Thematic Report

YEMEN:

Impact of the truce on fuel supply dynamics and fuel price structures using satellite imagery and price modelling

SEPTEMBER 2022

INTRODUCTION

This report collates and compares fuel price structures in areas under the control of the de-facto authority (DFA) in the north of Yemen (also known as the Houthis) and those under the administrative control of the Internationally Recognized Government of Yemen (IRG). It also examines the differences in fuel price structures in DFA areas when fuel enters directly via Al Hodeidah port compared to when significant volumes are trucked overland from IRG to DFA areas during periods of reduced import activity via Al Hodeidah. The report identifies and analyses overland fuel trucking and distribution routes – specifically routes used to truck fuel from IRG to DFA areas. It uses satellite imagery to examine the use of these trucking and distribution routes and assesses the number of fuel trucks present at key points along these routes, both before and after the UN-brokered truce came into effect on 2 April 2022.

The fuel price analysis in this report considers a number of elements, such as the different cost factors shaping fuel prices for consumers in DFA and IRG areas. The report also distinguishes between the different dynamics surrounding the setting of an 'official price' (i.e. the price set by the state-run Yemen Petroleum Company [YPC] for fuel sold at YPC stations or YPC agents) and a 'commercial rate' (for fuel sold at privately owned stations). Cost factors include:

- the cost of fuel in the international market as purchased by the importer
- fuel import taxes and customs
- transportation
- distribution and operating costs
- demurrage.

Other factors include the value of the Yemeni rial in DFA and IRG areas and how it affects the consumer price.

A deeper understanding of fuel price structures across Yemen and their correlation with international price dynamics has enabled the continued development of fuel price scenario estimates for DFA and IRG areas. The scenarios in this report cover different periods throughout the conflict, from February 2019 to July 2022, drawing comparisons between Al Hodeidah port disruption and non-disruption periods. The report also focuses on the impact of the Russian military intervention and continued conflict in Ukraine since February 2022 and the UN-brokered truce from April 2022.

> Although the drafting of the report was completed in July 2022, it is important to acknowledge the shift in Al Hodeidah fuel import dynamics at the end of August and beginning of September 2022. The build-up of fuel vessels in the Coalition Holding Area (CHA) and parallel shift in supply and price dynamics in DFA areas that occurred is a notable departure from the smooth entry of fuel via Al Hodeidah and the relative supply and price stability in DFA areas since the establishment of the UN-brokered truce in April 2022. Due to the timing of these events details of the latest Al Hodeidah fuel import standoff are not part of the analysis and data modelling completed in July 2022. ACAPS will look to analyse the latest standoff as it continues to unfold.

This report builds on previous ACAPS Yemen fuel dynamics analysis from August 2021 and April 2022 which focused on pre-truce periods.

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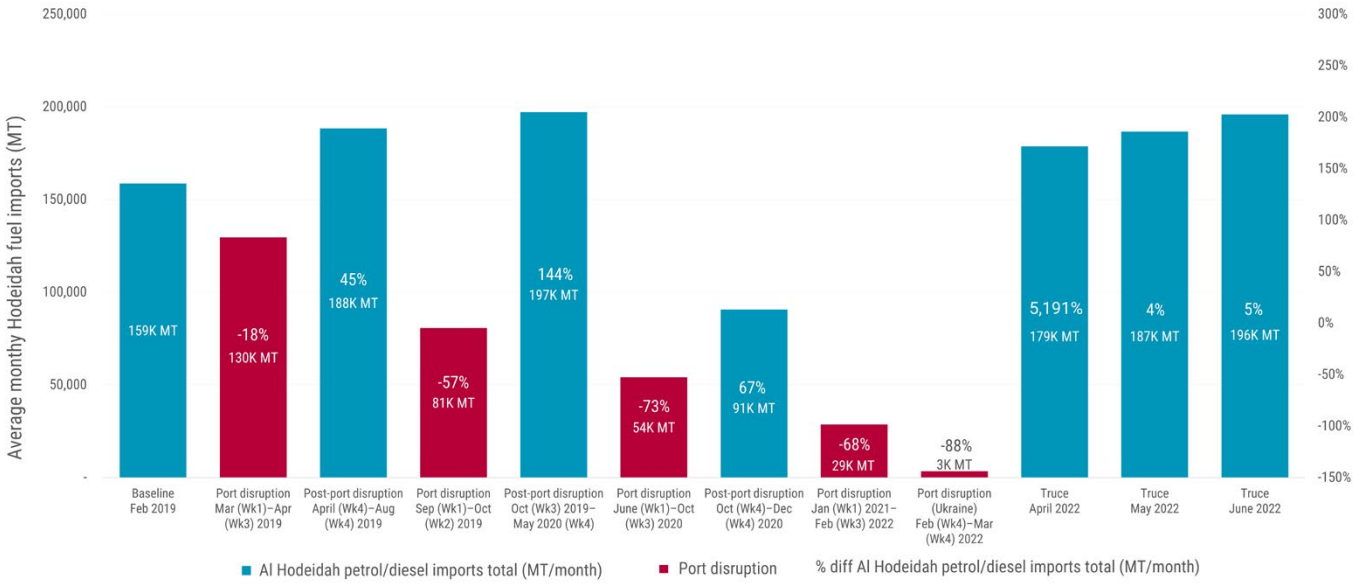
EXECUTIVE SUMMARY

Since March 2019, there have been four significant disruption periods at Al Hodeidah port. These periods have reduced fuel imports via Al Hodeidah by an average of 70% (see figure 1). These disruption periods spanned the following time frames:

- March–April 2019
- September 2019
- June–September 2020
- January 2021 to April 2022.

Figure 1. Average monthly Al Hodeidah fuel imports (MT).



