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Informal approaches towards a circular economy

– learning from the plastics recycling sector in India

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Content

Executive Summary

As natural resources come under increased stress due to population growth and an expanding middle class, optimization of material use becomes an urgent priority.

While collecting, reducing, reusing, and recycling some materials is technologically and economically feasible, others, like plastics, present a bigger challenge. Low oil prices, thousands of applications of plastics, sorting and recycling challenges, and poor waste management infrastructure have resulted in millions of tonnes of plastics flooding into the ocean annually.

Worldwide, both government and business have been struggling to implement practices conducive to the large-scale recycling of plastics. Instead of these formal actors, it is informal actors in developing countries that have successfully built businesses on the collection, trade and recycling of plastic waste. This informal sector consists of small businesses and self-employed persons with little or no legal recognition and low capital investments.

Its workers are often wrongly considered to be poorly skilled and to possess little technological know-how. Yet, the informal recycling sector as a whole contributes massively to a more circular plastic economy. Furthermore, this sector is one of the most dynamic and adaptive, catering to ever- changing demands in plastic products.

This report uses the example of India to raise awareness of the scale and structure of the informal recycling sector and its contribution towards a more circular plastic economy.

The direct contributions of the informal plastic recycling sector are described within the framework of the UN Sustainable Development Goals (SDGs). The report also describes how the informal recycling sector has addressed challenges commonly experienced by global business when moving towards more circular plastic economy and explores linkages with the informal sector.

This report has been jointly developed by the World Business Council for Sustainable Development (WBCSD), the World Resources Forum (WRF), and the Swiss Federal Laboratories for Materials Science and Technology (EMPA). The information presented has been collected from public sources and supplemented with discussions held with various formal and informal stakeholders in India. The Indian case study is based on investigations carried out as part of the Sustainable Recycling Industries Programme,[1] which is funded by the Swiss State Secretariat for Economic Affairs (SECO).

The Challenge

The WBCSD's vision is for a world in which 9 billion people live well within the boundaries of the planet by 2050. Achieving a global economy that does not generate "a particle of waste" requires that we address the impacts of today's megatrends.[2]

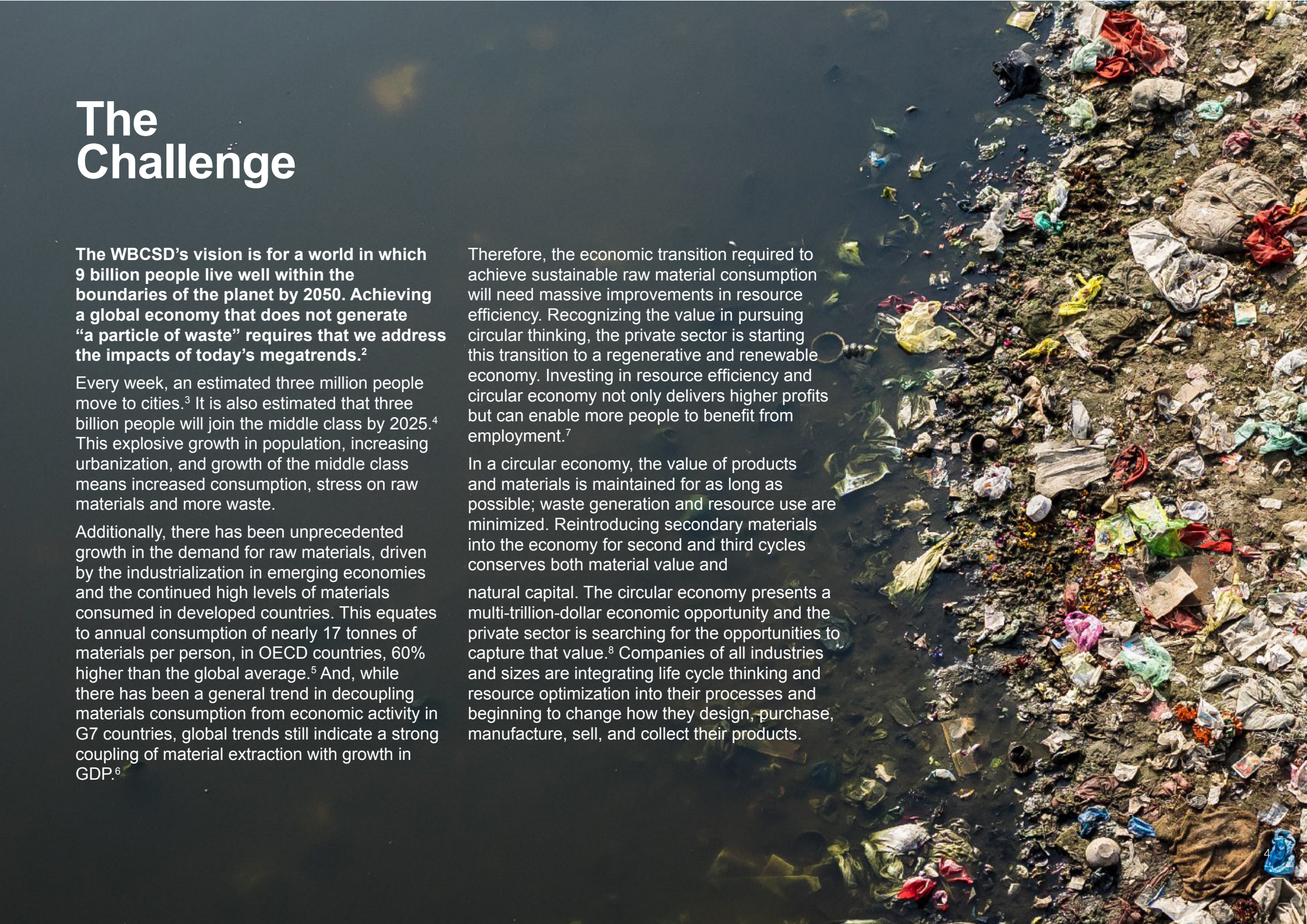
Every week, an estimated three million people move to cities.[3] It is also estimated that three billion people will join the middle class by 2025.[4] This explosive growth in population, increasing urbanization, and growth of the middle class means increased consumption, stress on raw materials and more waste.

