

Waste recycling issues and opportunities

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Content

- Present status on waste management in India
- Pathways and pollution
- Evolution of waste management
- Waste recycling and conflicts
- Need for regulatory convergence

Present status

Present status in India

- **Municipal - 62 million tonnes/annum**
- **Construction & Demolition - 500-700 million tonnes/annum**
- **Industrial**
 - Hazardous - 7.90 million tonnes/annum
 - Non Hazardous - 200 million tonnes/annum
- **Biomedical - 1.5 lakh tonnes/annum**
- **Electronic - 8 lakh tonnes/annum**

MSW characteristics in Indian cities

Parameter	Unit	Range
Physical composition		
Compostable	%	30 – 55
Plastics, Paper, Metal, Glass etc)	%	5 – 15
Inerts including C&D waste	%	40 - 55
Characteristics		
Carbon/Nitrogen (C/N)	Ratio	14 – 53
Moisture	%	17 – 65
Calorific Value	kcal/kg	520 – 3766

Major hazardous waste streams

Waste types	Annual quantities	
	Tonnes	Percentage
Cyanide waste	15,120	0.4
Heavy metals	381,015	9.3
Organic wastes including solvents and tars	633,615	15.4
Inorganic wastes including ETP sludge	3,039,513	74.0
Asbestos waste	7,786	0.2
Miscellaneous	30,353	0.7

Key features of MSW management

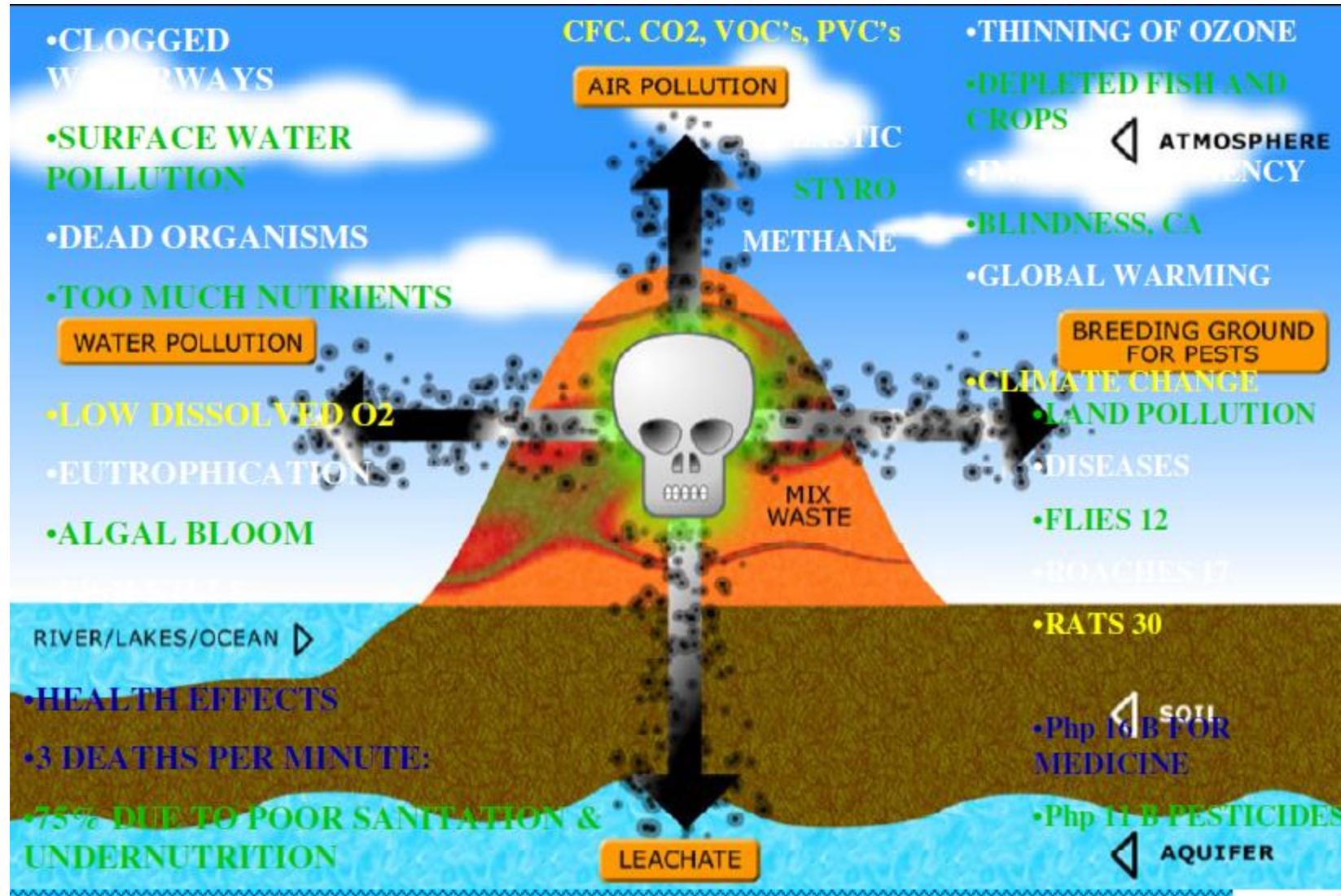
- Growing waste quantities Would require around 1750 acres of land if disposed
- Change in waste composition, increasing quantities of packaging waste, 40-50% of organics in waste stream
- Recyclable content of the MSW is picked up by waste pickers and send for recycling
- India reports high recycling rate of 60% though most of it happens in informal sector
- C&D waste presently disposed on land but can be recycled
- High moisture content and low calorific value of organic fraction of Indian MSW makes it more amendable to biochemical conversion

