

## LEONTIEF'S MODEL

In the thirties, Wassily Leontief (1906-1999), a Russian who became a naturalised American citizen, developed an economic model that linked together the economic and financial processes within an economy down to the consumer at the macro level. In 1973 he was awarded the Nobel Prize in Economics for his work. His model assumes that the output of one branch of industry forms the input for another. An automobile manufacturer, for instance, processes the output from steel, glass, rubber and plastic manufacturers. 'The beauty of this model is that it accounts for one hundred per cent of the input and output of the entire economy,' Tukker states.



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# Linking global economic and environmental data

**The EU wants its product policy to reflect the environmental impact of the products. But how do you quantify that impact for hundreds of thousands of items?**

TNO and the Institute of Environmental Sciences in Leiden were among the pioneers to apply Wassily Leontief's economic input-output model at the European level. Now, a large-scale project called Exiopol is using an adapted database format for application in this model. That will lay the foundation for creating the kind of environmentally oriented product policy the EU wants.

The nineties saw the rise of life-cycle analysis (LCA) as a tool for ascertaining the environmental impact of individual products. 'That method evaluates, down to the smallest detail, all of the aspects of a product's life-cycle that impact the environment,' Arnold Tukker of TNO explains. Beyond that, LCA is not very well suited to evaluating the impact at the macro-level. It would be nearly impossible to categorise the environmental impact of hundreds of thousands of products on the European market. And without a comprehensive scheme, politicians cannot target particular groups of products.

## COMPUTATIONAL POWER

As far back as the early seventies it was evident that the model developed by Wassily Leontief

(see box text) could be used to quantify not only the flows of money and goods, but also environmental impacts. 'But without sufficient computing power,' explains Tukker, 'you can only obtain rough estimates. Starting in 2000, you could see the model being used in the environmental arena with increasing frequency. That was how we calculated that half of overall expenditures account for almost three fourths of the overall environmental impacts.'

By zooming in on these findings, researchers identified three main product categories that cause the greatest environmental harm: food (which includes meat and milk products), mobility (cars and aeroplanes) and domicile (which includes heating and hot water). 'It should be noted that these American-based findings were converted to European practices,' Tukker says. 'They were derived in collaboration with the Institute for Prospective Technological Studies (IPTS) in Seville, among other parties, and appeared in the Journal for Industrial Ecology in 2006.'

## 95 PER CENT

These research findings convinced the EU that

it needed to obtain its own European data. Hence the sizeable Exiopol project, in which pertinent data suitable for use in the IPTS models is being compiled. TNO has been working on this for some time now, along with the Institute of Environmental Sciences, the University of Groningen and six prominent foreign participants.

'We opted for a method based on 130 sectors per country – and their emissions,' Tukker explains. 'Using a segmented model did not make sense, since Europe imports so many industrial products. After all, even a *clean* service economy uses products from *dirty* industrial operations outside the Union. You have to include those products in your calculations, too.' The Exiopol project is therefore surveying 16 large economies, in addition to the 27 EU countries. This will ultimately link all of the economic and environmental data for 95 per cent of the world's economy. And that will provide useful suggestions for a more detailed analysis of particular sectors. 'What's more,' Tukker adds, 'this will provide the EU with a basis for an environmentally oriented product policy. The EU's office of statistics, Eurostat, has already hired us to produce a study examining how they could use Exiopol. Our project has definitely made its mark.'

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