG emissions from reduced chemical fertilizer production and use. Carbon credits earned through avoided emissions over the base-case scenario can be sold in the global credit market to institutional and private investors (Figure 165). Carbon credits provide an additional value proposition that in most cases can help composting businesses on

FIGURE 165. BUSINESS MODEL CANVAS – LARGE-SCALE COMPOSTING WITH ENERGY GENERATION AND CARBON CREDITS SALE

KEY PARTNERS

- Government/ public entities
- Informal workers
- Agricultural department, fertilizer retailers
- Research institute
- International development agencies (for CDM process)

KEY ACTIVITIES

- Production of compost
- Branding, marketing, distribution and sale of compost
- Research and development
- Collection of MSW, agro-waste
- Collection and sale of recyclables
- Provision of consultancy and design services for turn-key waste management projects and franchisees operations
- Marketing and distribution support to franchisees facilities
- Production of biogas (bio-methanation) for internal use
- Production and sale of electricity
- Managing CDM processes to obtain emission reduction credits

KEY RESOURCES

- Agro and municipal solid waste,
- Capital investment (land, composting platform, equipment)
- Labor
- Partnerships
- Technology
- Composting technology development
- Field trials
- Contractual agreements (including franchising contracts)
- Positive (image) reporting by media on Green Economy

VALUE PROPOSITIONS

- Agricultural producers have access to high quality compost tailored to their specific needs, at a highly competitive price
- Urban residents and institutions have access to waste management services
- Recycling companies have increased access to input resources at a competitive market price
- Increased creation of business operations for communities via franchises
- Reduction in energy demand and expenditure from internal energy generation and use
- Improved energy availability to communities and businesses
- Tradable certified emission reduction to meet carbon emission commitments

CUSTOMER RELATIONSHIPS

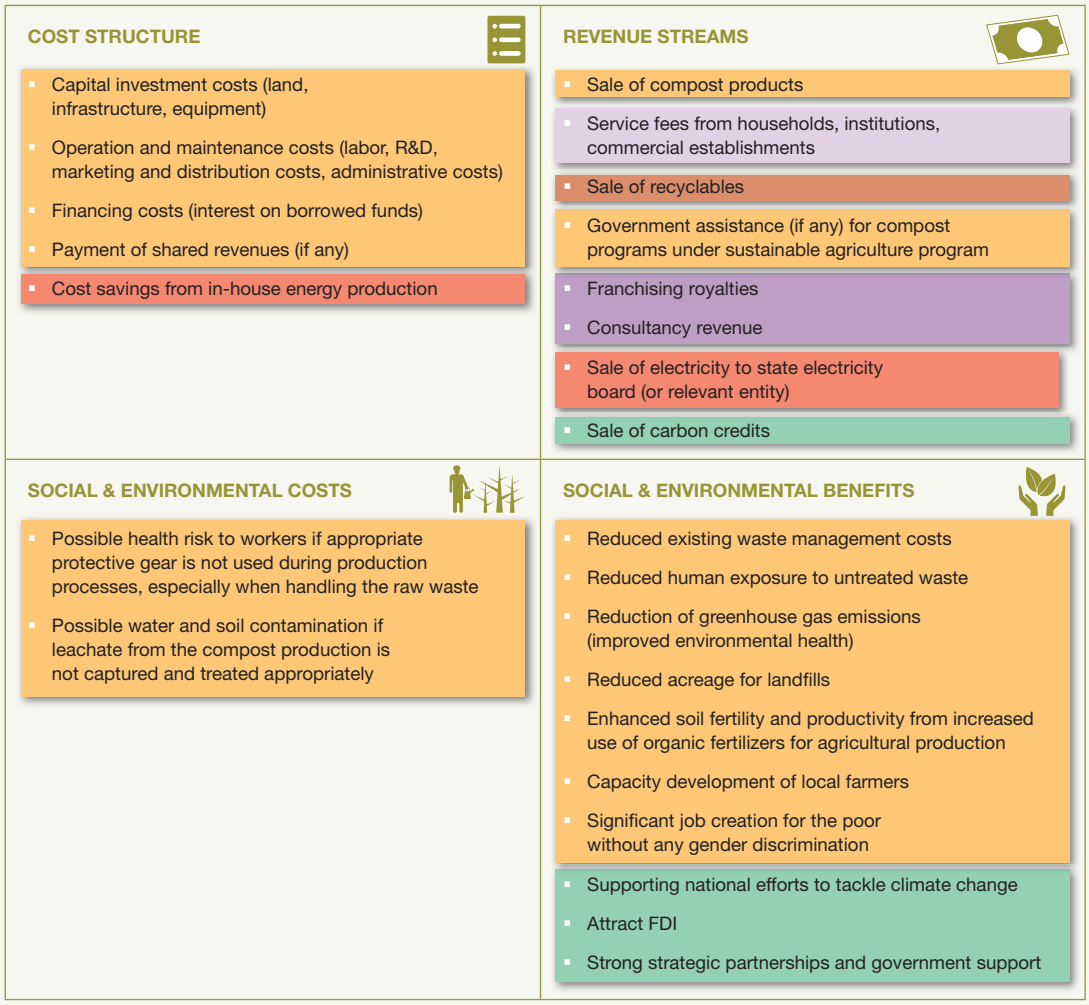
- Direct and indirect relations with dealers and retailers
- Direct service and via strategic partnerships/ agreements with government authorities
- Direct relations
- Formal franchisee agreements
- Formal contractual agreement with government
- Registered as CDM at UNFCCC

