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expertise along with the lowest bidder selections are the main barriers that exist in the Indian market.

The hazardous waste generated by industry and medical institutes must be dealt in an efficient manner to reduce the impact on the environment. It is important to send the message across industries to adopt appropriate waste management practices and this can be done only by enforcement of stringent regulatory norms and heavy penalties on polluters. Despite the availability of proven technologies for waste management and waste to energy conversion, lack of awareness amongst the policy makers, urban local bodies and companies has kept India off from making significant progress to manage the waste and harness energy from waste using appropriate technologies. On the operations side, like every other industry, trained manpower is mandatory to operate waste management systems, which is a constraint the implementing agencies are facing at present. Managing these complexities would resolve them and most effectively will spur the growth of these projects in the country.

## Waste Management: One Man's Garbage Everyone Else's Gold

**E**xcessive consumption of fossil fuels is one of the most important causes of the greenhouse effect that threatens to create dramatic climate changes worldwide. Being exhaustible and limited, development of alternate and renewable energy sources will be the key to sustain economic growth, energy security and most importantly environment protection.

Fossil fuels continue to be the most important energy source to meet the rising energy demand in India. India has an urban population of approximately 285 million that lives in 5000 cities or towns. Currently, urban and industrial waste generation in India is estimated at 1,00,000 MT/day. Considering the collection efficiency 50–60 percent, this waste offers energy generation potential of 1000 MW as an alternate energy source.

Developing treatment for solid and liquid waste management services in India are fraught with many challenges and complexities. Lack of awareness amongst the stakeholders, effective enforcement and technical

In addition a proper bidder selection is critical for successful execution of the project.

Potential of converting waste to energy is slowly getting recognised for its contribution towards overall energy security and economic sustainability. Given the fact that Government of India has introduced several reforms under 11th Five Year Plan to address the complexities, the market would offer several opportunities to the industry participants. Moreover, increased involvement of private sector to invest in waste management will bring adequate technical expertise increase in efficiencies and improved customer services. It is also now mandated that power producers using fossil fuels will necessarily have to produce 5 percent energy from renewable energy sources.

Indian market is in development stage as against other Asian countries. Waste treatment market is growing substantially in countries like China and

Korea whereas it has already matured in Japan and Singapore thus giving them the status of truly developed nations.

Compounded average growth rate (CAGR) for water and wastewater treatment is 13 percent, and for municipal waste management is 30 percent in India. Air pollution abatement practices are growing at a rate of about 16 percent. India's government has reserved 32 percent of capital outlay valued at ₹ 20,000 billion (USD 500 billion) for the investment in the environment sector under 11th Five Year Plan. Thus there is no dearth of opportunities and financial resources to sustain and grow beyond the CAGRs already mentioned for the Indian environment business to leap frog from development stage to a healthy growth stage in the next decade.

Indian water industry has witnessed significant changes in the past few years. Owing to rapid industrialisation and urbanisation, water demand has increased. There has been an increase in consumption of water for irrigation. Over-exploitation of groundwater has resulted in receding water levels and increase in wastewater discharge coupled with acute water shortage due to draught and sporadic rainfall pose threat to the environment.

On the other hand, the awareness on water issues, legislations and technology trends to promote greater efficiency is increasing amongst the stakeholders, which has created healthy demand of water treatment technologies in the country. Public Private Partnership (PPP) model is also gaining importance to manage water and wastewater treatment systems efficiently. Small and medium scale industries too are more open

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to adopt practices like zero liquid discharge (ZLD), which were being followed by large industry players

Indian environmental market offers lucrative business opportunities for the foreign players in the field of both waste and water management for the foreign players. Government has catalysed the growth rate and attractiveness by introducing various reforms and implementation of funding programs such as Jawaharlal Nehru National Urban Rural Mission (JNNURM) in the municipal sector to encourage private sector participants in infrastructure development through PPP mode. This is a welcome change to hasten the development of clean mechanism for the society we live in, as foreign players will provide impetus to accelerate development of sustainable management practices through infusion of technology, finance and management capabilities.

Industry is expected to undergo structural changes like consolidation within industry, acquisition of small companies by bigger Indian or foreign firms and infusion of capital to support the CAGR by venture capitalist or private equity (PE) funds that are already seeing the benefit of their investments in the environment sector.

Earlier both waste and water-management experienced slowdown because the industries kept postponing their expansion

plans, and also municipalities and urban local bodies could not utilise allocated funds to implement sewage treatment and solid waste management programs. However in the current year, the market is already looking upwards with swelling order books in second quarter itself. With long-term drivers already in place, post 2010 market is expected to grow at a healthy rate of 15 percent.

Growth will be driven by wastewater treatment and recycling amongst municipal, industrial and household sectors. The demand for sustained solid waste management technologies is growing especially in large urban centers.

No single entity in the Government or industry is involved in economic growth, energy generation and environment protection can meet the challenges of sustainable development on its own. However participative approach and combined effort can make a difference.

Greater interface with state and central government can accelerate the growth of these sectors. “An autonomous body should be constituted between promoter of clean development project, financial institutes or lending agencies and urban local bodies” he says. Ministry of Environmental Forest should extend its support to obtain carbon credits that are due for the projects. Accelerating reforms in financing and management of urban infrastructure development will be necessary to safeguard the promoter or interest of financial institutions (escrowing of urban local bodies [ULB] revenues) including taxes, commitment for gap funding to meet shortfalls in annuities, guaranteed payments with positive cash flow in case of Build, Operate, Transfer (BOT) contracts. ■