Supply chain mapping in Trase

Summary of data and methods

DECEMBER 2018

This document outlines the supply chain mapping approach used by Trase to connect subnational regions of production to trading countries and countries of import around the world: Spatially Explicit Information on Production to Consumption Systems (SEI-PCS). SEI-PCS is a form of enhanced material flow analysis that was first published by Godar et al. (2015). It has evolved substantially beyond its initial scope and ambition, including through the integration of additional fine-scale data sets on production, taxation, logistics, sanitary inspections and trade data.

The SEI-PCS approach provides a methodological framework for mapping subnational supply chains which is adapted to suit different country and commodity contexts. Depending on data availability and methodological improvements, a given country-commodity combination, such as the exports of Brazilian soy, is mapped using different approaches (SEI-PCS versions) on Trase.earth.

Prior to publishing any subnational data, a summary of national-level exports is first published on the Trase platform, which includes official export volumes and freight on board (FOB) values of commodity equivalents, allocated to individual trading companies and countries of destination.

The mapping of subnational supply chains, using the SEI-PCS methodology, is then developed in two normally successive versions. SEI-PCS version 1 releases rely heavily on modelling approaches, typically using transportation costs and optimization models to allocate export volumes to individual production regions.

If sufficient data are available, this can be replaced with SEI-PCS version 2. Version 2 uses a much more data-driven approach to link production regions, commodity logistic hubs and export facilities, providing very robust supply chain maps with high levels of accuracy and multiple weights of evidence from a variety of official sources.

Looking ahead to future Trase work, where version 2 can be applied directly then the need for version 1 is obviated, something that can happen in countries where Trase already has experience in mapping the supply chain of other commodities, and/or potentially in places where official and publicly available traceability systems are in place.

The first section of this manual describes Trase's unique approach to supply chain mapping. A second section describes the various versions of SEI-PCS, up to the new version (2.3) released in December

2018 for Brazilian soy. SEI-PCS 2.3 for Brazilian soy is Trase's flagship data product and is a major improvement in terms of accuracy and comprehensiveness over v 2.2, which was published in September 2017. This version is expected to be stable, with only minor improvements planned (v. 2.3.1) – for example when new data become available that can reduce the volume of unknown flows, or revise the name of trading companies following mergers and acquisitions.

The Trase team is constantly working to improve the supply chain mapping approaches that underpin Trase using new data sources and data technologies. We welcome feedback on our work and ideas for further improvement, including contributions by supply chain actors on unpublished data about their own supply chains – please write to us at info@trase.earth.

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Supply chain mapping with SEI-PCS

The Trase initiative is an independent, impartial and science-based provider of decision relevant information needed to support a transition to a deforestation-free economy. Trase is at the forefront of a data-driven revolution in supply chain sustainability, drawing on large sets of production, trade, customs and logistics data, for the first time laying bare the flows of globally traded commodities at scales that are directly relevant to decision-making. Its pioneering approach to data analysis and visualization provides full coverage of the export routes and buyers responsible for all production and trade, and the associated sustainability risks, of a given commodity.

The supply chain mapping at the core of Trase balances scale and data resolution. It does not yet go down to the level of individual farms or of individual consumer products or retailers. However, Trase is able to map commodity supply chains in their entirety, covering entire countries and farming sectors (e.g. Brazilian soy) at jurisdictional scales that are relevant to local decision-making (e.g. municipalities in Brazil).

Trase is not currently concerned with mapping physically segregated supply chains from farm to fork. Instead the Trase approach is about developing a logic-based map of *the best available evidence on supply chain connections from production region to trading companies to countries of import for a particular commodity* that is as good as possible using publicly available data, and then making continuous improvements via interaction with platform users and stakeholders.