Additionally, there has been unprecedented growth in the demand for raw materials, driven by the industrialization in emerging economies and the continued high levels of materials consumed in developed countries. This equates to annual consumption of nearly 17 tonnes of materials per person, in OECD countries, 60% higher than the global average.[5] And, while there has been a general trend in decoupling materials consumption from economic activity in G7 countries, global trends still indicate a strong coupling of material extraction with growth in GDP.[6]

Therefore, the economic transition required to achieve sustainable raw material consumption will need massive improvements in resource efficiency. Recognizing the value in pursuing circular thinking, the private sector is starting this transition to a regenerative and renewable economy. Investing in resource efficiency and circular economy not only delivers higher profits but can enable more people to benefit from employment.[7]

In a circular economy, the value of products and materials is maintained for as long as possible; waste generation and resource use are minimized. Reintroducing secondary materials into the economy for second and third cycles conserves both material value and

natural capital. The circular economy presents a multi-trillion-dollar economic opportunity and the private sector is searching for the opportunities to capture that value.[8] Companies of all industries and sizes are integrating life cycle thinking and resource optimization into their processes and beginning to change how they design, purchase, manufacture, sell, and collect their products.



The Leak in the Plastics Cycle

According to the International Solid Waste Association, only 5% of global plastics feedstock was secondary plastic material in 2012.[9] By comparison, paper and steel products consisted of 58% and 37% recycled content, respectively. Closing the plastics loop serves as one of the biggest challenges in transitioning to a circular economy. Before secondary plastic content can be incorporated into new products, the used plastics must be collected, sorted and processed into market-ready products.

The variety of plastic types and colors, inconsistent collection and recycling infrastructures, complexity that is borne out of composite and polymer materials, and the volatile price of fossil fuels are a few of the challenges that contribute to very low plastic recycling rates globally. For instance, only 14% of plastic packaging is collected for recycling in the US. And, in fact, the Ellen MacArthur Foundation estimates that 80-120 billion USD is lost annually to the economy from the material value of plastic packaging alone.[10]

There is tremendous value for companies to identify solutions that reintroduce used plastics back into the production cycle, including, that:

- Plastics producers can reduce the life cycle carbon emissions of their products through the use of secondary raw plastics;
- Packaging companies can reduce costs and diversify supply risks by purchasing cost-competitive secondary plastics;
- Brand owners address the risk of negative brand perception due to the association of their labeled packaging with beach or marine pollution;
- Collection and recycling companies operate with large enough quantities to achieve economies of scale.

There are also a number of societal benefits to closing the plastics loop, including reduced negative impacts on land and oceans, and recovered areas for recreation or agricultural purposes, or for urban developments, to name a few.

The economic case for business to act is substantial. The environmental case and social challenges for the public sector and society to respond may be even greater.

There is much that can be learned from the informal recycling sector in developing countries that capture economic gains that would otherwise be lost, while working to improve on the overall social challenges the informal sector faces.

The Informal Recycling Sector

A large informal workforce is making a living by collecting, sorting, recycling, and selling valuable plastics materials recovered from waste. In many developing countries, informal recycling fills a vacuum that is left by municipalities that are often lacking the legal framework, resources, and capacity to implement a formal waste collection and treatment system. The informal sector also contributes to waste reduction, reduces costs related to municipal waste management, and recovers valuable materials which otherwise would be lost. High waste collection rates of up to 80% have been reported for various waste streams. Thus it is acknowledged that the informal waste sector often reveals a great development potential.[11,12,13]

Discussions around the informal waste sector are also strongly related to adverse effects for humans and the environment. Due to their daily contact with garbage, people working in informal waste management, including children, are exposed to various health threats. In the absence of rules and regulations, materials with no monetary incentive are either not collected, get dumped or are burned, leading to various adverse effects on the environment.[14,15]

Despite the informal sector having been the subject to political and scientific discussions for decades, there is no clear definition of the sector. The informal recycling sector has an unclear or no legal status and the vast majority of people working informally barely earn enough money needed to survive. Their income is usually below the minimum tax threshold, defined as subsistence activity, and therefore cannot be perceived as being illegal.[16] However, the informal economy also includes various operators that are not established as legal entities, with income above the living wage and the minimum tax threshold, that purposely bypass national and/or local laws and regulations. These operators are defined as ‘unofficial’ business activities, being correctly perceived as illegal. For the purpose of this document the informal sector is characterized by both subsistence activities and unofficial business activities.

The Indian Plastic Recycling Sector

Annual Plastic Flows

The average Indian consumes roughly 13 kilograms (kg) of plastic per capita per year.[17] Of this, about 45% are quickly released as waste, while the other 55% are kept in use for longer time spans and contribute to a growing stock of plastics.

