CASE

Inclusive, public-private partnership-based municipal solid waste composting for profit (A2Z Infrastructure Limited, India)

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Supporting case for Business Model 12	
Location:	Ludhiana, India
Waste input type:	Municipal solid waste (MSW), High density inorganic material
Value offer:	Provision of waste management services, high quality compost and renewable energy
Organization type:	Private (with several public-private partnership projects)
Status of organization:	Operational since 2011
Scale of businesses:	900 tons of municipal solid waste / day
Major partners:	Ludhiana Municipal Corporation, Indian Potash Limited, Indian Farmers Fertilizer Corporation Limited, Krishak Bharti Cooperative Limited

Executive summary

A2Z Infrastructure Private Limited (A2Z-PL), established in 2011, is a subsidiary business of the A2Z Group – one of India's leading waste management companies. With a core mandate to provide sustainable waste management solutions to municipalities across India, A2Z-PL operated at the time of the assessment 21 integrated resource recovery facilities (IRRF) across India, processing in total 8,000 tons of municipal solid waste (MSW) per day. One of such projects, which has shown significant success is the 900-ton IRRF in Ludhiana, Punjab. With a partnership agreement with the Ludhiana Municipal Corporation (LMC), A2Z-PL is contracted to collect, transport, process and dispose the MSW in five jurisdictional zones in Ludhiana. Their activities have so far had an immense impact in addressing the health and environmental problems associated with the open dumping of waste. A2Z-PL's success is based on a solid business model grounded in five principles: 1) self-sustainability via a multi-revenue stream approach; 2) using an integrated and inclusive approach via synergies in business operational activities and a public-private partnership (PPP); 3) zero tolerance for compromise of product quality; 4) maximum resource derivation; and 5) strict compliance to regulations. The Ludhiana business generated an annual net profit of 25–30 million Indian Rupees[1] (Rs.) in 2012. This mainly came from the sale of recovered resources – compost, high density plastics and metals as the total cost of waste collection, provision of bins, transportation and processing is

equivalent to the revenue made from the provision of such services at Rs.395 per ton, a cost borne by the municipality. With a business model that cuts across the entire MSW value chain, the Ludhiana business employs about 300 people of which 70% are unskilled laborers. This has improved the livelihoods of landfill ragpickers by ushering them into mainstream jobs. The actitivies of the Ludhiana IRRF have substantially reduced human direct exposure to waste, reduced the municipality's waste management costs and saved several acres of landfill area.

KEY PERFORMANCE INDICATORS (AS OF 2015)						
Land use:	20 ha					
Capital investment:	USD 1,114,620					
Labor:	300 (210 unskilled, 90 skilled)					
O&M cost:	USD 5,249/day					
Output:	150 tons of compost / day					
Potential social and/or enviornmental impact:	Creation of 300 jobs, reduction of GHG emissions, waste management cost savings, improved environmental health.					
Financial viability indicators:	Payback period:	3–3.5 years	Post-tax IRR:	N.A.	Gross margin:	N.A.

Context and background

Ludhiana is a centrally located city of Punjab situated between Delhi and Amritsar. It is the industrial hub of Punjab State and the district is agriculturally advanced as the granary of India. It is the most densely populated city of Punjab with a total population of about two million. About 20% of its population is comprised of migrant laborers from Bihar, Uttar Pradesh, Rajasthan and other states, and even from Nepal. As the industrial hub of Punjab State, Ludhiana has experienced a rapid and unplanned expansion of the city, creating an increase in waste generation disproportionate with its management. Amid increasing public criticism of limited and ineffective collection systems and poor disposal practices especially in slum areas, Ludhiana Municipal Corporation entered into a 25-year PPP contract with A2Z to collect and process waste generated from five zones in Ludhiana. A2Z has taken advantage of the deficiencies in the municipality's waste management approach, increasing demand for energy and chemical fertilizer prices, and established a sound and financially sustainable waste management and reuse business. The recovery of resources from the collected waste represents opportunities for A2Z to solidify its business approach. The city's acute power shortage has created a great demand for RDF generated power, suggesting a sustained revenue stream for A2Z. Additionally, considering that Ludhiana is agriculturally advanced, the need for affordable and environmentally sustainable agricultural input options is imperative. The availability of MSW-based compost in the market offers agricultural producers an environmentally safe and cheaper fertilizer alternative. A2Z-PL believes that its activities will help address the health and environmental problems associated with poor waste management and the nexus of energy and fertilizer deficiency in India.

