Analysis Of Waste Management Policies In India

Application of AIM/Material to India

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Solid wastes problem in India

- As visible as water pollution, air quality in cities
- Management and safe disposal
- Generation is higher than collection

City	Solid wastes (Tons/day)	
	Generated	Collected
Bombay	3200	3100
Madras	1819	1637
Bangalore	1800	1225
Ahmedabad	1200	1080
Kanpur	2142	1500
Pune	1000	700
Lucknow	600	500

Types of solid wastes

- Rural
  - Chiefly organic, animal waste
- Municipal
  - From households
- Industrial

- Rural wastes handled adequately by traditional methods with little technological inputs

Quantity and nature of waste

- Per capita waste generation – 300 to 600 grams per day
- Characteristics
  - Low Calorific value
  - High Moisture content
  - High proportion of organic matter
  - Lower recyclable content such as paper, plastics, metals.

Composition of MSW

Composition	Percentage
Biodegradable	52%
Metals Scrap, Rubber, Textiles, Leather etc	11%
Stones and Rubbles	8%
Fine Earth and Sand	23%
Plastics	1%
Paper and Paper Products	5%

Industrial wastes

- Inadequate data
  - Availability
  - Quality
- Estimation: waste per unit of production
  - Technology differences? (Paper industry example)

	Wood-based	Agri. Residue	Wastepaper
Wastewater (kg/Ton of output)			
BOD	65	176	20
COD	246	741	70
TSS	168	160	60
Solid Waste (ton/ton of output)		1.5 - 2.0	0.15 - 0.2

- Hazardous waste - more attention

Hazardous waste

- High priority
  - Discharge without checks
  - Trade / Illegal dumping from developed nations
- High-powered Committee Report 2000
- Civil society (NGOs like Greenpeace) action
- Estimated annual generation around 4.5 Million tons plus around 0.1 Million tons of imports

Environment industry

- Currently estimated at $2 Billion and expected to grow to $7 Billion by 2010 (CII estimate)

Environment control equipment market for some sectors 1998 (Million Dollars)

	Total Market	Local Production
Coal	50.9	20
Textiles	39	29
Paper and Pulp	88	46
Power[1]	9.45	5.95

