



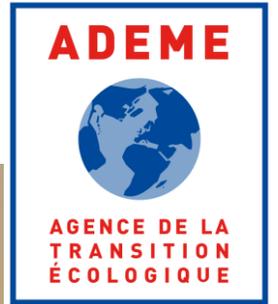
RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

Metaleurop Nord, Agricultural management of a wide Lead contaminated area

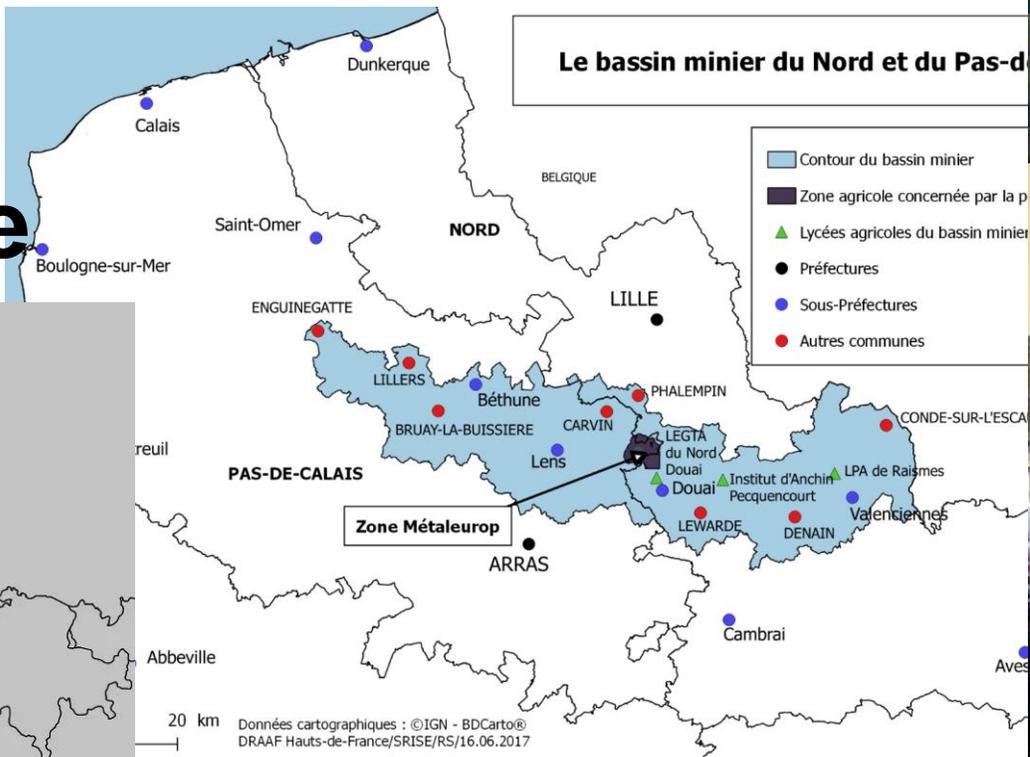
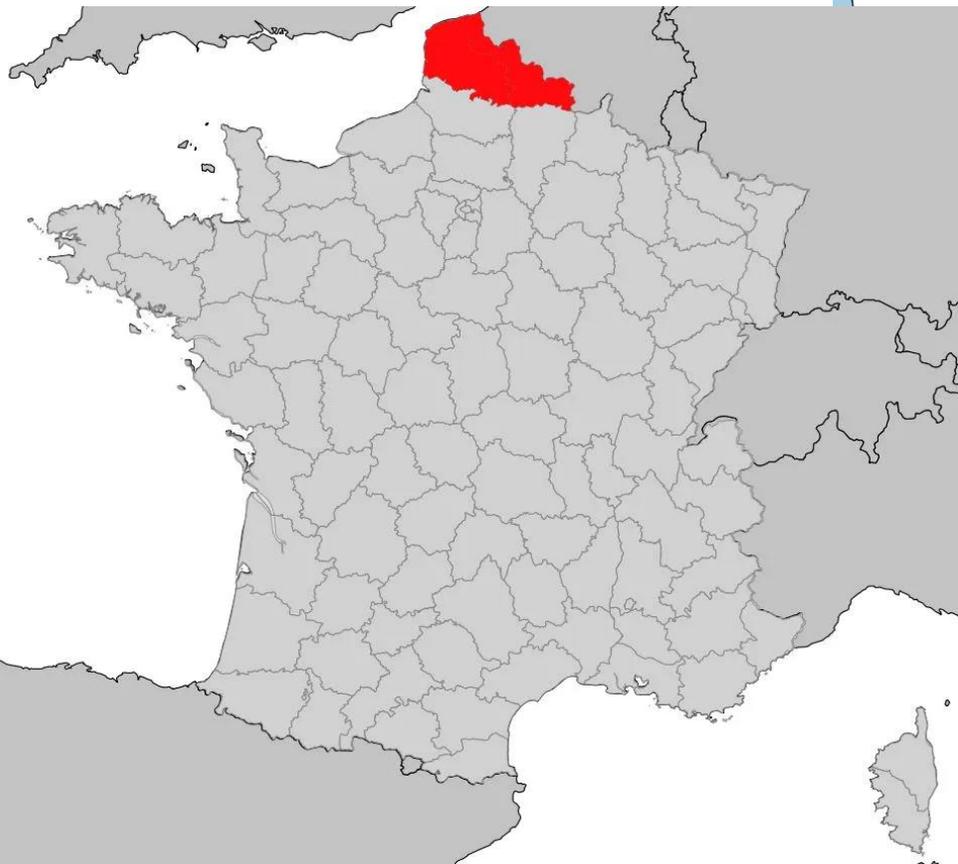