Market environment

Ludhiana, as most cities in India, is facing an alarming energy shortage due to increasing urbanization and industrialization. With dwindling natural energy resources in India, the demand for renewable energy sources such as bio-energy is growing, which has resulted in a demand surge for related inputs such as RDF. Although A2Z Group has established profitable businesses in many cities in India (for example, Varanasi, Meerut, Jaunpur, Moradabad, Badaun, Fatehpur, Basti, Loni, Mirzapur and Ranchi), it is relatively new in the organic fertilizer market in Ludhiana and currently penetrates a very small share of the market. The market for compost is in its nascent stage while that for substitute goods

such as chemical fertilizer has a well-established market and currently controls the largest share of the fertilizer market. Key drivers incentivizing farmers to use chemical fertilizer over more environmentally sustainable alternatives such as organic fertilizers–compost have been related to subsidy provision, and the high nutrient content and low application rate of the product. Although compost provides the dual advantage of price competitiveness and improved crop yields, these benefits typically occur on a long-term basis. For subsistence and smallholder farmers, additional incentives need to be put in place to encourage the use of compost. The Indian government has proposed phasing out the subsidy program to incentivize farmers to use chemical fertilizers more efficiently, lower related costs to the government and increase the adoption of environmentally sustainable alternatives – organic fertilizer.