Trase maps the entire middle section of a supply chain, linking regions of production to countries of import, via the individual companies that export and import a specific traded commodity. This builds on an enhanced form of material flow analysis that was first published by Godar et al. (2015): Spatially Explicit Information on Production to Consumption Systems (SEI-PCS). Different versions of SEI-PCS have been developed since 2015 and have been used in different Trase releases. They are described in the next section

More detailed arguments regarding the advantages of this “middle-ground” material flow supply chain mapping approach can be found in Godar et al. (2016). An example application to the assessment of virtual water flows embedded in Brazilian farming exports can be found in Flach et al. (2016). An example of the integration of SEI-PCS data for global footprinting can be found in Croft et al. 2018.

A stepped process

Before applying SEI-PCS to a specific country and commodity, we publish national-level export data on the Trase.earth platform (www.trase.earth), linking countries of production to downstream traders and countries of import. This provides a coarser-grained analysis of material flows and associated sustainability impacts, risks and performance measures at national level, as well as an entry point for more detailed work on poorly studied geographies and sectors.

The national-level data sets provide the market shares of all traders involved in exports of the commodity from that country (expressed in trade volumes and in financial terms using freight on board value; FOB).

The data also offer a full list of traders involved, a key precondition for understanding the relationship between key actors and specific sustainability risks and opportunities in a supply chain. Thus Trase offers the *only publicly available data* on commodity exports that identifies individual trading companies involved in imports and exports. Before publication, it is compared to global trade data sets (COMTRADE, FAOSTAT) and to existing documentation on per-trader volumes for quality assurance.

We then apply the SEI-PCS approach to map subnational trade flows, discriminating between producer regions down to the lowest level of government administrative unit possible given the data and the complexity of the supply chain in question. Often this is defined by the availability of production data at subnational scales.

This type of subnational supply chain mapping is referred to as “version 1”; the approach depends heavily on modelling, typically assuming a minimum transportation cost to allocate the production in subnational areas to ports and customs records.

The allocations to commodity production regions are then coupled with individual shipment trade data, linking subnational sourcing regions to individual traders and countries of import. SEI-PCS “version 2” uses a more advanced methodology for mapping subnational sourcing regions, and is the current gold standard for Trase. In contrast to version 1, version 2 takes a much more data-driven approach that combines multiple data sources to identify the subnational origins of specific amounts of a given commodity, and the ownership of that commodity, over space and time.

The version 2 approach is both highly data-intensive and tailored to individual country and commodity contexts depending on the availability of data and peculiarities of the supply chain dynamics of that context. As such, SEI-PCS version 2 cannot be fully replicated “as is” between countries, although the additional work needed to adapt a version 2 supply chain map between commodities within the same country is much lower.

SEI-PCS version 3 is anticipated for situations where it may be possible to link individual supply chains to specific production units (farms, plantations). The focus of work for the Trase initiative in the next two years is to roll out greater coverage of national data and of version 1 and version 2 subnational supply-chain mapping, covering over 70% of global trade in forest-risk commodities by the end of 2020. The priority is developing SEI-PCS version 2 for as many country-commodity combinations as is feasible. However, given time, resource and data constraints, some supply chains will only be mapped to version 1 level.

The version used in each supply chain map is made clear in the data download section of Trase.earth and in future releases will be visible in all of the online Trase tools that use the data.

What makes SEI-PCS unique?

A combination of five capabilities set SEI-PCS apart from other approaches to supply chain mapping.

1) SEI-PCS systematically links individual supply chain actors to specific production regions, and the sustainability risks and opportunities associated with those regions. In Brazil, SEI-PCS is able to link actors to individual producing municipalities, the country’s smallest administrative unit. The finer the scale of these production regions, the more effectively

Trase can differentiate the specific environmental, social and governance conditions associated with production and trade.

2) SEI-PCS names the individual companies that export, ship and import specific volumes of a given traded commodity.
3) SEI-PCS covers all of the exports of a commodity from a given country of production, ensuring that shifts in the sourcing patterns – and associated social and environmental impacts and risks – of a particular buyer or trader can be tracked and assessed over space.
4) SEI-PCS has multitemporal coverage, with identical methods applied to different years, allowing users to assess temporal dynamics and progress in key performance indicators over time.
5) SEI-PCS harmonizes multiple traded products that are derived from the same original farming commodity into single "commodity equivalents", making it possible to establish a direct link between a subproduct and the original cultivated raw material. This is done using conversion coefficients and creating dictionaries of which traded products correspond to which crop. As an example, soy cake and soy oil volumes are harmonized to soybeans.