Helene ROUSSEL - ADEME



Metaleurop Nord

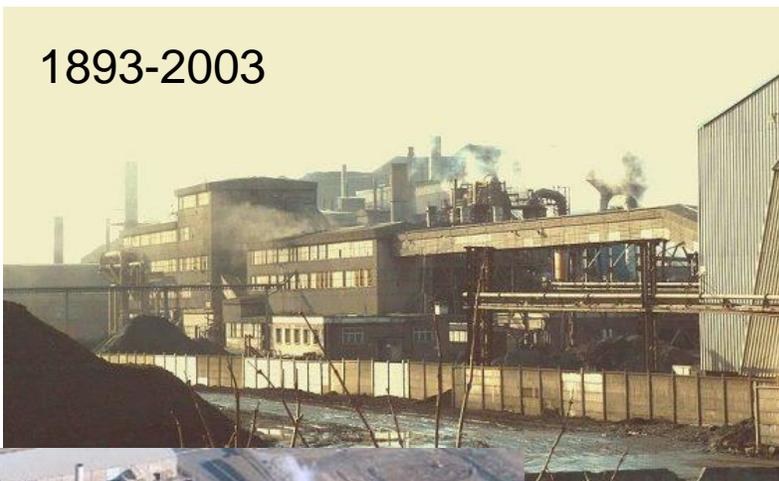
Industrial heritage



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Smelter closedown

1893-2003



Source
wikipedia

- Smelter closedown 2003
- Smokestack emissions and slag carried by wind erosion and gardeners practices (path stabilization and soil improver)
- Pollution was mainly Pb, Cd and Zn, but also to a less degree Ag, As, Bi, Cu, Hg, In, Ni, Sb, Se, Sn and Tl
- Compulsory liquidation => from private towards state responsibility for soil pollution in the outskirts of the site / > 1500 ha
- 50 ha of site transformed to industrial recycling center

Sanitary risk was handled but is not treated in this presentation (dust cleaning in schoolyards, lead poisoning screening, upper soil removal, etc.)

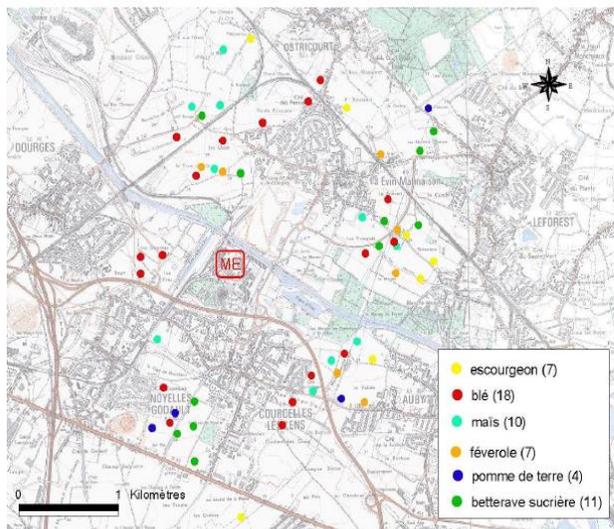
2008



2006



Agricultural products



		Alimentation	
		humaine	animale
Grains	Blé	72 % (18)	0 % (18)
	Maïs	10 % (10)	0 % (10)
	Escourgeon	71 % (7)	0 % (7)
	Féverole	100 % (7)	0 % (7)
Pomme de terre		50 % (4)	
Betterave sucrière		100 % (11)	
Paille de blé			28 % (18)
Paille d'escourgeon			0 % (7)
Maïs fourrager			40 % (10)
			Conformité totale
			Non-conformité totale
0%		pourcentage de non conformité	
7		nombre d'échantillons	