1 Only Environment monitoring equipment

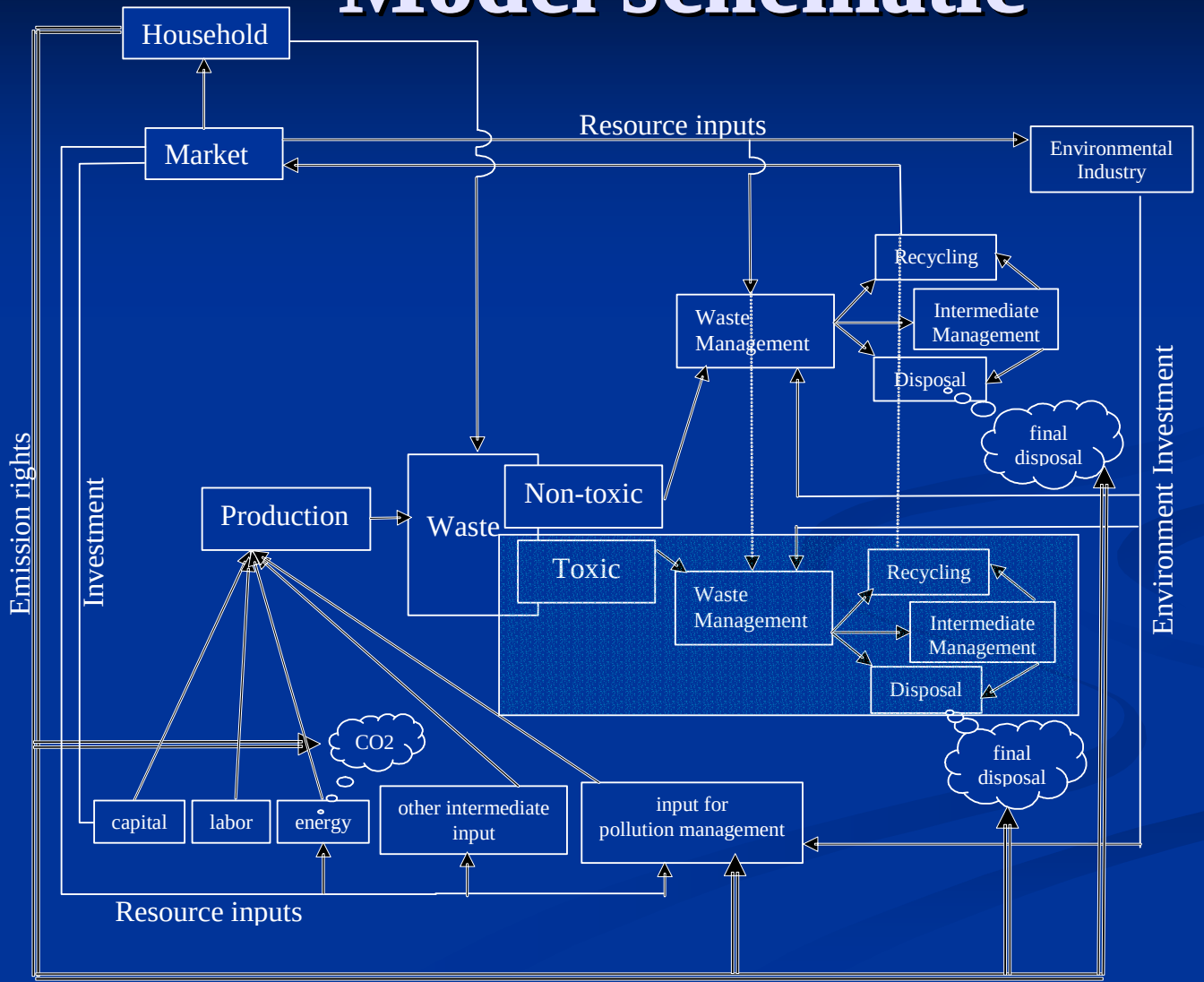
Recycling

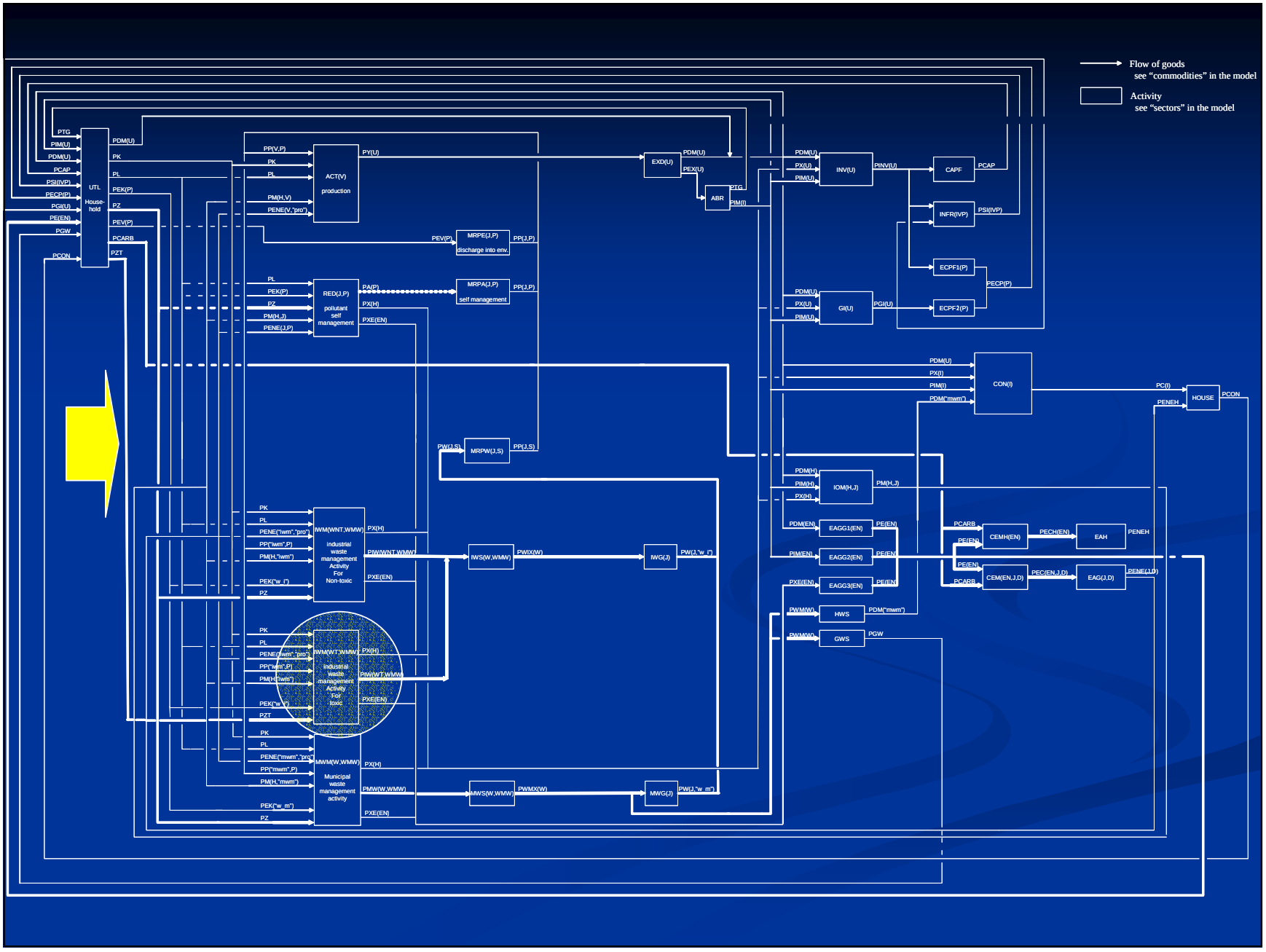
- Recycling from households
  - Old tradition
- Recycling from industries
  - Chiefly done through ‘Informal sector’
    - Absence of organized data
- Informal sector
  - Rag picker / Itinerant Buyer
  - Long chain of intermediaries – waste dealers, wholesalers,
  - Small recycling units or industries
- Plastics recycling ~ 60%
- Paper recycling - ~15-20%