Macro-economic environment

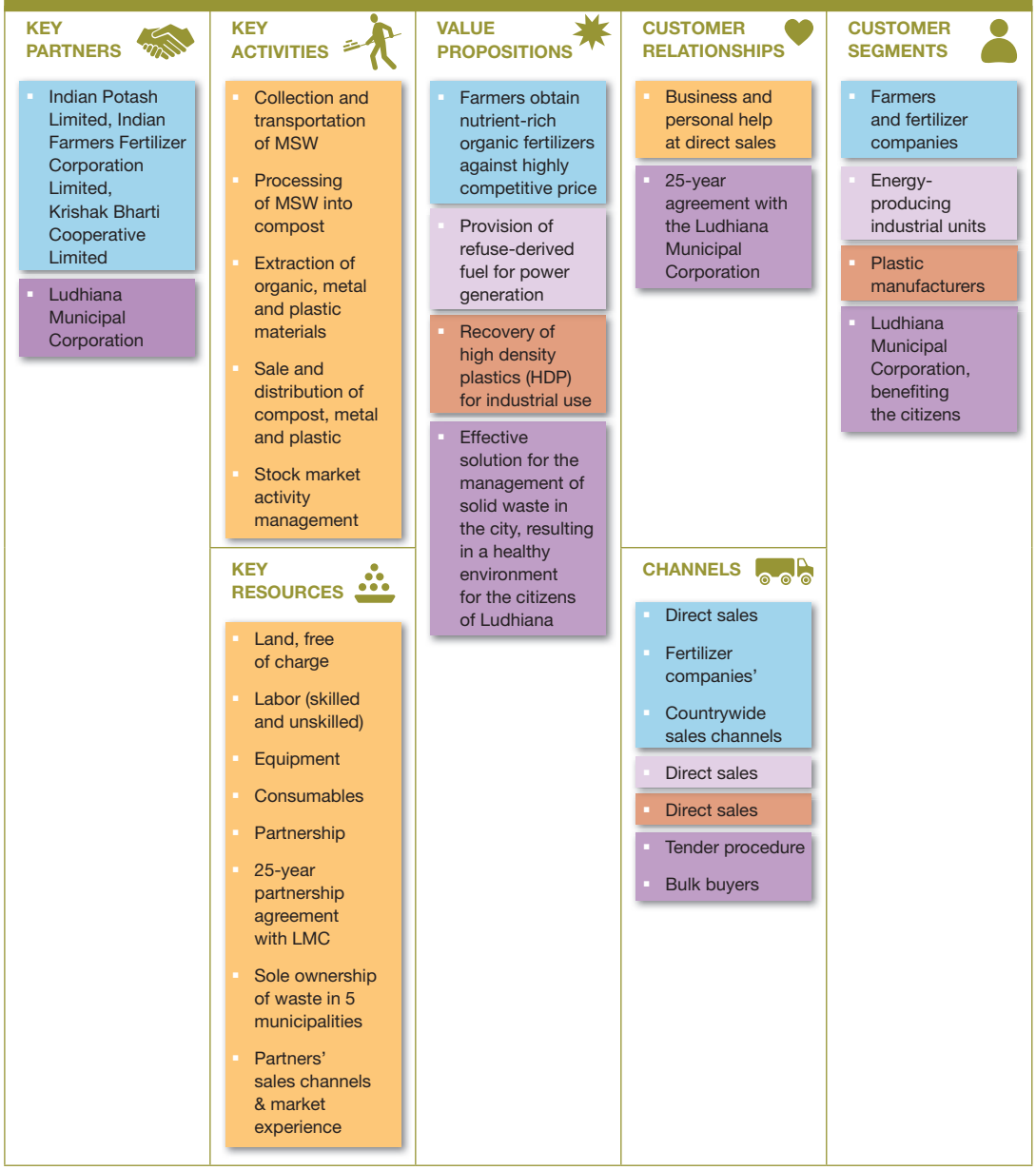
Chemical and synthetic fertilizers, particularly Nitrogen, Phosphorus and Potassium (NPK), are highly subsidized in India. The amount of subsidies on chemical fertilizer has grown in the last couple of decades from Rs.60 crore[2] during 1976–1977 to Rs. 349,980 crores in 2009–2010. Significant subsidy allocation has not only resulted in inefficient use by farmers and high costs to the government, but also significant soil degradation (NCOF, 2017). With a growing need to increase the availability and quality of bio-fertilizers and composts in the country for agricultural productivity improvement while still maintaining soil health and environmental safety, India set up a scheme to augment the infrastructure for the production of quality organic and biological inputs. As a result, the National Project on Organic Farming was birthed in 2004. This programme introduced the capital investment subsidy scheme for commercial production units for organic and biological agricultural inputs. Implemented by the Department of Agriculture and Cooperation through the National Centre of Organic Farming (NCOF), the scheme provides credit linked and back-ended capital investment subsidy equivalent to 33% of total financial outlay subject to the maximum of Rs. 60 lakh per unit, and 25% of total financial outlay subject to a maximum of Rs. 40 lakh per unit, whichever is less for bio-fertilizer/bio-pesticides production units (Ministry of Agriculture, 2011; NCOF, 2017). Policies to reduce the budget allocation for chemical fertilizers and provide capital investments for new and existing compost businesses such as these are important instruments that catalyze the business development in the RRR sector and the scaling-up of initiatives similar to that of A2Z.

