SOLID WASTE MANAGEMENT

- **SWM COMPRISES OF WASTE**
  - * COLLECTION
  - * TRANSPORTATION
  - * TREATMENT AND
  - * DISPOSAL
- **BASIC PRINCIPLES OF SWM**
  - MINIMISATION AND UTILISATION
- **TREATMENT AND DISPOSAL TECHNIQUES**
  - * LANDFILLING
  - * INCINERATION
  - * COMPOSTING
  - * WASTE-TO-ENERGY
  - * REUSE AND RECYCLING

SELECTION OF TECHNIQUE

PROBLEMS OF SOLID WASTE

- **EXISTS BUT DIFFERENT BOTH IN DEVELOPED AND DEVELOPING COUNTRIES (DCs)**
- **RISING POPULATION AND CHANGE IN CONSUMPTION PATTERNS OF DCs**
- **NO RELIABLE ESTIMATES**
- **PROBLEMS OF AUTHORITIES**
  - * **SHORTAGE OF FUNDS**
  - * **LACK OF TRAINED MANPOWER**
- **LACK OF PUBLIC PARTICIPATION**
  - * **AWARENESS PROBLEM**
  - * **NOT IN MY BACKYARD ATTITUDE**

ECONOMICS OF MSW

- IF PROPERLY MANAGED WASTE TURNS INTO GOLD
- COMPOSTING
- POWER GENERATION
- FUEL PELLETISATION
- TRADE OF WASTE
- VERMICULTURE
- RECYCLABLES IN WASTE
- REUSE OF WASTE

RECYCLING AS SWM FOR MSW

- **AN EFFICIENT TECHNIQUE**
  - ECONOMICALLY VIABLE
  - ENVIRONMENTALLY SUSTAINABLE
  - SOCIALLY BENEFICIAL
- **BASED UPON 4Rs PRINCIPLE**
  - REDUCE
  - RECOVER
  - REUSE AND
  - RECYCLE
- **MAJOR RECYCLABLES**
  - PAPER, PLASTICS, METALS ETC.
- **IGIDR STUDY ON WASTE PAPER**

DEVELOPMENT AND ENVIRONMENT

- **Economic Activities Vs Envtl. Degradation**
- **Recycling +vely Linked (Causes Less Damage)**
- **Important For Developing Countries**
  - **Economic Reasons**
  - **Ecological Reasons**
- **Wastepaper is 30% of MSW (World Average)**
- **Trade and Recycling Scenes Changing**
  - **Expansion of Recycling Infrastructure**
  - **Waste Paper as Secondary Resource**

Presentation Structure

- **World Paper Industry**
- **Indian Paper Industry**
- **Trade and Recycling**
- **Environmental & Socio-Economic Impacts**

WORLD PAPER INDUSTRY

- **Recession in Major P&P Producing Countries**
- **Feeble Growth in North America (Largest Producer)**
- **Total Production (1993)**