While the Indian per capita plastics consumption is rather low compared to that of other countries (12% of the per capita consumption of the USA which is 109 kg per year), the number of Indian inhabitants results in staggering yearly quantities of plastics consumed (18.6 million tonnes) and released as waste (7.3 million tonnes[18]).
In addition to the production of plastic waste in India, the country is also an importer of plastic scrap for recycling. While the quantities imported are considerable, they only contribute about 3-4% (or about 250,000 tonnes) to the total plastic waste that has to be managed. Out of all plastic waste in India (5.9 kilo per capita per year, or 7.5 million tonnes), around 60% (4.6 million tonnes) are recycled,[19] and the residual 40% (2.9 million tonnes) are disposed in various ways.
In comparison, only 6.5% of the plastic waste generated in the USA are recycled.[20] Due to the amount of secondary plastics produced per year, the local demand of primary plastics is reduced from 18.6 million tonnes to 14.0 million tonnes per year.[21]

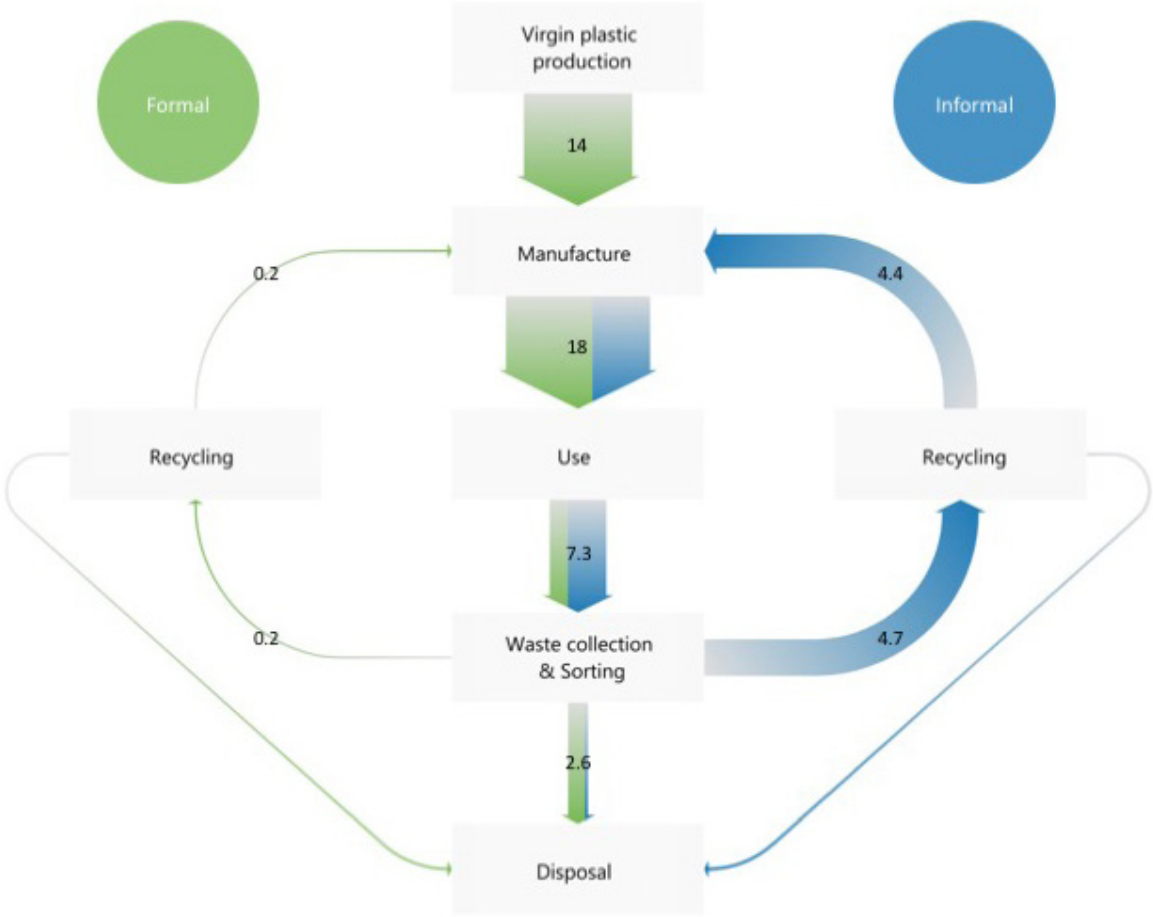
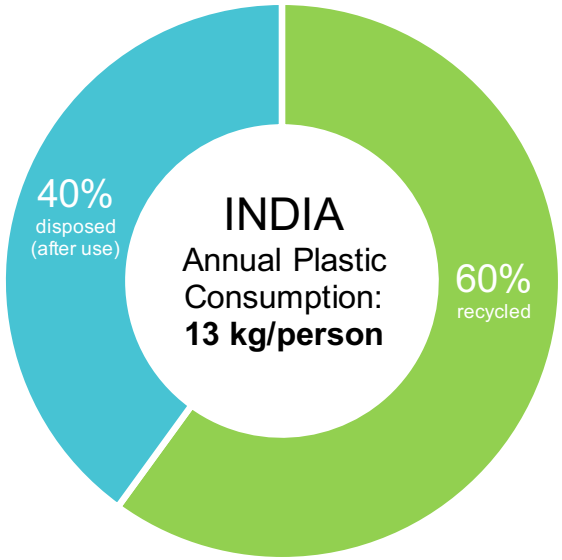


Figure: Plastic flows in India. Size is relative to mass. Values in million tonnes.