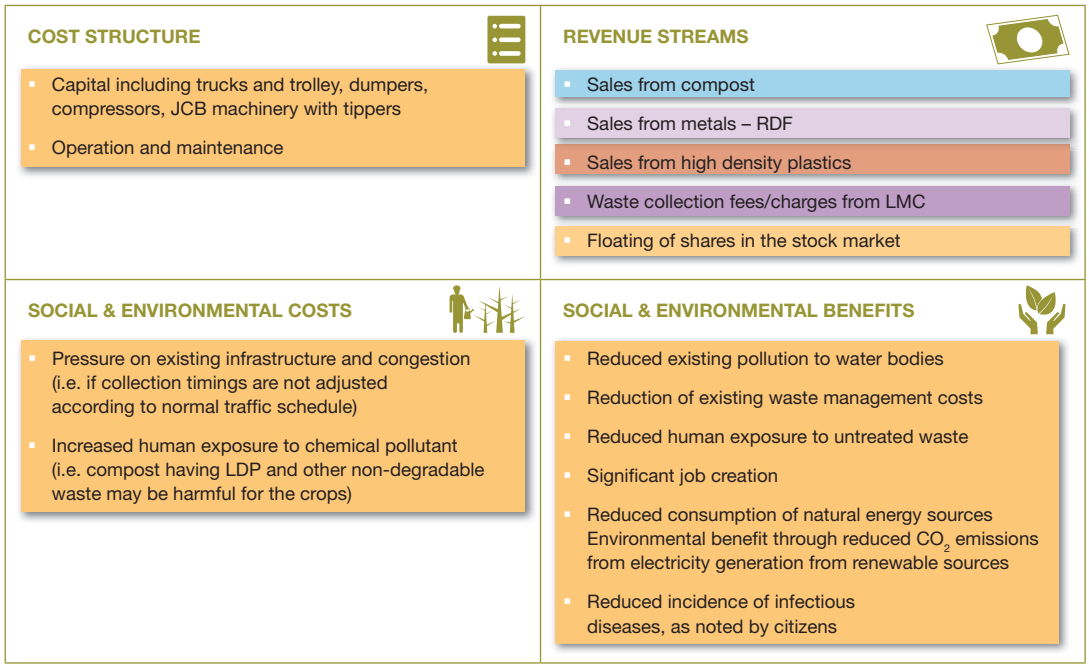
Business model

Figure 141 represents A2Z-PL Ludhiana's business model canvas. A2Z Ludhiana's business model is centred around the provision of several value propositions with its success grounded in five principles: 1) using an integrated and inclusive approach via synergies in business operational activities and a public-private partnership (PPP); 2) self-sustainability via a multi-revenue stream approach; 3) zero tolerance for compromise of product quality; 4) maximum resource derivation; and 5) strict compliance to regulations. A2Z-PL Ludhiana has a 25-year partnership agreement with Ludhiana Municipal Corporation (LMC) to collect and process all solid waste generated within the municipality. This partnership gives A2Z sole ownership, i.e. continuous and unrestricted access to waste in five municipalities and provides land free of charge for all operations. With business operations cutting across the entire MSW value chain and increasing land prices, this PPP agreement allows: 1) A2Z to diversify its portfolio, mitigating risk associated with fluctuations in compost demand; and 2) alleviates it of high initial investment costs (optimizing its allocation of resources and activities), whilst the municipality gains from effective waste collection and processing systems. Strategic partnerships with chemical fertilizer companies such as Indian Potash Limited, Indian Farmers Fertilizer Corporation Limited and Krishak Bharti Cooperative Limited allows A2Z to use their established countrywide marketing and distribution system, providing A2Z with an assured and large market base for their compost product. This has proven to be a valuable business approach given that A2Z is a fairly new entrant in the fertilizer market. A2Z-Ludhiana is however gradually increasing its market share via the

branding of its compost by ensuring to maintain a product quality surpassing the recommendations of the Fertilizer Control Order (FCO) board and selling at competitive market prices. Based on fertilizer application recommendations, A2Z's compost sold at USD 0.05/kilogram is comparatively cheaper than chemical fertilizer at a cost of USD 1. Another element to A2Z's pricing strategy is that it segments its compost market by selling to bulk buyers at USD 0.025/kg which is half of the price paid by retailers. Recovered non-degradable materials (high-density plastics and metals) are sold directly to plastic companies and industrial units. Additional revenue is earned from waste collection fees paid directly

