Waste as Resource
Recycling and Reuse of Scrap Waste

By

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21th September, 2008

Solid Waste

Solid waste is defined as material which no longer has any value to its original owner, and which is discarded. (Rouse,2008)

Scrap wastes are the wastes which are the part of the solid waste, segregated and taken further for reusing and recycling from the mixed waste.

Solid Waste

- **Biodegradable waste** is typically originating from plant or animal sources, which may be broken down by other living organisms
- **Non-biodegradable** is waste that cannot be broken down by living organisms

Objectives

- To identify alternative ways of Solid Waste Management
- To discover waste as a resource
- To recognize economics value of the waste

Why it is a Resource???

- Increasing Trend of Non-Bio-Degradable Waste (Scrap waste)
- Significant of Waste Recycling and Reusing
- High Monetary Value of Non-Bio-Degradation (Scrap waste)

Categorizations of Non-Bio-Degradable waste (Scrap Waste)

Items	Classification
Empty Bottles according to size (beer)	Glass
Empty Bottles (size >500 ml) of alcohols and others	Glass
Empty Bottles (size <500 ml) of alcohols and others	Glass
Jute Sack (size= 50kg)	Textile, Rubber and leather
Jute Sack (size= 100kg)	Textile, Rubber and leather
Garment cloth pieces	Textile, Rubber and leather
Tyre / tube	Textile, Rubber and leather
Newspaper	Paper
Other paper (carton)	Paper
Others metals (Copper, Brass)	Metals
Old tin	Metals
Iron	Metals
Plastics (bottles and utensils)	Plastic
Plastics Sack (size= 50kg)	Plastic

Glass Bottles

Empty Bottles according to size (beer)
Empty Bottles (size >500 ml) of alcohols and others
Empty Bottles (size <500 ml) of alcohols and others

- Empty Bottles (locally used) are cleaned and reused
- Plain glass are grinded in pieces and recycled
- Color glass are hard to recycle as they contain various chemicals

Textile, Rubber and leather

Jute Sack (size= 50kg)
Jute Sack (size= 100kg)
Garment cloth pieces
Tyre / tube

- Undamaged jute sack are reused
- Shoes sole are separated from shoes and send to shoes industries

Plastics

Plastics (bottles and utensils)
Plastics Sack (size= 50kg)

- Plastics bottles (Minerals water bottles) are shredded into pellets
- Plastics sacks are reused
- Plastics waste are also used to make handicrafts

Paper

Newspaper
Other paper (carton)