Interpolation par krigeage des teneurs en Pb (mg kg⁻¹)

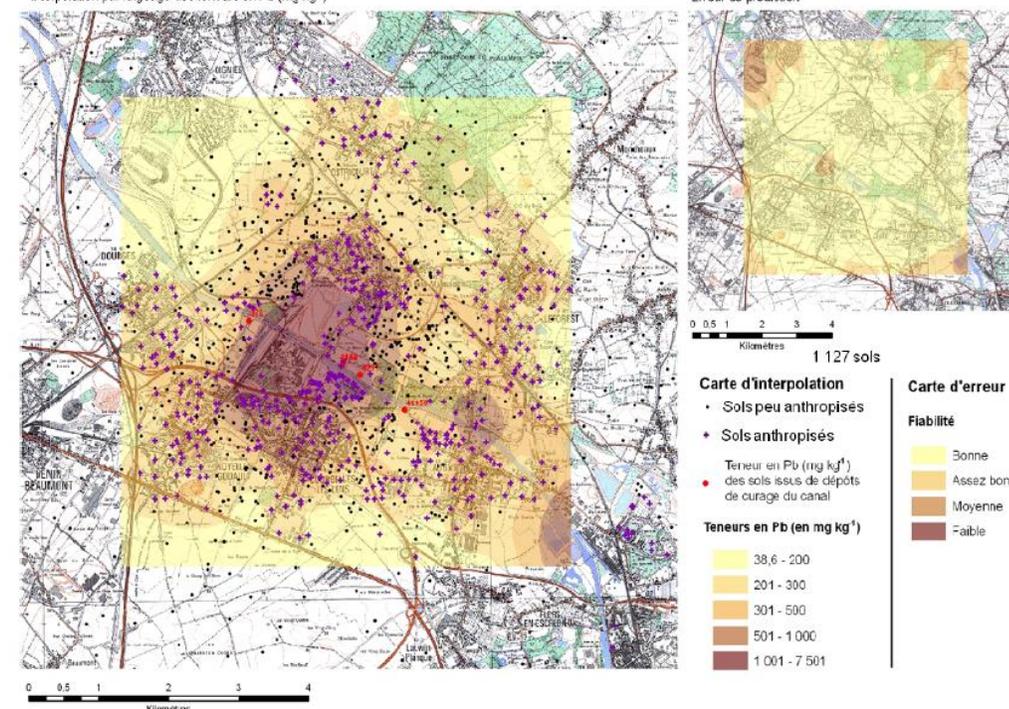


Figure 26a. Carte d'isoconcentration en Pb des sols échantillonnés depuis 1996 quel que soit leur degré d'anthropisation

- Around 40 farms concerned by soil pollution in 2003
- In 2010 : a study showed Noncompliance to human feed (EU regulation n°1881/2006)
- Necessity to make appropriate crop choices. Intra and inter specific variability concerning the transfer and accumulation of metals in =>favoring on the territory the species and varieties intended for animal feed with a satisfactory compliance rate or non-food species
- As far as possible, cultivate so-called sensitive species (beetroot, potato, etc.) outside the Metaleurop zone.
- Separate productions intended for human consumption and those intended for animal feed at collection centers and ensure their traceability
- Systematic seizure of the liver and kidneys of animals that have stayed for more than 3 months in the Metaleurop polluted area

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Agricultural restrictions

No possibility to depollute such a wide area (750 ha)

=> Adaptation of the agricultural activity present the territory, in particular by its reorientation towards non-food sectors.

