

Rethinking development: sustainable consumption, production and trade

The major cause of the continued deterioration of the global environment is the unsustainable pattern of consumption and production, particularly in industrialized countries - Rio Declaration on Environment and Development, Agenda 21, adopted by 178 governments in 1992.

The central role that consumption and production patterns play in the transition towards sustainable development has long been recognized. Yet in the quarter century since the Rio Declaration, global consumption and production, and the associated environmental impacts, have grown rapidly. Increasing international trade, coupled with globalization, has allowed many people to enjoy lifestyles and patterns of consumption that would otherwise be out of reach; it has supported livelihoods and development in many developing countries. But it has also brought new risks and vulnerabilities to both importers and exporters, and in some cases hindered progress towards sustainable development.

SEI's work in this area combines research on production systems and efficiency with analysis of consumption behaviours and demand. It aims to broaden discussions beyond the traditional economic view of supply and demand to highlight the broader environmental and social ramifications of consumption and production – and to identify changes in policy-making, behaviour and the economic and trade system that are needed to shift towards more sustainable patterns.

Key Insights

- ***Most currently used tools and indicators do not adequately reflect the full environmental costs of consumption***

One of the main aims of SEI's work on consumption and production is to reveal and quantify impacts of consumption that are not properly captured by currently used tools and indicators. For example, many indicators of a country's greenhouse gas emissions only count domestic emissions and ignore those resulting from the production and transport of imported goods. SEI has pioneered work to trace environmental impacts of consumption across borders and even down to the precise area of production, and so give a more accurate picture of a country's – or organization, city or household's – real footprint.

One of SEI's biggest contributions has been in developing local, national and global models of trade and resource use that track materials (or pollutants) all along supply chains, from the producers to the final consumers. SEI's multi-regional input-output (MRIO) models link economic resource flows with physical resource flows and associated environmental impacts. These form the basis of a suite of footprinting tools for different users (see below).

As part of the new Measure What Matters initiative led by the Green Economy Coalition, SEI is also exploring how global, national and corporate-level sustainability indicators can be better aligned to monitor progress towards sustainable development.



Living the good life? Increasing resource use and pollution to satisfy growing demand for goods and services are unsustainable. Can we find other ways to improve quality of life and keep lifting people out of poverty?

- ***Consumers can help in the switch to sustainable consumption patterns – but government and business hold the key***

Pressure on consumers and small changes in consumption habits alone will not be enough to deliver a shift to sustainable consumption. Interventions need to address factors that steer consumers towards unsustainable behaviours or can lock them in to unsustainable patterns. These factors include infrastructure design, social norms and the continuous encouragement to consume more that is inherent in most current business models, even where the products are ostensibly “green” and “responsible”. SEI initiatives work directly with businesses and authorities from national down to municipal levels to help them bring policies and practice in line with the aims of reducing the impacts of consumption.

- ***Complex global supply chains can “transfer” vulnerabilities between producer and consumer regions – they might also be a way to mitigate environmental impacts and build resilience***

The often complex global supply chains that link exporters and producers can create risky and sometimes hidden interdependencies. Shocks at one end of the chain can reverberate along its length. If importers change their import patterns, exporters may suffer; likewise, environmental problems or natural disasters in a producer region can impact importers through shortages, price shocks and market volatility. SEI research seeks to elaborate and clarify the concept of indirect impacts, as well as to identify risks and possible mitigation and adaptation strategies.



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Production of commodities for export supports livelihoods in many regions of the world; for example, soy exports are Brazil's main source of foreign currency. SEI has developed models to trace commodities from individual farms to importer countries – revealing what local environmental impacts are “embedded” in those imports.

Discussion

Consumption-based accounting

SEI is well placed to respond to the growing demand for consumption-based indicators from international down to local levels. The institute has made for some major advances in the field of footprinting – particularly looking beyond greenhouse gas emissions to take in land degradation, water consumption and a range of other impacts, and taking into account local characteristics in the producing area, such as water scarcity, to give a truer picture of the impacts.

