Waste Reduction, Circular Economy and Enhanced Livelihoods

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Ideas From Near and Afar

Waste Reduction, Circular Economy And Enhanced Livelihoods: Ideas from Near and Afar

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Speakers

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Anil Kumar Jain is a member of the Indian Administrative Service of the Government of India. He is presently Additional Secretary, Ministry of Environment, Forests and Climate Change.

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Amitabh Kant is presently CEO, NITI Aayog, a Government of India institution to foster involvement and participation of state governments in policymaking, and to enhance cooperative federalism.

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Chitra Mukherjee heads the Voice for Waste programme at Chintan, which focusses on advocacy and outreach. She has over 15 years of experience working in the development sector.

Froilan Grate is the Executive Director of GAIA Asia Pacific based in Manila, Philippines. Together with Greenpeace and others, GAIA is a core member of the global Break Free from Plastic movement.

Henriette Faergemann is the Environment, Climate and Energy Counsellor to the European Union Delegation in New Delhi. She is responsible for cooperation between the EU and India in these areas and in the area of Urbanisation and Smart Cities.

Jayprakash Chaudhary is one of the founders of Safai Sena, a registered group of waste pickers, doorstep waste collectors, itinerant buyers, small junk dealers and other waste recyclers.

Johann Ivanov is the Deputy Representative and Programme Director, Social Justice, Friedrich-Ebert-Stiftung. He studied Political Science and Political Theory at the FU Berlin and the University of Edinburgh.

Ken Lee is the Executive Director of EPIC-India and Senior Research Associate at the Department of Economics, University of Chicago. Prior to this, he was a post-doctoral research fellow at the Center for Effective Global Action (CEGA) and the Energy Institute at Haas.

Kuldip Singh Sangwan is a Professor at the Department of Mechanical Engineering at BITS, Pilani.

Laurence Hugues is Deputy Mayor of the 3rd arrondisement of Paris, as well as a filmmaker, writer and ecology activist. She implements global policies with local solutions in terms of climate emergency, circular economy, employment, urban agriculture and nature.

Leni Chaudhuri is the Country Director of the Tata Centre for Development (TCD). She was previously the Vice President of the Narotam Sekhsaria Foundation, a leading grant-making organisation in India.

Mahua Saha is a Senior Scientist at the Division of Oceanography, National Institute of Oceanography, Goa.

Malati Gadgil is a Sustainability Strategist, HP and Former CEO, SWaCH, Pune, prior to which she worked with waste pickers in Delhi.

Manbir Sodhi is a Professor at the University of Rhode Island. He has worked on projects funded by the National Science Foundation, Naval Undersea Warfare Center (Newport), EPA, Navy and others.

P. Madeswaran is a Marine Biologist and Scientist at the National Centre for Coastal Research, Chennai.

Ritu Sain is the Additional Resident Commissioner, Government of Chhattisgarh.

Sanjib Bezbaroa is Executive Vice President, EHS, at ITC Limited. He graduated in Electrical Engineering from NIT, Allahabad, and later completed a mid-career Postgraduate Diploma in Environmental Assessment from Imperial College, University of London.

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Shivani Wadehra is an Assistant Professor in the Economics and Planning Unit, Indian Statistical Institute (ISI), Delhi. Her research interests include environmental economics. Her doctoral research primarily studies the determinants to waste segregation at source.

Sujeet Samaddar is a Senior Consultant (Industry) at NITI Aayog, Government of India. He has been a visiting fellow at the Japan Institute of International Affairs, Tokyo, and at the United Services Institution of India, New Delhi.

Vandana Chavan is a Member of Parliament (Rajya Sabha) from Maharashtra, and the member of several committees, including the Committee on Empowerment of Women, MPLADS, Science, Technology, Environment and Forests, and the General Purpose Committee. She has played a leading role in several environmental movements in the city of Pune.

Introduction

Official figures report that municipal solid waste (MSW) has increased from 52,000 MT a day to 142,000 MT in the past 18 years. Of this, only 29,000 MT was treated in 2017. The composition of the waste shows that 40—60% is organic and 15—20% recyclable, despite which 70—80% is landfilled. These small mountains of waste, in danger of collapsing or combusting at any time, poison our environment and deprive us of potential raw material for circular economy. Our gutters and drains are choked with garbage that finds its way into the world's rivers and oceans, where it breaks down into insidious microplastics that have made their way into marine life and the deepest depths of the earth. Mindless consumption and explosive urbanisation are straining our already creaking urban infrastructure.

In 2016, the Government of India revised the Solid Waste Management (SWM) Rules, 2000. On World Environment Day, 2018, Prime Minister Narendra Modi set the tone for waste reduction by committing that India would eliminate single-use plastic by 2022. This year, the Government of India banned the import of solid plastic waste. Indian laws and the Swachh Bharat Abhiyan have focussed on the Herculean task of collecting, transportation and processing waste. Circular economy offer a newer paradigm to address the growing challenge posed by the increasing amounts of waste generated globally.

