



HAL
open science

ACTING ON THE VEGETATION TO REDUCE THE RISKS RELATED TO MINING WASTE DEPOSITS: ECOTECHNOLOGICAL APPROACH ON THE LIGNITE WASTE HEAP OF "LE DEFENS" (OHM BASSIN MINIER DE PROVENCE)

Axel Bergeon, Samuel Blot, Laurent Caoudal, Sinda Fitouri, Ashley Guez, Ludovic Marie-Dit-Asse, Laura Martin, Mathilde Pitout, Sébastien Roux, Lorène Tosini, et al.

► **To cite this version:**

Axel Bergeon, Samuel Blot, Laurent Caoudal, Sinda Fitouri, Ashley Guez, et al.. ACTING ON THE VEGETATION TO REDUCE THE RISKS RELATED TO MINING WASTE DEPOSITS: ECOTECHNOLOGICAL APPROACH ON THE LIGNITE WASTE HEAP OF "LE DEFENS" (OHM BASSIN MINIER DE PROVENCE). International Symposium of Labex DRIIHM -2019 Inter-Disciplinary Research Facility on Human-Environment Interactions -ANR-11-LABX-0010, Oct 2019, Lyon, France. hal-02311391

HAL Id: hal-02311391

<https://hal.science/hal-02311391>

Submitted on 10 Oct 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

ACTING ON THE VEGETATION TO REDUCE THE RISKS RELATED TO MINING WASTE DEPOSITS: ECOTECHNOLOGICAL APPROACH ON THE LIGNITE WASTE HEAP OF "LE DEFENS" (OHM BASSIN MINIER DE PROVENCE)



Bergeon A.¹, Blot S.¹, Caoudal L.¹, Fitouri S.¹, Guez A.¹, Marie-dit Asse L.¹, Martin L.¹, Pitout M.¹, Roux S.¹, Tosini L.¹, Farnet A.-M.², Foli L.², Folzer H.², Salducci M.-D.², Prudent P.³, Vassalo L.³, Labrousse Y.⁴, Laffont-Schwob I.⁴