The uniquely broad coverage of the Trase supply chain maps means that users can comprehend what can otherwise appear an overwhelming level of complexity and prioritize the places and actors that warrant the greatest attention.

Data sources

Trase is one of the first initiatives to make systematic use of per-shipment customs and shipping data for sustainability research. Central to the SEI-PCS approach is the use of multiple independent data sets to "triangulate" flows of traded commodities from regions of production via trading companies to countries of import.

SEI-PCS typically uses data that has been collected for other purposes, such as customs records and maritime shipping contracts, tax registration data, logistic ownership and capacity, sanitary and commodity movement controls, and production data. A common feature that allows these diverse data sets to be linked is the identification of a specific amount of a commodity in a specific location and time, as well as its ownership. The SEI-PCS approach is highly flexible and can be adapted to include new data sets that can help add further detail and/or provide additional validation for individual commodity flows.

Differences in data availability determine the SEI-PCS version that can be developed, and therefore the level of accuracy of the subnational supply chain mapping. The feasibility – and level of difficulty – of developing SEI-PCS for new country-commodity contexts requires a dedicated scoping exercise, including through engagement with country and commodity experts.

Trase has used no private or confidential information to date. All data sources are either publicly available (including from government and industry websites and repositories) or available for purchase (for example from trade intelligence companies). All the data are from official sources, whether from government agencies or industry representatives, and are obtained directly from these sources or via private vendors that have been granted access to it.

The trade data sources, such as per-shipment customs declarations or bills of lading, is integrated with other data sources in a final SEI-PCS data model, and the detailed shipment-level information is

aggregated per year, per commodity equivalent, per country of destination and per jurisdiction of sourcing, which makes it impossible reverse engineer the raw data or to get similar per shipment detail as is found in the originals.

A description of all the data sets currently used in Trase, and their sources, can be found at trase.earth.

Coverage of commodities and countries

By the end of 2020 Trase aims to map 70% of the total traded volume of major forest-risk commodities that originate in the tropics, from subnational regions of production via trading companies to global markets. A greater number of commodities and countries will be mapped at national scale. Subnational supply chain maps will be developed as SEI-PCS version 1 or 2 depending on data availability.

Commodities Trase will focus on depends on the country but include soy, beef, chicken, pork, maize (corn), cotton, sugar, palm oil, pulp and paper, cocoa, shrimp and coffee. For all of these commodities and countries of interest our aim is to provide, at a minimum, the subnational sourcing jurisdiction, trader names, country of destination, port of export, and volumes traded and their respective FOB values.

While the modelling framework and decision logic that underpin SEI-PCS are transferable between different commodities and countries, SEI-PCS version 2 is highly tailored to the specific contexts. Version 2 mapping requires data on national production, logistics and taxation as well as other commodity and country-specific data, along with a significant understanding of the structure and functioning of the specific supply chain. This means that with the current capacity of Trase, expanding to version 2 for a new commodity-country combination takes approximately six months. To learn about plans for SEI-PCS and Trase expansion to other countries and commodities please sign up for our newsletter at trase.earth.

How SEI-PCS maps supply chains

For all SEI-PCS model versions the basic structure of the supply chain is defined by highly disaggregated customs declarations and/or per-shipment bills of lading compiled from official sources.

For any commodity, the information is acquired for several specific trade codes that together make up the total trade from that country, calculated as a harmonized commodity equivalent. Standardized descriptions of all the derivatives of a raw farming commodity do not currently exist, and instead we compile our own for each commodity of interest.

For each commodity supply chain mapped by Trase we select raw products, subproducts and co-products that can be directly linked to the original farmed commodity. Highly transformed subproducts are excluded given the difficulties in tracing complex transformations. For example, Trase maps exports of soy beans, cake, oil and soy sauce, but not of animal feed or biodiesel, given that these involve other raw products that can be used in varying proportions, and in which soy could be substituted for example by corn or animal fat, respectively.