The recycling value chain

The recycling value chain includes a series of indispensable processes, starting with the collection of plastic waste and ending with the production of plastic pellets, the broadly recognized medium of exchange in plastic manufacturing. In between, sorting, cleaning, shredding and compounding steps, such as the adding of colorants or other additives are required. Sorting by source, polymer, color, quality (times recycled) is conducted several times and at different locations in the value chain, improving the quality of the handled fractions every time. The trading of waste plastics of various types, grades and states of processing is very common. This allows for large quantities of certain types of plastics to be purchased to be used in manufacturing specific materials. The informal recycling sector in India is active in all of these steps, as detailed on the next page.



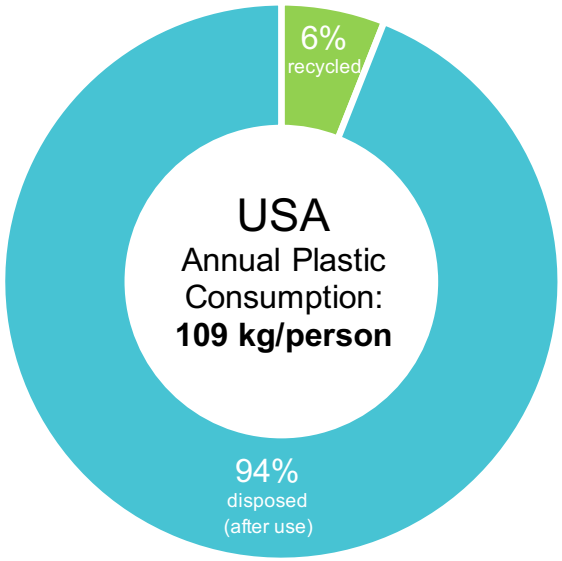


Figure: The informal plastic value chain

Formal and Informal Linkages

In India, waste collection and processing has traditionally been a task left to lower social classes and minorities, and often includes child workers. As these activities have been performed for the generation of income, these systems have been inherently circular, utilizing the value of wastes to the furthest extent possible.
With modernization and the creation of environmental and economic laws, these traditional waste management systems were all rendered informal to various degrees.[22]

Plastic is a fairly new material within India's waste management system. It was introduced into an economy with already existing (formal) industry and (informal) waste management. Similar to industries adapting to new materials, certain social classes and groups of the informal sector shifted into the management of plastics waste. These groups today possess most of the indigenous knowledge and form the core of today's informal plastic recycling sector.[23]

The result of this shift is the Indian plastic economy of today. Conventional economic activities largely follow a linear model of "take-make-dispose". These business models are styled after the globally prevalent modes of production, which are linked to large losses of material value. Informal activities insert themselves into this linear activity, and recover the value of waste plastics through recycling- closing the loop of the Indian plastic economy.

Overall, informal and formal activities complement each other and are highly interlinked. Within one circle, the ownership of materials can switch several times between formal and informal actors.

In manufacturing, primary plastics (of formal origin) are acquired by informal manufacturers and secondary plastics are used by formal manufacturers. In the case of outsourced component manufacturing, this may happen without the knowledge of the producer. In waste collection and sorting, waste auctions of formal businesses may be attended by informal traders. Collection from households also diverts materials into informal channels. Although some traders may be formal, they may still source from and sell to informal processors. The comparatively few formal recyclers also depend on the informal collection and sorting systems to source their raw material.

With the push towards the circularization of the global formal economy, competition between the two sectors is becoming more and more prevalent. Formal recycling companies have started up in recent years. However, they are often unable to compete with the informal recycling sector, which is able to pay the workers below minimum wage and avoid tax implications.

This may result in some of these companies slipping into informality under the pressure of remaining profitable.

Contrasts in Disposal Practices

The division of the Indian plastic economy in a formal- largely linear, and informal and typically more circular sector also leads to completely different modes of disposal of non-recycled plastics. The public waste management systems are driven by the supply of waste. Municipalities operate costly collection and disposal systems, resulting in most plastics being landfilled and becoming environmental hazards. Only a few waste-to-energy incinerators operate in India.

The informal disposal of non-recycled plastics is driven by the demand for cheap substitute fuels in various industries due to high calorific value. Plastic is often used as fuel in brick manufacturing, generating considerable emissions when baking bricks.[24]

The informal sector roughly diverts 4.7 million tonnes of plastic per year from the public waste collection system. This reduces the economic burden on public funds, reducing the costs of collection, transport and landfilling. However, the informal recycling sector also removes most high quality and high value plastic from the waste stream, making formal recycling systems economically unviable.

Littering of plastics is common in India and is a consequence of these two parallel systems. The informal sector, driven by revenue, collects valuable materials littered, but leaves the non-valuable material. Where local governments typically operate a waste management system that addresses the remaining waste, they often lack the financial resources to cover the scope the informal sector covers.

Delhi as Hotspot of the Informal Plastic Economy

The informal plastic economy shows a high degree of self-organization and operates within a pan-Indian network of trust, where materials are mostly traded between trusted partners.[25] Between different groups, power struggles for the access of higher quality materials are common.[26] As a result, plastic waste is transported over the whole subcontinent in staggering quantities. Delhi is one of the main recycling hotspots in India. It only generates 5% of the Indian plastic waste,[27] but produces roughly 25% of the plastics recycled in India.[28] To sustain this recycling industry around 1 million tonnes (or 13% of all waste plastics in India) have to be transported to Delhi per year.