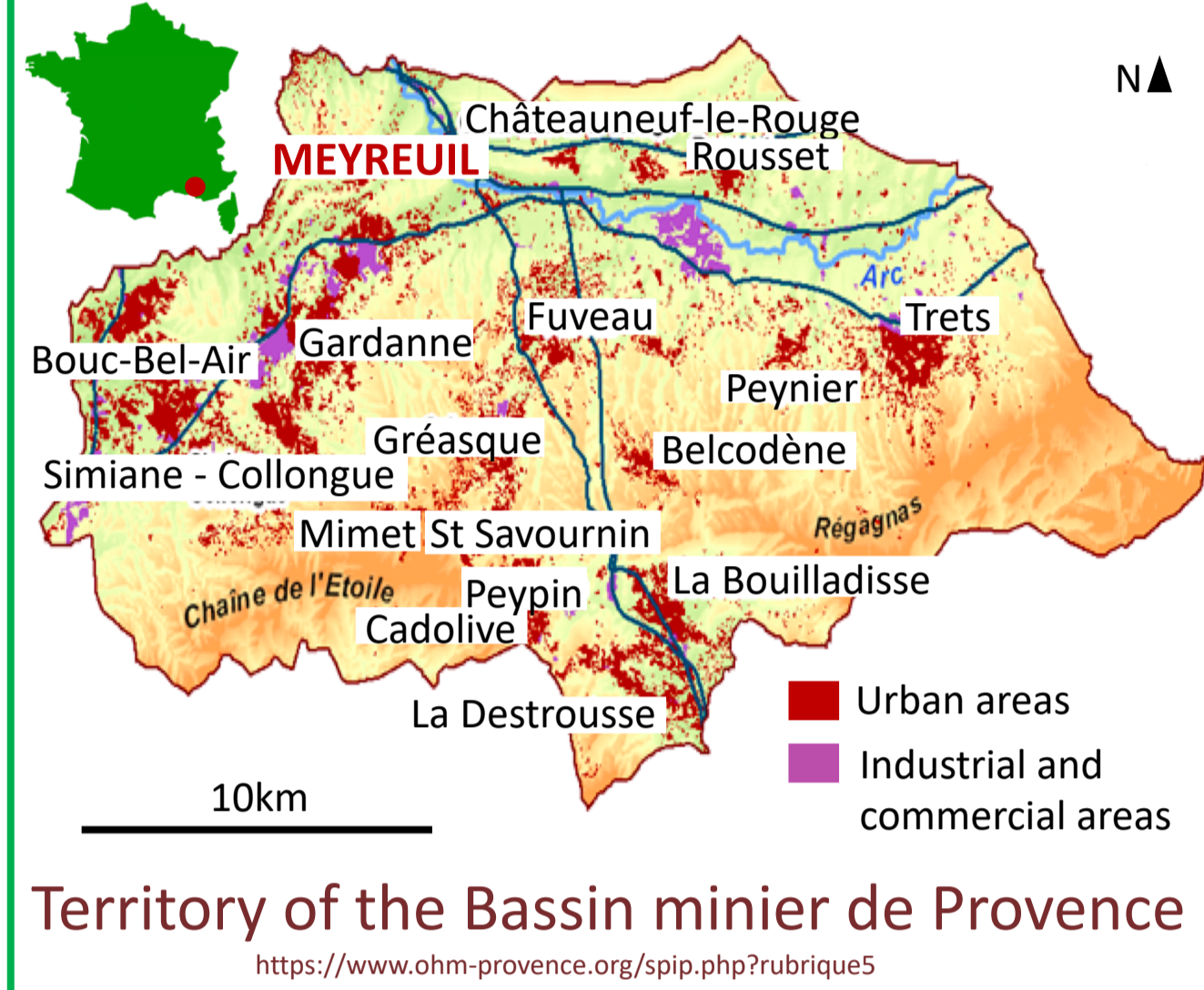
¹ Master Envi'Terre mention Biodiversité Ecologie Evolution parcours Ingénierie Ecologique finalité Ecotechnologies et Bioremédiation, promo18-19, Marseille, France, ² Aix Marseille Univ, Avignon Université, CNRS, IRD, IMBE, Marseille, France, ³ Aix Marseille Univ, CNRS, LCE, Marseille, France, ⁴ Aix Marseille Univ, IRD, LPED, Marseille, France.

masterS ENVI'TERRE



CONTEXT

The lignite waste heap named "Le Défens", located on the territory of the **OHM Bassin Minier de Provence**, is subject to hazards related to this mining waste deposit characteristics: **superficial landslide hazard**, non-negligible **fire risk** and **risk of contamination transfer** by substrate and water erosion. However, today it is **accessible to the public** and is the place of many practices despite the potential dangers.