Much of this work has been led by SEI's centre in York, UK, dating back to the development of the first Resources and Energy Analysis Programme (REAP) consumption-based accounting tool in 2006. Recent highlights include providing written evidence and an expert witness for the UK Parliament Energy and Climate Change Select Committee in 2012 on the topic of consumption-based emissions accounting for the UK. In 2013 SEI published the results of a two-year study for the UK Department of Environment, Food and Rural Affairs (Defra) measuring the impacts on global biodiversity of goods and services imported into the UK. In 2013 SEI produced the first biomass flow account for Scotland. SEI also presented the latest findings of a study of the Welsh national ecological footprint data to the Climate Change Commission for Wales at the end of 2013.

In the USA, SEI published the findings in 2012 of a pioneering study quantifying the greenhouse gas emissions of King County, Washington, which includes the state capital Seattle. It assessed the county's contribution to global emissions using both territory-based accounting and consumption-based accounting approaches, highlighting the very different results these two approaches can yield. Similar studies have been carried out in the state of Oregon and in San Francisco, CA.

Tools for consumption-based accounting

SEI has developed a suite of consumption-based accounting tools with a wide variety of applications. Some of these are primarily research models while others are designed for specific types of user.

All of these REAP tools are based on an underlying supply-chain analysis framework first developed for the UK in 2006, capturing

environmental impacts wherever they occur and reallocating them to end-consumers. The impacts are measured in terms of CO₂ and other greenhouse gas emissions (tons per capita); “ecological footprint” in terms of global hectares per capita; and material flows of products and services through a territory, measured in tons.

Two MRIO models for the UK were developed based on the original **REAP UK** tool and have been used in a variety of research projects. The second of these, **UK MRIO II**, used new data to recalculate the UK's ecological and carbon footprints for 2011 and was used in a Welsh Government-funded study to calculate the consumption footprints of Wales, at the national and local authority levels.

IOTA (for input-output trade analysis) is SEI's latest and most powerful MRIO model. It models global trade, tracking resource flows from producers to consumers between 57 industrial sectors in 129 countries. It also includes a large set of environmental extension data for commodities produced all over the world, including water, land and fertilizer inputs, along with country-specific contextual data such as water scarcity, land areas and biodiversity information. It was generated as part of another project for Defra, and can be used to analyze the consumption-based impacts of any of the 129 countries included.

REAP tools have also been designed with interfaces for specific groups of users, from academics to policy-makers to the general public. **EUREAPA** (www.eureapa.net) is an online footprint database and scenario analysis tool that was developed for EU member states. In order to properly account for global trade flows the tool contains baseline data for every EU member state and 18 other countries and world regions, expanding not only its geographical applicability, but also allowing users to explore the impacts of shifts in efficiency and consumption in one world region on another.

At the national level, **REAP Sweden** applies the REAP supply chain analysis approach to Sweden, with a footprint database and scenario functionality for policy-makers to explore the impact of future changes on the national or local footprints. It contains data down to the municipal level and is available free to Swedish municipalities and other users.

REAP Petite (www.reap-petite.com) is an online footprinting tool that allows UK users to calculate their household's ecological and carbon footprint and explore ways to reduce it. It has been used by several community-level projects in the UK, most recently to evaluate whether a housing development in Derwenthorpe, York, was meeting its aims of creating a low-carbon community. A Swedish version using REAP Sweden data was recently launched at minklimatpaverkan.se, and forms a central pillar of Hållbar Hökarängen (Sustainable Hökarängen), a community-level project in a suburb of Stockholm, Sweden.

The producer perspective

Looking at the production end of the supply chain, SEI has developed a so-called **Pixel-to-Consumer** model to trace commodities from the actual locality in which they were produced or extracted along their journey to export and international trade. In 2013, a Nordic Council-funded study using this approach looked at the growing locations, journeys and final destinations of soya bean grown in Brazil. The Brazilian study was able, for example, to show which countries' consumption of soya was more directly linked to Amazon deforestation.



