

Estimating the potential for used cooking oil from major Asian exporting countries

Used cooking oil (UCO), a kind of waste oil, is a low-carbon feedstock that is attractive for meeting biofuel mandates. It is used to produce biodiesel, hydroprocessed vegetable oil (HVO), or hydroprocessed esters and fatty acids (HEFA), all of which are technologically mature and commercially available means of producing biofuel. Indeed, the supply of domestic waste oil in the European Union is already largely utilized for biofuel production. Thus, increasing quantities of used cooking oils and animal fats used in the region are imported, and this trend is expected to continue in light of the new proposals in the “Fit for 55” package that incentivize or mandate renewable fuels: a revision to the Renewable Energy Directive (RED II) and the FuelEU Maritime and ReFuelEU Aviation regulations.

Most of the UCO imported by the European Union comes from Asia and the United States; 68% of total UCO imports in 2019 were from these regions.¹ Additionally, there have been multiple documented cases of waste oil fraud in the European Union already.² A new ICCT study thus estimates how much UCO is currently collected, and the total potential for collection, in six major UCO-exporting Asian countries: China, India, Indonesia, Japan, Malaysia, and the Republic of Korea. The work also considers how much UCO currently goes to other uses within each country and to export, to assess the potential availability of what is inherently a limited resource.

The study explores literature to estimate the potential for UCO collection from urban households, urban restaurants, and food processing, the sectors and regions from which it will be easiest to collect UCO. It also estimates the total amount of fuel that could be produced from current collection, and explores the risk of re-use as cooking oil, which is called gutter oil. The term gutter oil describes illicit cooking oil recycled from waste oil collected from sources such as restaurant fryers, sewer drains, grease traps, and slaughterhouse waste that is then re-sold as cooking oil in grocery stores. The study is particularly relevant for the FuelEU Maritime and ReFuelEU Aviation regulations, as neither currently contains a limit on the contribution of waste oils to the targets.

¹ UN Comtrade, <https://comtrade.un.org/data/>

² Sarantis Michalopoulos, “Industry source: one third of used cooking oil in Europe is fraudulent,” *Euractiv*, June 26, 2019, <https://www.euractiv.com/section/all/news/industry-source-one-third-of-used-cooking-oil-in-europe-is-fraudulent/>; and European Anti-Fraud Office, *The OLAF Report 2019*, (Publications Office of the European Union: Luxembourg, 2020), https://ec.europa.eu/anti-fraud/system/files/2021-09/olaf_report_2019_en.pdf.

KEY FINDINGS

A summary of the findings is in Table 1, where estimates of currently collected UCO and 2019 imports (from UN Comtrade data) are compared with 2019 exports (also from UN Comtrade) and the UCO already used in biofuel. The difference between these is shown in the final column.

Though other studies have suggested that thousands of kilotonnes of UCO could go to gutter oil in China and India each year, gutter oil is not considered in the estimates presented here because of a lack of data. Still, some of these countries have programs in place to reduce gutter oil, and many are also developing domestic biofuel programs to use UCO, either at the national or regional level.

Table 1. Summary of results (in kilotonnes)

Country	Estimated total potential	Estimated current collection	Imports in 2019 (from Comtrade)	TOTAL Collection + imports	Exports in 2019 (from Comtrade)	Domestic biofuel use	TOTAL Export + biofuel use	Net of totals
China	5,131	3,086-4,097	42	3,128-4,139	737	918	1,655	1,473-2,484
India	1,697	224-326	49	273-375	9	65	74	199-301
Indonesia	715	182-266	9	191-275	148	0.66	149	42-126
Japan	331	70-122	9	79-131	84	22	106	(27)-25
Malaysia	158	48-71	208	256-279	321	no data	321	(65)-(42)
Rep. of Korea	116	88-107	62	150-169	7	161	168	(18)-1

Note that Intra-Asia trade makes it difficult to trace the origins of UCO. For example, Malaysia acts as a hub, and both imports and exports large quantities of UCO. Further, because of the assumptions made about current collection, uses, trade, and lack of data on gutter oil, this study might underestimate or overestimate any surplus or deficit identified in the final column of the table.

In the European Union's current Renewable Energy Directive (RED) II, the contribution of waste oils like UCO, which are in Annex 9B, is limited to 1.7% of road and rail energy. In the proposed revision, the 1.7% cap would apply to *all* transport energy, including the marine and aviation sectors, and thus greater volumes of waste oil would qualify.

The study estimates that the revision to the RED II alone could create demand for 3,500 kilotonnes of UCO imports in 2030 in the European Union. FuelEU Maritime and ReFuelEU Aviation would further incentivize additional UCO-based fuels beyond the incentives in RED II. In 2035, for example, the ReFuelEU 15% SAF mandate (outside the 5% submandate) could incentivize demand for 5,600 kilotonnes of UCO imports. These are sizeable amounts compared to the UCO that we estimate is currently collected in the six countries of this study, which is in the range of 3,700 to 5,000 kilotonnes.

POLICY RECOMMENDATION

If the contribution of used cooking oil and animal fats is not limited, i.e., capped, in ReFuelEU Aviation and FuelEU Maritime, it could exacerbate existing sustainability risks due to waste oil fraud. The physical and chemical nature of waste oil and drop-in hydrotreated fuels makes it possible to disguise virgin vegetable oil as waste oil. These vegetable oils could include palm or soy oil, both of which are associated with high indirect land use change emissions (ILUC).

Capping the contribution of waste oils, which includes used cooking oil, to 1.7% in the ReFuelEU Aviation and FuelEU Maritime targets would limit the incentive to expand waste oil exports from Asia and reduce waste oil fraud risk. This would align with the cap in the RED II and would also help support the development of other, nascent, advanced fuel technologies that are needed to convert other feedstocks, and these technologies are going to be necessary to achieve deep decarbonization in the aviation and marine sectors in Europe.

PUBLICATION DETAILS

Title: *An estimate of current collection and potential collection of used cooking oil from major Asian exporting countries*

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Download: <https://theicct.org/publication/asia-fuels-waste-oil-estimates-feb22/>

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