

## **Detecting what drives a social issue: Forward structural path analysis with an integrated multiregional input-output framework**

Topic: (1.6) Environmental IO Modelling (1)

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Input-output analysis (IOA) has been widely used to footprint analysis, in which environmental burdens occurring at a number of sectors in various regions are added up to quantify the total burden (Hertwich and Peters 2009 *Environ Sci Technol*; Wiedmann et al. 2015 *Proc Natl Acad Sci USA*). The linearity and additivity assumptions on the environmental burdens and production structures are essential for application of this type. Given a growing interest in social issues in the literature of footprint and life-cycle assessment, in contrast, the inherent non-additivity of some social impacts makes it difficult to naively apply IOA to social issues. It should be noted that there are at least two possible ways to tackle this difficulty due to non-additivity. One is to develop an appropriate method specific to a particular social indicator; for example, Alsamawi et al. (2014, *PLOS ONE*) proposed a method to quantify inequality footprints of nations. The other is to avoid addition and matrix multiplication, which we propose in this study.

We have developed a method of forward structural path analysis, to quantify which sectors are concerned in social problems. The method is applicable to a multiregional input-output (MRIO) table in an integrated input-output framework as well as a table in the conventional one. The method is particularly suitable for a social issue the place of which has already been identified, at least, at the sector level; for example, illegal logging in Indonesia and conflict minerals in Democratic Republic of Congo. We will introduce the developed method and present detailed results of its application based on the Eora MRIO table to a quantitative evaluation of social issues.