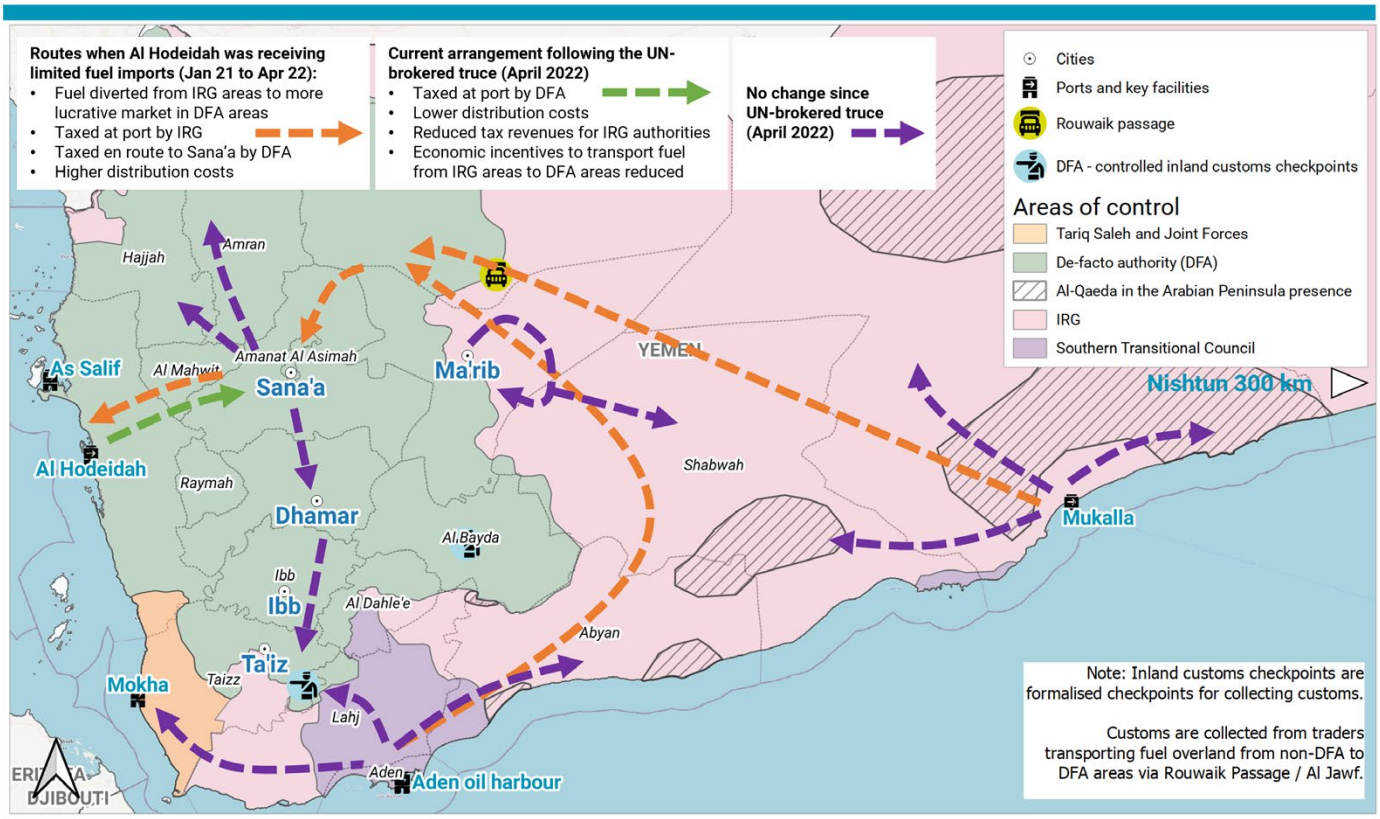
Source: ACAPS' discussions with stakeholders

In June 2020, the IRG suspended fuel imports and permitted only limited commercial fuel imports via Al Hodeidah port from July–September 2020. At the same time, the IRG issued additional clearances for fuel imports via Aden and Mukalla ports and, to a lesser extent, Nishtun port. The IRG strategy was based on the expectation that significant fuel volumes trucked overland from Aden, Mukalla, and Nishtun ports to DFA territories would mitigate reduced fuel imports via Al Hodeidah. After a brief three-month hiatus between October–December 2020 following pressure from international stakeholders regarding humanitarian concerns, the IRG reapplied the strategy from January 2021 to April 2022.

During port disruption periods, the reduction of fuel imports into Al Hodeidah did not directly lead to a fuel supply shortage in DFA areas. In-country supply chains were able to quickly adjust, with fuel trucked overland from IRG areas to the more lucrative market in DFA areas. Satellite and online imagery indicates that fuel trucks have been transporting fuel from Aden and Mukalla to DFA areas via Rouwaik passage and Al Hazm in Al Jawf governorate since January 2021. The supply-related problems periodically experienced in DFA areas have often coincided with the management and rationing of existing fuel supplies, including fuel that has already entered DFA areas overland. There have also been isolated periods when fuel trucks were seemingly prevented from advancing from Rouwaik passage to Al Hazm. During periods of increased disruption and, by extension, decreased fuel imports at Al Hodeidah, the IRG financially benefitted from the additional fuel import taxes and customs revenue generated from the increased volumes of fuel entering via seaports in IRG areas, namely Aden and Mukalla. On the other hand, the DFA generated revenue through domestic fuel sales and customs fees that would have normally been applied at Al Hodeidah but were instead applied against fuel trucks entering DFA areas overland.

On 2 April 2022, fuel import, distribution, and price dynamics in Yemen notably shifted following the onset of a two-month UN-brokered truce between the DFA, the IRG, and the Saudi-led coalition (Reuters 01/04/2022). The truce included an agreement to allow 18 fuel shipments to enter and unload at Al Hodeidah port during the initial two-month period (OSESGY 02/04/2022). Easing the disruption to fuel imports via Al Hodeidah port led to a sudden and huge increase in fuel import volumes via the port, with import activity returning to pre-disruption levels. The volume of fuel imports via Al Hodeidah increased from 3,000MT in March 2022 to 179,000MT in April (see figure 1). This specific component of the truce offered a key opportunity to ease supply constraints and reduce commercial fuel prices in DFA areas.

Figure 2. Fuel supply and distribution routes: pre-truce and truce comparison.



Date created: 26/05/2022
Sources: Google Maps (accessed 20/05/2022), OpenStreetMap (accessed 20/05/2022), HDX (accessed 20/05/2022), ACAPS

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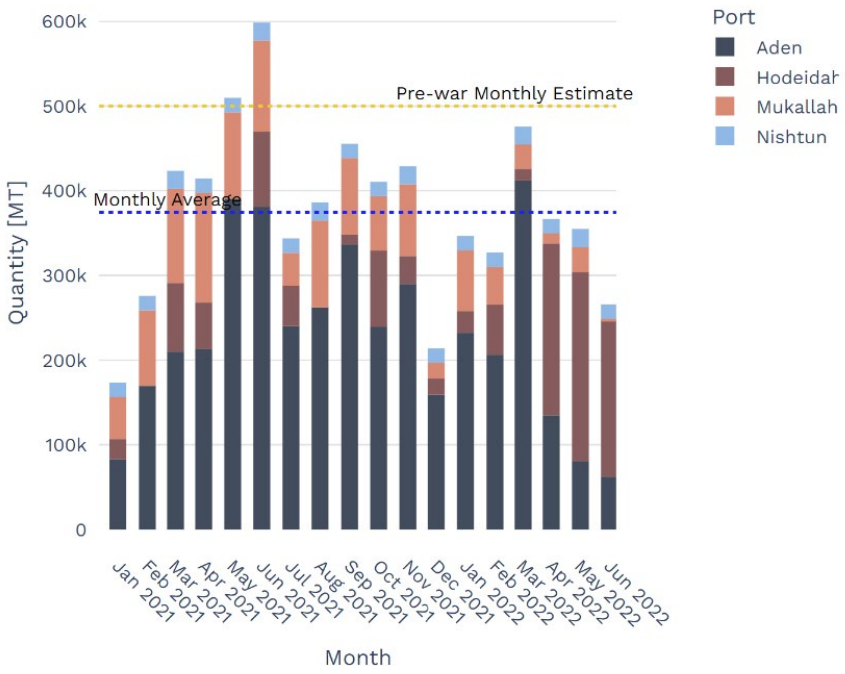
Since the start of the truce, fuel import, distribution, and price dynamics have significantly changed. Monthly fuel imports into Al Hodeidah have returned to pre-disruption import volumes. Fuel imports into Al Hodeidah during pre-disruption periods before the truce averaged 159,000MT a month. The number grew to 187,000MT monthly during the truce period. Conversely, Aden port saw a 67% reduction in monthly average fuel imports, from 284,000MT per month in January–March 2022 to 93,000MT per month in April–June (see figure 3). These Aden import figures are similar to pre-disruption imports.

