



Refuse Derived Fuel (RDF) in Solid Waste Management (SWM) in Egypt



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Ministry of Planning



Challenges of solid waste management





Basic Solid Waste Management

The **complexity** of an integrated SWM system depends mainly on:

- The political objectives
- The legislation, and
- The local situation

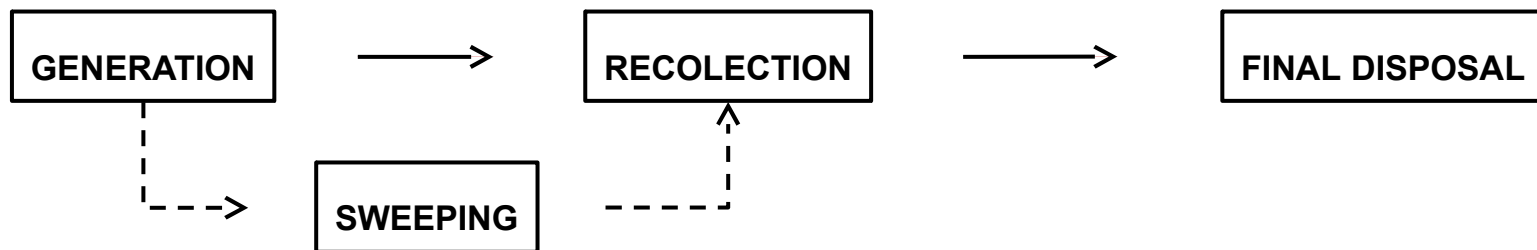


Figure 1: Flowchart of basic SWM



Complex Integrated Solid Waste Management

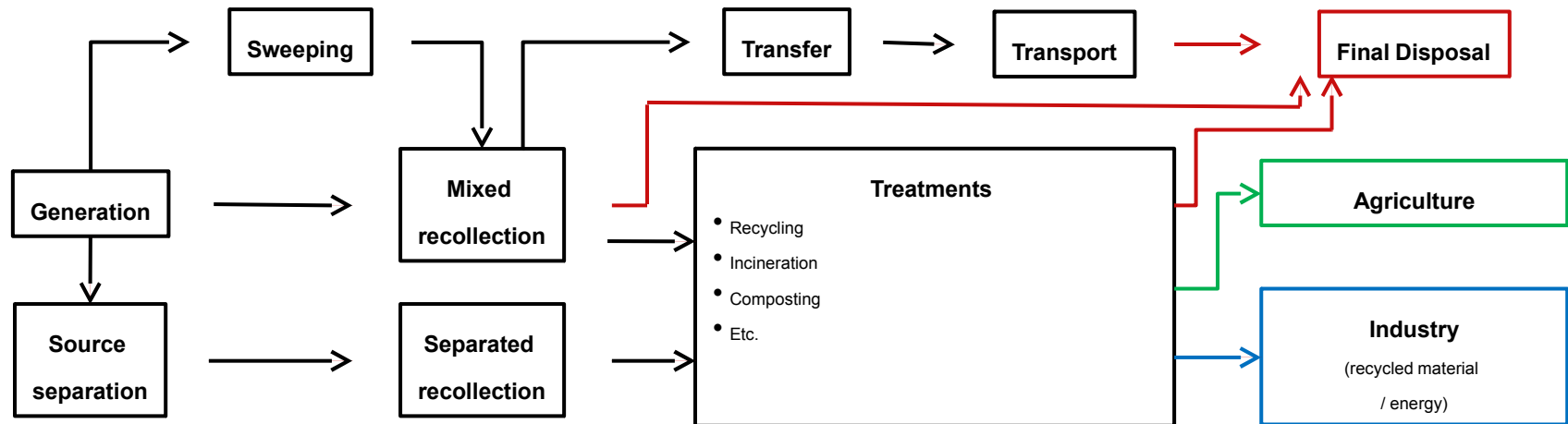