  Pulp: ~ 163 million tonnes

  P & B: ~ 252 million tonnes

  Growth Rate: 1.6 Percent

- **TOP 30 PRODUCERS AND CONSUMERS**

USA Maintained the Lead

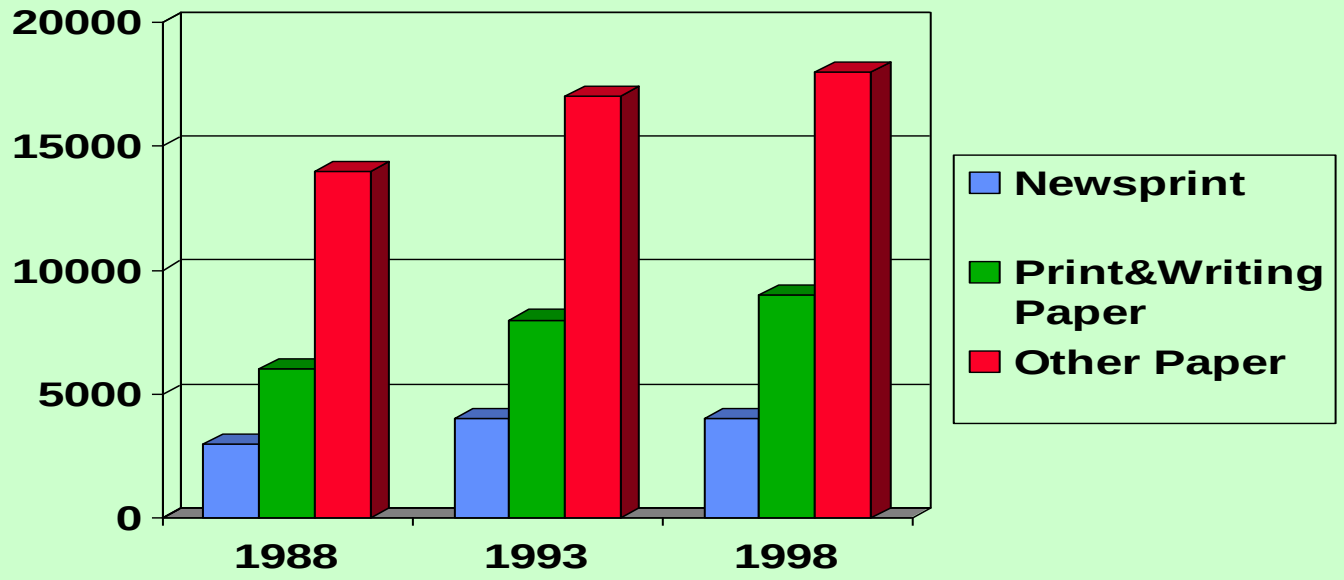
Japan Stands Second (despite –ve growth)

Decline in Europe (3-6 Percent)

INCREASE IN WORLD CAPACITY

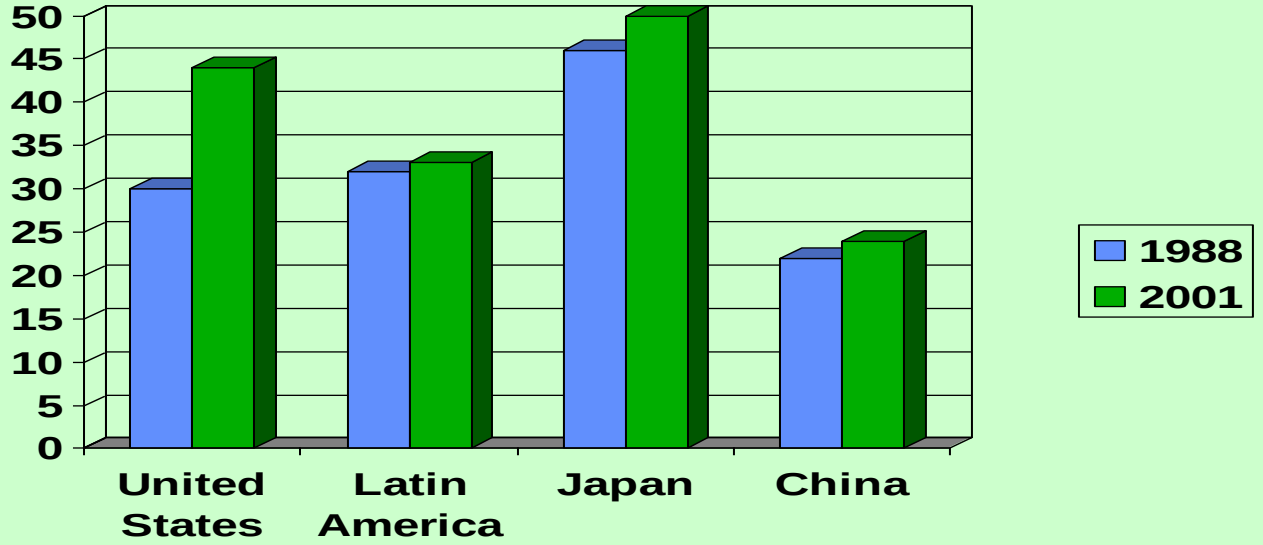
- **FAO : UN Projection**
  - Average Growth Rate 1.9% (93-98)
  - Global Demand 300 million tonnes (by ’98)