AIM / Material application

- 26 Sectors (24 Commodities)
- 15 Waste types
- Emphasis on solid wastes
- Separate treatment of hazardous waste
- Recycling

Model schematic




Flow of goods
see "commodities" in the model
Activity
see "sectors" in the model
UTL
House-hold
PTG
PIM(U)
PDM(U)
PCAP
PSI(IVP)
PECP(P)
PGI(U)
PE(EN)
PGW
PCON
PK
PL
PEK(P)
PZ
PEV(P)
PCARB
PZT
PP(V,P)
PM(H,V)
PENE(V,"pro")
ACT(V)
production
PY(U)
EXD(U)
PEX(U)
ABR
PIG
PIM(I)
PDM(U)
PX(U)
PIM(U)
INV(U)
PINV(U)
CAPF
PCAP
INFR(IVP)
PSI(IVP)
ECPF1(P)
PECP(P)
GI(U)
PGI(U)
ECPF2(P)
MRPE(J,P)
discharge into env.
PP(J,P)
PEV(P)
RED(J,P)
pollutant self management
PA(P)
MRPA(J,P)
self management
PX(H)
PXE(EN)
PM(H,J)
PENE(J,P)
CON(I)
PDM("mwm")
PC(I)
HOUSE
PENEH
PCON
MRPW(J,S)
PW(J,S)
IOM(H,J)
PDM(H)
PIM(H)
PX(H)
PM(H,J)
IWM(WNT,WMW)
industrial waste management Activity For Non-toxic
PENE("iwm","pro")
PP("iwm",P)
PM(H,"iwm")
PEK("w_i")
PIW(WNT,WMW)
IWS(W,WMW)
PWIX(W)
IWG(J)
PW(J,"w_i")
EAGG1(EN)
EAGG2(EN)
EAGG3(EN)
PE(EN)
CEMH(EN)
PECH(EN)
EAH
PENEH
CEM(EN,J,D)
PEC(EN,J,D)
EAG(J,D)
PENE(J,D)
HWS
GWS
PWM(W)
PGW
industrial waste management Activity For toxic
MWM(W,WMW)
Municipal waste management activity
PWMX(W)
MWS(W,WMW)
MWG(J)
PW(J,"w_m")
PEK("w_m")

Sectors

AGR	Agriculture, Forestry, Fishing	WTR	Water Supply
MIN	Mining	SRV	Services
FOD	Food	MWM	Municipal Waste Management
TEX	Textiles	IWM	Industrial Waste Management
PLP	Paper and pulp	EMC	Environment Industry
CHM	Chemicals	GOV	Government service
NMM	Non-metallic minerals	COL	Coal
BMT	Basic Metals	OIL	Oil
FMT	Fabricated Metals	GAS	Gas
MCH	Machinery	HYD+	Hydro Power
ELM	Electrical machinery	THE+	Thermal Power
TRE	Transport equipment	NUC+	Nuclear Power
OTH	Other manufacturing	ELE*	Electricity
CNS	Construction		