FIGURE 141. A2Z-PL (LUDHIANA) BUSINESS MODEL CANVAS



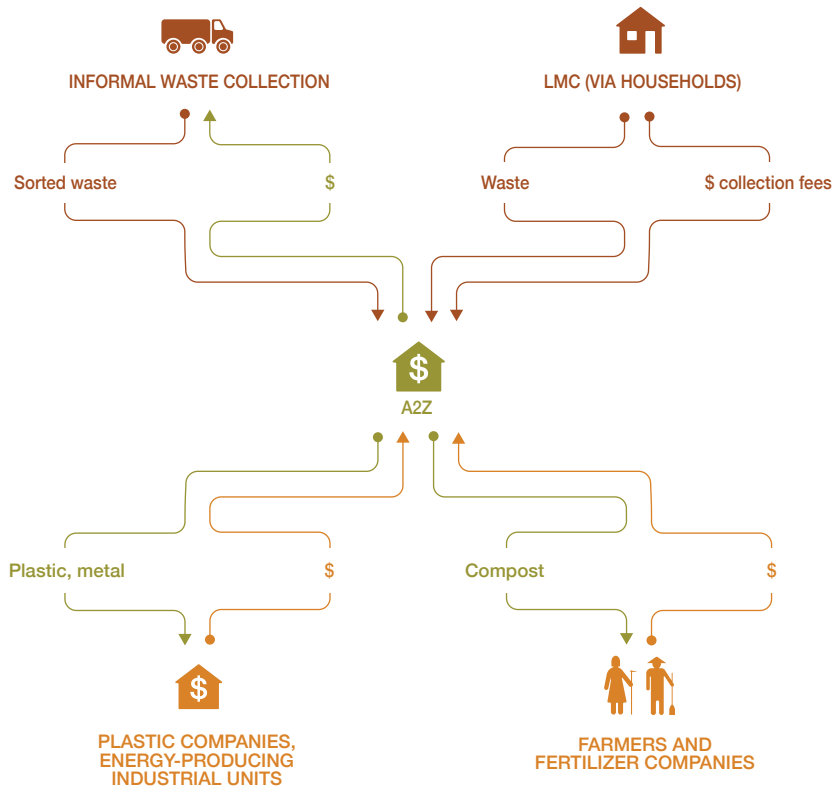


by LMC (recovered from household) at a rate of USD 7 per ton of waste collected. Also, essential to the model is the company's shares it floats in the stock market to generate additional revenue.

Value chain and position

A2Z's business operations cut across the entire MSW value chain – from collection and transportation of waste to processing and disposal. The value chain involves three key actors namely: waste suppliers – LMC and informal waste collectors; compost clients – fertilizer companies and farmers; inorganic material clients – plastic manufacturers and energy-producing industry units (Figure 142). A2Z is the focal point in the value chain. The raw material used by A2Z for compost production is municipal solid waste sourced directly from households and markets via informal waste collectors under permission from LMC. There is no competition from other entities in terms of input supply given the contractual agreement between A2Z and LMC, which ensures continuous and unlimited access to the waste from five zones in Ludhiana. A2Z contracts out some its waste collection activities to informal waste collectors. This has not only improved the livelihoods of landfill ragpickers by ushering them into mainstream jobs but has allowed A2Z to efficiently cover slum areas where poor road infrastructure make them less accessible. Compost produced by A2Z is sold mainly to chemical fertilizer companies who process the compost further or sell as is through their established distribution systems. With A2Z been fairly new in the organic fertilizer market and depending on others to access markets, they are also facing high price risk as the chemical fertilizer companies have a high buyer power. There is an increasing number of competitors – organic fertilizer businesses entering the market. Product branding strategies and field demonstrations to validate the product quality is been adopted by A2Z to gradually increase its market access and share. On the other hand, the demand for inorganic materials (i.e. RDF, high density plastics) is high and growing, although A2Z is not yet in a position where it can dictate the selling price.