INCREASE IN TOTAL WORLD CAPACITY (1,000 T)



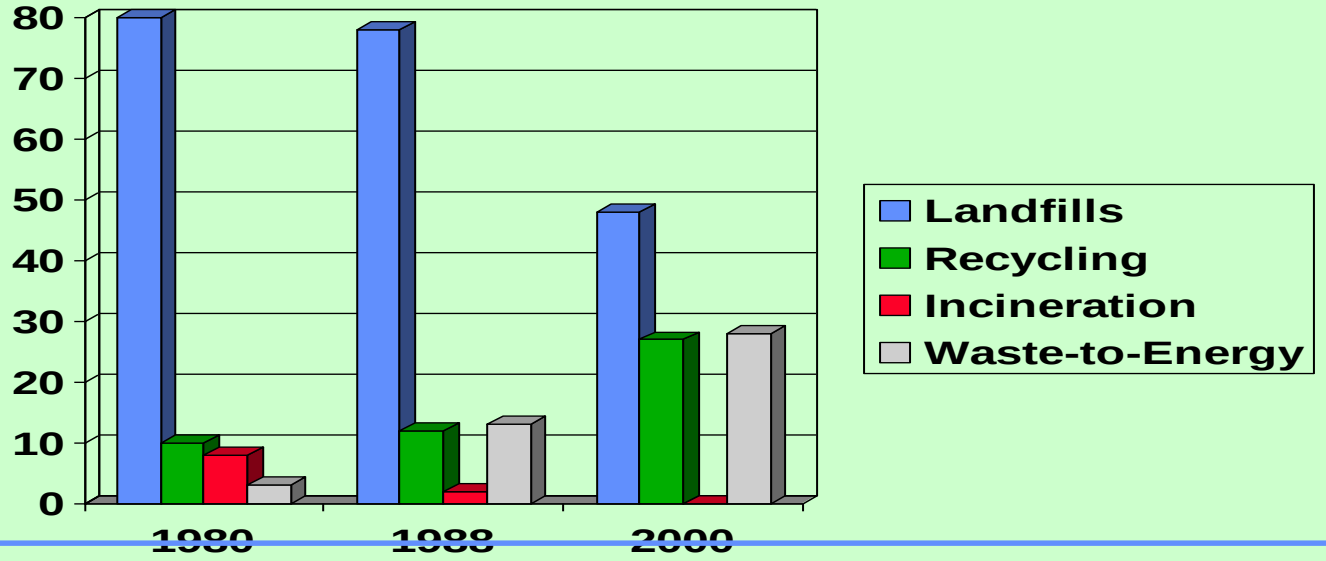
WASTE PAPER RECOVERYRATES IN SELECTED COUNTRIES

(Values shown are percentages)



THE CHANGING FACE OF WASTE MANAGEMENT

(Values shown are percentages)



PERFORMANCE OF ASIA

- 5-6 Percent Growth (1991-92) in P & B
- Share in World's Production

  Pulp: 17 Percent, P & B: 26 Percent
- Despite Low Production Trade Rose World Wide
  - Exports From Developed to Developing
  - High Consumption of Developing Countries

  (Asia's: 29 Percent of World's Prod)

INDIAN PAPER INDUSTRY

- **In 1993 PPI Reports:**

Total 327 P & B Mills ; 245 Pulp Mills

Production Capacity : 3.3 mills

- **Production Increasing Gradually**

P & B – 20th Largest Producer

Pulp – 17th Largest Producer

17th Largest Consumer(P & B)–Consumption Double during 90 – 92

- **Growth rate**

Pulp Production :	~	8 Percent
P & B :	~	6 percent

PERFORMANCE OF INDIAN PAPER INDUSTRY

(1,000 TONNES)

Item	Production		Imports		Exports	
	1990	1993	1990	1993	1990	1993
Paper & Board						
-News Print	295	340	270	225	0	0
-Printing Writing	1150	1200	10	15	0	0
-Board	850	1000	0	0	0	0
Total P & B	2295	2540	280	240	50	N.A.
Total Pulp	975	1400*	150	140	0	0

	Recovery		Consumption		Import/Exports	
	1990	1993	1990	1993	1990	1993
Wastepaper	355	375	650	750	300/0	375/0

(SOURCE: PPI, 1992, 1993 and 1994)

* PPI estimates ; N.A. – Not Available.