The goal of this conference was to provide a shared platform for global and domestic stakeholders – 27 policymakers, scientists, engineers, civil society organisations and practitioners shared their work, challenges and successes in reducing the burden of waste, with a view to contributing to knowledge and ideas to promote circular economy, fair livelihoods for grassroots actors and offer directions for policymaking in the specific Indian context. The discussions and insights centred on four key questions: the relationship between circular economy, waste reduction and jobs; how businesses can adopt newer models to become more circular and sustainable; innovations on the ground that are reducing waste and enhancing livelihoods; and finally, what the data and evidence teach us about India's waste sector.

The event walked the talk by incorporating several elements of local circular economy: local tailors created the name tags from leftover scraps of cloth, the snacks and most meals were provided by street vendors, who constitute a vital part of Delhi's street life. They used local foods and traditions to linkage between the halls and the street. Local toy sellers made the kaleidoscopes that went into the delegate bags, to draw attention to the possibility of meeting consumer needs by combining artisanal skills with sustainable materials. The bags themselves were made of cloth as a reminder of alternatives to plastic. Used pencils were shared and no speaker gifts offered, to save on materials.

Recommendations

The key recommendations that emerged from the conference are as follows:

1. As India's growth and urbanisation cannot be sustained with a linear model, it must follow both the EU logic of environmental protection for circular economy and the Chinese model of economic logic for sustainable growth. The thinking must become circular.
2. Increase the focus on triple bottom line, product lifecycle engineering, resource and energy efficiency and closed loop flow to make manufacturing more sustainable.
3. Look to the sunrise areas of growth: repair and recycling waste, and moving towards renewable energy.
4. Invest in research and data gathering. Apply research insights at low/ no cost to improve outcomes with high returns, helping government to optimise the use of limited resources.
5. Harness the power of advanced technology to close the loop using product recognition, state identification, robotics or cobotics, automatic material identification and product biography (RFID/ NFC).
6. Create a sustainable model of waste management by encouraging waste generators to segregate at source, by training and empowering informal sector waste collection workers, enabling entrepreneurs, tying up with recyclers, and funding the viability gap until the cycling market matures.
7. Adopt a systems approach to policy, and follow the PCS logic of Predictability, Credibility and Stability.

Day 1
18 March, 2019

Opening Session

Chitra Mukherjee, Head, Advocacy and Policy, Chintan, introduced the goals of the conference and declared it officially open.

Johann Ivanov, Deputy Representative and Programme Director, Friedrich-Ebert-Stiftung (FES), noted that India's per capita waste generation is on the rise and China's move out of the waste paper market could present opportunities in the vacated space. This testifies to the fact that new jobs can be generated in the process of circularising waste management, thereby bringing us closer to socio-ecological transformation.

Leni Chaudhuri, Country Director, Tata Centre for Development (TCD), presented an overview of TCD, and described its partnership with EPIC-India on innovative programmes for pollution monitoring, enhancing people's access to energy, and incentivising behaviour change as one of the feathers in the organisation's cap.

Bharati Chaturvedi, Founder-Director, Chintan, in her introductory address, introduced the Chief Guest, Justice Adarsh Kumar Goyal, who is transforming synergies between environmental law and government. She explained that the purpose of the conference was to explore the right way for India to move ahead and create more jobs, given our rapid urbanisation and the need to reduce waste. How do we use technology to move from a linear to a circular, sharing economy? Is sustainable manufacturing really possible? We have a long culture of reduce-reuse-recycle, but those solutions must be reframed in the context of our current challenges and economics.

Opening Remarks by Justice Adarsh Kumar Goyal, Chairman, National Green Tribunal

Justice Goyal spoke about the ways in which the law prescribes management of waste, exhorting the audience to share their ideas with implementing bodies such as the State Departments of Environment and Urban Development, State Pollution Control Boards, as well as NGOs and other organisations working on these matters. The Environment Protection Act gives the Central Government the power to issue any orders necessary to protect the environment. The SWM Rules, 2016, prescribe rules for the collection, segregation and disposal of plastic, biomedical, e-waste and construction and demolition (C&D) waste.

The Constitution of India places the responsibility of waste management upon local bodies, which must report to the State Pollution Control Boards (SPCBs), which in turn report to the Central Pollution Control Board (CPCB). The CPCB analyses the data and sends it to the Ministry of Environment, Forests and Climate Change (MoEFCC). The report is published on the CPCB website. In the wake of the lackadaisical response, Order 606 was passed on 6 January 2018, mandating that the Chief Secretaries of every state must appear before the National Green Tribunal (NGT) with an updated report of pollution in their state. Orders were subsequently passed to take up the completion and submission of these reports as the first question. The Orders also direct other stakeholders such as educational institutions to be included, and competitions, eco-clubs and awards to be instituted to raise awareness among school children.

Keynote Address by Amitabh Kant, CEO, NITI Aayog

Mr Kant observed that the process of urbanisation has begun in India at a time when land, gas and water are scarce commodities. Thirty Indians move from rural to urban areas every minute. According to the latest McKinsey study, close to 700 million Indians will be in the process of urbanisation by 2050. There will be more construction and urbanisation in the next 50 years than there has been in the past 5,000 years. With 14 of the world's most polluted cities already in India, it is essential to draw from innovative, sustainable models in Japan and Singapore, and replicate the Bhopal and Indore models of solid waste across the country.