Businesses of the informal plastic economy are usually very small and only employ a few workers each.[29] While some of them show some vertical integration and perform several processes in the plastics recycling value chain, most specialize in one or two activities. Given the constant need for specific raw materials these businesses are often found in localized clusters which develop their own recycling subculture.[30]

A well described cluster is the area called Tikri Kalan, a trading and sorting cluster located in the east of Delhi.[31] On an area of around 1.5 km^2, around 1900 tonnes of materials are traded every working day. Half of all plastics recycled in Delhi flow through this area. Within Tikri Kalan, three distinct groups and areas can be differentiated. The PVC market is a formal area which sees high turnovers, performs little sorting and mostly handles high quality plastic waste only. Two informal satellites, Badi Tikri and Choti Tikri, complement the function of this main market. Badi Tikri receives the lowquality waste rejected from the PVC market for further sorting. Choti Tikri acts as a long term storage area. Officially formal traders of the PVC market are to also own plots in Choti Tikri in order to optimize costs.

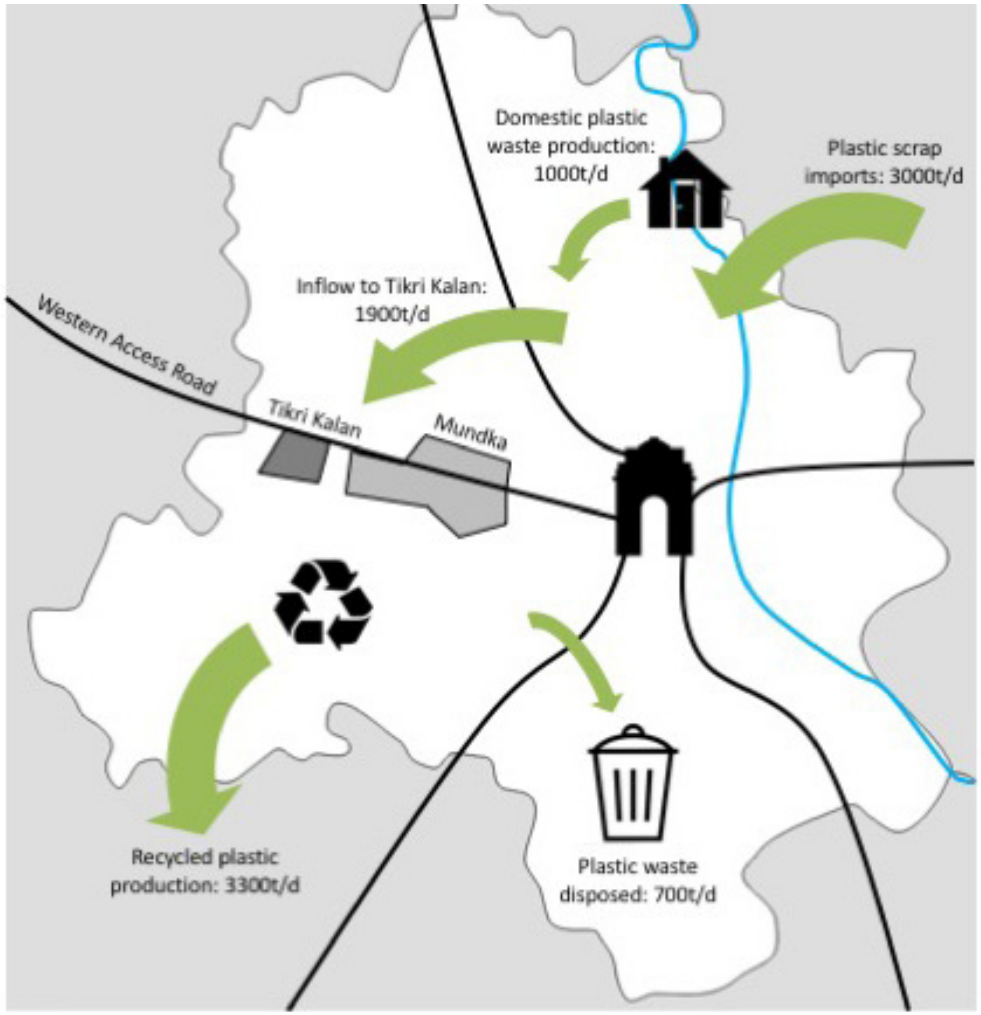


Figure: Tikri Kalan Cluster and Delhi - Plastic Flows

Clusters jointly sustain a more skilled and specialized workforce. The resulting improved processing efficiencies enable it to attract material over large distances by paying higher prices. The clustering of traders also enables them to specialize in different material types and qualities, yet still buy mixed plastic scrap. Often the traders form informal consortia and together finance large shipments of materials, which are then divided according to each trader's specialty. These shipments may come on large container ships from countries like the United Arab Emirates. The shipment stakeholders are constantly aware of their share's location and will know days in advance when their shipment can be collected from their local port (e.g. Mumbai).

A cluster cannot function on its own and needs good connections to other business in the value chain.[32] Multiple clusters focusing on single processes often form superclusters, which greatly reduce transport distances. Tikri Kalan for example, is located on the western outskirts of Delhi on one of the main access roads into the city centre. Located further towards the city centre is Mundka, where many units are sorting, cutting, cleaning and pelletizing the plastic often obtained from Tikri Kalan.