Moreover, it is impossible to comprehensively track the companies involved in trading highly processed products – which is a key aspect of the Trase approach. For example, the ownership of the embedded soy in poultry exports is lost when soy shipments from multiple origins are transformed into feed and provided to chicken in unknown proportions that cannot be discriminated from each other.[1] However, the flows of poultry exports from Brazil are mapped by Trase, and the estimated amount of soybean equivalents in those exports could then be estimated based on average feed ratios for different poultry production systems.

The commodity equivalents used in Trase to quantify flows are based on the raw form of the original crop or product, using conversion coefficients provided by official sources, such as the UN Food and Agriculture Organization. The choice of a given coefficient depends on specific contexts, given that there is no single or ideal criterion that covers all applications. They can be based, for example, on product monetary value, caloric content, dry matter, fresh weight, among others.

While in the future we aim to provide users with different options so they can adapt the data to specific applications, currently we are using only fresh weight conversion factors for most commodities. For example, in the case of soy this means respecting cake/oil crushing ratios and accounting for waste volumes during the soy crushing process. Similar criteria are applied to other commodities, for example accounting for the weight of bones in boneless meat exports and accounting for cattle carcass weight to cattle head conversion factors.

Previous versions of SEI-PCS data used caloric coefficients to harmonize sub-products to soybean equivalents, so weight of cake and oil exports given in SEI-PCS version 2.3 for Brazilian soy (published in December 2018) vary significantly from those in version 2.2 (published in September 2017). Users can apply their own coefficients, or analyse the flows of specific commodity derivatives, by requesting a copy of SEI-PCS results with data not aggregated into commodity equivalents (email: info@trase.earth).

For SEI-PCS version 2, once the trade data flows are standardized and ready for analysis, we identify the subnational origin of individual material trade flows by triangulating the trade and customs information with other independent data sets, including on the logistics of trading companies, production and taxation. This cross-validation approach is implemented using a logic-based decision tree, specific to each country and commodity. The decision tree is designed to provide with multiple weights of evidence, where confidence is increased by the use of multiple independent data sets to confirm a given subnational location as the origin of production of a given shipment. This decision tree can be readily updated when new data are available, for example if new supply chain data are made publicly available by a trading company or customs agency.

In the case of Brazilian exports a municipal tax location is recorded in all individual customs records. Logistic hubs, located in specific municipalities, are identified as supply chain nodes where a given commodity is produced, stored, handled or transformed, before being transported to an export facility and for shipment outside the country.

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[1] To account for these more complex supply change stages we have developed a hybrid MRIO approach that uses Trase data (from more details see Croft et al. 2018), but this approach cannot track commodity ownership.

Not all the shipments registered in the original trade data used by Trase can be linked conclusively to a logistic hub in or near a soy-producing area. For example, shipments are often linked to a distant export facility, or to a trader's headquarters. These shipments, which currently account for between 10% and 15% of total exported volumes for the case of Brazilian soy, are over-represented for cake and oil exports given that these subproducts are further removed from the original production location, because soy is often transported to crushing facilities in industrial areas and ports. They mostly correspond to shipments associated with trading companies that do not physically handle the commodity, and that have operations in large cities or industrial areas at considerable distances from soy production areas (e.g. Sao Paulo city, or Santos port).

The accurate linking of flows to global export markets and trading companies to subnational logistic hubs is the main advance of SEI-PCS version 2 over version 1. These logistic hubs are, in turn, served by the production of a given crop in the surrounding region. Individual farms and logistic hubs are connected by a complex web of relationships, including production, harvesting and storage operations that occur before the trader purchases a given amount of the commodity for export.

While some traders may have contracts with specific farmers, the large size of the spot market vis-à-vis their total traded volumes, the fact that commodity volumes sourced from different farms are typically bulked in intermediary storage facilities, and the fact that fluctuations in prices drives a high level of inter-annual variability in farmer-trader relationships, all make the mapping of specific volumes from individual production regions to individual logistic hubs a difficult and costly exercise, even for traders directly involved in these operations.