Mr Kant stressed that the way forward lies in reduction and segregation at the household level, holding municipal officers accountable, and initiating a mass movement to promote the issue. The best officers of the state must be posted as Municipal Commissioners and given adequate tenure to address the waste problem as a top priority, and penalties levied for failure to deliver. The use of regenerative, non-toxic resources must be prioritised, the life of existing products preserved and extended, waste used as a resource, design undertaken with a view to the future, joint value created across sectors through collaboration, and the business model rethought to increase opportunities to create value, digitally track and optimise resource use and strengthen connections between supply chain actors.

In the current context of high, volatile resource pricing, the circular economic model presents tremendous business potential by transforming the function of resources: waste can become a valuable input into other processes and products, which may also be repaired, reused or upgraded instead of trashed. Quoting a study by the Ellen McArthur Foundation, Mr Kant stated that by 2025, a trillion dollars in material cost savings could be generated from circular business models. Economic opportunities are poised to rise to USD 218 billion per year by 2030. They therefore offer the potential to create a business model that enables innovative and sustainable growth.

Maintaining that Indians across the globe are some of the most dynamic entrepreneurs in the recycling economy, Mr Kant urged the audience to look to the sunrise areas of growth: recycling waste, and moving towards renewable energy. He also mentioned converting waste to energy, a point that is strongly opposed by several civil society organisations working in waste management. Pointing out the relationship between circular economy practices and several Sustainable Development Goals (SDGs), he said it was an opportunity to transform the country. India has demonstrated a unique ability to innovate with frugal engineering at the right price points for the western world. GE's ECG machine, for example, is manufactured at a cost of USD 35,000 in the United States. India began producing it at USD 3,500, charging USD 1 instead of USD 35. Similarly, 50% of wide-bodied aircrafts of GE manufacturing is carried out at the company's facility in Bangalore where frugal engineering enables production at 50% of the cost. Mr Kant pointed out that India has demonstrated its abilities across sectors. He expressed the NITI Aayog's willingness to partner with the participants to provide information on best practices and extended full government support to them.

Session 1: The Big Picture

Moderator: **Bharati Chaturvedi**

Panellists

Dr Manbir Sodhi on global approaches to circular economy.

Henriette Faergemann on waste reduction, circular economy and the future of work in the EU.

Anil Kumar Jain on Indian policymakers' views on circular economy and resource efficiency.

This session was structured as a Q and A, with Ms Chaturvedi posing two questions each to the panellists and then opening the floor to questions from the audience. The discussion is summarised below.

Mr Jain defined circular economy as value creation through value retention and value regeneration, which comes through more scientific manufacturing processes – either a closed, slower or narrower loop. Dr Sodhi explained that while the current linear model adopts a take-make-break approach, the mechanistic perspective of the circular economy is of a number of circles that close the loop through repair, servicing, component reuse, and material recovery for reuse. Whether the ideal state of zero waste manufacturing can be achieved lies within the discussion on circular economy.

Speaking on global approaches to circular economy, Dr Sodhi called to mind that in 2008, China became the first country to pass a law to promote circular economy at the national level by building eco-industrial parks (EIPs). EIPs typically have a number of enterprises that work together, with waste outputs of one getting used by another, thereby reducing net waste and benefitting the companies as well as the world at large. Unlike parts of Europe, Australia, Japan and Korea, where the emphasis is on reducing consumption and increasing material efficiency, China's goal has been to reduce industrial pollution, with penalties for failure to meet targets. In terms of jobs, China has made an industry of recycling that could be an example for many countries. The village of Shijiao, for example, specialises in recycling a single product – Christmas lights imported as waste. In the United States, an Executive Order passed in 2015 led to the establishment of the Environmental Protection Agency to certify service providers who will take back material and certify that they are using it responsibly, thus promoting efficient material consumption. This, and the Shijiao model are approaches that other countries could emulate.

Ms Faergemann spoke on the EU's approach to waste reduction, which includes the adoption of a Circular Economy Package (CEP). The CEP takes a holistic approach to closing the loop, with an Eco Design Work Plan for designing resource efficient, easier to dismantle and less resource intensive products under development. The reference document BREFS has been produced to inform industry on resource efficient production, and significant effort invested into consumer education for conscious consumption. Updated EU recycling targets include 65% recycling of municipal waste and 75% of packaging waste by 2030, with only 10% landfilled. The region is looking at using recycled materials as secondary raw materials. New legislation is planned for fertilisers, and water reuse legislation is being reviewed. The EU has also invested heavily in research and innovation. In terms of employment, the EU aims to create about 600,000 jobs by 2035 through waste management. This will also contribute significantly to reducing greenhouse gas (GHG) emissions. Waste prevention, eco design and reuse could bring savings of 400 billion euro, which is 8% of the region's annual turnover. Energy savings would be equivalent to the energy consumption of Sweden by 2030. In India, an EU delegation has been working with the government on the resource efficiency agenda, conducting background studies on material consumption in various sectors and making detailed evidence-based recommendations for waste and EPR policies. A key achievement of the partnership has been to put these issue on the G20 agenda.

