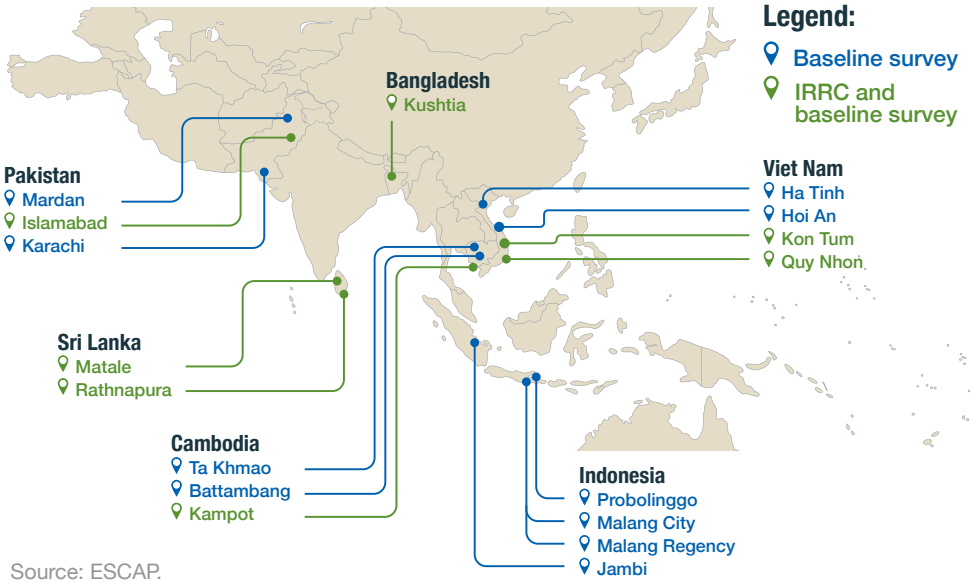
2. An inexpensive solution for transforming waste into resources: The integrated resource recovery centre

2.1 The integrated resource recovery centre model

ESCAP began developing the IRRC model across the Asia–Pacific region in 2007 after a regional assessment of viable low-cost and low-technology solid waste management practices that can thrive in unique conditions cited it as exemplary. Having been conceived, tested and refined in Dhaka, the IRRC approach was found to be robustly suited to the realities of low and middle-income cities.

In 2009, ESCAP launched a regional project called the Pro-Poor and Sustainable Solid Waste Management in Secondary Cities and Small Towns in Asia-Pacific. Under this project, ESCAP and Waste Concern, in partnership with national and local governments, community groups and technical teams, promoted the IRRC model in 17 cities, ultimately establishing facilities and pursuing associated activities in seven of them (Figure 4).

Figure 4. ESCAP-promoted integrated resource recovery centres



Source: ESCAP.

2.2 Why integrated resource recovery centres are versatile solutions

IRRCs provide communities and governments with a practical, affordable and decentralized alternative for sustainable solid waste management. The centre is a small-scale facility that can receive different types of waste, including organic and inorganic waste, and then transform it all into resources, such as compost, biogas and other fuels and clean recyclable material. The model relies upon the separation of waste at source and involves community engagement. Because it is based on the sale of resources produced in the facility as well as other sources of revenue, such as collection fees, sustainable operations and cost-recovery are possible.

The IRRC model can help cities manage municipal solid waste in a more efficient and effective manner because it:

- comprises both physical facilities and social systems;
- provides a low-cost mechanism for transforming organic and recyclable waste into valuable resources and thus generates revenue;
- utilizes simple technology and is non-mechanized;
- engages communities in behaviour change for separation of waste at source;
- offsets cost and land needed for landfills;
- brings a range of social, environmental and economic benefits; and
- is uniquely suited to the realities of cities in developing countries.

Box 1. Conception and development of the first integrated resource recovery centre

In the early 1990s, Dhaka struggled with immense volumes of waste, much of which was dumped illegally, generating a range of public health, environmental and economic problems. A new approach to solid waste management was drastically needed. Noticing the high percentage of organic material among the city's waste, Iftekhar Enayetullah and Abu Hasnat Md. Maqsood Sinha, co-founders of Waste Concern, an NGO based in Dhaka, realized the potential of composting.

"As in many tropical countries, Dhaka's climate speeds up the process of decomposition," explains Iftekhar Enayetullah, co-founder and Director of Waste Concern. "The heat and moisture in the air mean that organic matter tends to decompose quickly."