Key issues - MSW

- Overall, general apathy of local bodies and public to deal with the issues related to management of MSW
- Lack of waste segregation at source
- In efficient collection - efficiencies range from 50 to 90% in major metros; smaller cities, it is around 50%
- Inadequate transportation facilities in more than 70% of the cities
- Inadequate disposal - very few sanitary landfills
- Landfill gas emission and contamination of water and soil due to leachate
- Biomedical waste, slaughter house waste, industrial waste often reaching the MSW dumpsites posing potential hazard to sanitary workers and waste pickers

Pathways and pollution

Varied Impacts of Disposal



Contamination due to leachate



Fire due to LFG

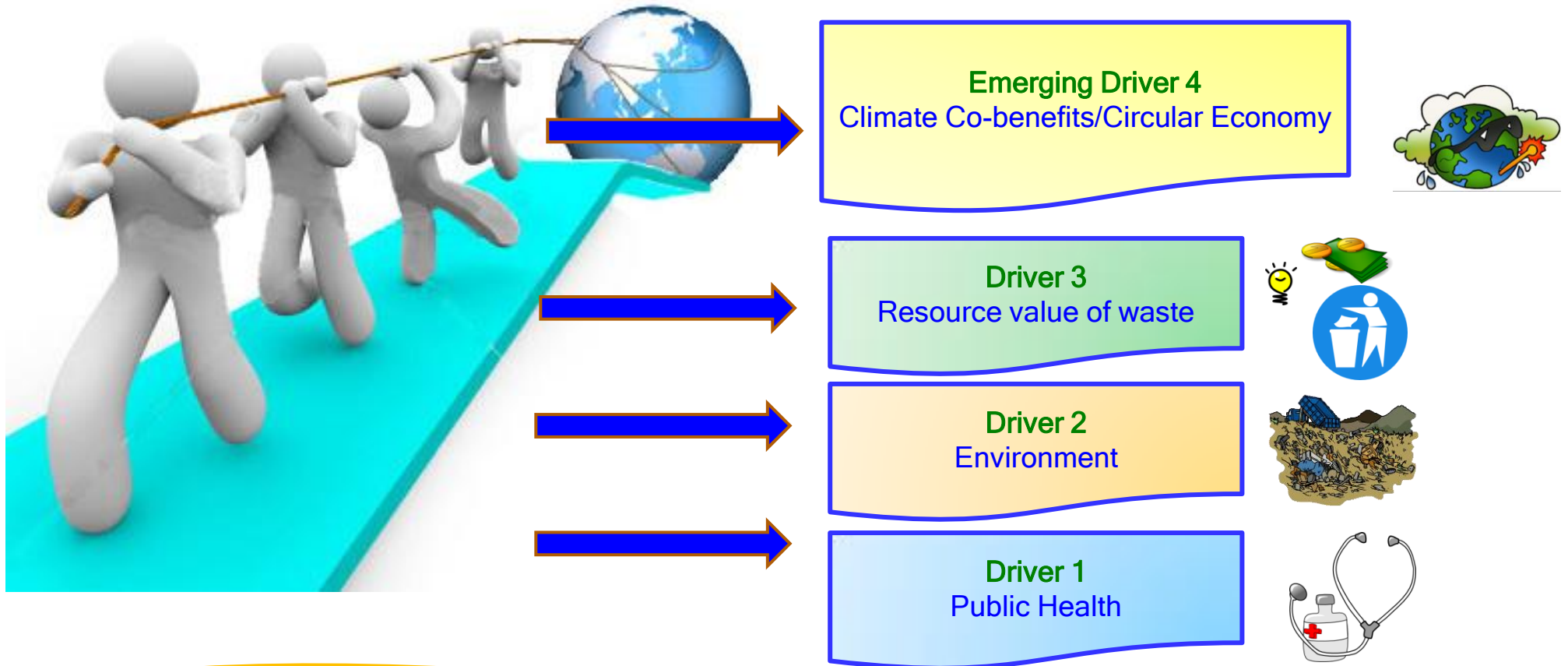


Evolution of waste management

Increasing Complexity of Waste Streams

Up to 1980s	Upto 1990s	Present
Solid		
<ul style="list-style-type: none"> • Municipal solid waste • Industrial hazardous and nonhazardous wastes 	<ul style="list-style-type: none"> • Construction and demolition debris • Plastic waste • Hospital waste 	<ul style="list-style-type: none"> • E-waste • Packaging waste • Exhaustive PV waste
Liquid		
<ul style="list-style-type: none"> • Municipal sewage • Industrial wastewater 	<ul style="list-style-type: none"> • Contamination of sewage from household industries 	<ul style="list-style-type: none"> • Discharge of residual pharmacy products • Neutraceuticals
Gaseous		
<ul style="list-style-type: none"> • Air pollution from stacks 	<ul style="list-style-type: none"> • Emission from incinerators 	<ul style="list-style-type: none"> • Emission from automobile exhaust • Emission of dioxins and furans

