Improvement of environmental conditions in coal mining areas of the Quang Yen Basin, Quang Ninh Province, Vietnam

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Vietnam is one of the world's leading producers and exporters of anthracite coal. With a total production of 38.9 Mt and a coal export of 29.8 Mt in 2006, Vietnam was one of the major suppliers of anthracite coal in the Asia and Pacific region. The majority of Vietnam's coal resources are hosted by the upper Triassic (Norian) Quang Yen basin in northeast Vietnam. The Quang Yen basin covers an area of about 5,000 km^2 and contains estimated anthracite resources of 3,300 Mt. Situated in the eastern part of the Quang Yen basin, the Hong Gai coal field has been the main coal mining area of Vietnam for more than 150 years. Here, various coal seams with a thickness of up to 50 m are exploited in several open pit and underground mines in the coastal area of Hong Gai / Cam Pha, situated close to the UNESCO world natural heritage site Ha Long Bay. The mining-induced environmental impacts such as dust emissions, acid mine drainage, and visual impairments due to waste dumps resulted in severe conflicts of interests regarding future land use and the protection of the world natural heritage site Ha Long Bay with its high biodiversity and its distinctive karst landforms.
In this context, the RAME R&D project (*R*esearch *A*ssociation *M*ining and *E*nvironment in Vietnam) supported by the German Federal Ministry of Education and Research (BMBF) and the Vietnamese Ministry of Science and Technology (MOST) and working in close co-operation with the Vietnamese coal and mineral resources company VINACOMIN aims at the improvement of the environmental conditions in Quang Ninh by developing suitable technology and planning measures for the mining industry in Vietnam. Major issues addressed in the frame of RAME comprise (i) water management and treatment in the mining regions, (ii) stabilisation and recultivation of waste rock dumps, (iii) dust mitigation and monitoring, as well as (iv) capacity building and building-up of environmental awareness in Vietnam's mining industry.
Focal points of the sub-project presented here are the development of concepts for a sustainable stabilisation and recultivation of waste rock dumps at the Nui Beo mine in the Hon Gai coalfield (including required monitoring measures), taking into account aspects like the climatic water balance of the dump, AMD generation and pollutant discharge, risks of coal fires, land use constraints and costs. One key point in this context will be the adaptation and improvement of prognostic tools for hydrological and geochemical reactive-transport modelling for the site specific conditions in Vietnam (or other countries with comparable climatic conditions). Concepts and planning tools (e.g. for dump construction/rehabilitation, predictive modelling, and/or monitoring) tested and approved at the Nui Beo mine will then be transferred to other mine sites and will contribute to an improved environmental planning in Vietnam's mining industry and the reduction of environmental impacts on Ha Long Bay.

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Abs. No. **100**
Meeting: **DMG 2008**
submitted by: **Deissmann, Guido**
email: **guido.deissmann@gmx.de**
date: **2008-05-28**
Req. presentation: **Poster**
Req. session: **S14**