

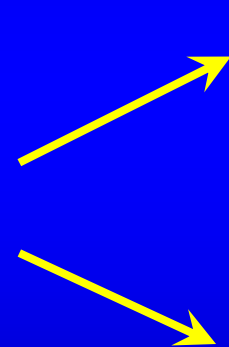
**PRELIMINARY ESTIMATION
OF DIOXIN AND FURAN
RELEASES FROM SOLID
WASTE (SW)**

By

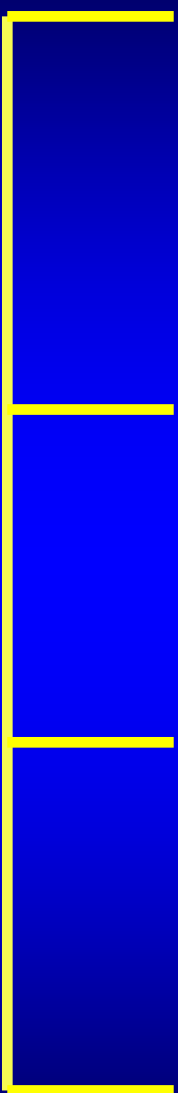
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1. CLASSIFICATION

— **Municipal MSW.**

— **Industrial**  **Hazardous.**
Non-Hazardous.

— **Medical.**

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- Slaughter Houses.**
 - Biomass.**
 - Sludges.**
 - ? Obsolete Pesticides.**

2. Main Dioxin & Furan

Producing Categories

- **Incineration.**
- **Uncontrolled Combustion
(burning).**
- **Composting.**
- **Hot Spots (Historic Dump Sites).**

3. Existing Conditions

— Much of the SW classes are still mixed with MSW.

$MSW \sim 15 * 10^6 \text{ t/y}$

— Incineration is very limited in use —
In some hospitals and veterinary colleges - Mostly small scale intermediate technology, capacities between 30-100 kg/batch.

Biomass Wastes

($\sim 28 \times 10^6$ t/y) is partly recycled and partly ($\sim 40\%$) burned either in open air or as fuel (particularly Sugar Cane industrial residues (bagasse) & Rice Husks).

Sludges

are not incinerated or burnt.

Also almost no Industrial Waste is being incinerated.

Open burning prohibited by Law (but it happens).

4.This will leave us with the
following Dioxin & Furan
Most Important Potential
Sources As Related to MSW

MSW

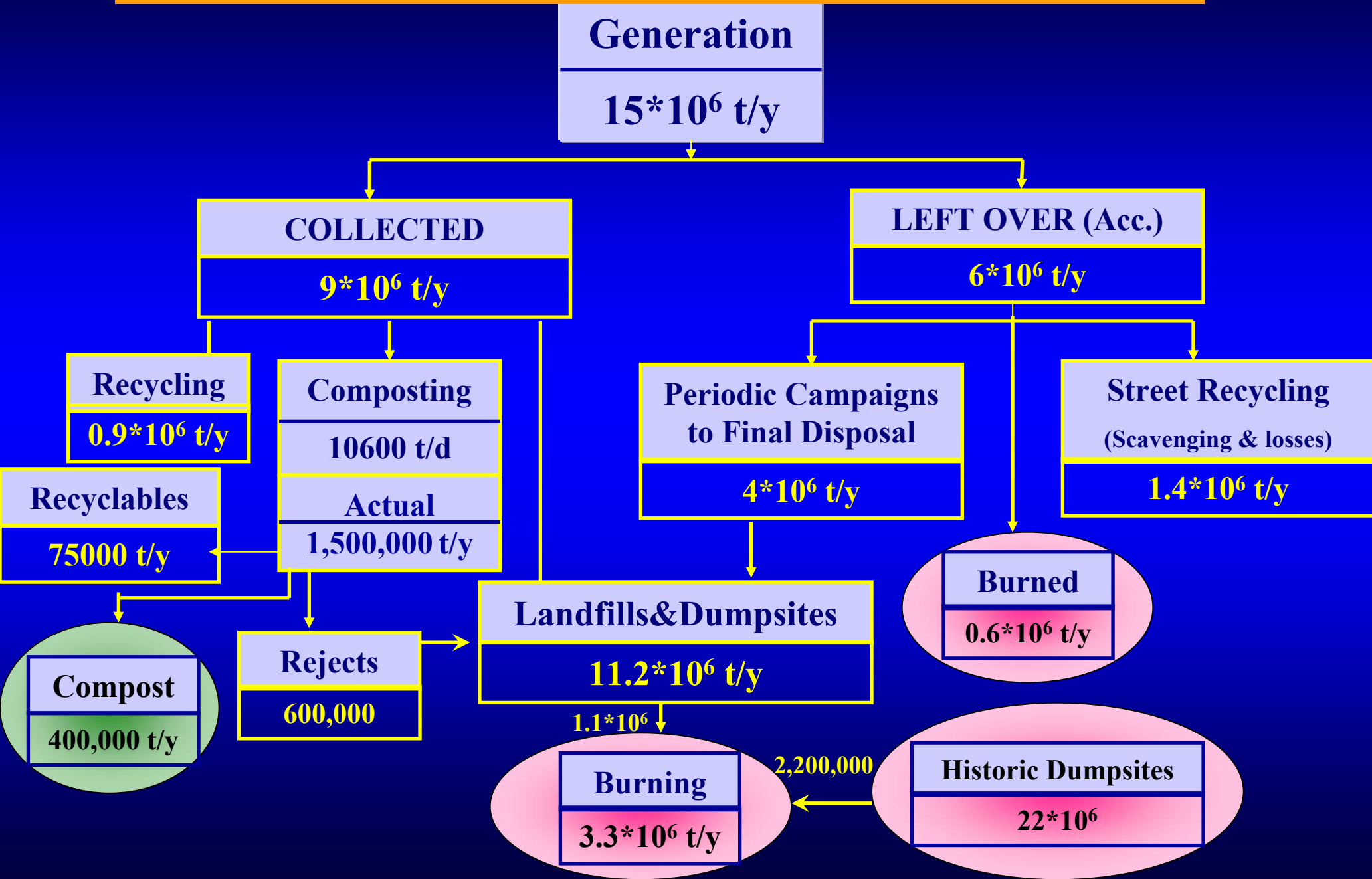
- **Open burning of MSW.**
- **Burnings of MSW in dumpsites.**