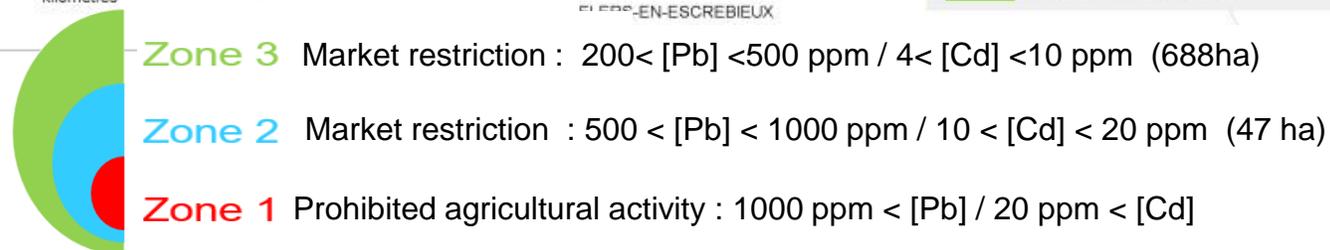
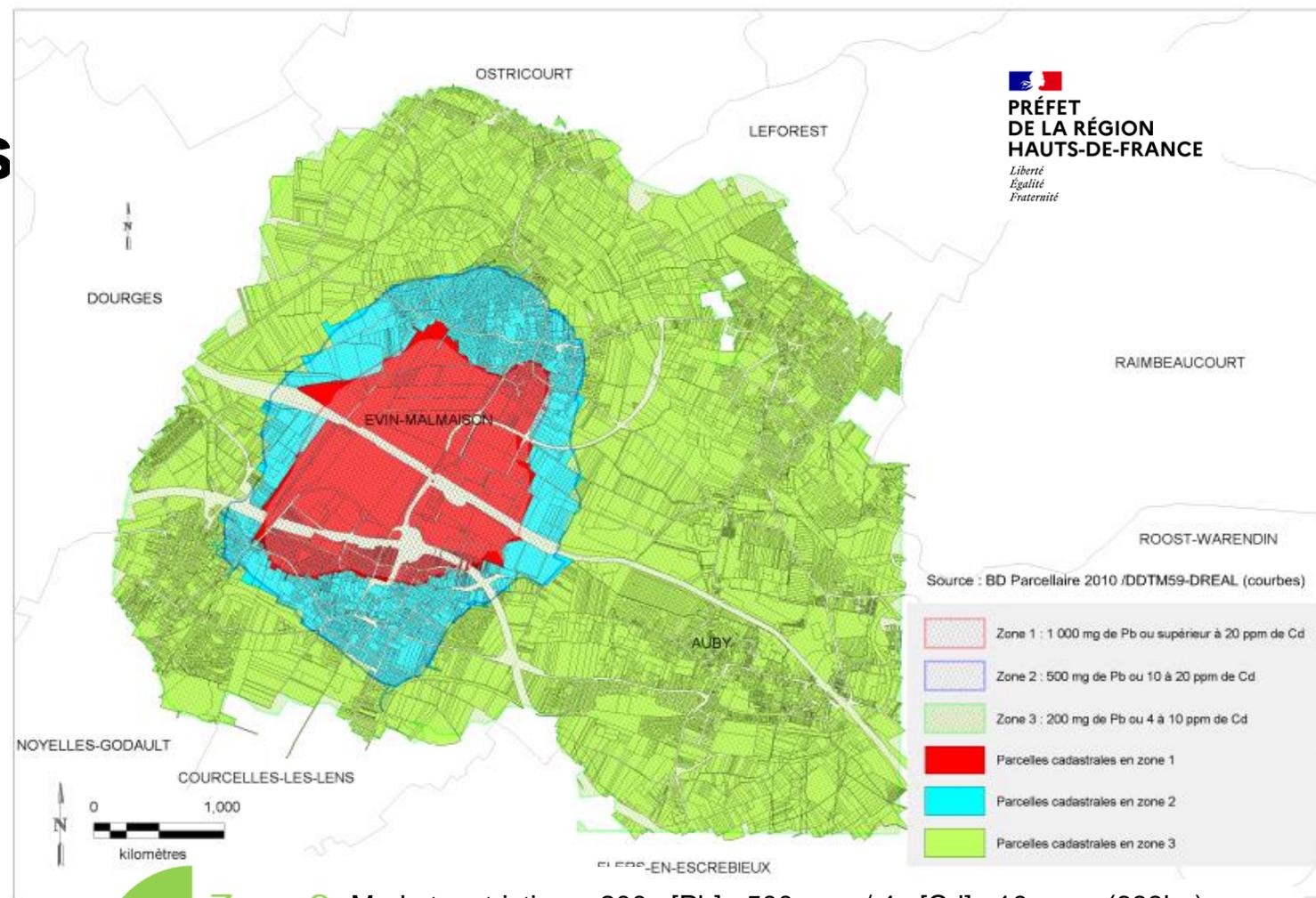
In 2015 a Prefectoral order conducted to a territorial agricultural project that was divided into 3 parts;