Instead, to link export volumes to an individual logistic hub from the municipalities of production, we use an optimization allocation model using linear programming techniques. It minimizes the distance covered from production to logistic hub, optimizing the allocation of the demanded traded volumes per logistic hub and the also spatially explicit domestic demand calculated from official sources. This optimization is heavily constrained by the level of detail in official information on the spatial distribution of assets linked to the trading company that owns the shipment (e.g. whether they are actual farms, crushing facilities, wholesale retailing activities, or storage facilities).

The optimization model distributes available supply (total known production per municipality) to known demand – both overseas and domestic (as defined by the precise volumes known to be exported from each logistic hub and centres of domestic demand, such as crushing facilities producing feed for Brazilian livestock production and export). The distribution of domestic demand is estimated by mapping the location and capacity (e.g. storage capacity, mill capacity, slaughtering capacity etc., depending on the commodity of interest) of individual processing facilities in the country. Although the soy may later be "embedded" in a highly transformed state in other exported products – such as chicken in the case of soy-fed poultry – it is not counted as exported soy in Trase. The linear programming algorithm ensures that total production matches total exports and domestic consumption, and that the relationship between production areas and logistic hubs reflects available information on the operations of each trader in the region.

As a result of this process, the information provided by Trase in the case of Brazilian soy is from official sources and highly accurate with regards to volumes and ownership of cargo from the logistic hub, to the port of export and the country of import. The linking of logistic hubs and the municipalities of production is modelled, but respects official volumes per trader, official municipal

production data, and the official location of the assets/operations per trader. Wherever possible, we validate the results of the SEI-PCS products with company information. Initial validations by some leading soy traders confirm that our approach to the allocation of production municipalities is robust and accurate.

What's new in SEI-PCS v2.3 for Brazilian soy

SEI-PCS version 2.3 for Brazilian soy (released in December 2018) features major enhancements over version 2.2 (released in October 2017). It is currently the gold standard Trase supply chain mapping product. The main improvements are as follows:

1) **Inclusion of accurate assessment of domestic demand and processing facilities.** In order to calculate flows of exports from individual municipalities, previous versions of SEI-PCS excluded a proportion of production in each municipality in a state, derived from state-level statistics on domestic demand. SEI-PCS v.2.3 greatly increases the accuracy by mapping, from official sources, all crushing facilities and oil biofuel refineries, as well as their processing capacities. Domestic demand basically consists of production of feed for livestock (whether consumed domestically or exported) and of oil for biofuel and other industrial applications.

   These centres of domestic demand now "compete" in the linear programming algorithm with export hubs in determining soy sourcing patterns. Consequently, v.2.3 makes allocations of soy going to export and to domestic demand at the level of individual municipalities, depending on their geographical location and the distribution of domestic demand. The mapping of all crushing facilities in Brazil has also allowed us to more accurately link cake and oil exports with specific logistic hubs, allowing us to decrease the total volume of cake and oil exports that are classified as having an unknown origin.

2) **Addition of key data layers** used to identify and cross-validate the subnational sourcing of a given export shipment. These include a more comprehensive National Registry of Legal Entities (CNPJ) database, which is the main data set used in Brazil to link customs records and taxation records. The new CNPJ database reflects changes in company registries over time (in previous versions the Trase CNPJ database was static, corresponding to the year 2017), improving in particular our ability to map exports in earlier years.

   Another new key data layer is a database of individual asset ownership based on Brazilian social security (CPF) registrations, making it possible to map exports linked to individuals as well as companies. Although this is relevant only for a relatively small percentage of the total, it is slightly more important in earlier years.

   Finally, v.2.3 includes more comprehensive data from the SICASQ cadaster of agricultural supply chain actors, which is a sanitary control system that is in place to allow for exporting specific products to countries that require sanitary assurances.

3) **Improved dictionary of trader names.** SEI-PCS version 2.3 standardizes the names of traders that keep the same ownership but change their name (mostly due to company mergers and acquisitions) over time. This capability will be further improved in upcoming releases.

