Smart air quality policies for a better climate: a regional analysis

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Feedbacks of climate policies on air quality (co-benefits as well as trade-offs) are now being recognized and introduced in optimization schemes for air quality policy development. However, also air quality policies can have consequences for climate. Some pollutants are contributing to warming (black carbon (BC), O_3), others are cooling (SO_4, NO_3, organic carbon). Air quality policies are commonly designed without taking into account possible feedbacks on climate, although there is a potential for smart air quality policies that lead to a win-win situation for both climate and air quality.

In this work we evaluate the local and regional benefits of a portfolio of 16 climate-friendly, region-specific air quality measures that were identified in the frame of a recent UNEP-WHO assessment [1] [2]. These measures go beyond the baseline of current legislation and provide a global potential for 0.5K temperature reduction in the coming decades. A first group of measures addresses the reduction of CH_4 emissions (with associated benefits for reduced background ozone), a second group targets BC (with additional benefits for O_3 for those sectors where NOx and NMVOC are co-emitted species). The portfolio of measures was designed in order to yield a maximal climate benefit worldwide, but the measures also generate clear local and regional air quality and crop production benefits which may help to incentivise the implementation. This local and regional aspect was not explored in the UNEP assessments.

In our analysis we apply a global source-receptor model with a relatively high regional resolution (global coverage with 56 regions) to each of the measures. As a result we provide a region-specific ranking of the most relevant measures in terms of local and regional benefits.

[1] UNEP / WMO (2011) Integrated Assessment of Black Carbon and Tropospheric Ozone. UNEP, Nairobi [2] UNEP (2011) Near-term Climate Protection and Clean Air Benefits: Actions for controlling Short-Lived Climate Forcers. UNEP, Nairobi.

Chemical stabilization of soil thallium using Mn(III,IV) oxide birnessite (δ-MnO_2)

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The effect of highly crystalline birnessite (δ-MnO_2) on Tl retention and bioavailability in contaminated soils was investigated. The stabilization/immobilization efficiency of the Mn oxide was evaluated on basis of Tl uptake by white mustard (*Sinapis alba* L.), sequential extraction and sorption experiments.

The obtained data clearly demonstrate that the application of birnessite to Tl-rich soils can effectively transform Tl from the labile (easily mobilizable) fraction to its reducible form, thus lowering Tl bioavailability and subsequent accumulation by plants. Substantial reduction of biological uptake of Tl was identified after the oxide application; the Tl levels in mustard tissues decreased by up to 50%, compared to the control treatment (non-amended soil).

The use of birnessite like soil additive might be an efficient and environment-friendly solution for soil systems contaminated with Tl. Nevertheless, further research focused on the long-term stability of the oxide in soil linked with Mn mobilization and potential toxicity for soil microbiota is needed before any general conclusion will be made.

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