1. Health supervision of agricultural production
2. Land support for impacted farmers
3. The establishment of non-food biomass recovery channels

Food Plant production is prohibited in zone 1 (essentially woods)

Plant production in zone 2 and 3 is authorized and their placing on the market for human or animal consumption is subject to the results of analyzes that comply with the regulatory threshold for Pb and Cd

Farmers who have suffered financial losses due to restrictions for health reasons are compensated by ADEME. Compensation is decreasing until the end of 2019. This transitional period is used to put in place the action plan and deploy the retraining channels.



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Biogas plant

- Over 300 ha (out of the 700 ha with restriction)
 - Sunflower
 - Green manure
 - Animal manure
 - Corn
 - Silage
- 1600 ha of digestate spreading
- Digestate comply with the regulation, compared to the limit values described in the decree of January 8, 1998, setting the technical requirements applicable to the spreading of sludge on.



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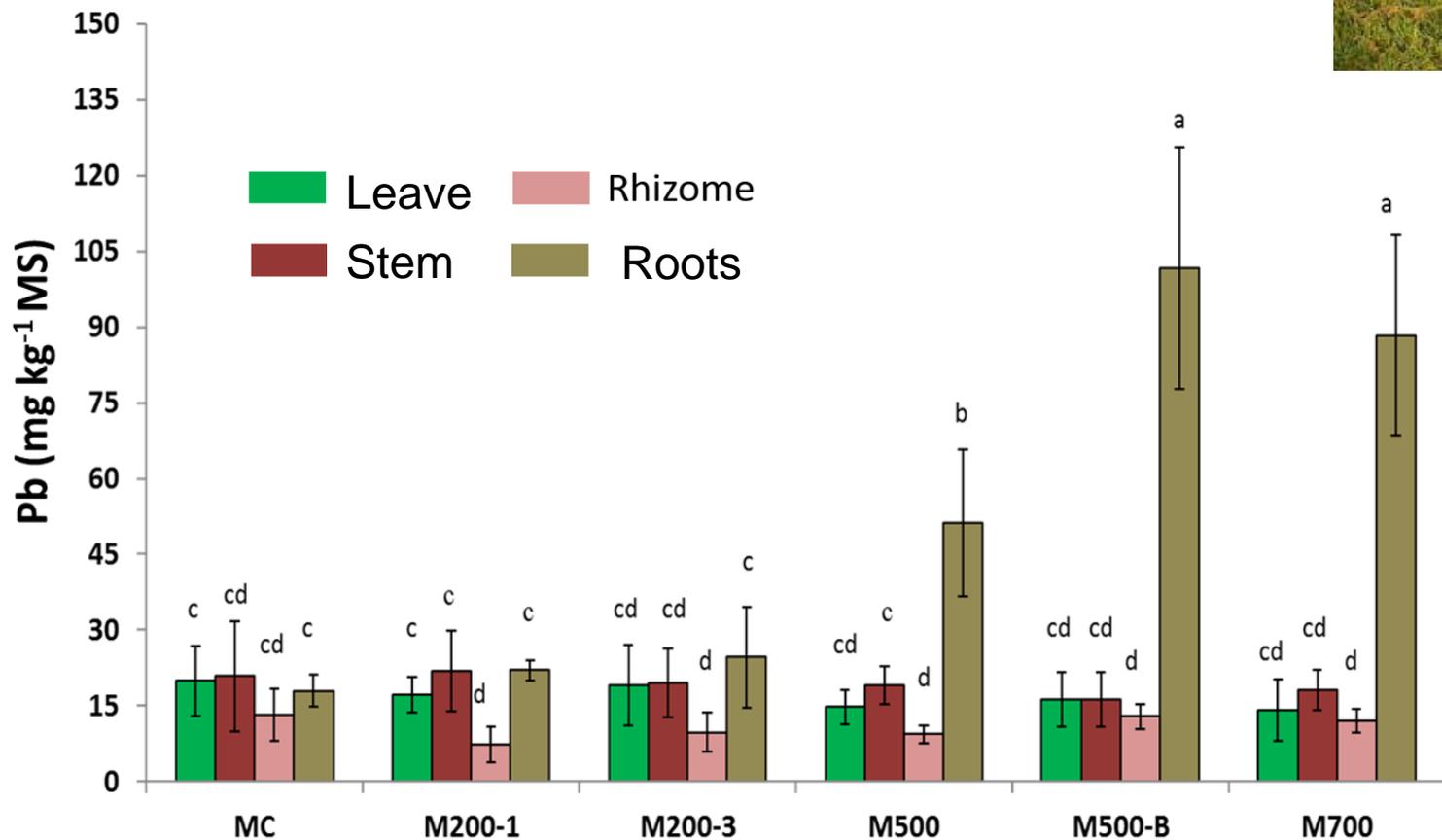
Miscanthus (Heat Network)