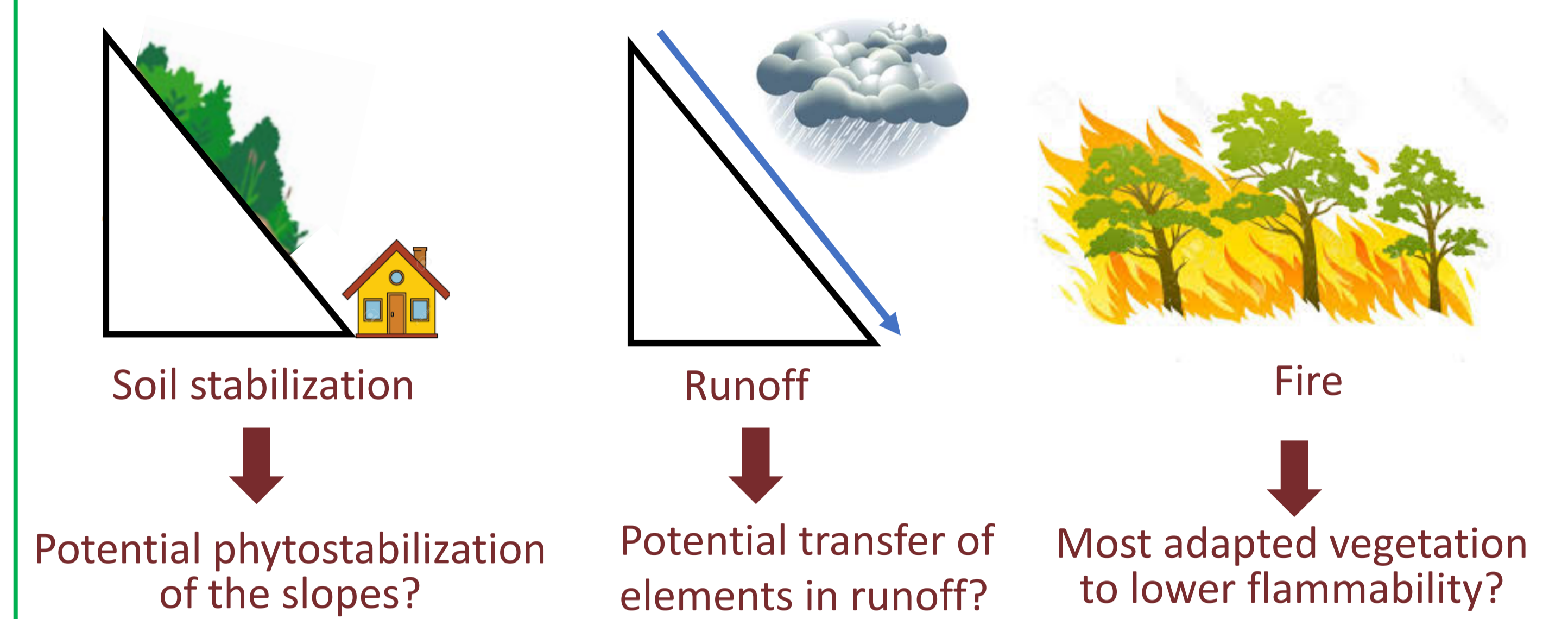
Aerial view of the lignite waste heap of "Le Défens" (Meyreuil)



A lignite waste heap completely integrated in the local landscape

OBJECTIVE

The objective of this study was to analyze the **effect of the various types of vegetation** present on the heap on the **quality and the stability of the substrate of the heap slopes**, on the **fire risk** and to **assess the quality of the runoff water** on the lignite waste heap in order to recommend the most appropriate ecotechnological actions to **limit the environmental risks**.



METHODOLOGY

Soil and sediment physico-chemical analysis

- Soil pH, conductivity and temperature
- Metal and metalloid composition
- Granulometry
- Organic carbon and nitrogen content

Soil and sediment biological analysis

- Microbial activity
- Root density /g soil
- Sulphito-reducing bacteria detection



Water analysis

- Lixiviation assay
- Cations and anions analysis



Vegetation analysis

- Plant cover and vegetation height
- Relative water content of soil, litter and plants
- Dominant biological type

MAIN RESULTS

- Poor substrate quality despite a relatively homogeneous vegetation cover
- Presence of an erosion facies = preferential paths of water flow but low transfer of substrate element to water runoff
- Soil and plant water contents, vegetation composition and structure may alter fire risk

ENVIRONMENTAL MANAGEMENT RECOMMENDATIONS

Grassland seemed to be the **most appropriate vegetation** type to reduce:

- Superficial landslide and substrate water erosion thanks to its dense and relatively homogeneous vegetation cover
- Fire risk due to its water retention capacity and its biological type diversity

The use of **pioneer local, nurse and engineer herbaceous plant species** could be an interesting solution to **stabilize the unvegetated slopes of the heap**.

The gradual conversion of the Aleppo pine stand to a **non-coniferous woody stand** with grassland under tree canopy could **limit the risks of fire spread and landslides**.

Moreover the **strict respect of regulation** of access to the heap without all-terrain vehicles may **limit soil erosion and potential ion transfer**.

TO PROMOTE ←

→ TO AVOID

Higher stability

Lower stability

Lower soil erosion

Higher soil erosion

Lower water concentrations of SO_4^{2-} & Ca^{2+}

Higher water concentrations of SO_4^{2-} & Ca^{2+}

Low potential flammability of vegetation

High potential flammability of vegetation