+ Only Sector

* Only Commodity

Waste categories

	Industrial Wastes	WCT	Construction Waste
ID	Description	DST	Dust
ASH	Ash	WZZ	Other waste
SLD	Sludge	WWT	Toxic Waste
WOL	Waste Oil		**Municipal Wastes**
WPL	Waste Plastic	ID	Description
WPP	Waste Paper	WPL	Waste Plastic
WWD	Waste Wood	WPP	Waste Paper
WTX	Waste Textile	WTX	Waste Textile
WAP	Animal and Plant Waste	WAP	Animal and Plant Waste
SCM	Scrap Metal	SCM	Scrap Metal
WGC	Waste Glass	WGC	Waste Glass
SLG	Slag	WZZ	Other waste

Waste to goods

	AGR	TEX	PLP	CHM	BMT	OTH	NMM	FMT
ASH								
SLD								
WOL								
WPL								
WPP								
WWD								
WTX								
WAP								
SCM								
WGC								
SLG								
WCT								
DST								
WZZ								
WWT								

Scenarios

- Scenario 1
  - Reference scenario – no interventions
- Scenario 2
  - Toxic Constraint Scenario – limit the discharge of toxic wastes.
- Scenario 3
  - Countermeasures – environmental investment with waste management efficiency improvement

Results

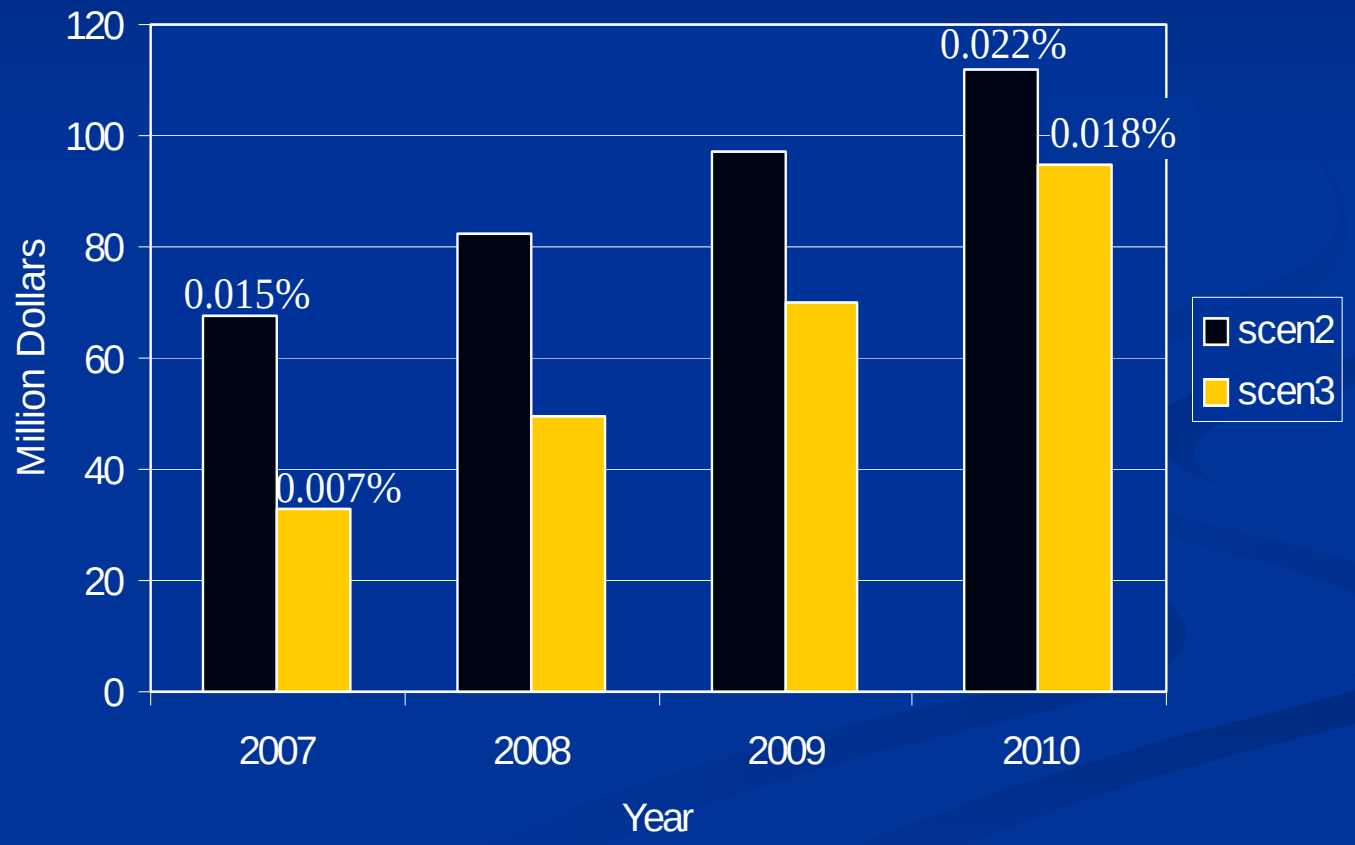
- Still preliminary and only indicative
- Demonstrate what we can do with this model when applied to India even with limited data availability