The following reasons largely explain the spike in fuel import activity at Al Hodeidah and the comparative reduction in fuel import activity via Aden:

- The truce allowed fuel traders to capitalise on the opportunity to import fuel via Al Hodeidah and sell it directly to the DFA-run YPC. Market confidence grew as the truce held and fuel continued to enter via Al Hodeidah – noting the comparative ease in the issuance of clearances and the entry of fuel via Al Hodeidah compared to previous pre- and post-disruption periods. Aden became a less desirable and necessary option for traders looking to sell fuel in the northern and north-western governorates, where an estimated 70% of the population resided and the majority of Yemen's commercial and industrial fuel demand was concentrated.
- The sudden onset of the truce and reduced demand for fuel to be trucked overland from Aden to DFA areas contributed to a fuel surplus in Aden in April. The fuel imported via Aden and loaded into storage facilities in March was no longer in line to be trucked to DFA areas, leading to reduced demand for imports while maintaining a surplus.
- Increased international prices for key imported commodities, such as fuel, are contributing to increased living costs in both IRG and DFA areas. The rise in international oil prices passes down to local fuel and commodity prices, affecting the cost of living for Yemenis.
- The DFA-run YPC allegedly raised the premium paid to fuel traders to incentivise them to import fuel via Al Hodeidah. Traders have also become more reluctant to import via Aden because of the higher risk associated with having to sell 50% of their shipment on the local market independent of the IRG-run YPC.

The shift in import activity during the truce influenced fuel distribution dynamics, as the demand and need for fuel to be trucked overland from IRG to DFA areas significantly decreased. The shift decreased activity along major overland supply routes previously used to truck fuel from IRG to DFA areas. For example, fuel truck activity notably decreased at Rouwaik passage – a desert-like corridor in Al Jawf governorate and above Ma'rib representing the major intersection for fuel trucked from either Aden or Mukalla port to DFA areas. The number of fuel trucks present at the Oil Harbour in Aden also decreased by 70% between the pre-truce and truce periods (see figure 18).

Figure 3. Monthly fuel import figures (MT).



Sources: ACAPS YETI (accessed 30/06/2022); ACAPS' discussions with stakeholders

In DFA areas, the shift in fuel dynamics decreased distribution costs by 35%, from USD 0.49/litre between January 2021 and February 2022 to USD 0.32/litre between May–June 2022 (see figure 8). Similarly DFA additional distribution costs and profits decreased by 80% over the same period. Despite this reduction and the decrease in commercial rates, which became more closely aligned with official prices, a 30% increase in international oil prices (see figure 5) resulted in a 17% increase in the consumer price of fuel in DFA areas, from USD 1.02/litre to USD 1.19/litre over the same period.

The lower distribution costs resulted from reduced overland trucking costs – noting the shorter distance from the port of entry, where fuel trucks loaded fuel to transport and distribute across DFA territory, and the removal of double taxation. The truce and the reopening of Al Hodeidah port for fuel imports mitigated the impact of the increase in international oil prices. The current consumer price of fuel would have been around 14% higher had the Al Hodeidah disruption continued with prices rising from YER 671 per L to YER 783 per L (USD 1.19 to USD 1.37) in DFA areas.

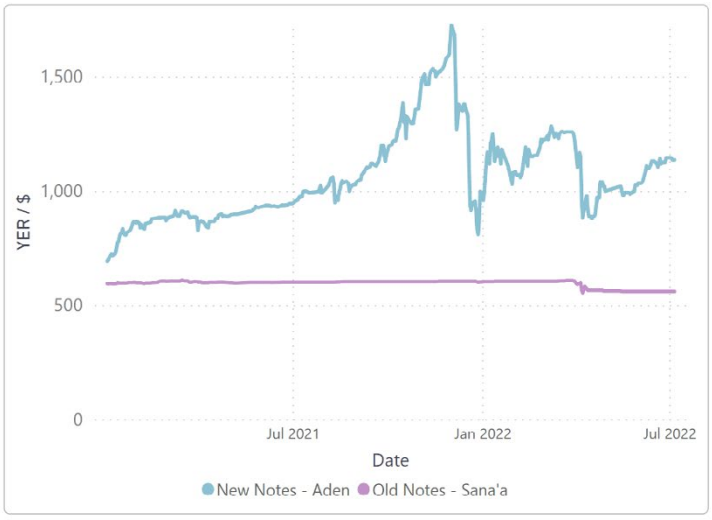
DFA distribution costs and commercial profit margins more than tripled, between January 2021 and February 2022 to March 2022, specifically in the period following the onset of the Russian invasion of Ukraine on 24 February 2022 and before the establishment of the UN-brokered truce on 2 April. The tripling partially resulted from the 30% increase in international oil prices, but this rise does not cover the whole revenue increase. Between February–April 2022, the commercial price of fuel averaged YER 25,000/20 L (YER 1,250/L), which stabilised to YER 14,000/20 L (YER 700/L) between April–June 2022 (see figure 10). Both the IRG and the DFA likely made significant revenues and profits from 24 February to April, with the huge increase in international oil prices and increased market volatility. After this significant increase, the truce period saw distribution costs and commercial profit margins return to pre-truce levels in DFA areas. For this analysis, the high volatility of both international oil prices and consumer fuel prices in February–April 2022 would make comparisons misleading. As such, the truce and pre-truce comparative analysis focused on the periods January 2021 to February 2022 and May–June 2022.