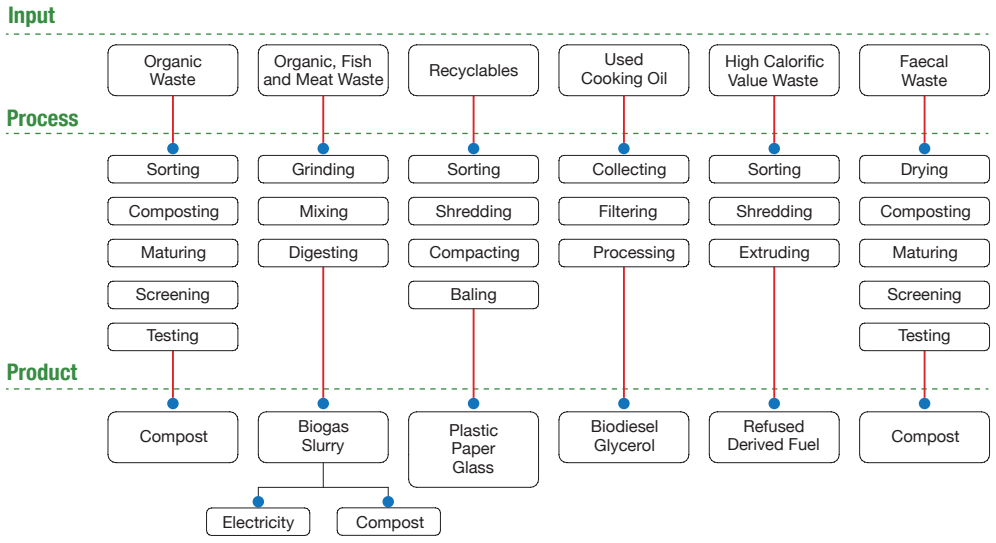
When Waste Concern developed the first IRRC in 1994, it could receive 3 tonnes of organic waste per day for composting. Since then, IRRCs have become increasingly popular in many Bangladeshi cities and across the Asia–Pacific region, capable of managing up to 20 tonnes.

"We confronted many challenges when we first started working. Compost had a bad reputation in Bangladesh, mainly because there were so many poor-quality compost products on the market," says Abu Hasnat Md. Maqsood Sinha, Waste Concern's other co-founder and its executive director. Through the IRRCs that it operates, Waste Concern ensures a high-quality compost product, which has slowly but surely won over the market. Now Waste Concern distributes its compost to farmers and gardeners all over Bangladesh and even to India and other countries.

2.3 How integrated resource recovery centres transform waste into resources

The IRRC transforms waste into resources using a range of techniques, such as organic composting and gas capture, and the processing of clean recyclable materials, such as glass and plastic. The specific techniques used in a particular facility depend on the waste composition and the needs and limitations of the communities and city that it serves. Generally, the techniques used in IRRCs are simple and straightforward, and this simplicity constitutes one of the main strengths of the model (Figure 5). Facility capacity ranges between 2 and 20 tonnes, requires minimum mechanization and incurs low operational costs.

Figure 5. Common techniques used in integrated resource recovery centres



Source: Adapted from Waste Concern.

Beyond cleaning recyclable inorganic material, there are five main techniques used in the IRRC model:

- ***Composting organic waste***. This is the most common process used in an IRRC. For a typical 3-tonne capacity plant, 12 perforated composting boxes are built of bricks, and each box can accommodate 15 tonnes of organic waste. Excess water and leachate drains from the biodegrading waste in the boxes and is collected and channelled to tanks for processing. For composting to be successful, incoming waste must be organic and non-contaminated. The composting process must also be closely monitored to ensure that the right temperatures are reached to kill any pathogens, germs or weeds in the organic waste.

- ***Co-composting organic waste with faecal sludge***. Another option is to jointly compost organic waste and faecal sludge collected from septic tanks and pit latrines. In this process, faecal sludge is transported to the co-composting plant where it is pumped into large shallow pools, called drying beds. Here the sludge separates into solid and liquid matter. The liquid passes through cocopeat filters for cleaning and then is released when it meets water-quality standards. The solid matter remains in the drying beds, where it dries before being added to the wet organic waste during the composting process described above.

- ***Producing biogas from organic waste***. Still another option is to use organic waste to produce biogas through anaerobic digestion, which is decomposition without oxygen. Biogas, which is a mixture of methane and carbon dioxide, can then be used as a cooking fuel or to generate electricity. For anaerobic digestion to be successful, incoming organic waste must be of high quality and contain no inorganic matter.

- ***Producing refuse-derived fuel***. Material that does not work for composting or biogas production can be used to make refuse-derived fuel (RDF). In this process, combustible materials are sorted from other waste types and crushed and shredded into a uniform size. They are then dried and compacted to form a small pellet, or RDF. RDF can be used as an alternative to fossil fuels, especially coal, in certain industries, such as cement factories and brick kilns.

- ***Producing biodiesel out of used cooking oil***. Used cooking oil collected from households and restaurants can be converted into biodiesel. Conversion is based on a reaction between the cooking oil and alcohol, which yields biodiesel and glycerol. Biodiesel can be a stand-alone fuel or can be mixed with petroleum-based diesel.

To ensure the financial sustainability of an IRRC, it is critical to identify a viable market locally for all the resources that can be derived from waste.

The rising popularity of IRRCs across the Asia–Pacific region is due to the many benefits that the model returns to communities, governments and the environment, as the next section details.