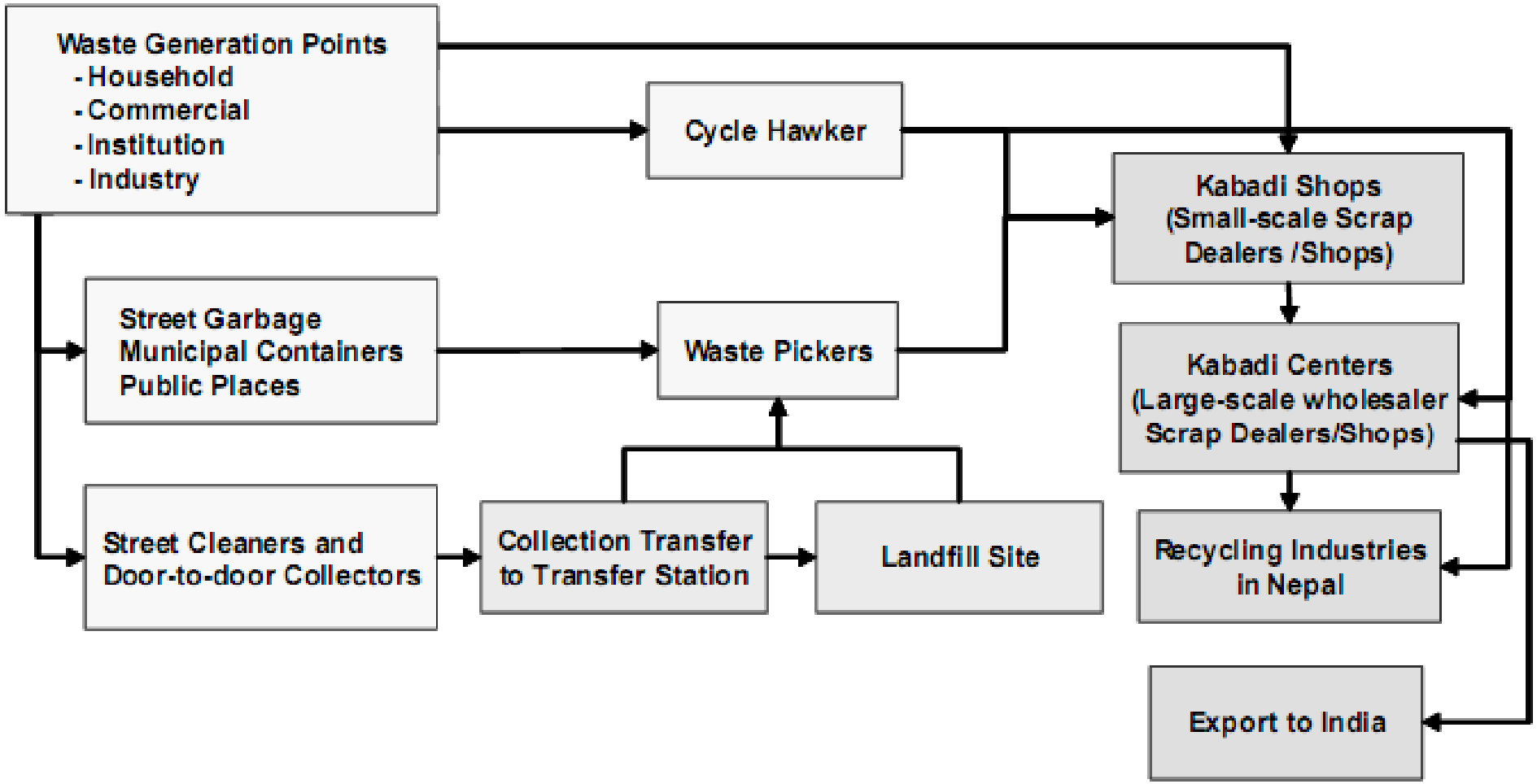
- Recyclables Paper are mixed with water and turned into pulp to make paper again
- Paper are also used for packaging also

Metals

Others metals (Copper, Brass)
Old tin
Iron

- Aluminum and iron are melted and produced new products
- Some iron rods are straightened for reuse

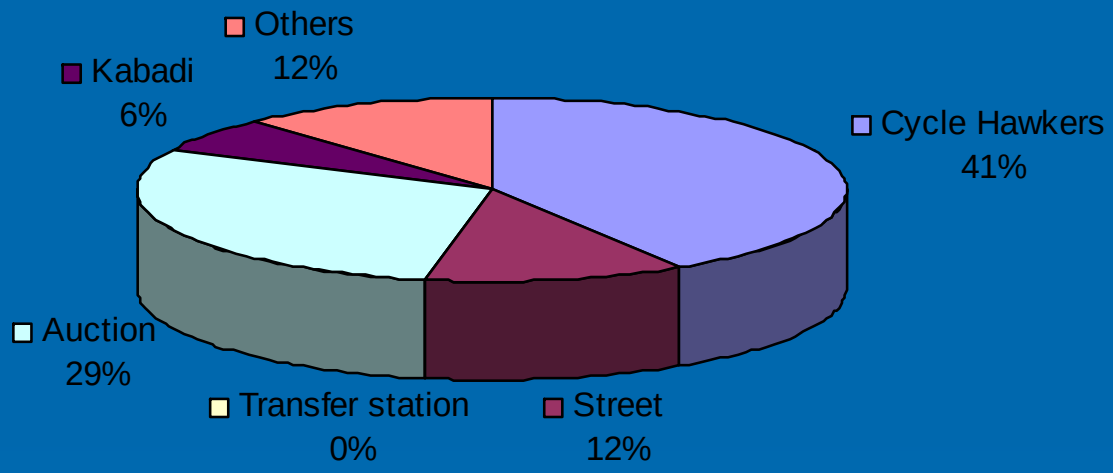
Non-Bio-Degradable Waste (Scrap Waste) Flowchart



(JICA, 2004)