The Informal Plastic Recycling Sector and the UN SDGs

In September 2015, the General Assembly of the United Nations, adopted the Sustainable Development Goals (SDGs) also referred to as the 2030 Agenda for Sustainable Development. This set of 17 goals is the first globally agreed framework for sustainable development. The SDGs aim to eradicate extreme poverty, fight hunger, improve health and education and fight against climate change through a holistic, inclusive, equitable and universally applicable approach.[33]

Transitioning to a circular economy would bring high economic, social and environmental benefits and contribute to the success of the SDGs. For example, “moving away from resource intensive processes and maximizing the use of existing material”,[34] not only contributes towards achieving SDG 12 (Responsible Consumption and Production) but also SDG 8 (Decent Work and Economic Growth), 9 (Industry, Innovation and Infrastructure), 11 (Sustainable Cities and Communities), and 13 (Climate Action). The transversal nature of circular economy makes it a highly valuable framework in the context of society achieving the Global Goals, and understanding how business can contribute to doing so.

In many regards, the informal plastic recycling sector in India also contributes positively towards achieving the SDGs. For instance, it generates employment for many, reduces the need for raw materials, and diverts plastic wastes from landfills and oceans.

However, some aspects call for improvement, particularly those related to pollution, workers’ rights, child labor and safety. Sustainable Development Goal 8 (Decent Work and Economic Growth) presents a formidable challenge that the informal sector must address.

Positive contribution of Informal Plastics Recycling Sector

Gives the opportunities for plastic recycling workers to generate a relatively good income and provide for their families

Informal plastic recycling sector adds value to the economy by transforming waste into tradable goods (saving of raw materials, transports and energy) [35]

Very high recycling rates achieved

Recycled plastics decreases the need for virgin material

Plastic recycling avoids incineration, which causes hazardous emissions

Pushes the transition towards circular economy and encourages technological innovation for recycling

Enables CO2 savings by avoiding carbon emissions related to the production of virgin plastics and reducing the need for incineration

Waste disposed on rivers and lakes coasts pollute water: managing waste contributes to making water less polluted

Public savings: reduce costs associated with waste management for municipalities (waste collection, disposal, …) [36]

Decreased quantity of waste ending up in the ocean: contributes to mitigate ocean's pollution.

The informal plastics recycling sector in India is also faced with several challenges that negatively impact the achievement of several of the UN SDGs. For example, the Informal Plastic Sector does not provide decent working conditions: waste pickers, including children, suffer from exposure to hazardous materials and taxing manual labor.

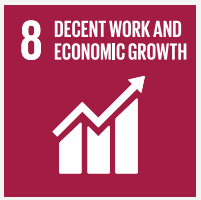
Workers can be exposed to hazardous materials, leading to health risks for workers.[37]Additionally, while cities can experience a reduced cost in waste management, due to the uncertain legal status of the informal sector, there can be negative impacts for citizens that have little or no legal status as workers, or for communities that do not receive taxes from businesses that are not registered entities.

Examples of positive contributions of the informal recycling sector in India to the UN SDGs

SDG 1
No Poverty

The informal plastic recycling sector employs hundreds of thousands of people in India (between half a million and a million according to various estimates[38]), and supports the livelihood of many more. In terms of income, large differences exist along the recycling chain. At the lower end, plastic waste pickers earn about $40 USD per month ($1.33 per day), and plastic waste sorters slightly more. Recycling factory owners earn between $600 and $3000 USD per month depending on the size of their business, and monthly wages among plastic scrap traders vary between $500 and $5000 USD.[39] With the exception of plastic waste pickers and sorters, all actors in the recycling chain therefore earn relatively high revenues from the activity considering that the median per-capita income is of $50 USD per month in India.[40] Many of the people working in that sector come from disadvantaged communities, traditionally occupying the lowest place in the Indian caste system.

However, $1.33 is just above the poverty line. In order to contribute towards SDG 1 the wage waste pickers earn must increase while sector employment is reserved for adults of legal working age.



SDG 8
Decent work and economic growth

The informal plastic recycling sector contributes to sustainable economic growth, by supporting numerous livelihoods and creating value out of waste, while having a positive impact on the environment. According to estimations, the informal sector as a whole reaches an annual turnover of $1 billion,[41] and it is set to grow even more with rising waste volumes on the supply side, and increasing purchasing power of consumers on the demand side.

As in other segments of the informal economy, shortcomings related to labor rights and occupational safety are widespread in the informal plastic recycling sector. Better practices are needed to ensure the sustainability of the whole value chain. Again, child labor must be addressed as it negatively impacts this goal.

SDG 12
Sustainable consumption and production

Each year, almost 5 million tons of plastic waste is recycled in India. Without the contribution of the informal sector, this mountain of waste would end up in landfills, roadsides or waterways and oceans. Furthermore, recycled plastics replace virgin plastics in new products; in the Indian case, the need for virgin plastics is reduced by 30% through recycling.

SDG 13
ClimateAction

Each ton of plastic being recycled saves about 1.5 tons of CO2, mainly due to the avoided extraction of virgin materials.[42] Scaled up to the Indian situation, this translates into annual savings of nearly 7 million tons of CO2, equivalent to the per capita emissions of 4 million Indians, 1.5 million Swiss or 0.4 million Americans.