— Composting.

— Historic Dumpsites (Hot Spots).

**MOST significant would be
Dumpsites.**

5. MSW LIFE CYCLE (Material Flow)



6. Examples of Toolkit

Emission Factors

UNEP Toolkit emission factors for waste burning and accidental fires

Classification	Emission Factors - μ gTEQ/t of Material Burned				
	Air	Water	Land	Product	Residue
Landfill fires (dumps mainly)	1,000	ND	NA	NA	ND
Uncontrolled domestic waste burning	300	ND	See residues	NA	600
Open burning of wood (construction/demolition)	60	ND	ND	NA	10

Emission factors for Composting

Classification	Emission Factors - μ gTEQ/t of dry matter			
	Air	Water	Land	Product=Residue
All Organic Fraction	NA	NA	NA	100
Garden, kitchen wastes	NA	NA	NA	15
Green materials from not impacted environments	NA	NA	NA	5

Emission factors for biomass burning

Classification	Emission Factors - μ gTEQ/t of Material Burned				
	Air	Water	Land	Product	Residue
Forest fires	5	ND	4	NA	NA
Grassland and moor fires	5	ND	4	NA	NA
Agricultural residue burning (in the field), not impacted	0.5	ND	10	NA	NA
Agricultural residue burning (in the field), impacted, poor conditions	30	ND	10	NA	NA

Emission factors for medical waste incineration

Classification	Emission Factors - μ gTEQ/t of Medical Waste Burned	
	Air	Residue
Uncontrolled batch type combustion, no APC system	40,000	200*
Controlled batch type combustion, no or minimal APC	3,000	20*
Controlled batch type combustion, good APC	525	920**
High technology, continuous, controlled combustion, sophisticated APC system	1	150**

* Refers only to bottom ash left in the combustion chamber.

** Refers to combustion bottom and fly ashes.

7. RELEASE ESTIMATES

(See calculation sheets)

I) Dumps

a) Fire

Burned (t/y)	Air (gTEQ/Y)	Residue (gTEQ/Y)
$3.3 * 10^6$	$3.3 * 500 = 1650$	$3.3 * 79^* = 261$

* measured

b) Hot Spot (historic Dump residue) in place

$22 * 10^6$ t with 79μ gTEQ/T ~ 1740 gTEQ

c) Uncontrolled Domestic Combustion

Air	Residue
$(0.6 * 10^6 \text{ t/y}) * 300 * 10^{-6} = 180$	$0.6 * 600 = 360$

II) Composting

$$\begin{aligned} \text{Dry Compost} &= 400,000 * 0.7 \text{ (d.m.)} \\ &= 280,000 \text{ t/y} \end{aligned}$$

Product Factor = 15 μ gTEQ/T (d.m.)
(garden + kitchen waste)

$$\text{Release} = 2.8 * 15 = 42 \text{ gTEQ/y}$$

III) Total Estimated Releases

Air	Residue & Product
1650 +180 = 1830	261 +360 + 42=663

Add 20 % for all other.

Calculation Table of PCDD/PCDF Emissions

Category 6- Uncontrolled Combustion Processes

B- Fires, Waste burning, Landfill, Industrial fires, Accidental fires

Factory	Burned amount (t/y)	Classification	Emission Factors (gTEQ/T)					Emission (gTEQ/y) for Egypt				
			A	W	L	P	R	A	W	L	P	R
Dumps	3.3*10 ⁶	Landfill fires	500				79*	1650				261
Non Collected	600,000	Uncontrolled domestic	300				600	180				360

* 3 Samples from landfill residue at different distances were taken.

* 79 micro g/ton the average quantity of Dioxin in Residue.

* The emission factor of Dioxin in residue of Egypt is 79 micro g TEQ/t.

* The capacity annually + historical accumulation over 10 years = 780,000+300,000=1,110,000.

A: Air

W: Water

L: Land

P: Product

R: Residue

Calculation Table of PCDD/PCDF Emissions

Category 9- Disposal/Landfill

D- Composting

Factory	Burned amount (t/a)	Classification	Emission Factors (gTEQ/T)					Emission (gTEQ/y) for Egypt				
			A	W	L	P	R	A	W	L	P	R
Compsted waste	280,000	2-Darden, kitchen wastes					15				42	

A: Air

W: Water

L: Land

P: Product

R: Residue

In Conclusion

- Appropriate information is lacking.**
- Need to upgrade estimates periodically.**

□ Urgently need:

- To identify geographic locations, capacities and status of all Landfills & Dumpsites.**
- Take few dioxin verification measurements:**
 - + at a large urban dumpsite.**
 - + for a typical hospital incinerator.**
 - + for a compost sample.**