STATISTICS OF WASTEPAPER IN SELECTED COUNTRIES (1,000 TONNES)

Country	Recovery		Consumption		Imports	
	1990	1991	1990	1991	1990	1991
USA	26395	28199	19719	21331	112	111
Japan	14022	14667	14613	15301	634	851
Canada	1310	1478	1789	2014	497	526
India	355	355	650	749	300	394
World Total	84306	87362	83687	88373	12326	13957

	Exports		Util Rate(%)		Recovery Rate(%)	
	1990	1991	1990	1991	1990	1991
USA	5901	5986	28	30	34	37
Japan	22	3	52	53	50	50
Canada	260	259	11	12	23	26
India	0	0	28	31	14	14
World Total	11046	11749	35	37	36	37

TRADE OF WASTEPAPER

- **GLOBAL WASTE TRADE :**

International Agreements

- **Basel Convention (March, 1989)**

(Signed by 33 countries including India)

  - **Sets Global Rules and Regulations**

- **Lome Convention (Dec, 1989)**

(66 Countries including EEC and ACP)

  - **Banning the Waste Trade**
  - **Deal with Hazardous Wastes only**

STATUS IN DEVELOPED COUNTRIES

- **Solid Waste Composition**

Paper by Weight: 31% (Indusrialised)

: 14% (Middle Income)

: 2% (Developing)

- **USA – Largest Producer & Consumer of Paper,**

JAPAN – Consumption may be>USA

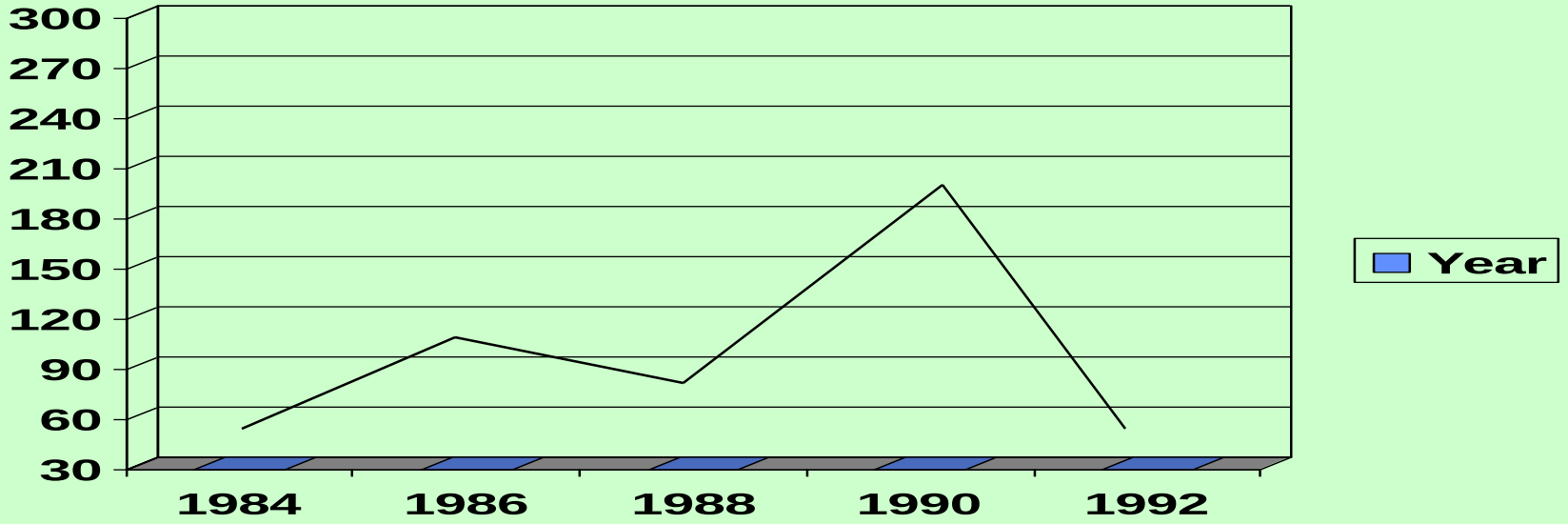
(in ’95)