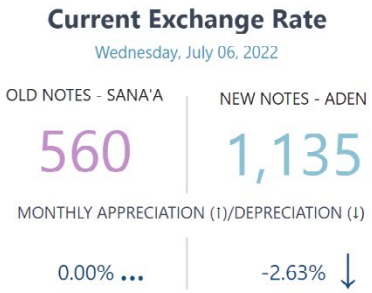
In IRG areas, international oil prices and the Yemeni rial exchange rate continued to influence fuel price dynamics. The truce resulted in the appreciation and stabilisation of the IRG Yemeni rial (see figure 4), supported by the Kingdom of Saudi Arabia (KSA) and the United Arab Emirates (UAE) pledge package of USD 2 billion to the IRG-controlled Central Bank of Yemen (CBY) in Aden for import financing and currency stability (US DOS 07/04/2022). Despite these developments, the potential decrease in consumer prices had not materialised. The consumer price of fuel increased by 67%, from YER 672 (USD 0.65) per litre between January 2021 and February 2022 to YER 1,121 (USD 1.10) per litre between May–June 2022 (see figures 9 and 11). Both the international oil price and distribution costs also increased in IRG areas during the truce. The increase in distribution costs is likely a result of local distributors and owners of private stations looking to recover increased costs from the rise in international oil prices. Similarly, there is likely a drive to recover revenue to offset the reduction of imports into Aden and Mukalla. Although there has been a 67% reduction in monthly average fuel imports into Aden and a 70% reduction in the number of fuel trucks present at Aden Oil Harbour, IRG monthly fees, taxes, distribution costs, and commercial profit margins only decreased by 15%, between January 2021 and February 2022 to May–June 2022.

Table 1. Key findings

DFA
• During the initial two-month truce period 18 fuel shipments unloaded at Al Hodeidah port. • Fuel imports via Al Hodeidah port increased from 3,000MT in March 2022 to 179,000MT in April. • 30% initial increase in international oil prices as result of the conflict in Ukraine. • 17% increase in the consumer price of fuel in DFA areas, from USD 1.02/litre between January 2021 and February 2022 to USD 1.19/litre between May–June 2022. This was mainly a result of an increase in the international oil price. to USD 0.32/litre. • The truce mitigated the impact of the increase in international oil prices. • Distribution costs in DFA areas decreased by 35%. • The consumer price of fuel would have been around 14% higher had disruption at Al Hodeidah port continued with prices rising from YER 671 per L to YER 783 per L (USD 1.19 to USD 1.37).
IRG
• Number of fuel trucks present at the Oil Harbour in Aden decreased by 70% between the pre-truce and truce periods. • Aden port saw a 67% reduction in monthly average fuel imports. • IRG consumer price of fuel increased by 67%, from YER 672 (USD 0.65) per litre between January 2021 and February 2022 to YER 1,121 (USD 1.10) per litre between May–June 2022. This increase is mainly a result of an increase in the international oil price and Yemeni rial depreciation.

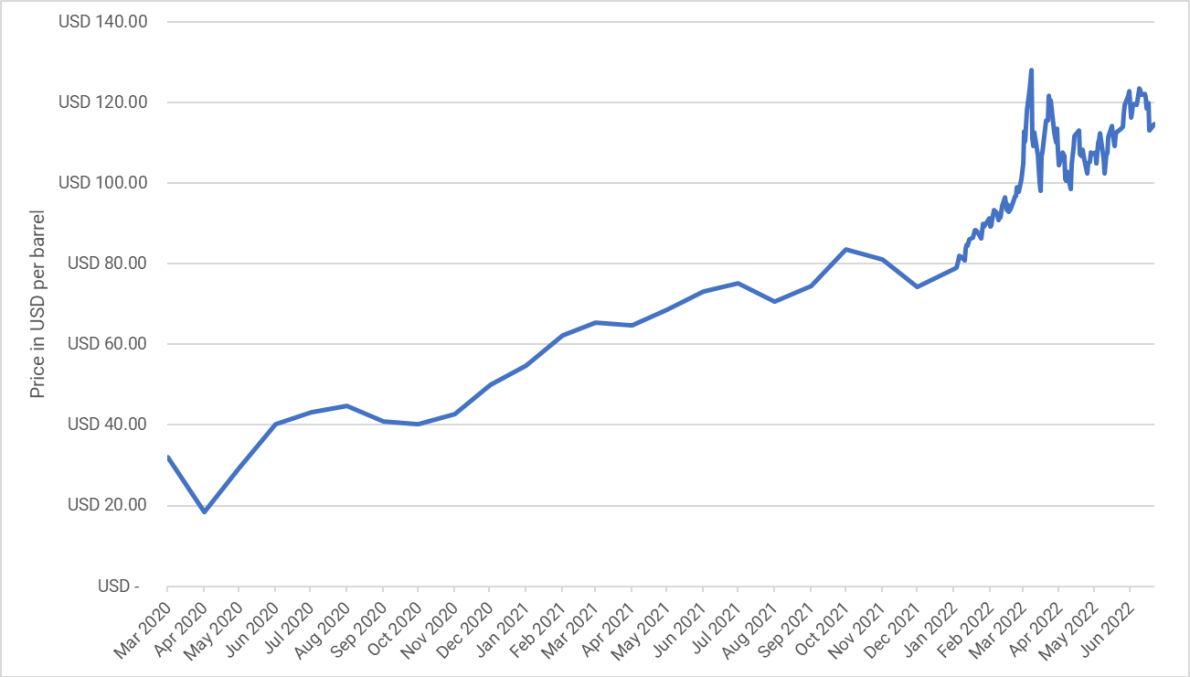
Figure 4. Yemeni rial exchange rate in IRG and DFA areas.





Source: ACAPS YETI (accessed 30/08/2022)

Figure 5. Average Brent crude oil price from March 2020 to June 2022.