Speaking on the Indian government's stance, Mr Jain stated that exploitation of natural resources and the adverse effects wrought are expected to be minimal. A number of government programmes, such as Per Drop More Crop, Make in India, the mandate under the Fly Ash Rules to include a percentage of fly ash in road construction, and the campaign to eliminate single-use plastic seek to promote resource efficiency and circular economy. In the SWM Rules, 2016, the government extended a two-year grace period to enable the electronics and plastics sectors to systematise collecting back their waste. A national EPR framework is in the offing, as is a Bureau of Resource Efficiency to enable specialists to offer policy guidance on resource efficiency and material recycling to all the ministries. Other investments in the environment include passing the Energy Conservation Act, which will be binding on large energy consumers, and promoting solar and wind energy, marketed across the country using Renewable Energy Certificates (RECs). It is now mandatory for every state to consume a certain portion of renewable energy.

In conclusion, the challenges in circularising the Indian economy, in particular, lie both in certain priority sectors as well as government processes. Markets alone do not support resource efficiency so people must be prepared to pay. Policy tools such as pricing and mandates are required to support a circular economy. Globally, circular economy can only work if the reverse loop is as efficient as the forward loop. Since geographical distance poses a major logistical challenge where materials must be recovered, triaged and sorted, communities must be creatively engaged to contribute to material segregation. Volatile markets also pose a challenge as the price of virgin materials fluctuates, whereas the business model for recycled materials requires some stability.

Session 2: Can Business Become Circular and Sustainable?

Moderator: **Sujeet Samaddar**

Panellists

Kuldip Singh Sangwan on the relevance of the findings of two studies to environmentally conscious manufacturing.

Malati Gadgil on the importance of livelihoods in sustainability initiatives, and the problem of inadequate data.

Sanjib Bezbaroa on ITC's progression towards closing the loop.

Jaiprakash Chaudhary on the key role of the informal sector in solid waste management.

Mr Bezbaroa called to mind the World Business Council for Sustainable Development's model for an ecosystem approach to circular economy: redesigning and reworking the business model to adjust internal business processes in terms of what is measured, rewarded and regarded as valuable for an organisation, and factoring sustainability into the design of products and services. Mr Samaddar pointed out that circular economy presents benefits for the environment as well as the economy. With a strong reverse logistics chain required to close the loop, there are opportunities for new business streams in extraction and processing, design engineering, manufacturing processes, distribution and logistics, end of life and final disbursal.

Dr Sangwan stated that the EU views sustainable manufacturing and circular economy as two sides of the same coin. In China, the focus of circular economy is on reuse, and that of sustainability is on the environment, but both the EU and China agree on the importance of economy, environment and social impact.

Two studies conducted with 280 Indian and 54 German companies in 2008 and 2015 sought to understand the drivers, challenges and performance indicators of sustainable manufacturing. The findings suggest that the main drivers of successful adoption of environmentally conscious manufacturing are customer demand, public and peer pressure

to influence legislation, and supply chain pressure. These enable organisational catalysts that lead to incentives, cost savings and competitiveness. With the exception of law enforcement, the policy, internal and economic barriers were found to be similar in both countries. The hypothesis that policy barriers affect economic barriers was rejected (as demonstrated by the National Manufacturing Policy's lack of impact despite the incentives offered by the Make in India initiative). It was also found that technological risk is an outcome rather than a cause of lack of awareness and information.

Mr Samaddar stated that India presently has a manufacturing output of about 380 billion USD at 16% of GDP, expected to increase to 25% of GDP by 2025. This growth will require people, facilities, energy and resources. Sustainability demands that we reconsider our manufacturing and business processes from the perspective of cradle-to-cradle design, replacing existing resources with low-cost secondary resources, and looking at the outputs of waste. Almost all waste streams, including low-value plastics have a market if the demands of quality, quantity and price are met. India has the experiential knowledge of managing the burden of waste but lacks consistent, reliable country-level data.

Ms Gadgil stated that only 12% of single-use plastic is currently recycled in India, with the bulk of collection and segregation carried out by the informal sector. Value recovery is a major challenge without source segregation. Recycling also has its drawbacks: almost all of it is open looped, and mechanical rather than chemical. The risk of contamination at every step makes recycled plastic unviable from a health and cost perspective. Supply chains are often compromised and there is low compliance with global recycling standards. Seventy to 80% of a product's cost and carbon footprint is known during the design stage, so it must be designed for disassembly and subsequent remanufacture. Recycling must be the last loop, less for value extraction than cleanliness, and reuse the first.

Mr Chaudhary recalled India's long tradition of reuse, and areas such as Chor Bazaar near the Red Fort in New Delhi and several other cities to service the demand for spare parts and obsolete components for electronics and automobiles. Delhi's dynamic waste picker community of about 1.5 lakh informal waste pickers collect and segregate waste into what can be reused and what can be recycled. It must be examined if they are really being brought into the waste management system or simply given identity cards. Policies must be more friendly towards them so that they have access to the facilities they need, such as space for the waste they segregate.