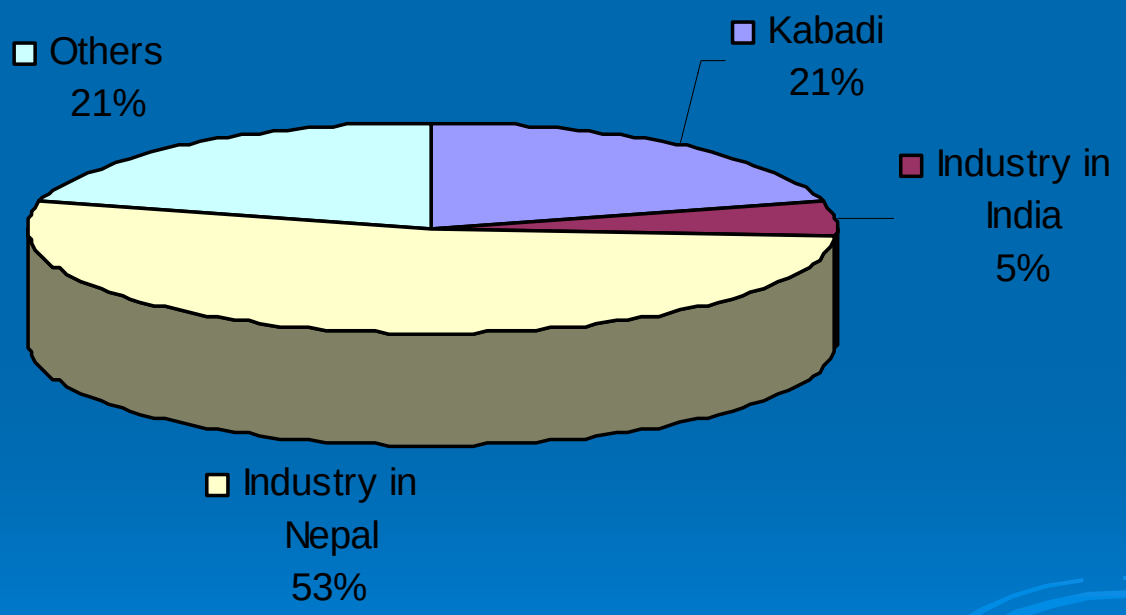
Some Research Findings

Way of Materials Collection



(Source:Luitel,2008)

Different Place to Sell



(Source:Luitel,2008)

Composition of Scrap Waste in Kathmandu Valley (Source: Luitel, K 2008)

Composition	Percentage
Glass	32.49
Plastic	22.65
Textile, Rubber and leather	2.58
Metals	18.4
Paper	23.89
Total	**100**
Reusable	**38.96**
Recyclable	**44.77**
Reusable and recyclable	**16.27**

Scrap Waste in Kathmandu Valley (Source: Luitel, K 2008)

Components	% of Scrap waste in KV (by weight)$_1$ (A)	% of Scrap waste collected (by weight)$_2$ (B)	Remaining % of Scrap waste (by weight) (A-B)
Plastics	12.30	2.79	9.52
Paper	9.25	2.21	7.04
Metals	0.91	0.17	0.74
Glass	3.66	1.19	2.47
Textile, Rubber and leather	2.86	0.07	2.78
Total Scrap	28.98	6.43	22.56

1(Khadka, 2008; Khanal, 2008; Baral, 2008; Bhatta, 2008a; Bhatta, 2008b); 2Field study 2008

Waste Reduction through Recycling and Reusing

Places	% of Waste Reduce	Source
Gaza Strip	4.21	Mustafa, 2002
Nigeria	11.4	Mohammed, 2003
Bangladesh	51	Visvanathan, 2006
KV	5	Visvanathan, 2006
Israel	20	Lavee, 2007
KV	6.43	Luitel, K 2008

Selling Value of Scrap Waste Collected in KV

Year	Selling Value (Rs.) per Day	Source
1999	3, 91,365	Shrestha, A. 1999
2004	4, 70,500	JICA, 2004
2008	8,42,684.45	Luitel, K. 2008

Scrap Waste Amount (%/ wt)	Selling Value (Rs./ month)
6.43	5,56,17,174.00
28.98	25,06,66,516.70
22.56	19,50,49,342.70

(Source:Luitel,2008)

Why it is Not Happening &@#!