- Plant stabilizer: heavy metals are immobilized in roots and do not migrate into the stems.
- Perennial plant (no tillage, no bare ground) reducing dust emission
- Around 30 ha
- A significant investment and the absence of income for 2/3 years
- Real know-how in terms of cultivation, harvesting and storage
- Use of biomass primarily for energy, diversification of uses to be found with a greater added value (biobased concrete, biofuels, mulching, etc.)
- A success explained by scientific / technical and political support as well as financial support



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Miscanthus (Heat Network)



Pb (mg kg ⁻¹) dans sol (0 - 25 cm)					
MC	M200-1	M200-3	M500	M500-B	M700
11	214	215	477	482	727

- No difference between stems and leaves regardless of the soil type and the degree of soil contamination
- Accumulation of Pb in the roots influenced by the degree of contamination and physicochemical parameters of the soils

Soil contamination gradient

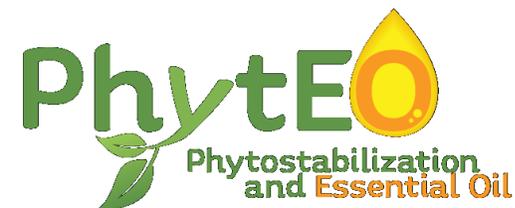
Nsanganwimana, 2014

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Essential oil

Experimental implantation of aromatic and medicinal plants on the territory (2 hectares):

- Sage
 - Coriander
 - Angelic
- Very low transfer of Pb, Cd and Zn in essential oil
 - Use of Coriander residues for biogas production
 - Use of Sage residues for animal feed to be tested
 - Cost of distillation equipment (150k €): 20 to 30 ha to make the equipment profitable
 - Interest of Angelic (perennial plant)



Technical and economic viability



⇒ Coriandre



⇒ Sauge sclarée



⇒ Angélique

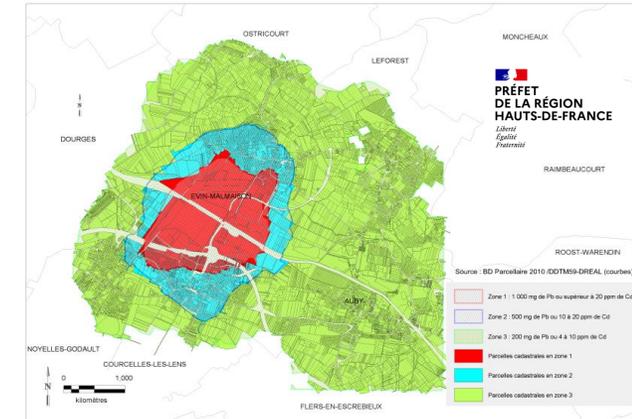


=>Next project DEPHYTOP



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Land restructuring



A specific policy of land support for affected farmers has been introduced. It is based on 3 principles :

1. Comfort the farmers who remain in the area by allowing them to expand their plots to compensate for the loss of profitability per hectare
2. Facilitate relocations outside Metaleurop perimeter for farmers wishing to leave the area permanently
3. Avoid the entry of new farmers into the area

To date, a land reserve of approximately 80 ha has been established. It made it possible to cultivate, so-called sensitive productions (market gardening, potatoes, sugar beet) outside the polluted areas. It is the 1 for 2 rule that has been applied as part of this land compensation: 2 ha in a polluted area giving right to 1 ha in a healthy area.

Thank you for your attention !



AFP/François LO PRESTI