Results – Reference Case

- GDP growth of 5.85% for the period 1994-2010
- Total waste generation grows at 4.9%
- Growth in disposal of non-toxic waste is 3.5%
- Growth in disposal of toxic waste is 3%
- Waste management service sectors (IWM and MWM) growth rate is 5% while Environment Industry grows at 6.28%.

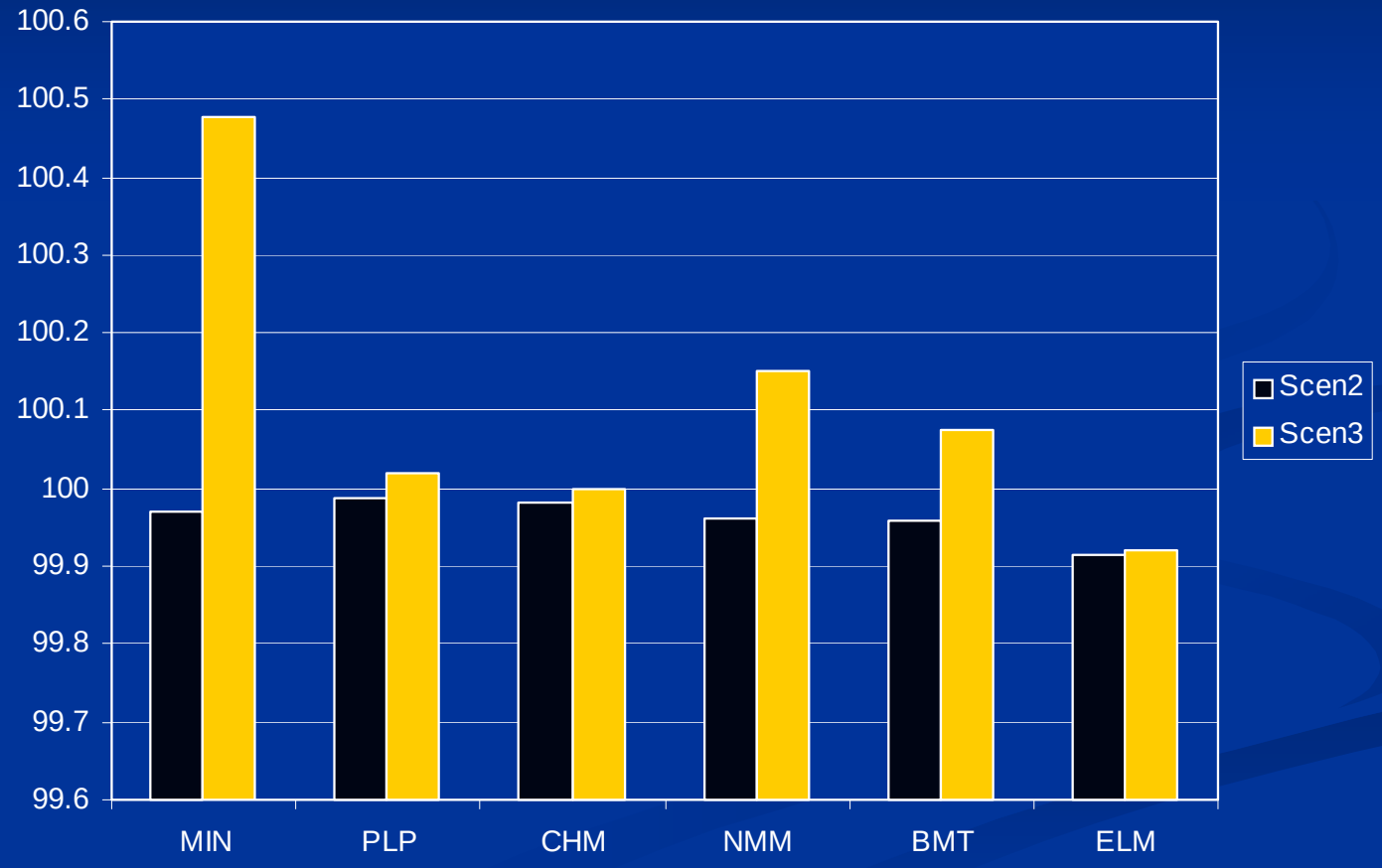
Results - Policy