Mr Bezbaroa said ITC's progression towards closing the loop began around 2017, when it initiated the process of designing for the environment by using less packaging, and plastics, where required, that permit a higher level of recyclability. As a paper manufacturer, the company was struggling to source paper fibre. India has one of the lowest recycling rates in paper because source segregation is sub-par. Recyclers had a supply chain problem that begins and ends with source segregation. The company has had much success with its sustainability partnerships. Key success drivers were raising public awareness about source segregation and creating market linkages with recyclers.

Dr Sangwan stated that according to the Center for International Climate Research (CICERO), Norway, India's emissions grew by 4.6% in 2017. The government's call to the top 500 Indian companies to reduce their carbon footprint has resulted in reductions in the manufacturing component, when in fact the bulk of the footprint is in the supply chain. To achieve circularity we must put in more effort into understanding how it works

from start to finish. Closing the loop on resources is not a technical problem because established solutions already exist. From a business perspective, the single biggest challenge is posed by unstable policies, with social inequity and climate change playing an important role as well. But neither policy nor costs can be viewed in isolation. The former must adopt a systems approach, and changes introduced incrementally, failing which implementation becomes harder to achieve. Cost effective solutions are possible if policies remain in place for long enough to allow businesses to adjust to them. Internal barriers such as low top management commitment, lack of organisational resources, technological risk and lack of information and awareness must be addressed.

The conclusions that emerged from the session were that livelihoods must remain the foremost concern in all circular economy initiatives, and models such as the Indore example, which marginalises huge numbers of waste pickers to keep the streets clean, must be questioned. Local bodies must bear the primary responsibility of collecting segregated waste. The private sector can contribute with specialised skills such as behaviour change, developing market linkages and gap funding. Civil society must ensure accountability and transparency. In an era where so much has been invested in older models, the way forward lies in a multi-objective, closed loop supply chain model with forward and reverse logistics, and a triple bottom line approach.

Session 3: Ideas at Work: Real World Experiences

Moderator: **Malati Gadgil**

Panellists

Ashish Mehta on Safai Bank, an organisation that works with school students to collect multi-layered plastics (MLPs), and with cement companies for co-processing.

Ritu Sain on the efforts put into creating the Ambikapur model, which transformed a small town in Chhattisgarh into the second most waste efficient in the state.

Froilan Grate on two high waste diversion initiatives in the Philippines.

Laurence Hugues on local solutions to promote livelihoods and wellness in the Circular Economy Plan for Paris.

Mr Mehta spoke about Safai Bank, which works on the premise of 'Don't Bin it, Bank it', leveraging school students to affect behavioural change by encouraging them to segregate MLP waste from other MSW at home, and bring it to school where it's kept in temporary storage. Every school is like a branch of a bank and the students, account holders. The programme's goal is to encourage consistent behavioural change at home. Since July 2018, when the programme was launched, Safai Bank and its partners have moved almost a million items out of the waste stream. As of March 2019, over 16,000 students in 59 schools across six cities have collected MLP waste every week. Some programme partners adopt a hub and spoke model, while others work directly with schools or in particular areas. Safai Bank provides backend and administrative support, logistics and communication. With data forming a critical part of the programme, a backend IT system allows schools to update how many items each student collects into their 'account'. Unlike one-time clean-ups, Safai Bank is a lifetime programme that affords schools the flexibility to conduct drives as often as they choose. It also works with cement companies such as ACC for co-processing.

Mr Mehta suggested that other waste streams that can lead to material recovery, such as e-waste and other plastics, be similarly banked using this model which has exploded across the country. What is required is to draw the government, ragpickers, retailers, corporates and manufacturers into the conversation on the critical issues. As something that has not been done before, it would require, as the pollution norms did, a high degree of interaction between the stakeholders.

Extraordinary impact due to behaviour change, among other factors, was also noted in Ambikapur, a district with a population of 1.25 lakh in Chhattisgarh, despite its challenges of geographical remoteness, logistic issues, and paucity of well-qualified human resources and capital. The case study, presented by Ms Sain, explained how the idea was to develop a simple model that did not require very high logistics, was easily operated, 3R compliant, financially viable, replicable in the state's 168 towns at a minimum, and would also promote livelihoods.

The process in Ambikapur began with extensive discussions to involve multiple stakeholders in the design and decision making. The citizens wanted a clean environment and were prepared to segregate garbage but it was the responsibility of the administration to collect and segregate it. Twenty-five thousand students became ambassadors in their homes. Today, 447 women collect waste from door to door and transport it by battery operated, GPS-enabled rickshaws to garbage clinics where they segregate, wash and weigh it prior to entering the data. Organic material is composted for biogas, and non-organic waste segregated in 139 categories. Around 90% of the waste generated is sold. Whatever can be sent for secondary and tertiary segregation is disposed of. Ambikapur is currently working on awareness to discourage consumption of non-recyclables such as MLP and thermocol, as well as scientific disposal at cement plants so that all waste goes into a circular economy.