FIGURE 142. A2Z-PL'S (LUDHIANA) VALUE CHAIN



Institutional environment

The institutionalization of the Municipal Solid Waste (Management & Handling) Rules 2000 has resulted in the provision of bins for households by LMC which has facilitated the collection and reuse of MSW in Ludhiana and the resulting business activities of A2Z. In terms of production, there is currently a statutory guideline – the Fertilizer Control Order (FCO) instituted by the Ministry of Agriculture and Rural Development for the production and distribution of all fertilizers including organic fertilizer. Product quality recommendations are provided for different organic fertilizer types for which producers have to adhere to. This is particularly beneficial to farmers as they get what they are paying for, but also for compost businesses as they are able to build their product brand. Although yet to be fully implemented, the phasing out of the subsidy program for chemical fertilizers by the Indian government represents an opportunity for compost producers to gain an easier entry into the fertilizer market.

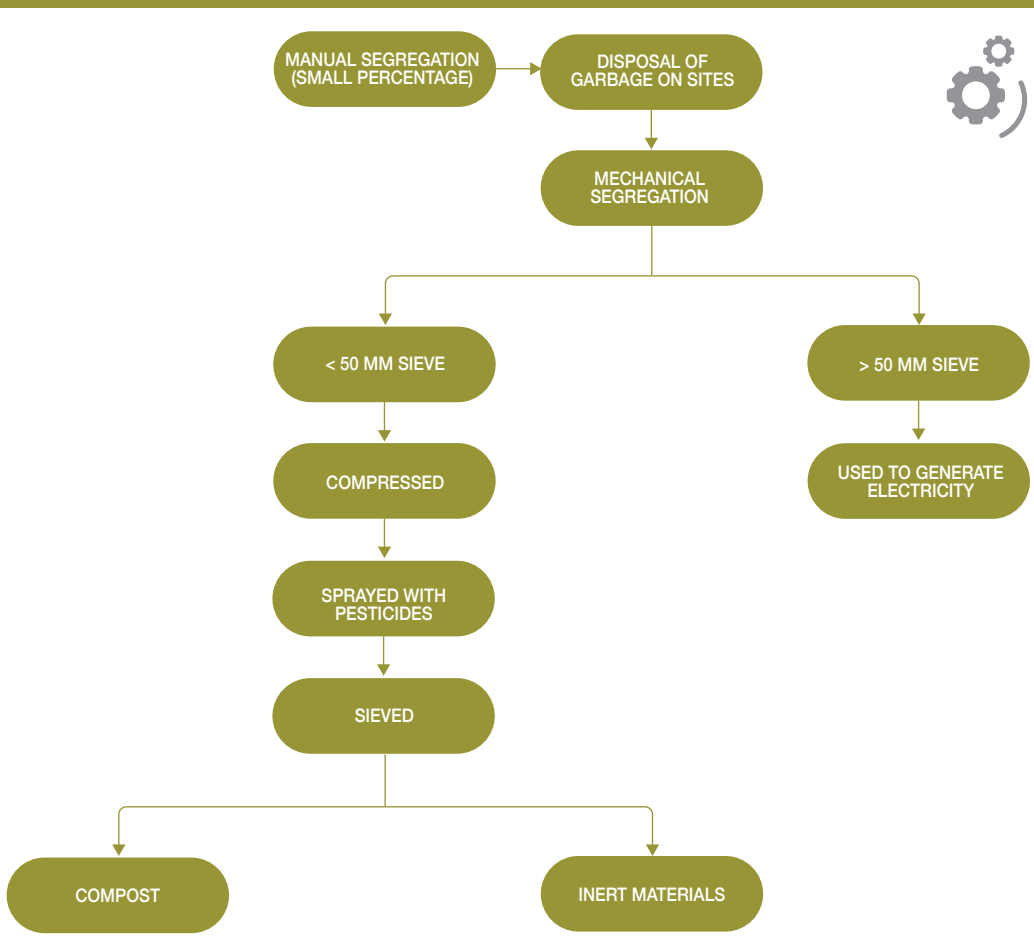
Technology and processes

Open-windrow composting system is the technology adopted by A2Z for processing MSW into compost (Figure 143). The technology has a high rate of recovery for the bulking material and thus suitable to composting large volumes of waste. Although this technology is not space efficient, it has low capital investment requirements as it is manufactured locally and has the capacity to handle large volumes of waste at a time. The first process includes collection and sorting of the waste. Sorting out waste into biodegradable and non-biodegradable portions is mainly a mechanized process although