Drivers For Waste Management Modernization

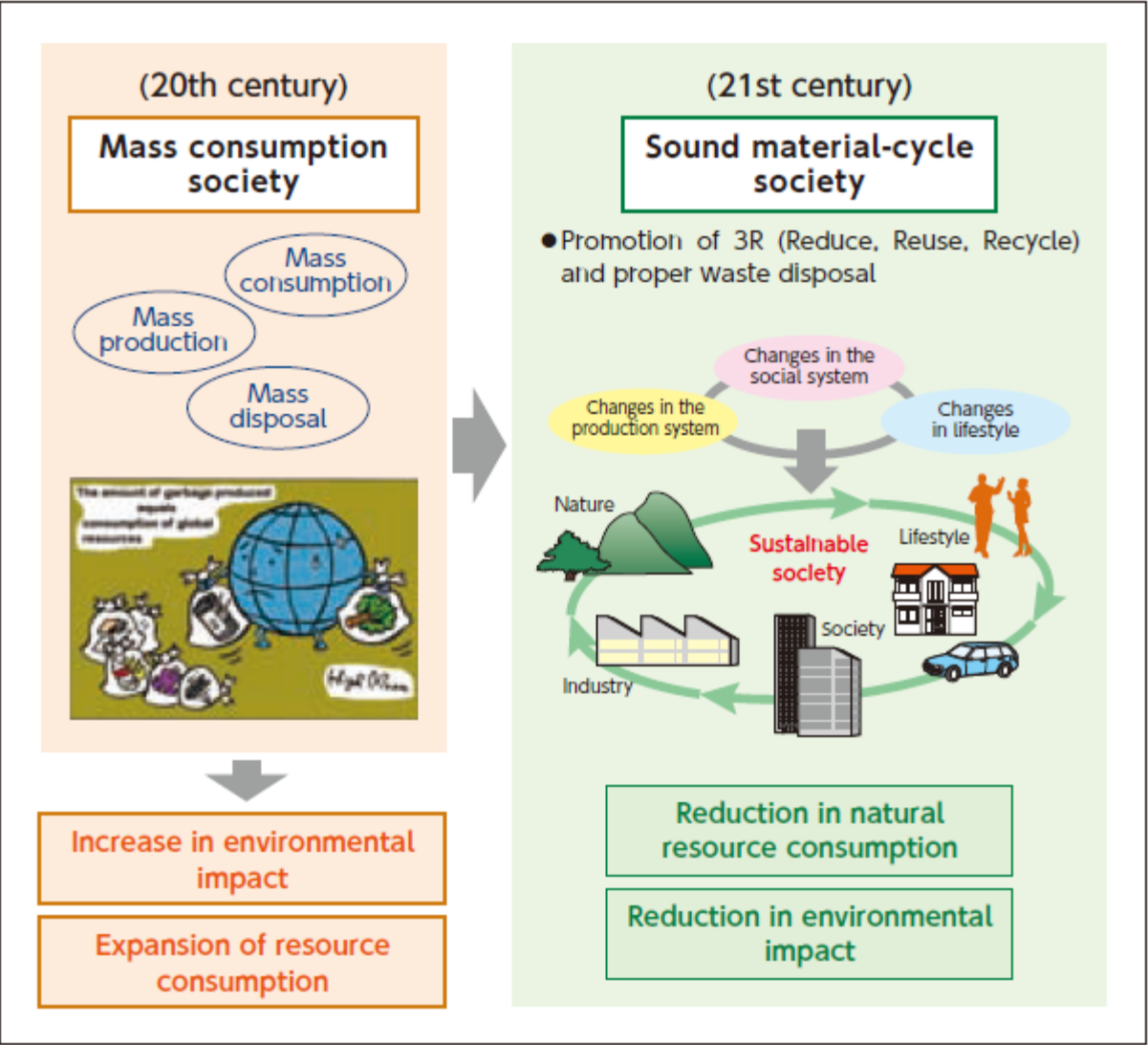


Moving from **Waste Management** to **Resources Management**

Waste Management Evolution

- Public and Environmental Health Protection was the driver for waste management few decades ago, and it still is for some developing countries