Figure 2: Flowchart of integrated SWM



General alternatives of Waste treatment

Option 1: Inert material

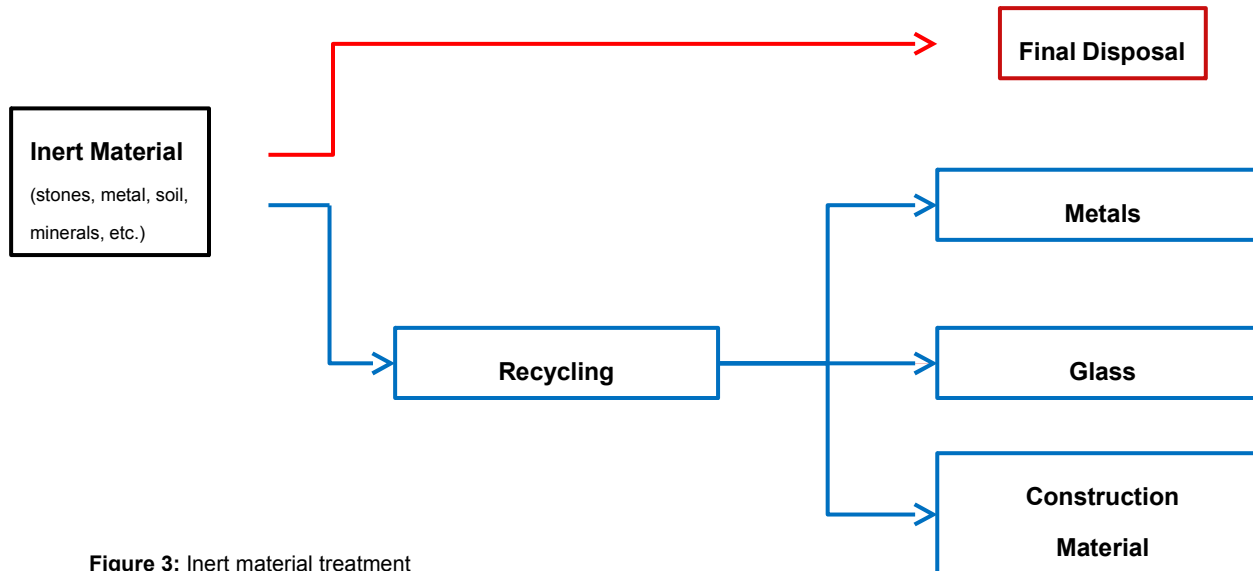


Figure 3: Inert material treatment



General alternatives of Waste treatment

Option 2: Organic Waste *(easy degradable)*

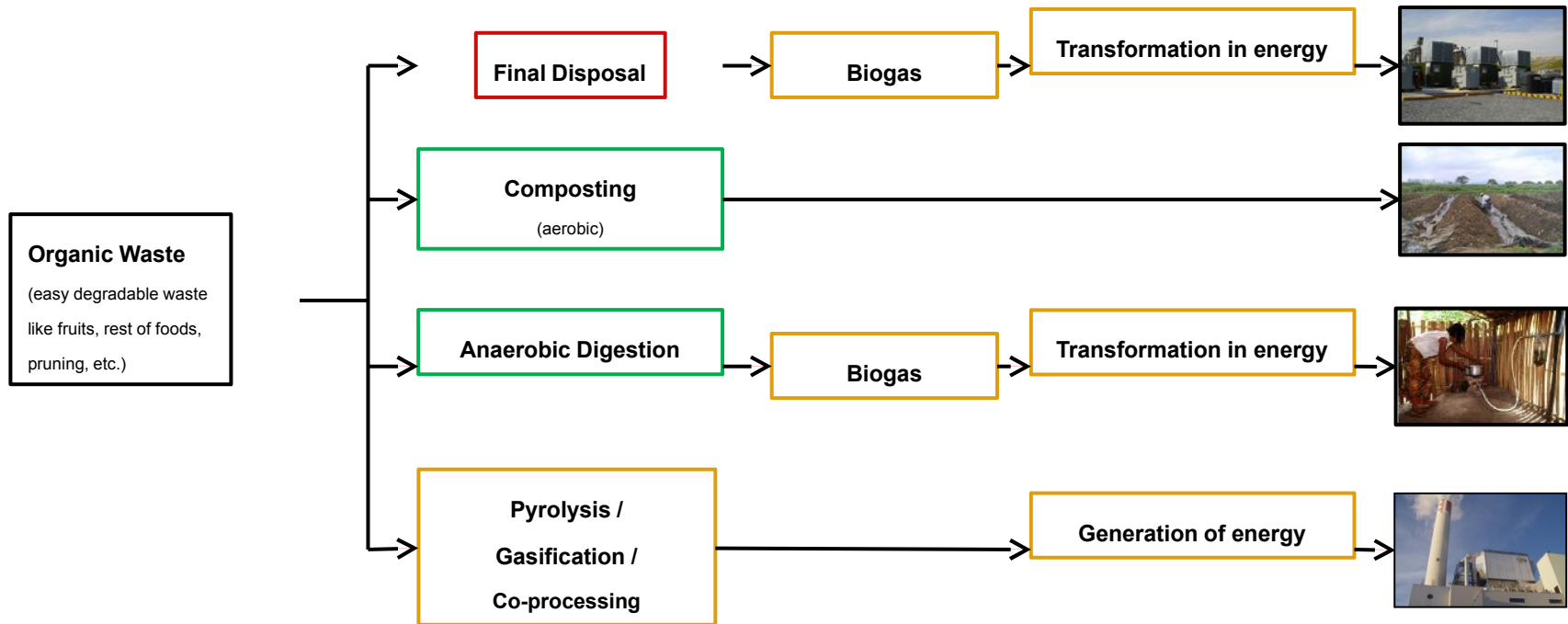


Figure 4: Organic waste treatment alternatives



General alternatives of Waste treatment

Option 3: (In-)Organic Waste *(hardly degradable)*

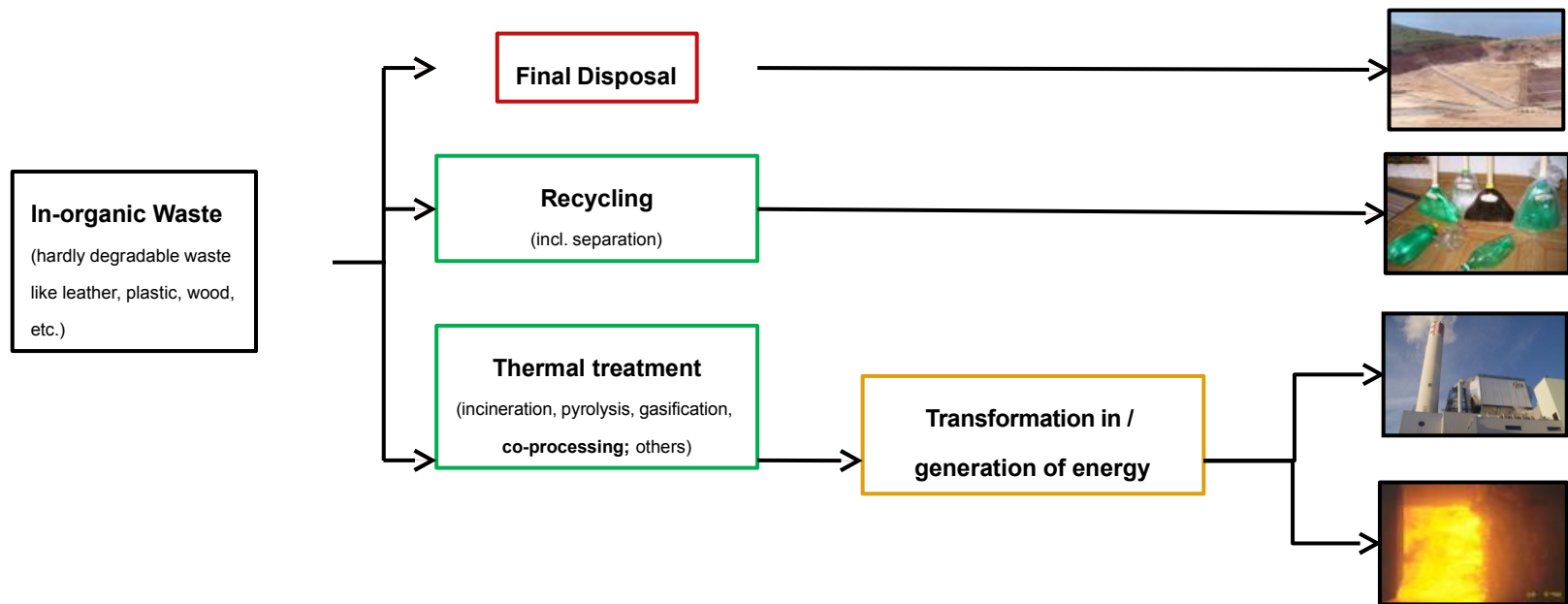


Figure 5: In-organic waste treatment alternatives



Actual situation of Solid Waste Management

- General **consensus** exists for an urgent need to **improve waste management** in developing countries and countries in transition.
- Despite innovative solutions there is still a **lack of technical infrastructure** for environmentally sound and financially feasible treatment and final disposal of waste.
- International **environmental agreements** are in place aiming for a controlled management of hazardous waste