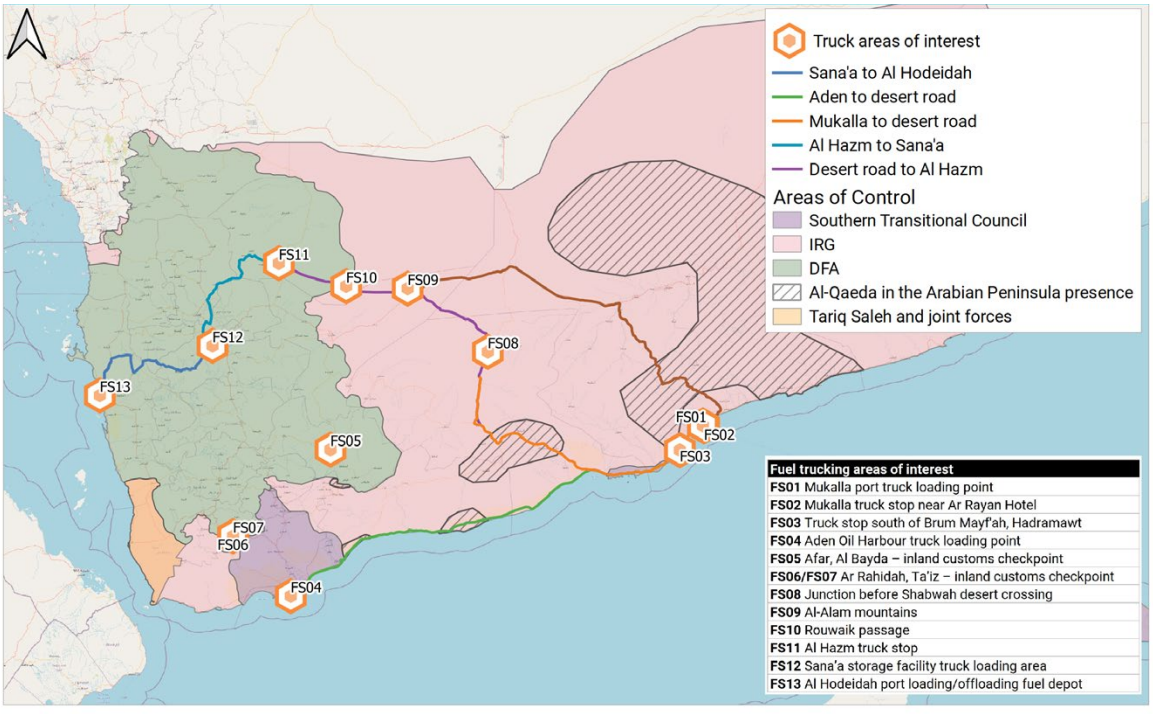
Source: Statista (accessed 21/06/2022); Business Insider (accessed 21/06/2022)

FUEL TRUCK SATELLITE MONITORING

This report carried out satellite imagery analysis to assess any changes in the presence of fuel trucks at different points along key overland fuel supply and distribution routes in Yemen. Following ACAPS discussions with stakeholders and with reference to online imagery and other content, it identified and analysed 13 areas of interest, focusing on the main supply routes connecting Aden and Mukalla (FS01–FS04) to Rouwaik passage (FS10) and Al Hazm district (FS11) in Al Jawf governorate.

In the absence of in-country fuel distribution data within Yemen, satellite imagery offered the opportunity to analyse trends in changes in fuel distribution dynamics by showing the number of fuel trucks present over time.
For a full breakdown of the methodology, analysis, and findings of the report, see Annex I and Annex II.

Figure 6. Map of fuel trucking areas of interest.



Date created: 19/05/2022
Source(s): OpenStreetMap (accessed 19/05/2022), ACAPS discussions with partners

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FUEL TRUCKING AREAS OF INTEREST
FS01 Mukalla port truck loading point
FS02 Mukalla truck stop near Ar Rayan Hotel
FS03 Truck stop south of Brum Mayf'ah, Hadramawt
FS04 Aden Oil Harbour truck loading point
FS05 Afar, Al Bayda – inland customs checkpoint
FS06/FS07 Ar Rahidah, Ta'iz – inland customs checkpoint
FS08 Junction before Shabwah desert crossing
FS09 Al-Alam mountains
FS10 Rouwaik passage
FS11 Al Hazm truck stop
FS12 Sana'a storage facility truck loading area
FS13 Al Hodeidah port loading/offloading fuel depot

Key finding 1: usage of Rouwaik passage for fuel distribution to DFA areas

During periods of increased disruption to fuel imports via Al Hodeidah, Rouwaik passage (FS10) became a key area for overland fuel trucking. Rouwaik passage is a stretch of desert located in Al Jawf above Ma'rib leading to Al Hazm district (also in Al Jawf). Fuel transport would go from Aden and Mukalla to Al Hazm via the passage and then to Sana'a before distribution throughout DFA areas. Satellite imagery, key informant interviews, online imagery, and media reports (see Annex III and Annex VI) highlighted the importance of Rouwaik passage for the overland transportation and supply of fuel from IRG to DFA areas during disruption periods at Al Hodeidah port. These sources also highlighted how the Rouwaik passage could become a bottleneck for fuel distribution to DFA areas, with trucks held up along the passage – as was the case in February–March 2022. Any disruption or delay to the overland transportation of fuel at Rouwaik passage subsequently affected fuel availability and prices in DFA areas. There are three potential causes for holdups at Rouwaik passage:

1. the DFA preventing fuel trucks from advancing to the Al Hazm area
2. the IRG preventing fuel trucks from advancing to DFA areas
3. smaller traders delaying entry as they attempt to negotiate better sale terms with YPC-Sana'a.

The opening of Al Hodeidah port for fuel imports during the truce period reduced the reliance on Rouwaik passage for fuel distribution and supply to DFA areas, in turn reducing the number of trucks present within Rouwaik passage. As a result, the risk of fuel trucks being held up along Rouwaik passage decreased, although the consumer price of fuel remained high in IRG and DFA areas mainly because of the Russian invasion keeping international oil prices high. Attempts by local distributors and owners of private stations looking to recover increased costs from the rise in international oil prices and reduced import into Aden and Mukalla also kept consumer prices higher in IRG areas.

Key finding 2: impact of the truce

The truce has had an impact on fuel distribution dynamics throughout Yemen. Table 2 summarises the findings from the truce.

Table 2. Summary of findings from fuel trucking satellite monitoring during the truce period.

FUEL TRUCKING AREAS OF INTEREST	IMPACT OF THE TRUCE ON THE NUMBER OF FUEL TRUCKS PRESENT
FS01 Mukalla port truck loading point	No impact
FS02 Mukalla truck stop near Ar Rayan Hotel	No impact
FS03 Truck stop south of Burum, Hadramawt	No impact
FS04 Aden Oil Harbour truck loading point	70% reduction in the number of fuel trucks present
FS05 Affar, Al Bayda – inland customs checkpoint	No impact
FS06/FS07 Ar Rahidah, Ta'iz – inland customs checkpoint	Not enough imagery for truce analysis
FS08 Junction before Shabwah desert crossing	Slight increase in number of fuel trucks during the start of the truce
FS09 Al Alam Mountains	Not enough imagery for truce analysis

- Reduction in fuel truck presence
- Increase in fuel truck presence
- No change in fuel truck presence

FS10 Rouwaik passage	Reduction in the number of fuel trucks, although fuel trucks continue to be present
FS11 Al Hazm truck stop	No impact
FS12 Sana'a storage facility truck loading area	Increase in fuel truck activity
FS13 Al Hodeidah port loading/offloading fuel depot	Increase in fuel truck activity, although has not returned to 2019–2020 levels