- Therefore, end-of-pipe technology to manage waste after its been generated was most practiced course of action
- Then came the reduce reuse and recycle of waste (waste as resource management)
- Now, waste management is revolutionizing as tools for attaining sustainability and circular economy

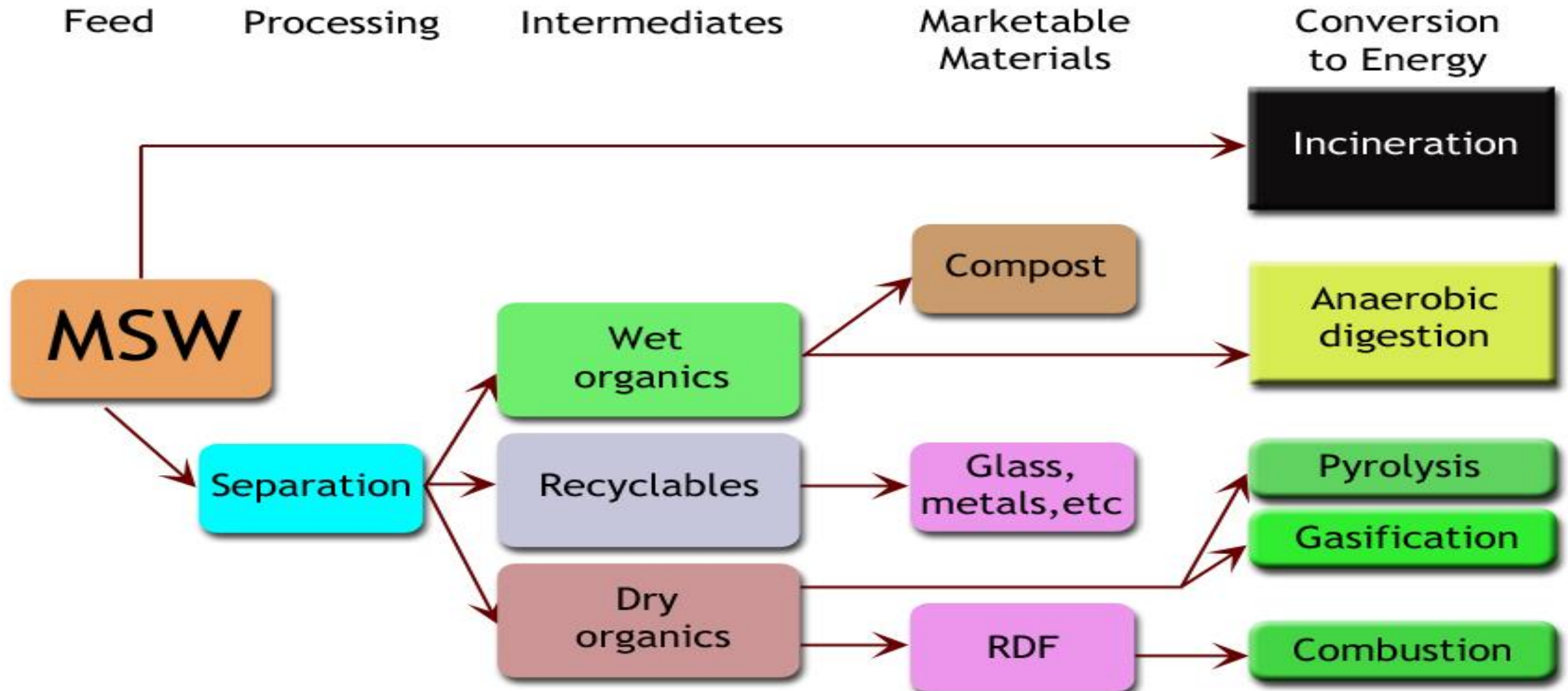
Shift towards closing the material use cycle



