# Optimizing Production in Greece under Particulate Pollution Constraints with cross-Regional Transfers

Topic: Environmental input-output modeling I
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"Optimizing Production in Greece under Particulate Pollution Constraints with cross-Regional Transport Effects:

Particular matter (PM10) pollutants, generated from combustion-based processes largely attributed to economic activity, are known to cause serious adverse effects on human health, including respiratory and heart related effects. PM10 pollutants are a significant problem in Greece, and especially in the Attica region, which includes Athens and about half of the country's population. Some studies report that a PM10 increase of 10 μg/m3 could increase daily death rates by 0.6 %.

We propose an input-output model for optimizing production in Greece under constraints on the PM10 concentrations which are deposited in Attica. Production is optimized on a regional, sector-by-sector basis. Our analysis uses the Greek environmental input-output matrix and takes into account PM10 concentrations which are "deposited" in the Attica region but may have originated in any region of Greece. The percentage contributions of each region and economic activity (identified in a regional Greek NAMEA) are determined via high-resolution atmospheric simulations, taking into account weather conditions in Greece, using the WRF-inverse HYSPLIT model combo. Besides pollution constraints, we require that the resulting sectoral/regional production levels satisfy constraints on overall demand, energy use, and maximum sectoral variations over current-baseline levels.

We use our model to determine (via linear programming) economically optimal policies (sectoral production targets) that lead to desired reductions of PM10 in the Attica region, and examine whether those reductions can be achieved without worsening the PM10 concentrations in other regions. To our knowledge, this study represents the first approach to consistently integrate high resolution atmospheric models with NAMEA. This study also paves the way for extending our model to a broader setting where regional production is optimized with pollutant transfers from and to all regions being taken into account.

Keywords: PM10 emissions, input-output analysis, cross-regional pollution transport.