The project has shown exemplary impact: a community-managed value chain, service delivery impact and quality improvement to the extent of 100% on many indicators. Expenditure has declined due to savings on fuel, transportation and tipping fees. Funds from user charge collection and sale of resources are moving the programme to financial viability. Approximately 2,000 reclaimed garbage dumps have been cleaned and restored to productive use as garbage clinics and anganwadis.

Successful synergies between citizens and the government defied expectations in the barangay of Fort Bonifacio and the city of San Fernando in the Philippines, both of which were transformed from areas with rampant illegal dumping and burning to zero waste cities. Mr Grate spoke about the transformation of Fort Bonifacio, a barangay of 15,000 residents, which would dump its waste on the street to be collected by five trucks from the City every night. Under the Zero Waste Programme in partnership with the Mother Earth Foundation, tasks were differentiated for households, wards and the City. Households were mandated to segregate waste, wards to collect, Materials Recovery Facilities (MRFs) to compost and store recyclables, and the City to collect non-compostable, non-recyclable waste. Despite the local officials' conviction that segregation would be complicated for the residents, they achieved 95% compliance with household segregation, composted 80% of the waste, and diverted about 92% in all. The model was replicated modularly in San Fernando, with a population of 300,000. In less than six months, it had achieved 55% waste diversion, and is currently at 80% waste diversion.

Underlying the success of the initiatives was data from a methodological study that assessed the type and volume of waste, as well as the brands and materials of problematic waste that can neither be recycled nor composted at the community level. This was conducted in 50—60 households across Zero Waste sites. A Waste Assessment and Brand Audit tool was used to identify the problematic products and packaging, as well as the companies responsible for them. The findings showed that 63% of the waste was compostable and that 55% of problematic waste was branded. This information enabled a saving of billions of dollars on a waste-to-energy facility as the bulk of the waste could be composted. It allowed the organisation to name the offending companies, thereby

bringing some of them to the table for discussions. Furthermore, the public attention it attracted compelled officials running for office that summer to commit to tackling the problem. Seeing the numbers on social media, ordinary citizens began speaking of the need to reduce and ban widely used problematic products such as sachets.

In Paris, the Circular Economy Plan involves a local level solution that respects the environment as well as creates jobs and well-being for its residents. Ms Hugues described how the drafting of the plan called for a long consultative process with non-profits, businesses and citizens. Five priority areas emerged: construction waste, waste for reduction, support for stakeholders, public procurement and sustainable consumption. The initiatives that have been launched combine environmental and social impact through the Maison des Canaux space for eco-design workshops and seminars, and calls for projects on innovative solutions to environmental problems. Among the projects funded are one for bio-waste collection in schools, and a glass bottle deposit system for microbreweries. A popular Repair Café, run by volunteers and people seeking to re-enter the workforce, has residents lining up to have things repaired or to acquire the skills themselves. Reuse centres have been established under an umbrella organisation that helps people who are unemployed or in poor health find support and access useful resources. Other angles being explored include resource optimisation by using the heat from data centres to heat up swimming pools, and mending and recycling used uniforms from the public procurement department.

In a Zero Waste House supported by the city of Paris, people participate in workshops for sustainable living, and buy agricultural products and organic food. The City supports stores that sell in bulk to reduce plastic wrapping but which allow consumers to buy only as much as they need. To combat food waste, an app called Too Good to Go, developed by a Parisian food incubator has restaurants and bakery listings for leftovers that people can buy for a fraction of the price every evening. Bio-waste is collected door to door, but the City has set up a Canadian process that enables faster composting in a smaller space. It is also experimenting with distributing compost boxes with and without worms. In addition to its environmental impact, this popular initiative also provides a social dimension by giving neighbours the opportunity to interact with each other at their composting sites. Ecological consciousness is promoted as a fun activity through awareness events where discarded fruit and vegetables are cooked into soups and salads, and electricity for the music generated by pedalling cycles at the venue.

The model for Zero Waste Cities that emerges from these cases is one of decentralised waste management, a focus on the 3Rs, communities that are empowered to participate in the process, modular interventions, provisions for fair livelihoods for grassroots actors, and addressing the issue of problematic waste through bans, redesign, private-public partnerships (PPPs), and better delivery systems.

Day 2
19 March, 2019

Welcome Note by Dr Ken Lee, Executive Director, EPIC-India

Dr Lee said that air pollution is a major problem in India and went on to describe the Air Quality Life Index tool developed by researchers at EPIC-India. The tool provides information on the number of life years lost to air pollution exposure in a country, state or district. The tool was developed for every country on the basis of the findings of the Huai River natural experiment in China.

Session 4: What Does Data and Evidence Teach us About the Waste Sector in India?

Moderator: Dr Ashish Chaturvedi

Panellists

Dr Saugato Datta on the behavioural drivers of change in waste management.

Dr Shivani Wadehra on her experiment with regard to the drivers of segregating at source.

