FEDENE

Bottom ash valorization

Case of France

Legal Framework FRANCE

1. Framed by the Ministerial Order of 18/11/2011 on the recycling of bottom ash from the incineration of non-hazardous waste for road use.
   - **very restrictive initial framework for the use of bottom ash.**

2. Note from the Directorate General for Risk Prevention (2016)
   - **Expansion of usage possibilities compared to 2011**.

3. **2 practical guides are available**, setting out the rules for valorization :
   - Acceptability of **alternative** materials in road construction techniques.
   - Environmental acceptability of alternative materials in road construction techniques – Bottom Ash

Every guide is made **to control the risk of environmental impact**!

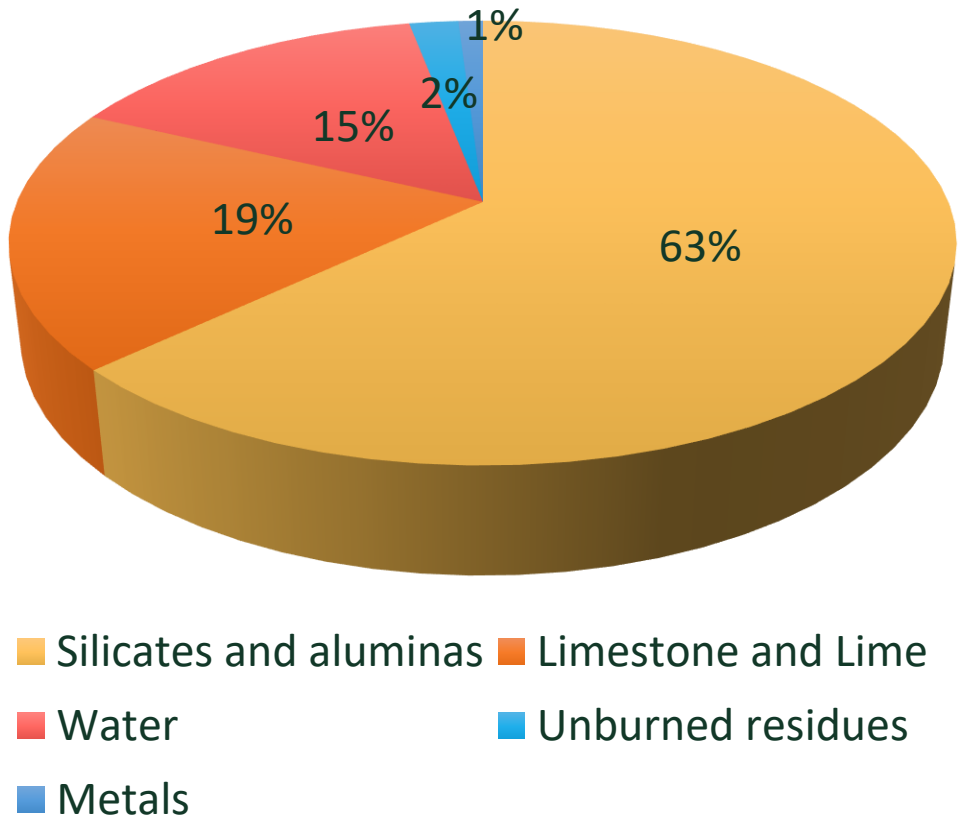
General information on the recycling of bottom ash

1. Bottom ash represents **15 to 20%** of the initial waste tonnage.
2. **2.5 to 3 million** tonnes of bottom ash are produced by the **116 WtE** each year
3. **77 facilities** treat bottom ash.

Two ways to treat it:

1. on the WTE plant site
2. on a dedicated platform

Chemical composition of bottom ash aggregate



Specific situation in France regarding Refuse-derived fuel (RDF): There is no regulation for bottom ash derived from RDF, and we advocate for it to be the same as for WtE plants.

Bottom ash treatment processes and criteria

- **The operations most commonly performed on bottom ash are:**
  - Maturation,
  - Screening,
  - Crushing operations,
  - Extraction of large unburned materials,
  - Extraction of ferrous metals,
  - Extraction of non-ferrous metals.

Fiche de classement environnemental d'un lot de mâchefer élaboré

Usine de traitement thermique	Lot
XXXXXXXX	Mois/Année
Classement environnemental	V1 ou V2

Paramètre Teneur intrinsèque en éléments polluants	Valeur limite à respecter V1 Usages routiers de type 1	 V2 Usages routiers de type 2	Résultat de l'essai
COT (carbone organique total)	30 g/kg de matière sèche		
BTEX (benzène, toluène, éthylbenzène et xylènes)	6 mg/kg de matière sèche		
PCB (polychlorobiphényles 7 congénères)	1 mg/kg de matière sèche		
Hydrocarbures (C10 à C40)	500 mg/kg de matière sèche		
HAP (hydrocarbures aromatiques polycycliques)	50 mg/kg de matière sèche		
Dioxine et furannes	10 ng I-TEQ$_{OMS\ 2005}$/kg de matière sèche		

Paramètre Comportement à la lixiviation	Valeur limite à respecter exprimée en mg/kg de matière sèche V1 Usages routiers de type 1	 V2 Usages routiers de type 2	Résultat du dernier essai
As / Arsenic	0,6		
Ba / Baryum	56	28	
Cd / Cadmium	0,05		
Cr total / Chrome total	2	1	
Cu / Cuivre	50		
Hg / Mercure	0,01		
Mo / Molybdène	5,6	2,8	
Ni / Nickel	0,5		
Pb / Plomb	1,6	1	
Sb / Antimoine	0,7	0,6	
Se / Sélénium	0,1		
Zn / Zinc	50		
F^- / Fluorures	60	30	
Cl^- / Chlorures *	10 000	5 000	
SO_4^{2-} / Sulfates *	10 000	5 000	
FS / Fraction soluble *	20 000	10 000	

* Concernant les chlorures, les sulfates et la fraction soluble, il convient, pour être jugé conforme, de respecter soit les valeurs associées aux chlorures et aux sulfates, soit de respecter les valeurs associées à la fraction soluble.