Actual situation of Cement Industry

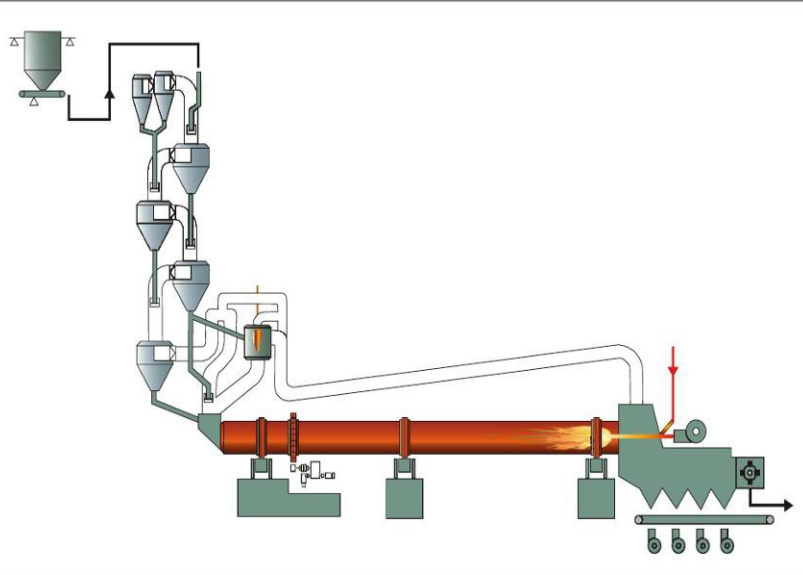
- The cement industry is **consuming** significant amounts of **natural resources and fossil energy**
- Worldwide cement consumption is increasing. There is consensus that is required to **optimize** the use of **virgin raw materials and energy**.
- In many industrialized countries the **substitution** of **fossil fuel and raw material waste** (**Alternative Fuels and Raw materials - AFR**) has been recognized as a method of recovery and disposal, friendly to the environment.



Co-processing a sound alternative

- **Co-Processing** refers to the use of waste materials in industrial processes, such as cement, lime, or steel production and power stations. It is a recovery of energy and material from refuse.

| Characteristics | Temperature and time |
|-------------------------------|--|
| Temperature at main burner | >1450°C: material >1800°C: flame temperature. |
| Residence time at main burner | >12-15 sec and >1200°C >5-6 sec and >1800°C |
| Temperature at precalciner | >850°C: material >1000°C: flame temperature |
| Residence time at precalciner | >2 - 6 sec and >800°C |



The diagram illustrates the cement production process. It shows a vertical precalciner on the left, where waste materials are fed into a series of rotating chambers. The material then moves to a horizontal main burner on the right, where it is heated to high temperatures. The final product is collected in a silo at the bottom right.