some level of segregation is manually done by the informal waste collectors serving mainly the slum areas. Waste of particle size greater than 50mm are separated, shredded, packaged and sold partly to electricity-generating units and cement and tile manufacturers. A precentage of the RDF material is sold and the remaining is burnt to generate electricity at one of A2Z's plants at Nakodar, where 15MW electricity is generated.

The organic component of separated waste (partical size <50mm) undergoes the composting process. The waste is piled into windrows. The additional aeration from the bottom of the pile allows microorganisms to decompose the organic waste efficiently through better oxygen supply and improved temperature control. Within 24 hours the micro-organisms within the waste start to multiply and generate heat. Pile temperature increases to 55–65°C, which is optimal for aerobic composting. To enable the micro-organisms to obtain sufficient oxygen, the pile is additionally aerated by turning the waste from time to time (approximately once a week depending on the temperature reached). High temperature leads to water losses through evaporation, so additional water must usually be added with each turning. After 40 days of composting the temperature has decreased, indicating a slowing

FIGURE 143. PROCESS DIAGRAM OF A2Z-LUDHIANA



down of the process. As less oxygen is demanded, the raw compost enters the maturation phase. For another 15 days, mesophilic micro-organisms further stabilize the compost leading to the final mature compost product. The final stage involves screening the piles for undecomposed materials and unwanted products. The compost product is then bagged into different weights for sale.

Funding and financial outlook

The investment cost at the start of the business is estimated at USD 1,114,620. Land for plant operations is provided for free and on a long-term lease basis from the Ludhiana Municipal Corporation. Operation and maintenance costs comprising of wages, salaries, fuel and other consumables are estimated at USD 5,248/day. A2Z receives financial support in the form of a 10% subsidy to cover operational and investment costs offered by the Jawaharlal Nehru National Urban Renewal Mission (a city-modernization scheme launched by the Government of India under Ministry of Urban Development). A2Z generates revenue from the sales of compost, non-degradable materials (plastic and metals) and waste collection fees. Collection fees of USD 7.4/ton of collected waste paid by LMC is sufficient to exactly cover the costs of waste collection and transportation and thus surplus revenue (i.e. profit) comes from compost and inorganic materials sales. On a yearly basis A2Z-Ludhiana makes a net profit ranging between USD 465,290 and 558,348, indicating a 3–3.5-year payback period.

Socio-economic, health and environmental impact

The simple idea of converting the high organic content of the waste into compost has brought about a valuable substitute for chemical fertilizers. Overuse of chemical fertilizers has been a serious problem in India, which has led to severe soil degradation and a costly venture for the government. Farmers now have real alternatives to chemical fertilizers and have the potential to increase their per hectare yield and soil health, which will improve agricultural productivity in the long term. A2Z's activities have so far had an immense impact in addressing the health and environmental problems associated with the unhygienic collection, open transportation and dumping of waste. Ludhiana citizens have noted that the waste management activities of A2Z has significantly reduced the risk of spreading of diseases (such as malaria, diarrhoea and cholera) through the proper collection and disposal of municipal solid waste. Additionally, improved collection systems have reduced water pollution and there is limited to no indiscriminate disposal of waste into nearby flowing *Budha Nala* (water bodies) and sewer pipes. A2Z's business activities has created 300 jobs (both skilled and unskilled) and counting along the entire MSW value chain – from informal waste collectors to plant workers, reducing the level of unemployment in Ludhiana.

