Data sources available for oil flows globally

CREA uses Kpler (a ship tracking and commodity database) to track the seaborne fossil fuel flows globally. Kpler uses a variety of sources and metrics, including historic and live AIS data, customs data, bills of lading, market sources to estimate volumes and commodities exported on each shipment.

Kpler provide us with data regarding the exports of Russian fossil fuels in trades. A trade has a registered buyer and seller and may involve multiple ships if there is a ship-to-ship transfer of goods. A ship's voyage may be split between multiple trades if the ship(s) load or offload at different locations.

Each trade includes details about the volume and the type of commodity. It also includes the port of departure, the port of entry as well as the installation that produced and received the cargo.

Other databases that track fossil fuel flows

While ship tracking databases like MarineTraffic and Global Fishing Watch are free and open source for use, many commodity databases require subscriptions which differ based on an organisation's needs. Their datasets are not restricted purely to fossil fuels and even extend to fertilisers, wood chips, grain etc. Other such databases include Vortexa, Argus Media and Windward. Vortexa in particular offers the same services as Kpler.

How CREA's estimates volume of oil products as being refined from Russian crude

We use data from Kpler and government sources for refinery data to estimate the value and volume of oil products made from Russian crude for export to G7+ countries from third-countries.

We assume that all feedstock crude oil is perfectly mixed by refineries to produce refined oil products. For each refinery, we multiply the percentage of the feedstock crude oil that is of Russian origin to the total volume of oil products flowing out of the refinery. This allows us to attribute products as being derived from Russian crude. For example: if 30% of a

refinery's feedstock crude is of Russian origin, and the refinery exports 100 tonnes of diesel, we assume that 30 tonnes of the diesel comes from Russian origin crude.

To model the impact on imports from these refineries on Russian revenues, we first derived the value of the Russian crude being used to create products for sanctioning countries. To do this we multiplied the percentage of the refineries' output directed to export by the total volume of their imports of Russian crude.

Our data on each refinery's monthly output comes from the respective countries' government mandated monthly reports. We combined this with Kpler data on oil products exports to G7+ countries. We also use Kpler data to estimate the refineries' imports of Russian crude oil to which we applied CREA's pricing model for Russian crude.

Pricing

Fossil fuels are sold on a variety of contracts including fixed-price, indexed to average oil prices and in other cases contracts can be indexed to other spot prices. This means that the revenue received by the exporter is not directly equal to the current spot price. To develop our tracker, we therefore rely on some assumptions.

To estimate prices of fossil fuel trades, we first derive historical monthly average prices for imports from Russia to the EU from Eurostat, and to the rest of the world from UN Comtrade, since the trade values are indicated both in volume and monetary terms. We then fit models between these historical prices and average monthly spot prices for the current and previous months (commodity pricing includes: Brent crude oil, Title Transfer Facility gas, Newcastle steam coal, Asian LNG, Amsterdam-Rotterdam-Antwerp coal). Prices are collected from OilPrice.com, Energy Information Administration, and Intercontinental Exchange; their website models are built for main trading partners individually, and for the rest of the world as a whole, too.

After the start of Russia's full-scale invasion of Ukraine, the reluctance of many traders to take cargoes from Russia has driven discounted pricing of Russian oil. We apply the discount between Brent and Urals crude prices to crude oil exports to Europe, and the discount between the relevant grade of oil — derived from Kpler — for exports to the rest of the world. For pipeline exports to China, we apply the discount between Brent and ESPO (Eastern Siberia–Pacific Ocean oil).