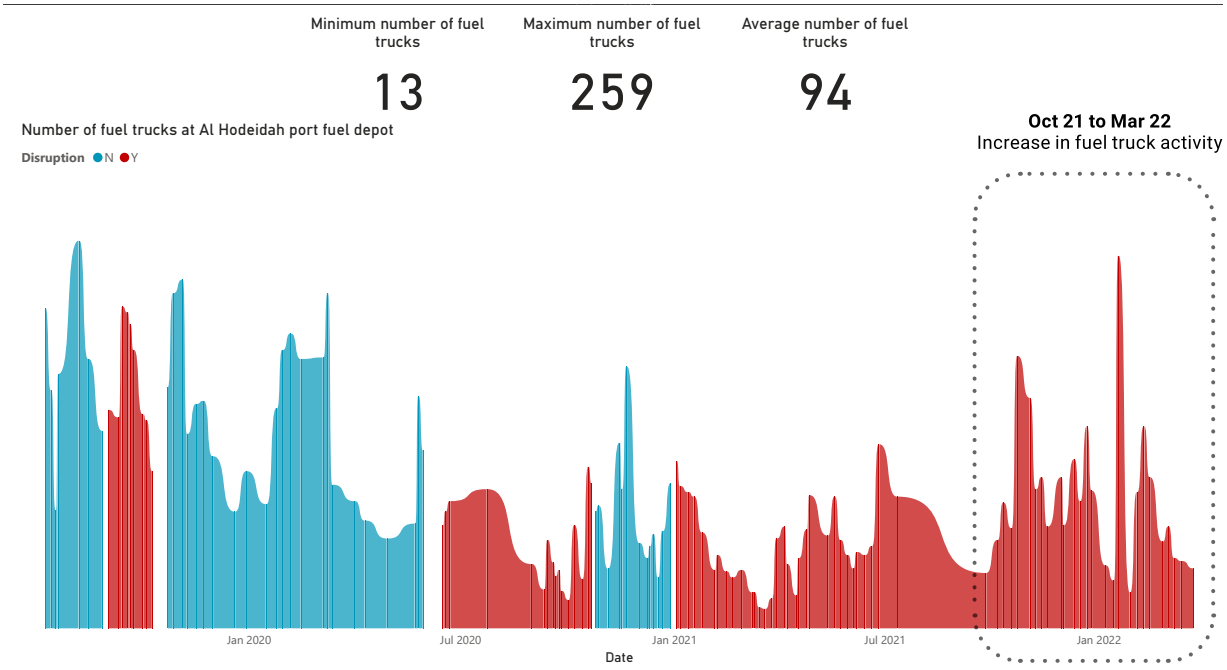
Aden (FS04) and Rouwaik passage (FS10) saw a reduction in the number of fuel trucks present during the truce period. This observation aligns with the 70% reduction in the number of fuel trucks and 67% reduction in import volumes into Aden.

Al Hodeidah port (FS13), the Sana'a storage facility (FS12), and the Shabwah desert crossing (FS08) saw an increase in fuel truck activity. Al Hodeidah has seen a significant increase in imports since the start of the truce, so an increased presence of fuel trucks in Sana'a and Al Hodeidah is expected. On the other hand, the increase in the number of fuel trucks at the Shabwah desert crossing likely resulted from weekly variations rather than highlighting a significant trend. The continued presence does highlight that, despite the continuation of fuel imports into Al Hodeidah port, Rouwaik passage remains active. A possible reason is some fuel continues to be trucked from IRG to DFA areas. It could also be linked to incoming and outgoing fuel truck movements from Ma'rib.

Other areas of interest did not see a change in fuel truck presence during the truce, with Affar (FS05) continuing to have no presence of fuel trucks. For Mukalla port, although there was a reduction in imports during the truce, the presence of fuel trucks remained consistent (FS01, FS02, FS03). This trend suggests that fuel distribution has continued throughout the truce period. Al Hazm truck stop (FS11) also experienced no changes, with the presence of fuel trucks remaining below an average of seven per day. Al Hazm does not appear to be a consistent location for fuel trucks to stop at, which correlates with ACAPS discussions with stakeholders. The outcome also suggests that fuel trucks are held up in Rouwaik passage before they reach Al Hazm and continue to Sana'a and the wider DFA area.

Key finding 3: the possible movement of fuel from Sana'a to Al Hodeidah

Figure 7. Number of fuel trucks at Al Hodeidah port fuel depot during disruption and non-disruption periods.



Note: during this period, imports remained below average because of a disruption at Al Hodeidah port. Regardless, the figure shows an increase in the number of fuel trucks at Al Hodeidah port from October 2021 to early 2022.

The number of fuel trucks present at Al Hodeidah port increased during the last disruption period. A number of reasons may be behind this increase:

- Fuel may have been redistributed and stored at storage facilities in Sana'a and Al Hodeidah despite the reduced availability of fuel on the local market in DFA areas. Such rationing may have been used to maintain the fuel supply crisis within DFA areas and keep humanitarian pressure on the UN.
- Fuel traders may be using the fuel trucks as mobile storage units, waiting for the optimum moment to proceed and sell fuel in the local market in DFA areas to maximise profit.

The truce period has resulted in an increased presence of fuel trucks at Al Hodeidah port because of an increase in fuel imports. As such, the fuel price dynamics hypothesised in this scenario is no longer relevant. That said, such dynamics are worth monitoring should the disruptions at Al Hodeidah port recommence. The managed rationing in DFA areas rather than availability often causes fuel shortages. Monitoring can help ensure that fuel distribution flows within DFA areas remain open, are efficient, and ensure fuel availability to consumers.

REVENUES AND FUEL PRICES

A deeper understanding of fuel price differentials enabled the development of fuel price scenario estimates for IRG and DFA areas. The scenarios cover different periods throughout the conflict, between February 2019 and June 2022. Scenarios have been broken down into:

- Port disruption periods: periods of fuel import disruption at Al Hodeidah port, increasing the reliance on overland trucking from Aden to DFA areas
- Post-port disruption periods: periods of no fuel import disruption at Al Hodeidah port, reducing the reliance on overland trucking.

The report analysed a separate port disruption period between February–March 2022 to determine the immediate impact of the Ukraine conflict, which continued to shape the high international oil prices and underlying volatility affecting Yemen. While the report specifically focused on the immediate impact of the Russian invasion of Ukraine starting 24 February, the conflict transcended into the subsequent period of analysis, which then looked at the activity after the UN-brokered truce came into effect in April 2022. The report examined the truce period by month, as the high volatility of both international oil prices and consumer fuel prices from late February to early April 2022 would have made comparisons misleading. The IRG, the DFA, and fuel traders also likely made significant revenues and profits in this period because of market volatility, before relative market stability returned in May–June 2022. As such, the truce and pre-truce comparative analysis focused on the periods from January 2021 to February 2022 and in May–June 2022.

See Annex VII for a detailed timeline of port disruption periods and key events.