4) **Conversion factors to commodity equivalents are now based on weight and not caloric coefficients.** This modifies considerably the equivalent volumes of cake and oil with respect to previous versions, decreasing those of oil and increasing those of cake. This was done to tailor Trase data to better serve the needs of typical Trase users; however, specialist users can apply their own conversion factors on the Trase data that retains the sub-commodity identification, by requesting the data at info@trase.earth.

5) **Minor improvements to the SEI-PCS decision tree.** These mostly involve a more conservative weight-of-evidence approach to determine subnational sourcing of soy exported from the state of Sao Paulo where there are a lot of wholesale and retail facilities of trading companies that are far removed from areas of production. As a result, most of the remaining "unknown origin" volume in SEI-PCS 2.3 for Brazilian soy is related to the state of Sao Paulo, and there has been an increase in the total amount of unknown volumes (although this increase was compensated for in other areas of Brazil by having improved input data – see point 2).

6) **A new approach to allocate soy from production municipalities to individual logistic hubs**, based on preferential sourcing from municipalities where the trader handling a given shipment has known assets and economic activities (e.g. whether farms, storage facilities, crushing operation, wholesale retailing operations), and on the competition for soy volumes with accurately defined domestic demand centres (see point 1).

7) **Inclusion of more years (2003–2009).** This involved data mining to find old CNPJ taxation records and trader names, as well as adding decision tree branches accounting for lack of data (e.g. SICASQ) during those years.

Although not directly related to the supply chain mapping of exported and domestically consumed flows, the indicators of deforestation embedded in the export flows of SEI-PCS v.2.3 for Brazilian soy have been improved significantly following the availability of new data sets, specifically with the publication of PRODES Cerrado and the expansion of soy crop maps from Agrosatellite to the Amazon biome.

From supply chain mapping to sustainability indicators

In systematically linking individual supply chain actors with specific production regions Trase represents a step-change in our ability not only to link actors to places, but also to link actors to the sustainability risks and investment opportunities associated with different production areas. Trase unlocks the value of vast spatial data sets on deforestation and other environmental and social impacts, as well as the agricultural, economic and political conditions associated with different production regions, for the benefit of downstream actors.

Trase links environmental and social indicators of places of production to individual trade flows in two ways. First, quantitative indicators for a specific region – such as measures of deforestation – are embedded in the trade flows in Trase. This means that users have the option of visually resizing the trade flows to reflect potential contribution to that indicator. This method also means contributions to indicators associated with a trade flow can be summed across regions and actors for comparative

analysis (e.g. as shown in the place and actor profiles on trase.earth). Quantitative properties of the trade flow itself – such as the financial value of the commodity, or greenhouse gas emissions related to production or transportation – can also be used to rescale the flows.

Second, qualitative indicators such as the biome of origin or a categorical scale for an indicator that cannot be aggregated across regions, such as levels of legal compliance or extent of water scarcity, are reflected visually by recolouring a trade flow or by place-specific indicators in detailed profile reports.

Guide to SEI-PCS versions used on trase.earth

VERSION	COMMODITIES	RELEASE DATES	DESCRIPTION AND CHANGES
2.0	Brazilian soy 2010-2015	11 November 2016 (COP 22), discontinued.	First release of SEI-PCS on www.trase.earth. Uses detailed per-shipment customs data to identify state of production for each shipment, and multiple independent data sets to identify soy logistical hubs (storage, crushing facilities), including detailed self-declarations from corporate websites and sustainability reports. Production municipalities are connected to logistic hubs within predetermined soy-sheds based on levels of production
2.1	Brazilian and Paraguayan soy 2010-2015	20 March 2017(Tropical Forest Alliance meeting, 2017), discontinued	As v.2.0 but with optimization modelling (minimum transportation cost allocation) to link logistical hubs to production municipalities.
2.2	Brazilian soy 2010-2015	20 September 2017, discontinued	Links per-shipment information from customs data to localities of production and logistics facilities based on common asset-level tax registration numbers (eliminating potential uncertainties in determining the plausibility of reported logistic hubs per trade record). Hard-to-obtain self-declarations become obsolete and are removed, the analysis becomes more automatic and streamlined, with much higher accuracy at fine scales.
2.3	Brazilian soy 2003-2017	December 2018	As v.2.2 but with significant improvements in the accuracy with which the sourcing regions of individual shipments are mapped, due in particular to mapping of domestic demand centres, improved data coverage and the inclusion of tens of thousands of official records of assets per trader, activity and municipality. The system becomes replicable to other Brazilian commodities, and all data sources become year-specific, allowing earlier years to be mapped with similar levels of accuracy to more recent years.