CHANNELS

- Partners' established marketing and distribution networks, marketing alliances, sales outlets, direct sales
- Direct and bulk sales to fertilizer companies
- Contract agreement with waste suppliers
- Direct sale
- Open bidding, call for tenders
- Contract agreement with state electricity board
- CDM certificate trading on international market

CUSTOMER SEGMENTS

- Agricultural producers, fertilizer trading companies, agricultural departments
- Urban residents, institutions, commercial enterprises
- Plastic and metal recycling companies
- Cement industries
- Energy-producing industrial units
- Clients of franchise network
- State electricity board
- Investors from UNFCCC Annex I countries



a trajectory for profitability. However, the application process for a CDM project can be lengthy and complicated, involving certification, verification and accreditation to ensure compliance with various international standards, and often requiring additional investments for plant upgrade or retrofits. This thus requires support from international development agencies, government entities, and other private sector entities (consultancy support for formulation and submission of the application). In view of associated risks, the net returns on investment in the CDM project have to be carefully considered.

Scale plays an important role in this model given the related requirements for carbon credit sales. Additionally, waste-to-energy generation, which can contribute to improving the eligibility for a CDM project, requires a certain scale of operation for full efficiency. See Figure 165 for a diagrammatic representation of the business model.

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: In developing countries, the composting business has the potential of being a burgeoning industry. However, there are oftentimes market entry barriers that may limit business development. The organic fertilizer market is typically less commercialized and the related market structure and business dynamics can be informal, while the inorganic fertilizer market, on the other hand, is more formal and commercialized. A market condition that would potentially affect the sustainability of compost businesses is the market power held by chemical fertilizer producers. This is because the fertilizer market can be traditionally highly concentrated – with few chemical fertilizers companies having the largest share of the market (characteristic of a strong oligopolistic market) – although a limited established distribution network represents an opportunity that organic fertilizer producers can capture.

Additionally, existing policies (e.g. price subsidies) supportive of chemical fertilizers distort market prices making compost comparatively more expensive; and making it difficult for compost producers to enter the market. New organic fertilizer businesses will need at the start-up a highly unique and differentiated product, and innovative marketing strategies to mitigate these competition effects. Furthermore, high seasonality in demand for compost may increase investment cost for storage facilities which may also imply increased operational costs. Risks related to the waste input market are relatively low for this model as it is assumed that depending on the type of entity operating the composting business (i.e. public, private, PPP or social entity), they have exclusive ownership or access (via partnership agreement) to the relevant waste streams. Another significant risk that the business needs to consider is the price volatility in the carbon market. If a business is highly dependent on carbon credit sales for its viability, then it puts its sustainability at an increased risk. As mentioned above, particularly in developing countries, electricity producers are price takers and restricted to the price ceiling set by state-owned transmission entities. Limited negotiation ability in a monopolistic/oligopolistic market puts the business' viability at risk if highly dependent on energy revenue sales.

Competition risks: Key market competition (fertilizer market) as noted above arises from policy instruments that make substitute products more affordable to farmers than compost. Additionally, competition for cheap labor will imply increasing labor wages which may imply increased operational costs for the business if the technologies/production processes are more labor-intensive than mechanized. A profit structure that is highly dependent on cheap labor exposes a business' viability to significant uncertainties.

Technology performance risks: The composting technology typically used (windrow composting) is a relatively mature and simple technology. For large-scale operations, it can be highly mechanized which implies increased investments in advanced technologies and labor costs for highly skilled labor. Additionally, given its high energy requirements, any shortage or infrequency in energy supply can significantly affect operations and in turn business viability. The option of energy generation for internal use can address this challenge. Although, it is worth noting that investments in the required technologies can be costly. Centralized operations may imply high transportation costs, however the adoption of a more decentralized operational system (e.g. via franchises) can reduce the resulting operational costs.

Political and regulatory risks: Policies and regulations related to waste-based compost sectors differ by country. The oftentimes stronger political support for chemical fertilizer use (slow phasing-out of fertilizer subsidies) and lack of specific government guidelines for the certification of compost and internationally accredited third-party certification entities can represent a significant risk to the sustainability of the business model. Furthermore, for the additional value proposition of energy generation, certain limiting factors to business development and sustainability have to be taken into consideration, particularly for developing countries: a) continued interest and large hydro-power potential; b) significant interest in small hydro-power projects; and c) waste-to-energy projects currently viewed as high-risk ventures by financial investors. While producer prices can be increased, additional

market failures inherent in the energy sector can only be rectified with the institution of sound policies. Additionally, even with fairly easy entry into the energy market, transaction cost associated with long negotiation processes can be representative of a barrier to market entry. Additionally, high capital requirements and difficulty in accessing funds can be a disincentive for new businesses. By nature of the industry, the lead time for projects can be long and the cost of loan appraisal huge, especially for small projects. Lenders often tend to be concerned about government's interference in the tariff review process and which can increase the tariff risk (regulatory risk) and viewed as reducing businesses' repayment ability.

