

Risk of spontaneous combustion in Belgium mining waste deposits

Nathalie STEPHENNE¹, Mathieu VESCHKENS¹, Rudi GOOSSENS², Vincent TIGNY³, Philippe HEMROULLE⁴

¹ISSeP, Institut Scientifique de Service Public, 200 rue du Chéra, 4000 Liège, Belgium

²Universiteit Gent, Krijgslaan 281 S8, 9000 gent, Belgium

³GIM, Geographic Information Management, Interleuvenlaan 5, 3001 Herverlee, Belgium

⁴SPW, Service Public de Wallonie, 15 av. Prince de Liège, 5100 Jambes, Belgium

n.stephenne@issep.be

EU Directive 2006/21/EC requires Member States to identify closed mining waste facilities potentially posing a serious threat to human health or the environment. To comply with this Directive, the regional Authorities supported by ISSeP provided an inventory of 50 coal mining tips with potential risks among the 300 identified in Wallonia. However the pre-selection protocol proposed by an Ad-hoc Group of the Technical Adaptation Committee (TAC) of the Directive (Stanley et al., 2011¹) does not currently take into account the risk of spontaneous combustion which is particularly relevant in our region (Nyssen et al. 2011²). This paper thus proposes an analysis of a time series of ASTER images to derive surface temperature products and identify temperature anomalies which can be considered as potential indicators of spontaneous internal combustion.

While the pre-selection protocol considers several criteria, such as the presence of pollutants, the stability of the source, and four types of pathways and four receptors components, the link between stability and spontaneous combustion wasn't integrated by the EU directive TAC. However burning coal tips and potential slides induced by the combustion represent a danger for the population and infrastructures around the sites. During the pre-selection, ISSeP already modified the protocol in order to better account for some specific regional conditions but the combustion issue wasn't yet integrated in this first assessment. This study thus assesses the potential of low resolution imagery to address this issue and refine the current Walloon inventory.

Using 2011 imagery, Nyssen et al (2011) mapped the average temperature of 14 coal tips to detect susceptibility zones for debris detachment. New Aster data from 2013 were used to update this analysis over the entire Walloon mining region and assess the changes between the two dates. Until now, a list of potential burning coal tips is provided by the administration based on expert knowledge. The comparison of this list with remote sensing results illustrates the relevance of this technology. However the detected anomalies have to be checked with other tools offering a better resolution to confirm or reject the risk. While the resolution (90m for Aster thermal infrared channel) doesn't fit the regional administration requirements, the temperature anomalies could be used as

¹ Stanley G., G. Jordan and T. Hamor, 2011, Guidance document for a risk-based pre-selection protocol for the inventory of closed waste facilities as required by Article 20 of Directive 2006/21/EC

² Nyssen, Jan; Diependaele, Stijn; Goossens, R. (2012). Belgium's burning coal tips - coupling thermographic ASTER imagery with topography to map debris slide susceptibility. *Zeitschrift Für Geomorphologie*, NF, 56(1), 23 – 52.

one indicator of risk in a multi-criteria model of combustion and as a mean to target the field inspections by experts hence improving the accuracy and cost-effectiveness of this process.