- Due lack of knowledge about its usefulness
- Carelessness
- Lack of Acknowledgments for people working in this regard

Conclusions

The materials we throw is not a waste but a resources with high economic value

References

- Shrestha, Ashim (1999). *Solid waste Management Practices and Resource recovery analysis of Kathmandu.* A Project report submitted in partial fulfillment of the requirement for the Bachelor's (Honors) Degree in Environmental Science. Department of Environmental Science and Engineering, Kathmandu University.
- Nippon Koei Co. Ltd; Yachiyo Engineering Co. Ltd. (2005). *The Study on the Solid Waste Management for the Kathmandu Valley, Final Report* (Clean Kathmandu Valley – CKV- Study)". Kathmandu: Ministry of Local Development, His Majesty's Government of Nepal; Japan international Cooperation Agency (JICA).
- Baral, Indira(2008). *Baseline Information on Solid Waste Management of Lalitpur Sub-Metropolitan City***.** Solid Waste Management and Resource Mobilization Centre Ministry of Local Development Lalitpur, Nepal.
- Bhatta, Nima(2008,a). *Baseline Information on Solid Waste Management of Bhaktapur Municipality of Nepal*. Solid Waste Management and Resource Mobilization Centre Ministry of Local Development Lalitpur, Nepal
- Bhatta, Nima(2008,b). *Baseline Information on Solid Waste Management of Madhyapur Thimi Municipality of Nepal***.** Solid Waste Management and Resource Mobilization Centre Ministry of Local Development Lalitpur, Nepal.
- Khadka, Kendra Joyti (2008). *Baseline Information on Solid Waste Management of Kirtipur Municipality***.** Solid Waste Management and Resource Mobilization Centre Ministry of Local Development Lalitpur, Nepal.
- Khanal, Bimala(2008). *Baseline Information on Solid Waste Management of Kathmandu Metropolitan City of Nepal***.** Solid Waste Management and Resource Mobilization Centre Ministry of Local Development Lalitpur, Nepal.
- Rouse, J. and Ali, M. (2008). *Technical brief: Planning for sustainable municipal solid waste management*, Practical Action.
- Mustafa El Hawi et. Al (2002). *Recycling of municipal solid waste in the Gaza Strip.* 28th WEDC Conference: SUSTAINABLE ENVIRONMENTAL SANITATION AND WATER SERVICES. Kolkata (Calcutta), India.
- Mohammed Dauda and O. O. Osita, Nigeria (2003). *Solid waste management and re-use in Maiduguri, Nigeria.* 29th WEDC International Conference: TOWARDS THE MILLENNIUM DEVELOPMENT GOALS. Abuja, Nigeria.
- Visvanathan C. (2006). *Reduce, Reuse, Recycle: The 3Rs in South Asia.* Environmental Engineering and Manage Program, SERD - Asian Institute of Technology.Thailand.
- Lavee, Doron (2007). *Is Municipal Solid Waste Recycling Economically Efficient*? Environmental Management. p.:926–943.

THANK YOU!

Waste Amount

Items	Unit	Annual Amount	Percentage
Empty Bottles according to size (beer)	Piece	1,285,483.64	5.01
Empty Bottles (size >500 ml) of alcohols and others	Piece	1,174,800.00	4.58
Empty Bottles (size <500 ml) of alcohols and others	Piece	5,877,106.91	22.90
Plastics Sack (size= 50kg)	Piece	1,223,345.45	4.77
Jute Sack (size= 50kg)	Piece	388,363.64	1.51
Jute Sack (size= 100kg)	Piece	48,545.45	0.19
Iron	Kg	4,174,909.09	16.27
Plastics (bottles and utensils)	Kg	4,587,545.45	17.88
Garment cloth pieces	Kg	223,309.09	0.87
Tyre / tube	Kg	1,553.45	0.01
Old tin	Kg	504,872.73	1.97
Newspaper	Kg	166,025.45	0.65
Other paper (carton)	Kg	5,962,352.73	23.24
Others metals (Copper, Brass)	Kg	41,360.73	0.16
Total		**130,560.75 Kg 833,137.09 pieces**	**100.00**
Reusable Material	Piece	**9,997,645.09**	**38.96**
Recyclable Material	Kg	**11,487,019.64**	**44.77**
Recyclable Materials and Reusable materials	Kg	**4,174,909.09**	**16.27**