GDP Loss over reference scenario



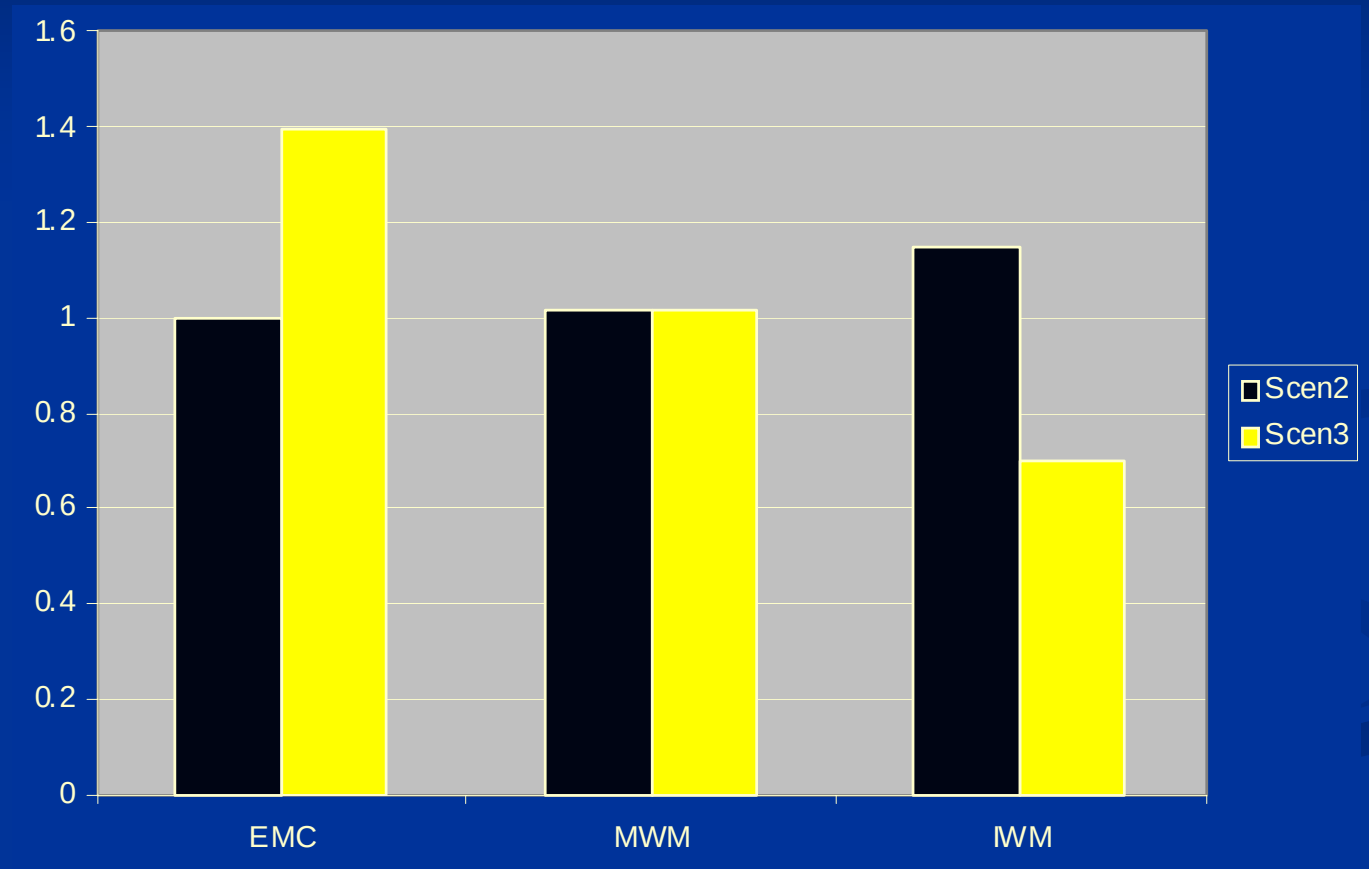
Results - Policy

Economic sectors - change in output (2010) over reference scenario



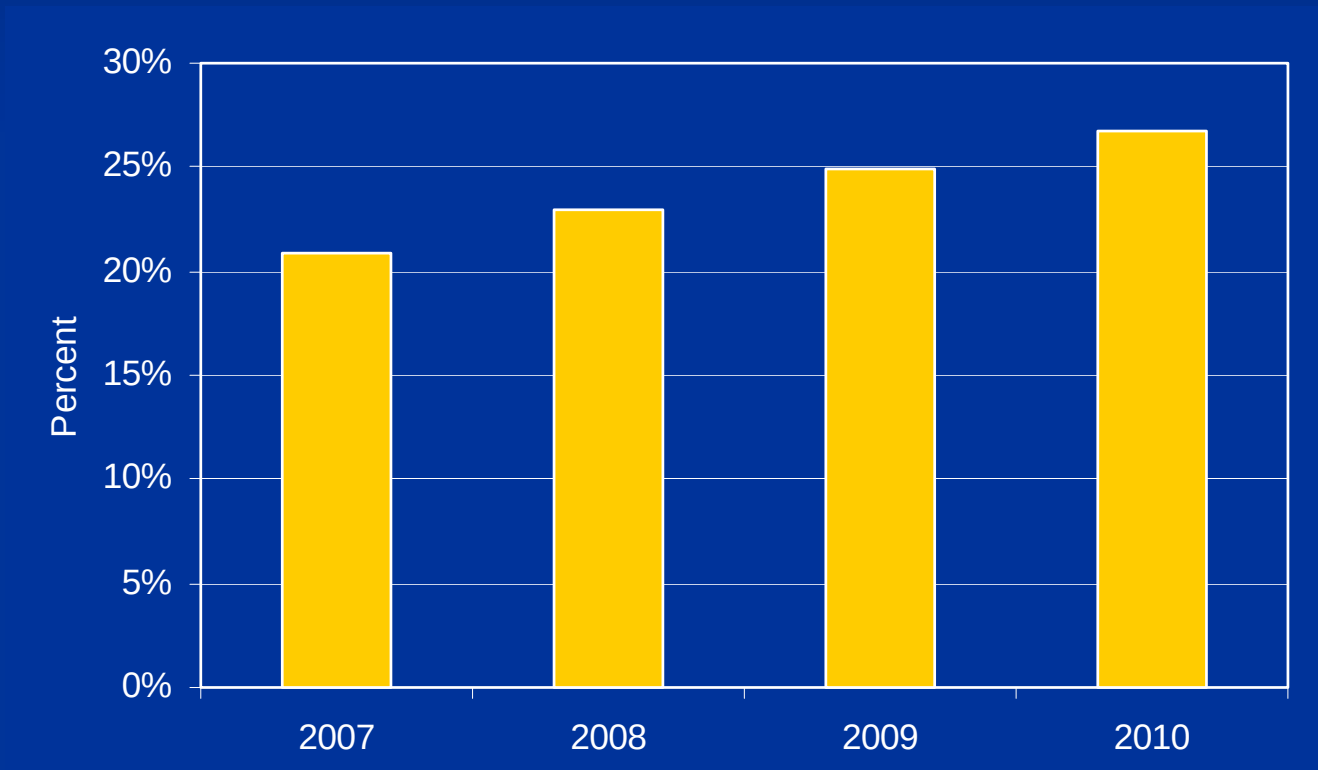
Results - Policy

Environment sectors - change in output (2010) over reference scenario



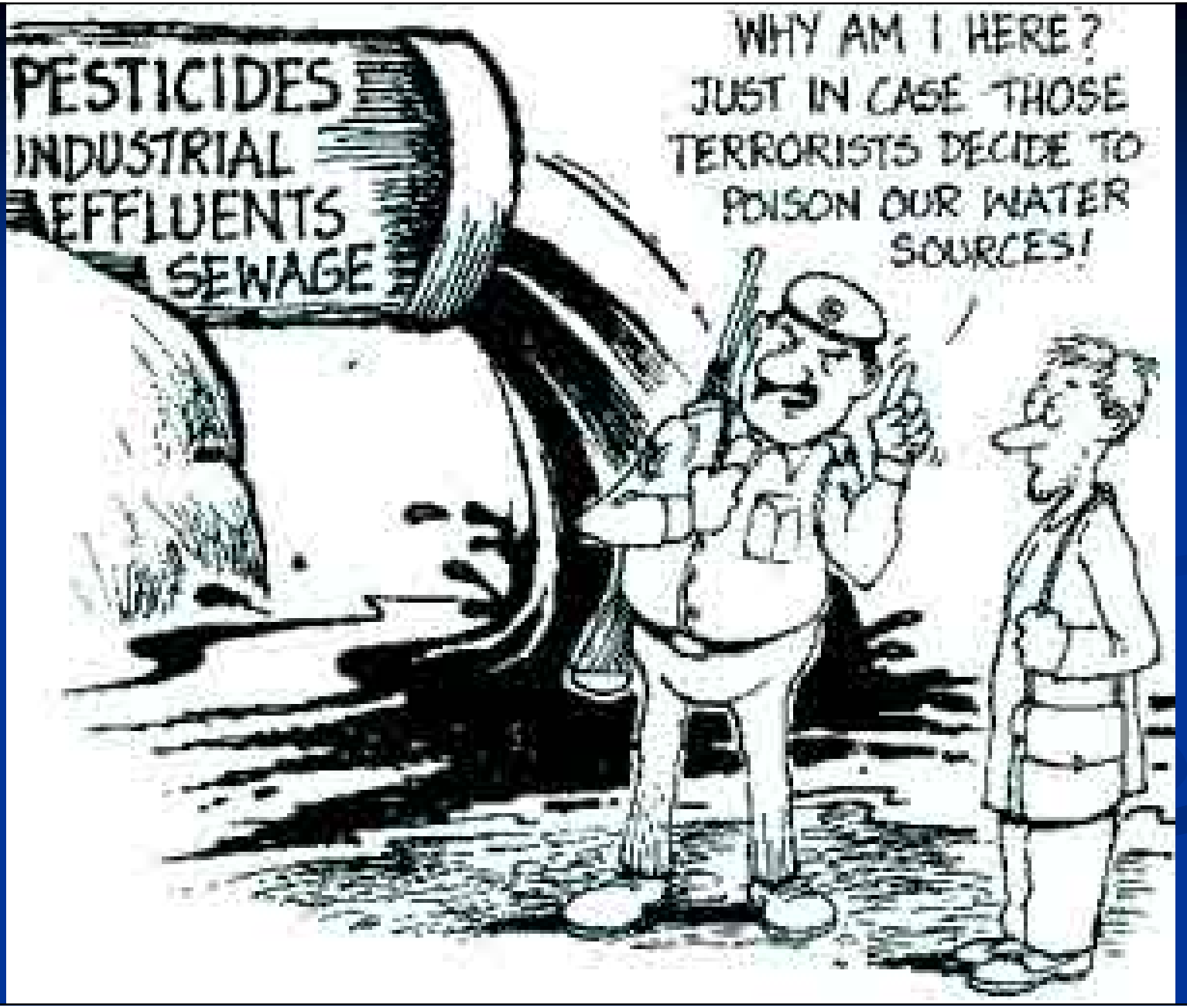
Results - Policy

Reduction in cost of toxic disposal in Scenario 3 over Scenario 2



Concluding remarks

- Environmental interventions – ‘No Regret’
- Future tasks:
  - Improvement of database
  - CO2 mitigation
  - Include Sewage sector
  - Include Water pollution, Air pollution


PESTICIDES
INDUSTRIAL
EFFLUENTS
SEWAGE
WHY AM I HERE?
JUST IN CASE THOSE TERRORISTS DECIDE TO POISON OUR WATER SOURCES!

Thank you