Table 2: Temperature and residence time during cement production

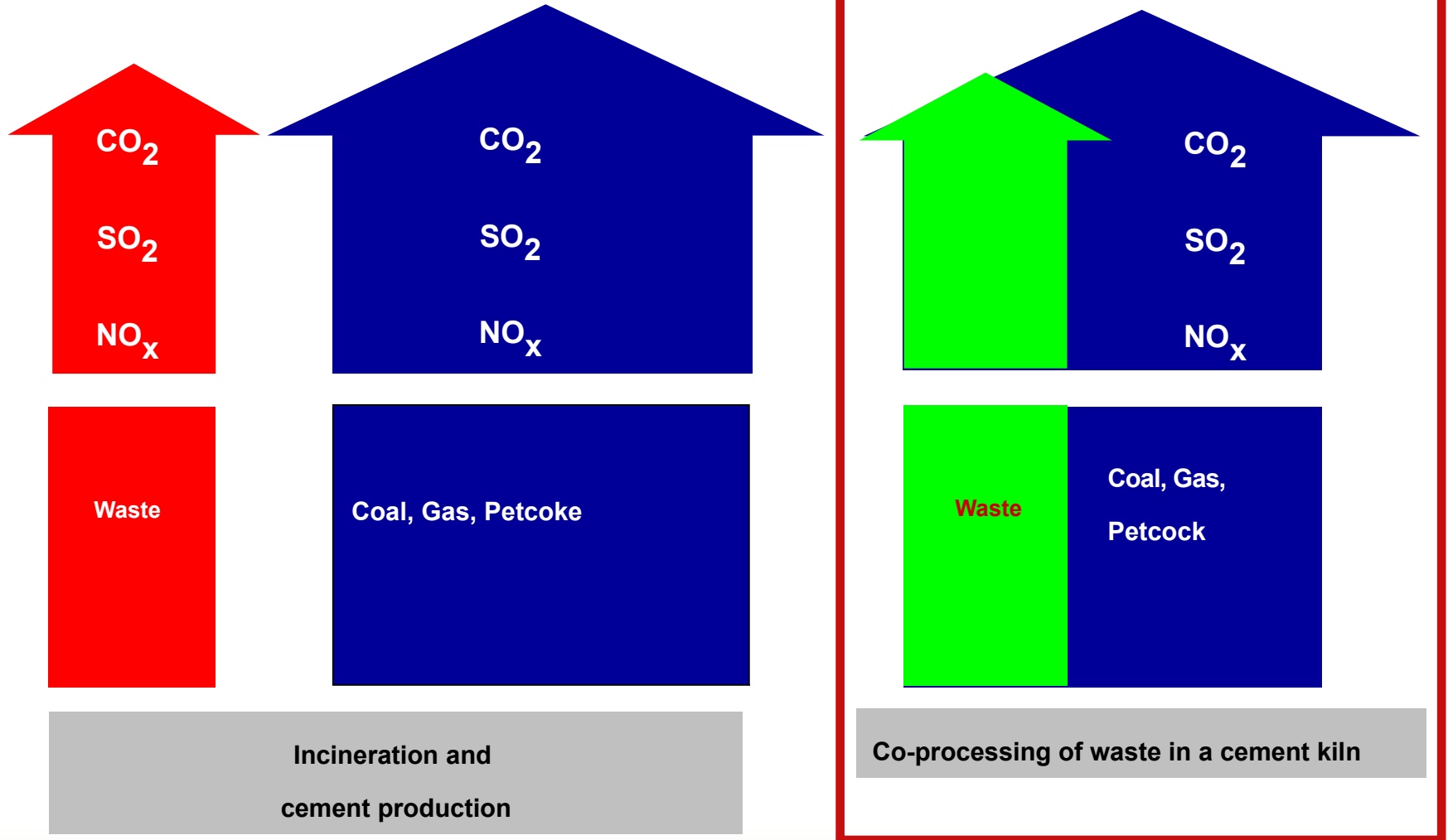


Co-processing and emission reduction

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Co-processing and emission reduction





Use of AFR in selected countries

| Country | % of thermal energy substituted by AFR | Year |
|-------------|--|------|
| France | 32% | 2003 |
| Germany | 62% | 2013 |
| Noriega | 45% | 2003 |
| Switzerland | 47% | 2002 |
| EE.UU. | 25% | 2003 |