Source for the illustration: Website of the Miyako Ecology Center

Waste recycling and conflicts

MSW Processing Pathways



Public institutions involved in Waste Management

- Municipal authorities
 - MSW
 - C&D
 - E-waste
 - Hospital waste
 - Silt
- Utilities
 - Domestic wastewater and sludge
- PCBs
 - Industrial solid and liquid wastes
 - Biomedical wastes

Why...Recycle?

- Resources already in the human economy use much less energy than virgin materials
 - 95% for aluminium
 - 85% for copper
 - 80% for plastics
 - 74% for steel
 - 64% for paper
- Energy embodied in waste is retained and slows the pace of climate change - reduces GHG emissions
- Recycling - an essential part of responsible materials management addresses
 - Shift from a 'linear' economy to 'circular' economy
 - Brings money- provides jobs
 - Reduces landfill needs and curbs leachate and soil pollution

Recycling and Job Creation...



Dumping 10,000 tons of waste in a landfill

6 Jobs



recycling
Of 10,000 tons of
waste
36 Jobs

Recycling generates more jobs (at higher income levels) than other forms of waste management

Technology and Policy Misfits: Reduce/Reuse Vs. Recycle

- Most of the 3R interventions are heavily inclined towards “Recycling” rather than “Reduce and Reuse”
- However, there is ‘limit to recycling’
- Countries and cities are now paying attention to the source reduction and reuse
- But as cities have already invested and encourage recycling facilities, and reduce and reuse came later, in rare cases of successful reduce and reuse happening
- Countries are opting waste import (as a result, exporter countries have ‘an easy way out’ and invest less on 2 Rs)
- Similarly, there seems a clash between material recycling facility versus waste to energy, where WTE facilities are losing out on high calorific waste (ex. plastics) to recycling

EU Waste Import: To Burn or Not to Burn?

- A rush to build incinerators to burn waste may threaten recycling rates
- WTE has become a preferred method in the EU, there are now 420 plants in Europe equipped to provide heat and electricity to more than 20 million people
- Germany ranks top in terms of importing rubbish, ahead of Sweden, Belgium and the Netherlands.
- This is not in line with **Zero waste Europe** or **Circular Economy Pathway**?!



Technology and Policy Misfits: Competition between WTE and Recyclers

- Many WTE are facing a tough competition for waste flow, hence experiencing difficulty meeting committed tonnage, Reasons being
 - Overestimation of waste streams
 - recycling underestimated
 - Clash with mandatory recycling program
- WTE facility in the Town of Smithtown filed a lawsuit against a local hauler, USA Recycling Inc., to prevent the firm from sorting out paper, metal and wood from commercial waste before taking the residue to WTE

Post Recycling Requisites: The Market for Recycled Products

- After the waste is recycled into various products- the ultimate requisite is the 'market' to absorb those recycled products
- A report commissioned by Veolia has stated that the world market for waste, from collection to recycling, is worth around 300 billion Euros (US \$410 billion).