Tax Collected

Items	Tax Collected (Rs.)	Percentage of Tax
Empty Bottles according to size (beer)	1,285,483.64	5.46
Empty Bottles (size >500 ml) of alcohols and others	587,400.00	2.49
Empty Bottles (size <500 ml) of alcohols and others	1,469,276.73	6.24
Plastics Sack (size= 50kg)	305,836.36	1.30
Jute Sack (size= 50kg)	97,090.91	0.41
Jute Sack (size= 100kg)	24,272.73	0.10
Iron	8,349,818.18	35.44
Plastics (bottles and utensils)	4,587,545.45	19.47
Garment cloth pieces	446,618.18	1.90
Tyre / tube	3,106.91	0.01
Old tin	252,436.36	1.07
Newspaper	83,012.73	0.35
Other paper (carton)	5,962,352.73	25.31
Others metals (Copper, Brass)	103,401.82	0.44
Total	**23,557,652.73**	**100.00**
Reusable Material	**3,769,360.36**	**16.00**
Recyclable Material	**11,438,474.18**	**48.56**
Recyclable Materials and Reusable materials	**8,349,818.18**	**35.44**

Profit Achieved

Items	Unit	Profit (Rs.)	Percentage of Profit
Empty Bottles according to size (beer)	Piece	3,213,709.09	3.90
Empty Bottles (size >500 ml) of alcohols and others	Piece	2,937,000.00	3.57
Empty Bottles (size <500 ml) of alcohols and others	Piece	17,631,320.73	21.42
Plastics Sack (size= 50kg)	Piece	2,446,690.91	2.97
Jute Sack (size= 50kg)	Piece	776,727.27	0.94
Jute Sack (size= 100kg)	Piece	145,636.36	0.18
Iron	Kg	16,699,636.36	20.29
Plastics (bottles and utensils)	Kg	13,762,636.36	16.72
Garment cloth pieces	Kg	669,927.27	0.81
Tyre / tube	Kg	23,301.82	0.03
Old tin	Kg	2,019,490.91	2.45
Newspaper	Kg	498,076.36	0.61
Other paper (carton)	Kg	20,868,234.55	25.35
Others metals (Copper, Brass)	Kg	620,410.91	0.75
Total		**82,312,798.91**	**100.00**
Reusable Material		**27,151,084.36**	**32.99**
Recyclable Material		**38,462,078.18**	**46.73**
Recyclable Materials and Reusable materials		**16,699,636.36**	**20.29**

KV Waste Composition % (by weight)

Components	[1]2008	[2]2005	[3]1999	
Organic waste	68.72	60	60.6	
Paper	9.25		6	
Plastics	12.30		5.4	Non-Bio-Degradable Waste (Market waste)
Glass	3.66	20	3.6	
Metals	0.91		4.8	
Textile, Rubber and leather	2.86		-	
Other	2.29	20	19.6	
Total	100	100	100	
Non-Bio-Degradable Waste (Market waste)	**28.98**	**20**	**19.8**	

([1]Khadka, 2008; [1]Khanal, 2008; [1]Baral, 2008; [1]Bhatta, 2008a; [1]Bhatta, 2008b;, [2]Nyachhyon, 2005;, [3]Shrestha A, 1999)

Statistics of the Study Area

Municipalities	Households (HHs)	Population (persons)	Area (km2)	Density (per/km2)	Average daily generated quantity[1] (t/day)	[1]Budget of SWM for the fiscal year 063/64 (Rs. In million)
KMC	152,155	671,846	49.45	13,586	252.61	230
LSMC	34,996	162,991	15.15	10,759	15.71	30.96
BKM	12,133	72,543	6.88	11,058	14.51	25.10
MTM	9,551	47,751	11.47	4,298	10.03	2
KRM	9,487	40,835	14.76	2,767	3.55	2
Total	218,322	995,966	97.03	6,284	**296.42**	**290.06**

(Statistical Year Book of Nepal, 2003. Central Bureau of Statistic, [1](Khadka, 2008; Khanal, 2008; Baral, 2008; Bhatta, 2008a; Bhatta, 2008b))