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Concepts for Green House Gas Emission Estimation of underground Coal Seam Fires

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In our contribution we address the topic of green house has (GHG) emission estimation from underground coal seam fires, which are burning in many countries worldwide. The fires are ususally mining induced and lead not only to the deterioration of vegetation, the collapse of overburden bedrock layers due to volume loss underground, and to safety risks for mining operations. They especially lead to the loss of the economic resource coal through the burning of this resource, and, more important, to the release of green house gasses such as CO_2 and CH_4. These are known to contribute to global warming. Especially with regard to this fact a growing number of scientists is currently researching the topic of coal fire related GHG contribution to the overall global human induced CO_2 budget. To date, the question of coal fire related GHG quantification on a local, regional, and country-wide or even global scale is still unanswered. However, the approximation of a GHG release number for fires in

certain coal fire areas or individual countries is not only a task to win scientific merits, but also to point out economic opportunities arising from future coal fire extinction. The minimization of coal fire related emissions through extinction is closely related to certified emission trading under the framework of the Kyoto Protocol and similar protocols to follow in the future. Especially the Clean Development Mechanism (CDM) allows for Annex I countries (industrialized countries) to minimize emissions in developing countries (definition according to the Kyoto Protocol). Thus, Annex I country governments or private companies could invest into coal fire extinction to decrease GHG emissions outside their own territorial borders. However, in our contribution we demonstrate, why to date no coal fire related CDM contract has been signed yet. We list numerous factors, which currently still hamper a proper baseline estimation of coal fire related GHG emissions. It is mainly geophysical parameters such as physical and chemical characteristics of coal (coal petrography), heterogeneities in coal layering, differences in overburden bedrock characteristics, varying crack and vent pathway densities above the burning seam, related variations in degree of combustion, uncertainties in measuring techniques, as well as the problem of spatial – and especially timely – transfer, which complicate a proper emission estimation of even individual fires. However, through the combination of numerous geo-scientific disciplines, an estimation on local and regional scale can – according to our opinion – be achieved. We thus present a method to quantify coal fire related GHG emissions on a local scale (individual fire) as well as on a regional scale (one coal fire area with larger extent and many fires). Furthermore, we present some simple calculation examples and lay out, why we assume that all coal fires in China – the country with the biggest coal fire problem worldwide – contribute with less than 0.3% and probably even less than 0.1% to all annual human induced CO_2 emissions on a global scale.