Challenges & Solutions

Globally, innovative businesses are struggling to move towards more circular material cycles. These businesses often face similar challenges, which fall under the four categories: economic, regulatory, data & technical, and social. Across these four categories, the table outlines the twelve challenges that are commonly cited when discussing sustainable materials management.

CHALLENGE		DESCRIPTION
ECONOMIC	Imports & Commodity Prices	Volatile commodity prices and inexpensive imports can undercut local secondary material prices
	Stable Supply & Demand	Inconsistent secondary material supply quantities and quality make it difficult to achieve economies of scale
	Established Business Case	Companies do not have a good understanding of how the circular economy impacts their value drivers
REGULATORY	Definitions & Criteria	Definitions of “waste” or “hazardous” may differ between jurisdictions, complicating reuse
	Hazardous Materials	Presence of hazardous substances may contaminate large quantities of secondary materials or create logistical barriers
	Cross-Border Transportation	Exchange across borders may require additional resources to address legal uncertainties and multiple regulatory requirements
DATA & TECHNICAL	Information Access	Information of secondary materials available, quantities demanded, and other details is difficult to find
	Quality Control	Processes and systems for determining the quality of secondary materials have not been defined or widely accepted
	Waste Stream Contamination	Comingled waste streams create sorting challenges that often make recycling uneconomical
SOCIAL	Consumer Perception	Consumers hold a bias against recycled content, citing quality and durability concerns
	Good & Sustainable Work	Although new jobs are created through recycling and sorting, the working conditions are not always fair or healthy to employees
	Establishing Trust	Confidential information security and reliability must be reached by companies exchanging materials

The relative success of India's informal sector in achieving a circular economy for plastics raises the question of how these multiple challenges have been addressed by informal recyclers. Some of the above-mentioned challenges may not be relevant in the context of the informal plastics recycling sector in India, such as issues related to formal definitions of waste. In other cases, relevant challenges were overcome through technological or organizational solutions implemented in the informal sector, such as the large collection network and extreme specialization of downstream processing channels. Finally, the remaining challenges, such as those related to environmental and social externalities, are highly relevant in the India context and are yet to be solved.

The adjacent boxes give a short overview on the relevance, eventual solutions, and remaining issues related to the above-mentioned economic, regulatory, data & technical, and social challenges, in the context of informal plastic recycling in India.

Economic challenges

The economic challenges are very relevant in the Indian context as the entire industry is profit-driven.

Several factors might explain why plastic recycling is financially successful in India. Relatively **low labor costs** enable secondary plastic prices to be mostly kept below or equal to virgin materials. A constant supply of secondary materials is ensured by a **large and competitive collection network**, delivering high volumes of relatively homogenous plastic scrap to **highly specialized recyclers**. The strong reliance on manual labor enables **efficient sorting**, which facilitates further processing and allows recycling of most plastic types. At the end of the chain, the large and growing domestic market for inexpensive consumer products, partly made of secondary materials, guarantee a **sufficient demand** for recycled plastics.

Regulatory challenges

By definition, informal business activities often occur beyond the realm of regulations. As most plastic recycling is done by informal actors in India, regulatory challenges faced by global corporations are often not met by informal recyclers. This can lead to **problematic situations.**

For instance, some fractions of plastic waste, such as those containing heavy metals or brominated flame retardants, should be considered as hazardous waste and disposed of in an environmentally responsible way. In the Indian informal sector, such distinctions do not exist and those materials are being recycled, posing **threats to public health and the environment.**

Bringing the informal recycling sector closer to compliance with regulations will require a **joint effort** by the Government, NGOs, companies using secondary plastics, and the recyclers themselves.

Data & technical challenges

Plastic scrap collectors, sorters, and recyclers are regularly communicating with each other regarding availability and quality of secondary plastics. Information is exchanged face-to-face, via telephone, or services like WhatsApp. Value chain players use a set of terms developed in the informal sector to describe content and quality of plastic scrap. These **bottom-up communication channels** enable efficient transfer of information among actors.

Some technical challenges are inherent to plastic recycling, such as sorting complexity and inconsistent quality. Drawing on a large pool of **indigenous knowledge**, plastic sorters are able to sort almost all plastic types using their hands, eyes, ears and noses. In contrast, more cost-intensive mechanized automation processes used in state-of-the-art recycling plants can usually only sort a few polymer types from comingled waste streams. As for quality control, informal recyclers also rely primarily on their senses, for instance assessing the quality of scrap based on visual aspect. It is unclear how such methods compare to standardized measurements, but they may contribute to an overall low quality of secondary plastics produced in the informal sector.

Social challenges

Reuse and recycling are part of India's traditions. The demand for recycled plastics is substantial. Secondary materials find their way into affordable products such as toys, pipes, bags, buckets and canisters.

A **network of trust** exists among actors of the recycling chain. Lasting relationships exist between scrap suppliers and customers. Cheaters are removed from the trade network.

Plastic recycling provides livelihood to hundreds of thousands in India, often coming from disadvantaged communities. Unsafe and unfair working conditions however persist at lower levels of the value chain, particularly for workers involved in waste collection, sorting and factory work.

Approaches and opportunities in linking with the informal sector

The waste collection activities of the informal sector are highly accepted in Indian society. The general public is used to having people collecting valuable waste from their doorsteps and getting paid for it. As such, companies looking to transition to more circular business models in India are almost required to cooperate to some extent with the informal sector. Global businesses may struggle in building cooperative relationships in the informal sector, especially considering legal and organizational aspects. A few approaches being piloted are described in the adjacent boxes.