Dr Ken Lee on Delhi's e-waste market being found to be larger and more spread out than previously believed through a recent research experiment with Chintan.

Dr Chaturvedi opened the session by commenting on the paucity of data on the ground. Many of India's waste management statistics date to 2005, and 1997 prior to that. The data is inconsistent across streams, with more on solid waste, hazardous and environmental waste than e-waste and plastics, as a result of which insights cannot be translated across streams. The past decade has seen a shift, however, with more granular data collected, as evidenced in this year's Swachh Sarvekshan. Experiments in Ambikapur, Alappuzha, Bangalore and Gurgaon have provided lessons and messages that will comprise the second generation of data. They have also been translated into policy insights, as presented during this session.

Dr Datta put forward the need to examine the behavioural drivers of change with regard to waste management, and to understand the actions of those in the ecosystem, as policy outcomes are based on decisions. The amount of waste generated, for example, is the

outcome of production-related and buying decisions. Bottlenecks are created by the human propensity to adhere to social norms, procrastinate, and be deterred by small hurdles. While applied behavioural principles are consistent, they may manifest differently across geographies and cultures. Their impact must be evaluated in specific contexts to identify cues that trigger the desired behaviour. The decision to incentivise or penalise must be similarly evaluated.

A study conducted to discourage the single-use plastics in Chicago showed that raising the salience of plastic bag use and negatively cueing habitual use with a small tax significantly reduced the number of people opting for plastic bags. It also increased the number of people who carried their own cloth bags. In Costa Rica, interventions that leveraged data to tell people how their actions stack up against their neighbours' and what this means in a way that makes sense to them, such as by indicating the equivalent of their daily water consumption in buckets rather than a nebulous metric unit, also spurred positive behavioural change. Closer home, the cleanliness of the Delhi Metro is in sharp contrast with the litter directly above or outside it: littering inside is frowned upon; outside, it is habitual.

In an experiment conducted by Dr Wadehra and her team in apartment localities in Delhi, seven apartment localities in South Delhi, and four each in North and East Delhi were surveyed to understand the extent to which information, social norms and incentives drive segregating behaviour. Interventions were given to 60 households in each locality. These included distributing dustbins and brochures that explained the meaning of organic and recyclable material, and that carried sobering pictures of city landfills. A monetary incentive of Rs 50 was offered to households that segregated. The results showed that even low cost interventions such as information on what is biodegradable and recyclable, and norm sharing can be effective drivers of segregation behaviour. While there was no

specific question to the effect built into the study, it appeared that distance from the landfill was inversely proportional to the likelihood of households segregating. In this case, monetary incentives were found to have an impact at least in the beginning to convert people to the other side and sustain behaviour change.

Dr Lee described a data exercise that EPIC-India ran in partnership with Chintan. The exercise generated a new data set on what happens to e-waste in Delhi, on which there was very little data before. The question asked was how the Electronic Waste Management Rules (EWMR), 2016, and approaches such as EPR and Producer Responsibility Organisations (PROs) could encourage cleaner recycling in its large informal sector. The researchers were interested in who was involved in the typical e-waste recycling process of collection-segregation-dismantling-metal extraction-refurbishment, and what they did.

Although very little data existed at the time, it was believed that about 25,000—85,000 people in Delhi recycled e-waste, the bulk of which is generated by government and industry. Activities were believed to be concentrated in well-known clusters in Seelampur and Mustafabad, and illegal and dangerous metals used to extract the precious metals.

From July to November, 2018, teams of surveyors on motorcycles rode through every street in Delhi in search of these enterprises. Some key insights that emerged from the exercise were that there are in fact about 12,000 people in Delhi's informal e-waste sector, less than 1% of who admitted to using acid or burning to recover valuable materials. Clearly, the rules must be revised to include items such as music systems and household appliances released on the streets, create upward pressure on formal prices, incentivise informal sector players to participate more broadly in the official EWMR, shift materials to authorised recyclers or implement cleaner practices themselves.

Session 5: Vision for Waste Free India, Challenges and Opportunities

Moderator: **Dr Mahua Saha**

Panellists

Vandana Chavan on the challenges to a waste-free India and successful approaches.

Dr P. Madeswaran on the Ministry of Earth Sciences' efforts to maintain the quality of marine water and sea life.

Amita Patil on the transformation of Panchgani and Mahabaleshwar into some of India's cleanest towns.

Dr Saha stated that plastics coming from land constitute 60—80% of marine litter. These have spread across the surface water, and into the water column down to sediments in the world's oceans. Dr Madeswaran expanded on the point by stating that a seawater quality monitoring study conducted by the Ministry of Earth Sciences, Chennai, indicated that coastal water has deteriorated up to 2 km due to industrial effluents and increasing construction along India's 7,500 km coastline. Port construction is diverting natural currents. These factors have collectively created a crisis for the health and cleanliness of our marine waters. In the wake of this, the Ministry of Earth Sciences is building human resources and a Water Quality Index to monitor coastal water quality, inform the government and other stakeholders on the status of coastal health, and facilitate action to protect and preserve the marine environment.