Table 3. Port disruption and post-port disruption periods

PERIOD	
Baseline: February 2019	
Port disruption: March (week 1) to April (week 3) 2019	
Post-port disruption: April (week 4) to August (week 4) 2019	
Port disruption: September (week 1) to October (week 2) 2019	
Post-port disruption: October (week 3) 2019 to May (week 4) 2020	
Port disruption: June (week 1) to October (week 3) 2020	
Post-port disruption: October (week 4) to December (week 4) 2020	
Port disruption: January (week 1) 2021 to February (week 3) 2022	
Port disruption (Ukraine): February (week 4) to March (week 4) 2022	
Truce: April 2022	
Truce: May 2022	disruption period
Truce: June 2022	non-disruption period

Fuel price dynamics have been separated into five categories:

- International oil price (Brent crude)
- DFA fees and taxes
- IRG fees and taxes
- Baseline distribution costs and commercial profit margin
- Additional distribution costs and profits

Baseline distribution costs and commercial profit margin and additional distribution costs and profits have both been estimated. Baseline distribution costs and commercial profit margin has been estimated at 23.11% of total cost of fuel. This is based on the average distribution costs during non-disruption periods. Any remaining revenue after baseline distribution costs, taxes, fees and international oil price has been classified as additional distribution costs and profits. See Annex I and II for a detailed breakdown of fees and taxes.

Key findings

During port disruption periods, there was a 70% average reduction of imports into Al Hodeidah port. The initial truce agreement allowed 18 fuel ships to enter the port during the first two months, between April–June 2022 (OSESGY 02/04/2022). This development saw a return of pre-disruption period import levels into Al Hodeidah port, with imports increasing from 3,000MT in March to 170,000MT in April (see figure 1). It should be noted that the truce was extended for an additional two months, till August 2022, and fuel continued to be imported via Al Hodeidah in much higher volumes than pre-truce.

The truce has had an impact on revenues, distribution costs, taxes, customs, profits, and consumer fuel prices in both IRG and DFA areas. The 30% increase in international oil prices has also had a significant impact. When the international oil prices are high, the consumer price of fuel is unlikely to decrease because of increased fuel costs and attempts by traders to recover from these increased costs. The lower the international oil price, the lower the consumer price of fuel in both IRG and DFA areas.

To an extent, the truce and the reopening of Al Hodeidah port for fuel imports mitigated the impact of the increase in international oil prices. The current consumer price of fuel would have been around 14% higher had the Al Hodeidah disruption continued with prices rising from YER 671 per L to YER 783 per L (USD 1.19 to USD 1.37) in DFA areas. The high price of fuel would have a ripple effect on other goods' prices in Yemen due to increased transport prices. People's mobility would also reduce due to the rise in fuel prices, likely limiting access to livelihoods and other basics services like healthcare, education and humanitarian assistance.

DFA areas

- During port disruption periods, consumer fuel prices rose because of longer distribution routes and related transportation costs, as well as the double taxation and customs payments implemented by the DFA to recoup revenue lost through decreased fuel import activity at Al Hodeidah port.
- Distribution costs and commercial profit margins decreased by 35%, from USD 0.49/litre between January 2021–February 2022 to USD 0.32/litre in May–June 2022.
- Additional distribution costs and profits decreased by 80%, from USD 0.25/litre between January 2021–February 2022 to USD 0.05/litre in May–June 2022. Decreased Additional distribution costs and profits are a result of the easing of restrictions at Al Hodeidah and the subsequent reduction in supply chain costs.
- The overall consumer price of fuel increased by 17%, from USD 1.02 to USD 1.19 per litre over the same period as a result of the 30% increase in international oil prices.
- Through calculating the difference between the average additional distribution costs and profits during disruption periods against additional distribution costs and profits during the truce period, it is estimated the consumer price of fuel would have been around 14% higher had disruption at Al Hodeidah continued. Were disruption to recommence, consumer prices are estimated to rise from YER 671 per L to YER 783 per L (USD 1.19 to USD 1.37) in DFA areas. This percentage decrease aligns with ACAPS Al Hodeidah fuel dynamics modelling from December 2021 (ACAPS 04/04/2022).

IRG areas

- Historically, IRG fuel price dynamics have been influenced by the international oil price and Yemeni rial exchange rate and have largely not been caused by the disruption at Al Hodeidah port.
- The consumer price of fuel has been broadly following this trend during the truce period and has seen an increase in consumer prices because of higher international oil prices.
- The consumer price of fuel increased by 69%, from USD 0.65 (YER 672) per litre between January 2021 and February 2022 to USD 1.10 (YER 1,121) per litre between May–June 2022.
- Distribution costs and commercial profit margins increased by 107%, from USD 0.15/litre between January 2021 and February 2022 to USD 0.31/litre between May–June 2022.
- During the truce period, there was a 67% reduction in monthly average fuel imports into Aden and a 70% reduction in the number of fuel trucks present at Aden Oil Harbour.
- The higher increase in fees, taxes, distribution costs, and profit margins likely resulted from attempts by local distributors and owners of private stations looking to recover increased costs incurred from the rise in international oil prices and the reduction of imports into Aden and Mukalla.

Fuel price breakdown per litre (USD)

Figure 8. DFA fuel price scenarios (petrol and diesel): fuel price breakdown per litre (USD).