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Complex global supply chains link producers and consumers. They transfer goods, but they can also transfer risks and vulnerabilities.

On the sustainable production side SEI also looks at smallholder livelihoods and development, pollutant management and control, and the impacts – both social and environmental – of plantations and large-scale agribusinesses (see Beyene et al., 2013; Emberson, 2013).

In 2010 SEI entered a partnership with the global business leaders’ initiative 3C – Combat Climate Change to produce research at the intersection of climate policy and business. One of the main strands of this research looked at issues around production, consumption and climate change-related constraints on resources that are central to plans to develop low-carbon economies (see Davis, 2012, for a summary).

Tools for businesses

Scenat (www.scenat.com) is an online tool for businesses to identify carbon “hotspots” along their supply chains. A similar approach has been used to examine municipal waste management in the Baltic states and to develop the **Ecotoolkit** online platform (ecotoolkit.eu), which is being used to train small and medium-sized enterprises in Estonia on how to manage their environmental impact.

The **NETpositive** Initiative for business management is being co-led by researchers at SEI. It aims to encourage businesses to think about the social and environmental impacts of their activities. An online tool has been launched and is being piloted with the construction industry in Scotland, and with the higher education sector in England.

Supply chains: benefits, vulnerability and adaptation

Looking at the supply chain as a whole, SEI has investigated the benefits that arise from global interconnectedness, along with the vulnerability of supply chains to disruptions linked to climate change and other environmental problems.

The Sida-funded project *Adaptation Without Borders* is exploring countries’ vulnerability to climate change impacts in other parts of the world, including through disruption of supply chains. It also looks at options for improving the stability of supplies. Some preliminary findings were published in 2013 (Benzie, Wallgren and Davis, 2013).

In 2011 SEI studied the potential impacts on developing countries of action in wealthier countries to reduce carbon footprints by cutting consumption. The study re-emphasized the importance of a whole-supply-chain perspective and demonstrated the inherent

complexities of moving towards more sustainable consumption (see Erickson, Owen and Dawkins, 2012). In Progress in Renewable Energy and Biofuels Sustainability (PREBS), a joint initiative helping the European Commission to evaluate progress towards renewable energy targets, SEI is analyzing the dispersed environmental impacts associated with European biofuel consumption.

An upcoming project, *AVOID II*, will use data from the IOTA global trade model to compare the indirect and embedded resource requirements of consumption in the UK with anticipated climate change impacts in the source countries. The aim is to identify not only future risks associated with direct imports, but also those that arise indirectly, through complex supply chain networks, which may be hidden in standard trade analyses.

New research and future pathways

Currently, individual or small parts of the systems that link production and consumption are studied from a variety of disciplinary perspectives – economic geography, economics, sociology, political economy, human geography and environmental science, and others. SEI is embarking on a new initiative on Sustainable Trade, which will attempt to combine these perspectives. It will explore the interactions and links between producers, consumers, economic systems, society and natural resources, to inform decision-making at different scales and locations. It will investigate global-level drivers of change such as geopolitics, climate change, population growth and rising consumption, and their impacts on producers, consumers, supply chains and the system as a whole. It will also seek to provide insights into gaps in policy and evidence, to contribute to both the advancement of scientific understanding and the production of practical and policy-relevant outputs that could help tackle some of the most important environmental challenges.

Alongside policy-relevant research, SEI will continue to engage with community and corporate groups. This will be essential for identifying the roles of different actors within the system and has the scope to expand more broadly into research on new business and economic models and lifestyles. SEI will continue and develop research in this area in projects such as the Sida-funded *New Approaches in Economic Modelling for Sustainable Development*.

This synthesis was written by Caspar Trimmer and Elena Dawkins, with contributions from Javier Godar and Chris West.

FURTHER READING

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