EUROPE – Demand for Recycled Paper is increasing

- **Government Policies**
  - **Recycled Content Mandatory in US**
  - **White House Order (20% - 94; 30% - 98)**
  - **Fees, Tax Incentives**

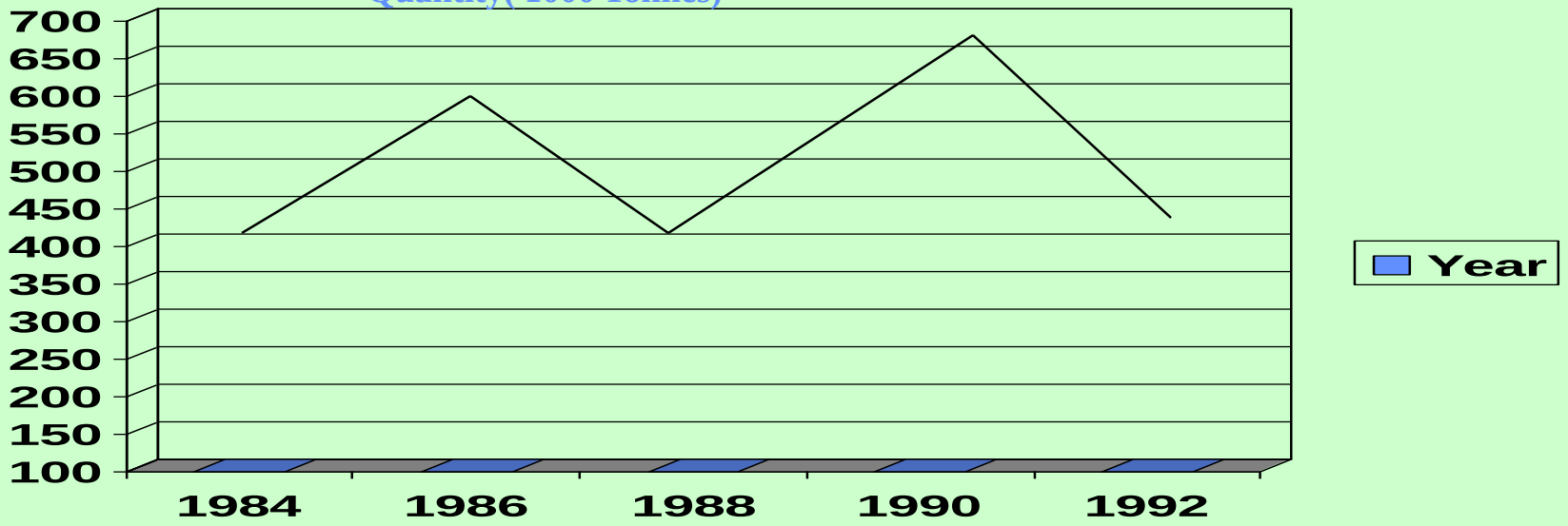
Trends in Value of World imports to india

Value(1000 US$)



Trends in Quantity of World Imports to India

Quantity(1000 Tonnes)



WASTEPAPER RECYCLING

- **PAST**

  Initially Diversion from Land Fills

- **PRESENT**

  Environmental Concerns, Govt. Policies

- **FUTURE**

  Socio-economic and Environmental

  Public participation

  Green Movements

- **RISI (USA) ESTIMATES**

	1993	2009
Recovered Paper	32%	42%
Wood Pulp	58%	46%

STATUS IN DEVELOPED COUNTRIES

- **Econometrics**
  - Rising Landfilling Fees (’92 Ave US $28.8/tone)
  - Waste Processing Fees (upto $ 24/tonne)
- **Public Participation**
  - 500 to 5000 communities in Ten Years (USA)
  - AF & PA Surveyed that 75% Americans Would like to Buy Recycled Products
- **Environmental Concerns**

