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ROBUST FOOD–ENERGY–WATER–ENVIRONMENTAL SECURITY MANAGEMENT: STOCHASTIC QUASIGRADIENT PROCEDURE FOR LINKAGE OF DISTRIBUTED OPTIMIZATION MODELS UNDER ASYMMETRIC INFORMATION AND UNCERTAINTY[1]

Abstract. The paper presents a consistent algorithm for regional and sectoral distributed models' linkage and optimization under asymmetric information based on iterative stochastic quasigradient (SQG) solution procedure of, in general, non-smooth nondifferentiable optimization. The procedure is used for linking individual sectoral and regional models for integrated and interdependent food–energy–water–environmental security analysis and management.

Keywords: decision support, asymmetric information, linkage, SQG solution procedure, non-smooth optimization, subgradient, integrated modeling, food–energy–water–environmental nexus.

INTRODUCTION

Detailed sectoral and regional models have traditionally been used to anticipate and plan desirable developments of respective sectors and regions. These models operate with a set of feasible decisions and aim to select a solution optimizing a sector- or region-specific objective function, depending on various input scenarios. When interdependencies between sectors and regions are increasing, an independent analysis that does not take the interconnectedness into account can become highly misleading. Hence, the sectoral and regional models must be linked together to produce truly integrated solutions that are optimal for the overall system. Interdependent food–energy–water–environmental (FEWE) security goals

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