- **Analyses :**

  Intrinsic analyses: detection of TOC, BTEX, PCB, dioxins, PAH, etc.

  Leaching tests: to assess the mobility of elements (heavy metals, …) over time.

- **Categorization based on analysis results:**
  - **V1 (restricted use) and V2 (extended use)** if the results are compliant.
  - **Non-compliance:** directed to landfills for bottom ash exceeding the thresholds.

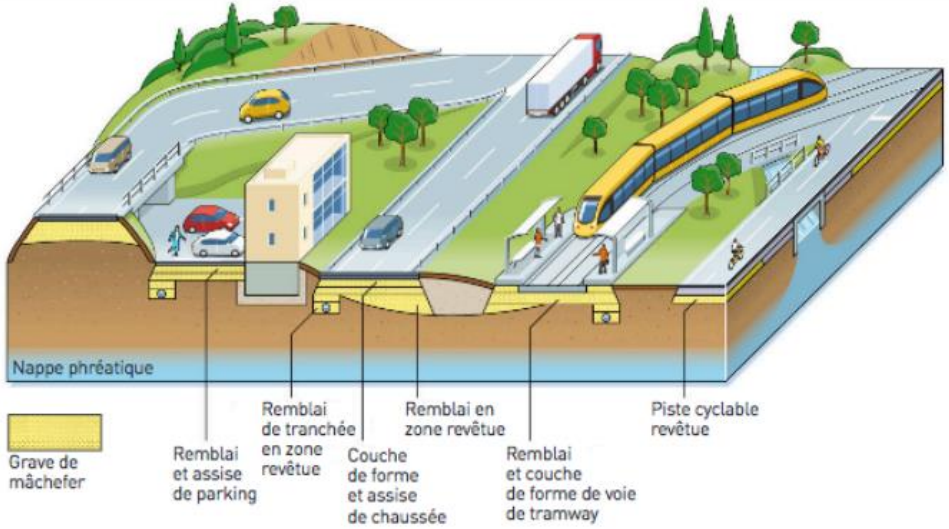
Eligibility criteria for the use of bottom ash

- **Regulations on specific distances**: avoid water catchment areas, national parks, and geologically sensitive areas such as limestone regions.
- **Environmental precautions**: no contact with water, restrictions in protected areas, and near watercourses.
    - **Exclusion zones:** watercourses, protected geographic areas, and geologically sensitive areas to prevent groundwater contamination.

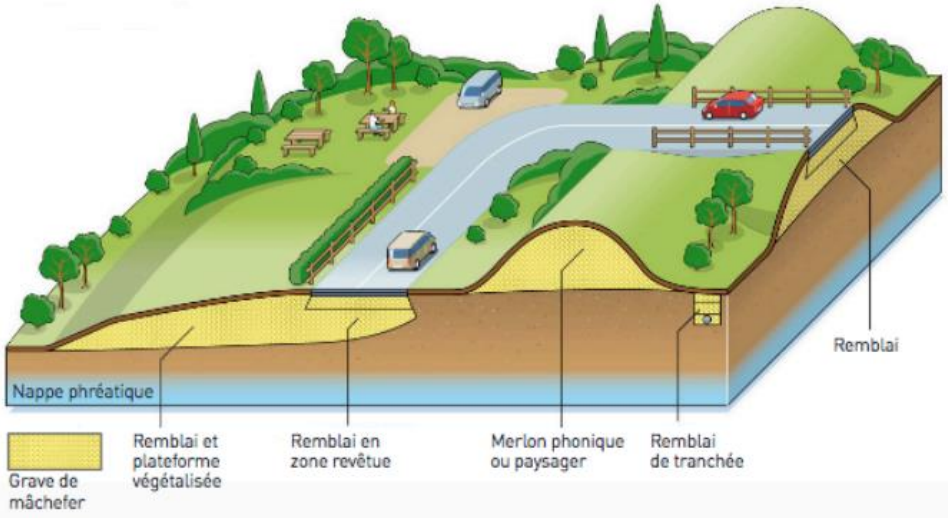
Examples of bottom ash recycling

1. Road platform and lower embankment
2. Green waste platform
3. Roundabout
4. Store parking lot
5. Waste collection center road
6. Local road, roundabout
7. Platform extension
8. Boulevard in an urban area
9. Embankment under a waste collection center dock
10. Roundabout and highway exit ramp
11. Esplanade in a highly urban area

Usages (type 1)



Usages (type 2)



Benefits of recovery of bottom ash (especially on the environmental level)

- **Generally cheaper than natural materials**.
- **Preservation of landfills volumes (for other waste).**
- **Avoids the extraction of natural materials (with the related environmental impacts : dust, CO2, other pollutants emissions, noise, visual impact, …).**
- **CO2 emissions avoided : 0,004 t CO2 per ton of bottom ash valorized (value ADEME/FEDEREC).**

Future prospects and research

Trend towards fewer roads and more construction projects -> Therefore, more opportunities for recovery are needed.

1. **Exploration of new applications:**
   - **Use of bottom ash as aggregates in concrete.**
   - **Development of new methods for their integration under buildings.**
2. **Challenges and opportunities for diversifying uses: expanding possible options despite pressure from lobbies favoring traditional materials.**