What next for SEI-PCS and Trase

Rather than a specific method, SEI-PCS offers a novel data-driven approach to mapping global commodity supply chains that harnesses data that are typically not used for supply chain mapping. These data sources vary by commodity and country, with new data becoming available all the time, for example in response to open-government initiatives or to meet new sanitary and health standards in both domestic and international trade.

In addition to new data sources becoming available new data-gathering and modelling techniques are also making it possible to access and use pre-existing data in new and more systematic ways. The Trase team will continue to explore new ways to improve supply chain mapping using the SEI-PCS approach, including through these new data sources and methods as well as new logic-based systems that combine and cross-validate independent data sets to improve both the coverage and accuracy of our work.

A priority for 2019 is applying SEI-PCS version 2 to other Brazilian commodities, as well as version 1 to Paraguayan beef and soy, as well as Argentinean soy and Colombian coffee. During the first half of 2019 we will also release a first SEI-PCS v.2 mapping of oil palm exports from Indonesia.

Alongside the development of the main SEI-PCS v.1 and v.2 products, linking subnational regions of production to companies and importing countries, Trase will also publish per-shipment national level export data for a wider set of countries and commodities, including a stronger focus on Asia and for the first time African countries, in addition to global coverage of bilateral trade flows for all farming commodities based on national trade statistics, providing a powerful entry point for high-level analyses of trade dynamics. For all products data will be updated annually, usually in the first quarter of each year.

Some of the areas of research and development of SEI-PCS and related supply chain mapping work that are underway or in an advanced planning stage include:

- Improved information on the importing companies that physically handle commodities at ports and sell to downstream buyers
- Inclusion of commodity re-exports from the country of first import to other countries where the commodity is then processed or consumed
- Inclusion of embedded exports of farming commodities in animal products, such as soy in chicken and pork exports from Brazil
- Exploring ways to extend the supply chain mapping of SEI-PCS beyond the country of final consumption to buyers (manufacturers, retailers – initially through pilot work with private-sector partners), as well as on the production side from regions of production to individual properties and concessions
- Improved mapping of material flows that are traded by commercial trading companies that do not physically handle the commodity
- Exploring ways to extend supply chain mapping of SEI-PCS to domestic buyers and markets
- Mapping of relationships and dependencies between traders and other companies (including subsidiaries, parent companies and investors)
- Improved visualizations to capture the growing complexity and richness of the SEI-PCS supply chain mapping, including the use of graph theory and 3D visualizations.

In addition to improvements in supply chain mapping a major area of research and development for Trase is the inclusion of additional environmental, social, economic and governance indicators associated with both specific production regions and supply chain companies. The selection of new

indicators is guided by engagement with key stakeholders, and Trase will also include indicators of environmental and social impacts associated with downstream stages of the supply chain, including for example emissions from transportation and processing.

The supply chain mapping products developed by Trase for specific commodities and countries are all made publicly available on the Trase Data Portal. These data are used by the Trase partnership and wider research and practice community to advance understanding of the dynamics and sustainability of global commodity trade, including progress on sustainability targets and commitments and the effectiveness of government and voluntary interventions to improve supply chain sustainability.

Research led by the Trase team is published through the Trase Info Brief and Issue Brief series, as well as blogs, and research papers – all of which will contribute to an annual supply chain sustainability assessment exercise that Trase will convene starting in 2018. Please sign up for the Trase newsletter at trase.earth to follow these developments.

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