Scalability and replicability considerations

The key drivers for the success of this business are:

- Increasing fertilizer prices and industrial demand for power supply, which suggest a foreseeable increase in the demand for the recovered resources – RDF, compost and high-density plastic.
- Strong industrial development and agriculturally advanced status in the area go hand-in-hand, requiring a solution that works both ways.
- Strong commitment of state government in providing an enabling environment for the implementation of the public-private-partnership.
- Positive reporting of A2Z's activities and potential benefits by media.
- Widespread public acceptance of A2Z activities has facilitated their waste collection activities.
- Policy initiatives to phase-out chemical fertilizer subsidies and capital investment subsidies to new and existing compost businesses.

A2Z's model has a high replication potential in cities of developing countries with the support from external support agencies as well as local entrepreneurs. 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 machinery, which removes one of the major constraints for business start-ups especially in the developing world context. But if scaling up can be achieved, then an advanced technology will have to be adopted. Public support is needed to dismantle the existing system of paving way for systematic disposal for which public awareness is needed. Additionally, field demonstrations to validate compost product quality are necessary to increase a business's entry into the fertilizer market as oftentimes compost sales constitute a fair share of the revenue generated and thus key factor for business sustainability.

Summary assessment – SWOT analysis

Figure 144 presents the SWOT analysis for A2Z-Ludhiana. Composting is a promising business in India, although a nascent market in Ludhiana. A2Z has been particularly successful by implementing innovative business partnerships with different actors across the entire value chain. Self-sustainability has been driven by a multi-revenue stream approach and gradually gaining market share via product branding. The use of a simple technology has been key – taking advantage of cheap labor; however with increasing wages, A2Z will have to consider other alternatives with future expansion plans. Increasing

FIGURE 144. SWOT ANALYSIS FOR A2Z-LUDHIANA

	HELPFUL TO ACHIEVING THE OBJECTIVES	HARMFUL TO ACHIEVING THE OBJECTIVES
INTERNAL ORIGIN ATTRIBUTES OF THE ENTERPRISE	**STRENGTHS** ▪ Already in business and thus has experience, expertise and resources at their command ▪ Technology has limited investment and energy requirements ▪ Requires little technical skills or expertise to operate ▪ Continuous and unrestricted access to waste	**WEAKNESSES** ▪ Opposition from private sweepers and farmers close to dumping site ▪ Technology is labor-intensive (costly amid rising wages) ▪ High initial capital investment cost ▪ High cost of maintenance and repairs ▪ Dependency on door-to-door garbage collection by rag pickers ▪ Up-scaling requires adapted technology and more skilled labor
EXTERNAL ORIGIN ATTRIBUTES OF THE ENVIRONMENT	**OPPORTUNITIES** ▪ Government scheme set up for promotion of production of biological/organic fertilization products (set up a scheme to augment the infrastructure for production of quality organic and biological inputs) ▪ Mechanization of activities to increase production and economies of scale ▪ Up-scaling potential for a CDM project to earn carbon credits ▪ Replicate activities in other cities given market entry opportunities with capital investment subsidies and phasing-out of chemical fertilizer subsidies ▪ Possible phasing-out of subsidy on chemical fertilizers	**THREATS** ▪ Increasing and high cost of labor ▪ Well-established and subsidized chemical fertilizer market

governmental support along with growing demand for normal and enriched compost, spurred by the user awareness building programmes, will represent key opportunities for replication and up-scaling of the business. A2Z is an example of an innovative PPP utilizing a simple business approach to address some of the major waste management and environmental challenges in Ludhiana, India.

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Michael Kropac, CEWAS, Switzerland
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References and further readings

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Personal communication with: Sh. BPS Chauhan (Vice President), Sh. Parmod RM (Human Resources), Sh. Ravinder (Supervisor).

Case descriptions are based on primary and secondary data provided by case operators, insiders or other stakeholders, and reflect our best knowledge at the time of the assessments 2015/16. As business operations are dynamic data can be subject to change.

Notes

1 USD 1 = about INR (or Rs.) 65.62 in 2015.
2 Crore are 100 lakh, and lakh is a unit for 100,000. Rs. 60 lakh were in 2004–2012 about USD 120,000, and about USD 90,000 in May 2017.