Ms Chavan pointed out that India's urban population has grown by 31% since the first census in 1951, and is predicted to increase to 65% by 2050. A recent report by the Ministry of Statistics and Programme Implementation stated that the top 10 cities saw a population growth of 25% in the last decade but the waste generated has increased by 72%. Recognising the scope and complexity of the problem, a group of former and current mayors constituted an Urban Cell to look into the crisis in Maharashtra. Subsequent interactions with municipal officials in the state revealed that their main problems were garbage and mobility.

Ineffective local administration is one of the main challenges to a waste free India. Garbage must be a non-negotiable programme and the Municipal Commissioner held accountable. The SWM Rules, 2000, directed municipal corporations to set up water processing disposal facilities, but most have not complied. Other directives such as monitoring the performance of waste processing disposal facilities, improving existing landfill sites and identifying and preparing sites for future use have also not been implemented. Elected representatives such as Municipal Corporators clearly require capacity building. Citizens, young and old, must be invited to participate, motivated to segregate their waste, and to pressure local authorities to implement the programme. Technology and outreach activities should be branded so that the programme takes on a fun image that encourages youth and children to get involved. Information must be provided so that citizens know where and how waste ends up. Auditing and reporting are mandatory under the 2016 Rules. Ms Chavan also recommended a carrot-stick-'Gandhigiri' approach that involves leading by example, offering incentives such as tax rebates on vermicomposting pits, rainwater harvesting and solar panels, and penalties for non-compliance.

Ms Patil spoke about the transformation of the popular Panchgani and Mahabaleshwar hill towns, which now rank among the cleanest towns of their size in India. In 2000, when the SWM Rules came into existence, Panchgani, population 14,000 (additional floating population 1,000,000—1,200,000), was among the first to come up with by-laws for them. Since it is an eco-sensitive zone, they were compelled by the MoEFCC to tackle the waste problem urgently in 2012. It was difficult at first to convince the public to segregate. The municipal council distributed red and blue dustbins to each household, and demonstrated the kind of waste that goes into each bin. Garbage dumps were cleared and contractors ordered to collect segregated waste. Citizens, schools, students, women from self-help groups (SHGs) and hotel owners were approached to raise awareness. A semi-mechanical composting machine was built and customised with some *jugaad* to be able to process about 10 MT of segregated waste every day. The SHGs monitored its collection, segregation and transportation. The town achieved segregation at source within six months.

The mountain of legacy waste was cleared and crudely segregated. Single-use plastics were collected, shredded and used for road construction. The two-acre plot is now a garden and popular tourist spot known as Swachh Bharat Point. The success of the programme has been attributed to the active participation of citizens, SHGs, NGOs, local authorities and political representatives, as well as to successfully implemented incentives and penalties. While the compost produced from the organic waste is sold, the disposal of dry and inert waste continues to remain a challenge. The opportunities for innovation and technology are many, but the greatest would be to have future generations say that this was a generation that brought about a change.

Vote of Thanks

Ms Chaturvedi thanked the speakers and audience of over 400 over the two days, adding that she hoped it had been an opportunity to learn, share and think. She closed the conference by urging the gathering to visit Chintan and its partner sites for excellent resources on circular economy and related issues.

Organisers

Waste Reduction, Circular Economy and Enhanced Livelihoods: Ideas from Near and Afar', an international conference held from 18—19 March 2019, was organised by Chintan Environmental Research and Action Group in partnership with its knowledge partners Friedrich-Ebert-Stiftung and EPIC-India.

Chintan Environmental Research and Action Group

Chintan's is a non-profit, non-governmental organisation whose mission is ensure human consumption of resources is more responsible and less burdensome on the planet and the poor. It addresses this through two of the biggest challenges of our times: waste and air pollution. It uses waste to fight poverty. While reducing waste and unsustainable consumption, it enables better management of waste from green livelihoods, builds public capacity, and conducts research and policy advocacy. It fights air pollution by enhancing public knowledge, and creating and advocating for the implementation of protocols and policy that protect human health. Vulnerable populations – the poor, marginalised, children and women – remain sharpest on the radar in all its work.

Friedrich-Ebert-Stiftung

Friedrich-Ebert-Stiftung (FES) is a German non-profit foundation committed to the ideals of social democracy through social justice, freedom and solidarity. Its mission is to facilitate policy shaping through a deliberative process. The FES working group on climate change under the International Department on Sustainability has the broad objective of shaping climate policy in a socially just way. Its Big Green Initiative informs development and livelihoods practitioners about the Scale Up Framework that can help bring scale to enable local initiatives to address the effects of climate change through long-term intervention, proactive planning and optimal use of available resources.

EPIC-India

The Energy Policy Institute at the University of Chicago (EPIC) launched EPIC-India in 2014 to help confront the challenge of pollution reduction while also sustaining economic growth and expanding access to reliable and affordable energy in the country. EPIC-India employs a comprehensive strategy to affect real change through foundational research, policy engagement and by communicating evidence to drive change, create lasting impact and solve some of the world's most pressing problems.

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