The main strengths of the informal sector are its high collection and sorting efficiency and the high degree of specialization. For example, motorbike seats are found in concentrated areas of one to four recyclers across Delhi. A manufacturer of a certain product can therefore obtain a high purity fraction of their own product as a waste.

Private sector dependence on the informal sector does not come without its risk or challenges. Businesses must be confident that the materials they source do not violate human rights standards. Issues such as child labor, poor work conditions, and lack of basic health and safety programs all present risks to global business. Businesses must (1) locate their dependencies on the informal sector; (2) identify their risks due to unsavory supply chain activities; (3) implement risk mitigation strategies; and (4) periodically check supply chain activities to confirm business compliance with all material standards and regulations.

A local intermediary can help in gaining trust and building relationships between global businesses and the informal sector. Such an intermediary provides a safety function to both sides. If deciding to work with intermediaries, trust between the intermediary and a global business is key.

Standards requiring processes and conditions which ensure that the material has been handled in socially, environmentally and technically acceptable conditions are essential in establishing this trust. Such standards can also be used to continuously improve the local conditions of the plastic recycling sector and giving informal businesses a chance to adapt to the stricter requirements of a future circular economy.

Banyan Nation Recyclers – Making Better Plastics™

Banyan Nation Recyclers is a startup located in Hyderabad and was founded by former Silicon Valley engineers.

Bayan Nation an intermediary between informal collection systems and global brands. By putting mechanical cleaning and pelletizing processes

in-house, Banyan is able to deliver customers high-quality recyclate.
http://goo.gl/cL6c3N

CIIs GreenPro product certification process

The Confederation of Indian Industries (CII) GreenPro Product certification scheme aims to support businesses in procuring green and more sustainable materials, products and services.

Spearheaded by CIIs Sohrabji Godrej Green Business Centre, GreenPro has already supported the transition towards a more sustainable sector for building materials. A certification scheme is currently being developed for recycled plastics.

http://goo.gl/zhYyyf

Conclusions

In order to transition towards a more circular economy, there is a need to capture the value of materials and keep them in use for as long as possible. In the case of plastics, business, society and governments have been faced with multiple challenges ranging from the large variety of applications for plastics, inadequate collection mechanisms, to quality issues from use of secondary plastics, to name a few.

In India, it in many other developing countries, it is informal actors that have successfully built businesses on the collection, trade and recycling of plastic waste. This informal sector, consisting of small businesses and self- employed persons with little legal recognition, are one of the most dynamic and adaptive. Furthermore, they are finding solutions to these challenges and intersecting with large businesses in the path towards a circular economy of plastics.

While several social challenges exist for the informal sector, its contributions towards a circular economy for plastics should be understood by global businesses exploring similar resource and materials challenges today.

The informal recycling sector in India is diverting 4.7 million tonnes of plastic per year from the public waste collection system, conserving natural capital, identifying material and resource value, and finding innovative solutions to several challenges large businesses are facing in secondary materials management.

Lastly, the informal recycling sector in India can be an example of how transitioning towards a circular economy will help business, governments, and society achieve the UN SDGs. The transversal nature of circular economy will help achieve many diverse goals – from responsible consumption and production, to healthier oceans and waterways, to reducing greenhouse gases from landfills. Through understanding the informal recycling sector in India, it is hoped that new and innovative ways can be stimulated to help focus efforts to achieve 9 billion people living well within the boundaries of the planet by 2050.

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About Empa

As an interdisciplinary research institute of the ETH Domain, Empa, the Swiss Federal Laboratories for Materials Science and Technology, conducts cutting-edge materials and technology research. Research and development activities focus on meeting the requirements of industry and the needs of society, and thus link applications-oriented research to the practical implementation of new ideas.

Within Empa, the Critical Materials and Resource Efficiency group (CARE) models the distribution, exposure and fate of materials required by technologies and products and investigates on resource efficiency and recovery and reintegration into the product life cycle.

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About the World Business Council for Sustainable Development

The World Business Council for Sustainable Development (WBCSD), a CEO-led organization of some 200 forward-thinking global companies, is committed to galvanizing the global business community to create a sustainable future for business, society and the environment. Together with its members, the council applies its respected thought leadership and effective advocacy to generate constructive solutions and take shared action. Leveraging its strong relationships with stakeholders as the leading advocate for business, the council helps driv4e debate and policy change in favor of sustainable development solutions.

The WBCSD provides a forum for its member companies - who represent all business sectors, all continents and a combined revenue of more than $7 trillion - to share best practices on sustainable development issues and to develop innovative tools that change the status quo. The council also benefits from a network of 65+ national and regional business councils and partner organizations, a majority of which are based in developing countries.

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About the World Resources Forum

WRF is an independent non-profit international organization that serves as a platform connecting and fostering knowledge exchange on resources management amongst business leaders, policy-makers, NGOs, scientists and the public. WRF aims to make its vision of sustainable use of resources worldwide a reality through organization of high-level international conferences and capacity-building workshops, dissemination of relevant research findings and scientific discussions, development of resource efficiency indices, setting standards for sustainable resource use, creation of opportunities for financing resource efficiency projects as well as through engagement with young leaders and the wider public. WRF is committed to the inclusiveness of economic growth and elimination of poverty and marginalization, thus making these issues a core element in any objectives it pursues.

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