World's Recycling Industry and Market

- Approximately 1.6 million people worldwide are active in the recycling industry
- Together, they handle more than 600 million tonnes of recyclables every year
- Annual turnover of more than \$200 billion, similar to the GDP of countries such as Portugal, Colombia and Malaysia
- About 10% of this amount is spent on new technologies, R&D that contribute to creating high-skilled jobs and making recycling more efficient and environmentally sound
- Recycled Materials supply 40% of the global raw material needs

“Bureau of International Recycling” <http://www.bir.org/industry/>

Waste is Wealth: Billion Dollar WM Companies

- Businesses everywhere generate trash, but trash also generates new businesses



Market Cap \$10.9 Billion (as of May 2015)
#723 Global 2000



Waste Management Market Cap \$19.49 billion (As of May 2014)



€ 14.324 Billion (2014)

Fortune 500 Companies



India's Dharavi Recycling Slumdog Entrepreneurs

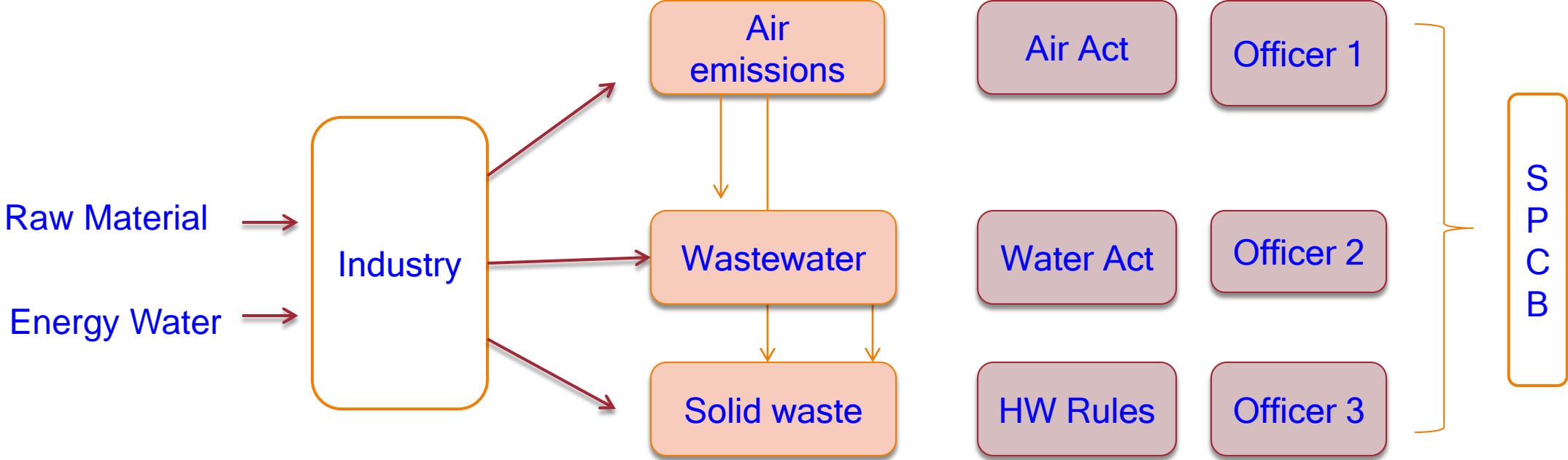
- Dharavi- Asia's largest slums is now labelled as the recycling centre of India with an estimated 15,000 single room factories, employing around a quarter of a million people and turning over a staggering £700 million (\$US 1 billion) each year
- Over 80% of Mumbai's waste is given a new lease of life by recyclers
- Wages in Dhavari are in range of 3,000 to 15,000 rupees per month

<http://www.sustainablebusinessToolkit.com/dharavi-indias-recycling-slumdog-entrepreneurs/>



Need for regulatory convergence

Regulations in silos



Desired regulatory convergence

- The High Level Committee at Government of India (Gol) suggests that for pollution control purposes, environment needs to be treated as single, inter-related system
- Legislation is presently targeted towards media - air, water and land in isolated manner yet sources of pollution are inter-related and often inter-changeable
- For instance single source may pollute the air, water and land at the same point of time
- Present pollution control strategies often transfer pollution from one media to another, e.g. air to water or solid phase, water to solid phase
- HLC proposes integrating air, water and solid waste acts and rules in proposed Environment Law (Management) Acts and Rules

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