Recommended 5 principles

Principle I Co-processing respects the waste hierarchy

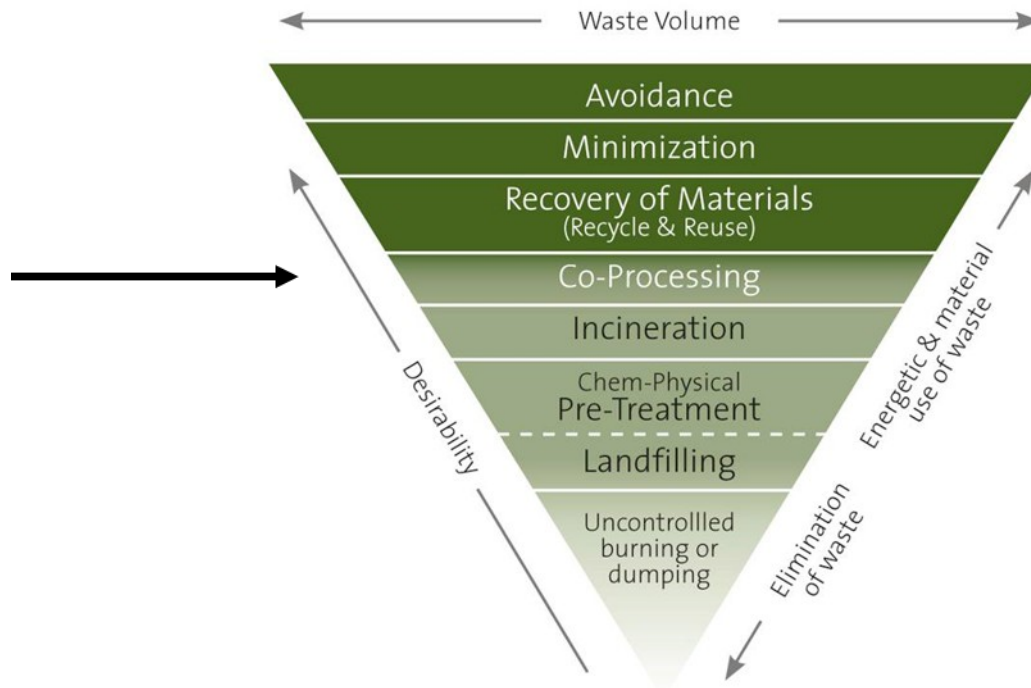


Figure 1: Waste management hierarchy



Recommended 5 principles

| | |
|---------------|---|
| Principle II | Additional emissions and negative impacts on human health must be avoided |
| Principle III | The quality of the cement product remains unchanged |
| Principle IV | Companies engaged in co-processing must be qualified |
| Principle V | Implementation of co-processing has to consider national circumstance |



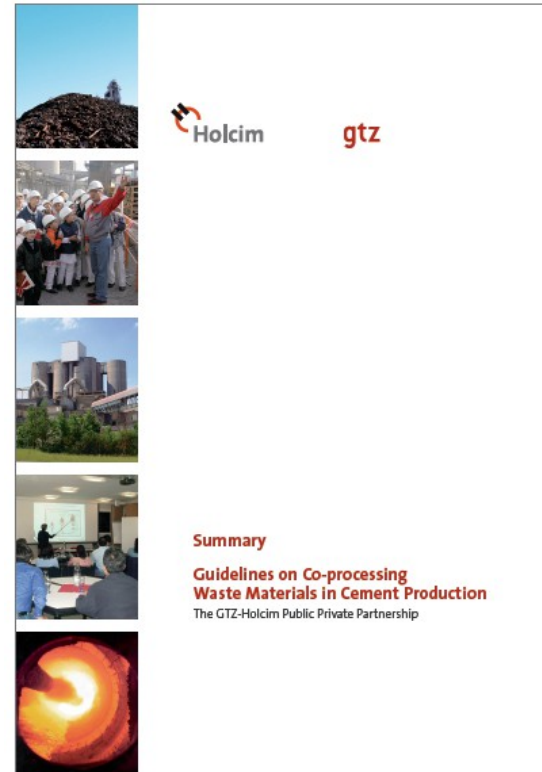
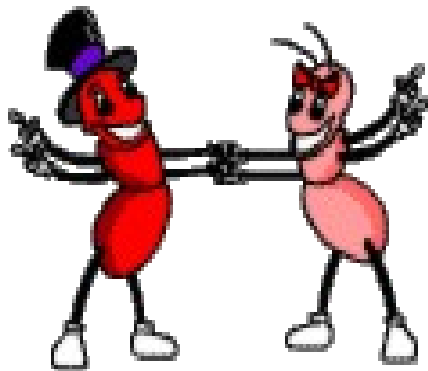
Summary

Co-processing of determined waste within the cement-production:

- Is an adequate solution for determined waste (solid and liquid), but not for all
- Can be part of an integrated waste management system and strategy
- Several principles should be followed, especially the waste hierarchy
- A good collaboration between the different stakeholders should be achieved
- It is a win-win-option



Thank you for your attention



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