JAPAN – “ Recycle 55” Slogan

GERMANY – Green Dot, Blue Angel

SWITZERLANDS & NETHERLANDS–(51% & 53%)

INDIAN SCENARIO

- **SOLID WASTE MANAGEMENT**
  - No Concept of Waste Separation
  - Only Mixed Waste Collected
  - Toxic Waste Finds the way
- **Sanitary Landfill is not Practiced**
  - Open and Uncontrolled Dumps
- **Paper Content 4-5% (NEERI Study)**
- **Bombay 5-25% (MEIP Study)**
  - Paper Consumption Very Low
  - Manual Scavanging

ENVIRONMENTAL IMPACT

- **AIR POLLUTANTS:**

  Nox, Sox, CL2, TRS

- **WATER POLLUTANTS:**

  BOD, COD, SS, SAR

- **SOLID WASTE : Heavy Metals in Sludge**

  Cd, Pb, Mn, Zn etc.

PERMISSIBLE LIMITS OF POLLUTANTS AND EFFLUENT DISCHARGE

Details of the Industry	Parameter	Permissible Limit(mg/litre)
Large Plants (Capacity > 24000 TPA)		
Wastewater		
a)Quantity	**--**	**100 (m3)**
b)Quality	**pH**	**6.5-8.5**
	BOD	**30**
	COD	**350**
	SS	**100**
	TOCL	**2.0 (kg)**
c)Emissions	**PM**	**150(mg/m3)**

ENVIRONMENTAL IMPACT

PERMISSIBLE LIMITS OF POLLUTANTS AND EFFLUENT DISCHARGE

Industry	Parameter	Permissible Limit
Small Plants (Capacity <= 24000 TPA)		
a. Wastewater Quantity		
1) Agrobased mills	**Effluent Discharge**	**150 (m3/Tonne of Paper)**
2) Wastepaper based mills	**Effluent Discharge**	**50**
b. Wastewater Quality	**pH**	**5.5-9.0**
	SS	**100**
1) Stream Discharge	**BOD**	**30**
2) Land Disposal	**pH**	**5.5-9.0**
	SS	**100**
	BOD	**100**
	SAR	**26**