Social equity related risks: Similar to Business Model 11, this model does not result in any clear social inequity risks. On the other hand, with an extensive reach across the MSW value chain, it has the potential to generate thousands of jobs among the urban poor, particularly for women who are traditionally known to engage in waste segregation. On another front, contracting-out some of the waste collection activities to informal waste collectors brings an inclusive element to a 'for-profit' model. This not only improves the livelihoods of landfill ragpickers by ushering them into mainstream jobs but it can allow the business to efficiently cover slum areas where poor road infrastructure make them less accessible.

Safety, environmental and health risks: On one hand, the simplicity and labor-intensive technology of large scale MSW composting can offer many job opportunities for unskilled workers. On the other hand, MSW is usually contaminated by fecal matter ("flying toilets") and thus poses a higher risk of pathogenic exposure, aside physical hazards (glass, metal) for workers, as well as possible chemical contaminants which might enter the compost and food chain. The provision and use of protective gear for all production operations should thus be mandatory. From the consumer perspective, microbial testing should be a routine measure for quality assurance of MSW compost products. 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. To address safety and health risks to workers, standard protection measures are required as shown in Table 41.

TABLE 41. POTENTIAL HEALTH AND ENVIRONMENTAL RISK AND SUGGESTED MITIGATION MEASURES FOR BUSINESS MODEL 12

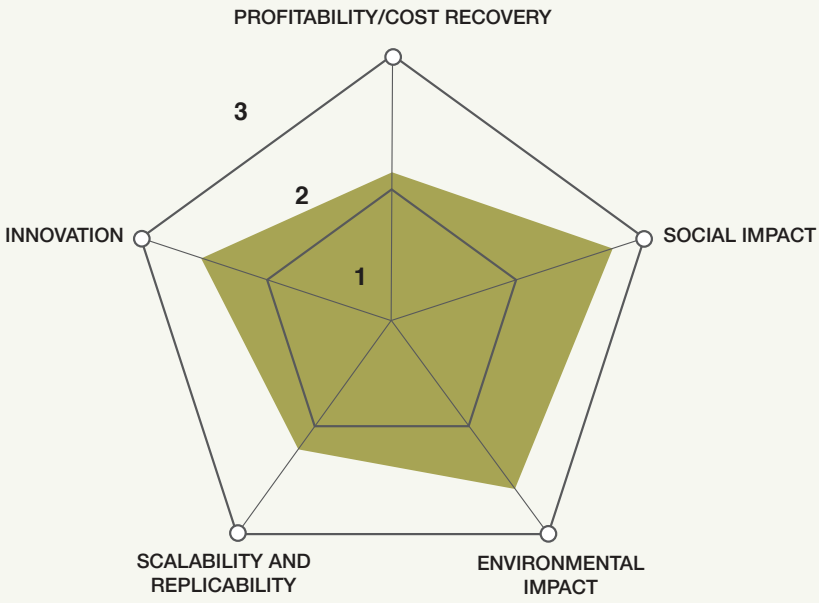
RISK GROUP	EXPOSURE					REMARKS
	DIRECT CONTACT	AIR/ DUST	INSECTS	WATER/ SOIL	FOOD	
Worker						Risk of sharp objects in MSW and fecal contamination Potential risk of dust, noise, and chemical compost contaminants
Farmer/user						
Community						
Consumer						
Mitigation Measures						

Key: NOT APPLICABLE; LOW RISK; MEDIUM RISK; HIGH RISK

C. Business performance

This model ranks high on profitability and this is attributable to the multiple-revenue stream approach it implements (Figure 166). By diversifying its portfolio, the business is able to mitigate risks, for example, associated with seasonal compost demand, with a combination of revenue generation from sale of energy, carbon credits, recyclables, waste collection service fees and franchise royalties. This model is ranked high on social impacts due to benefits to the wider society in terms of providing sustainable waste management services and nutrient recovery as organic fertilizer for reuse to support more productive and sustainable farming, also generating new jobs for people. The model ranks high on environmental impacts due to its role in protecting public health and the environment by significantly reducing GHG emissions from landfilled waste, waste disposal costs and (large-scale operations) and contributing to soil health while restoring degraded and exhausted soils. The model also ranks high on innovation in terms of adaptation of technology to local conditions and innovative partnerships and pricing strategy, but lower on scalability and replicability due to large capital investment requirements.

FIGURE 166. RANKING RESULTS FOR THE BUSINESS MODEL ON LARGE SCALE COMPOSTING FOR REVENUE GENERATION



References and further readings

Kaza, S., Yao, L., Stowell, A. 2016. Sustainable financing and policy: models for municipal composting. Urban development series Knowledge Papers 24. Washington, D.C.: World Bank Group.

Note

1 Industrialized or transitional economies as listed in Annex I of the United Nations Framework Convention on Climate Change (UNFCCC).