POSITIVE IMPACT OF WASTEPAPER USE

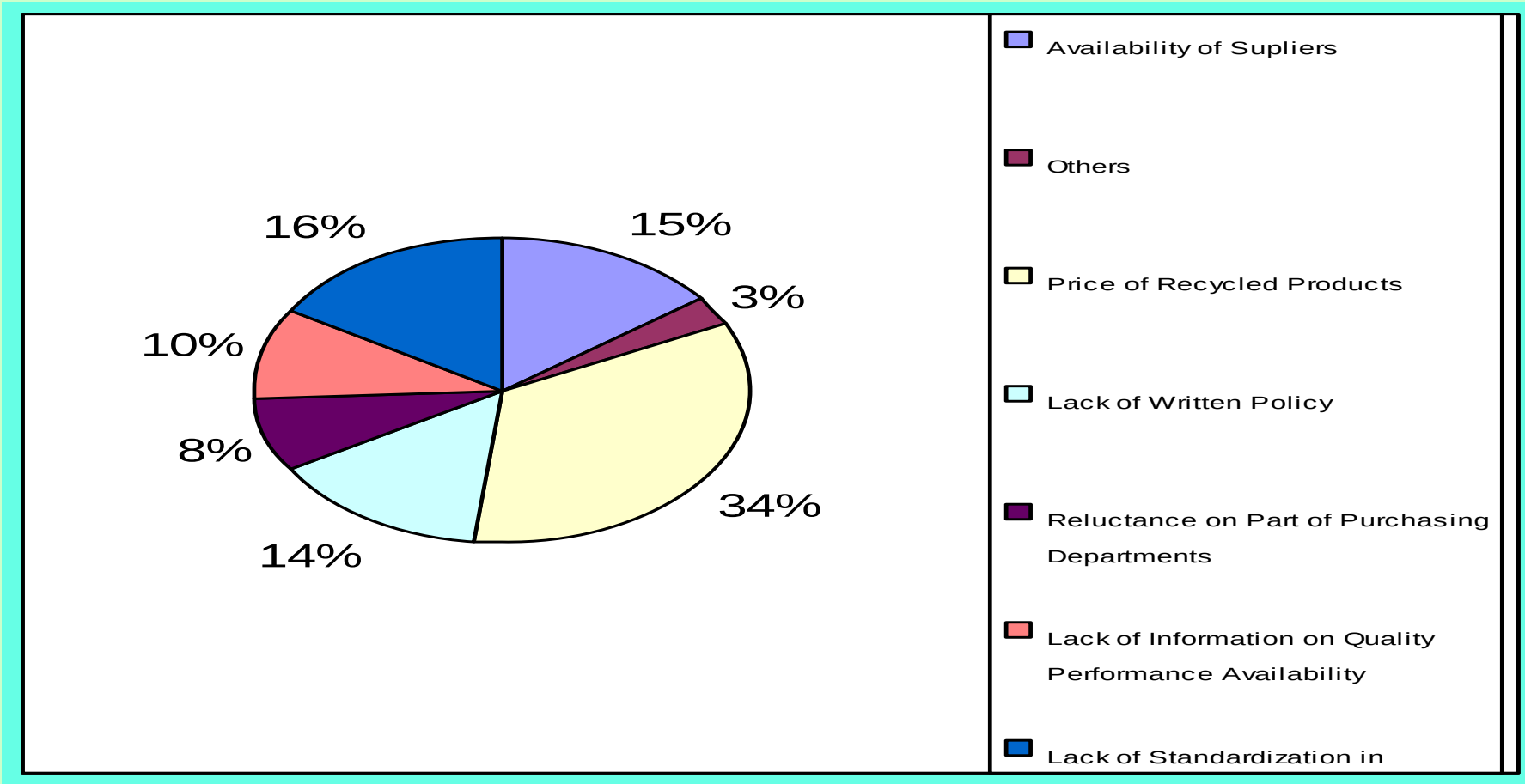
Comparison Point	Agricultures Residues as Raw Material	Waste Paper as Raw Material
Pulping Process	Chemical	Mechanical
Average Water Consumption	275m3	125m3
Pollution Generated		
a. Air Pollution	Process and Stack Emissions	Only Stack Emissions
b. Wastewater Characteristics		
BOD	180 kg	20 kg
COD	750 kg	70 kg
SS	160 kg	60 kg
c. Solid Waste	1.5–2.0 tonnes	0.15 tonnes
Average Power Consumption	High	Low
- Steam	6.25 tonnes	2.75 tonnes
- Coal	3.35 tonnes	1.45 tonnes

SOCIO – ECONOMIC IMPACT

- **Informal Waste Collection**
  - Huge Network of Ragpickers
  - Estimates for Calcutta : 20,000
  - Comparable Number in Bombay, Delhi
- **Employment for Otherwise Unemployed**
  - Primary Source of Income
  - Exploitation by Middlemen
  - Assets to the Society
- **Adverse Health Impacts**
  - Skin and Respiratory Diseases
  - Increase Morbidity,
  - Reduced Life Expectancy

CONSTRAINTS TO RECYCLING

- Economic Constraints
- Barriers To buying Recyclables



- Environmental Barriers
- Alternative Uses of Wastepaper

GENERAL CONCLUSIONS

- WASTE RECYCLING STUDY COVERS SEVERAL SECTORS
- STATISTICS ON WASTE DATA IS NOT RELIABLE
- WP TRADE AND RECYCLING IS IMPORTANT
- WP RECYCLING PAYS WELL
- RAW MATERIAL KEEPS ON RENEWING
- OTHER WASTES CAN BE UTILISED
- ALTERNATIVES TO RECYCLING