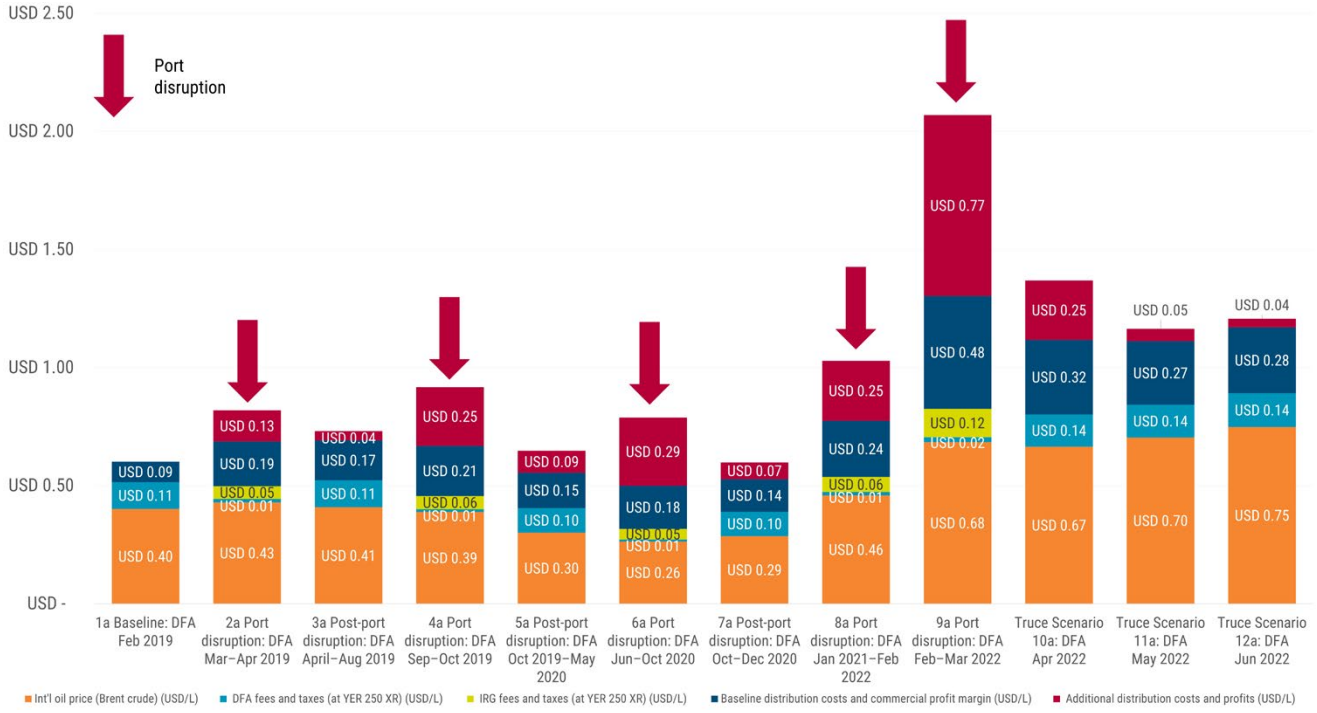
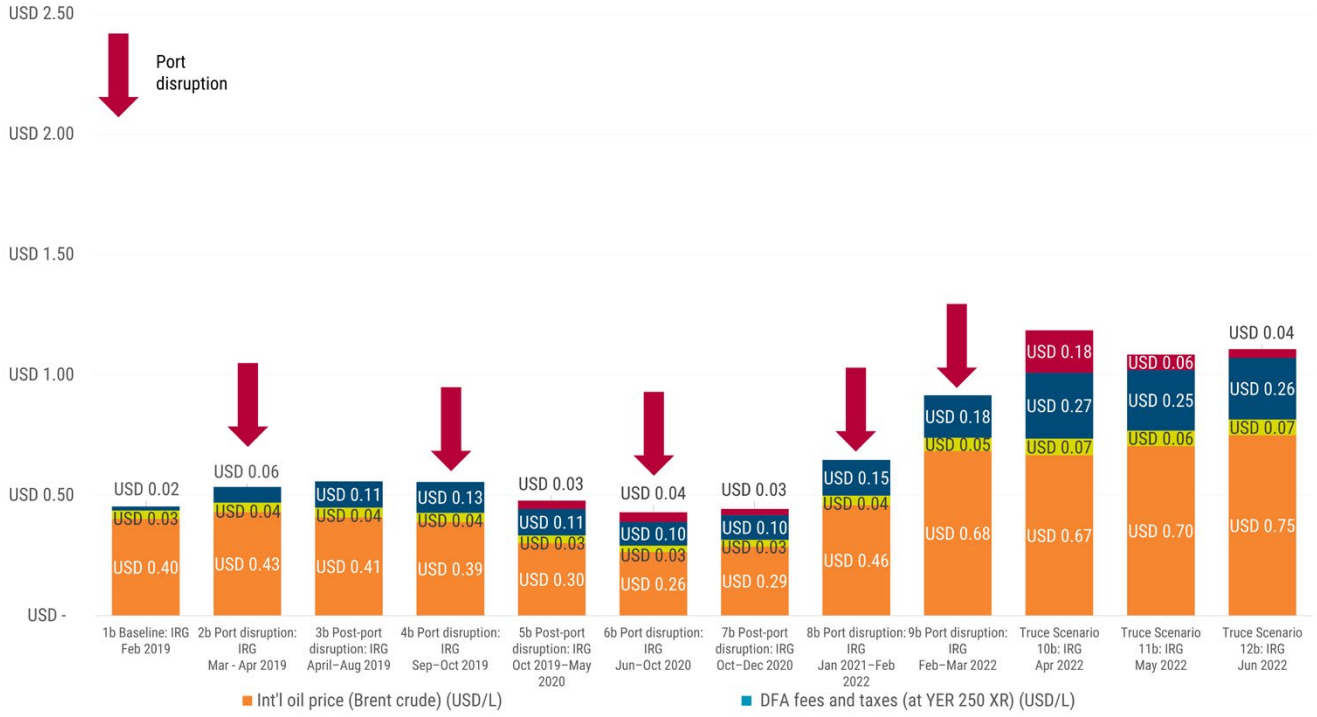


Figure 9. IRG fuel price scenarios (petrol and diesel): fuel price breakdown per litre (USD).



Analysis: fuel price breakdown per litre (USD)

Figures 8 and 9 show the average fuel price breakdown per litre in USD between February 2019 and June 2022.

DFA areas

In DFA areas, during port disruption periods, fuel price increased – with the reduced availability of fuel sold at the lower 'official price' (i.e. at YPC-run stations and those operating as YPC agents) versus the greater availability of fuel sold at a higher 'commercial rate' at privately owned stations. The higher fuel prices during disruption periods at Al Hodeidah resulted from longer distribution routes and related transportation costs, double taxation, and a further price increase to incentivise traders to truck fuel overland to DFA areas.

During the truce period, in May–June , although distribution costs and commercial profit margins decreased by 35%, from USD 0.49/litre from January 2021 to February 2022 to USD 0.32/litre in that period, the 30% increase in international fuel prices led to a 17% rise in the overall consumer price (from USD 1.02 to USD 1.19 per litre). There was also a 80% decrease in additional distribution costs and profits from USD 0.25/litre from January 2021 to February 2022 to USD 0.05/litre in that period. The reopening of Al Hodeidah port increased DFA taxes and customs by 600%, from USD 0.02 to USD 0.14 per litre in the same period. The increase is a result of DFA authorities being able to implement fuel import taxes and fees at Al Hodeidah port instead of just the customs taxes implemented at Aden port during disruption periods (see Annex I and Annex II).

IRG areas

In IRG areas, the international oil price and Yemeni rial exchange rate influenced fuel price dynamics, while disruptions at Al Hodeidah port did not have a visible impact on prices. During the truce period, the Yemeni rial value stabilised with limited volatility, supported by the KSA-UAE USD 2 billion pledge package, the increased transparency of CBY Aden, and the sustainable weekly foreign exchange auctions. On the other hand, international oil prices increased by 30%.

The consumer price of fuel broadly followed this trend during the truce period and increased with the rise in international oil prices. The consumer price of fuel increased by 69%, from USD 0.65 (YER 672) per litre between January 2021 and February 2022 to USD 1.10 per litre between May–June 2022.

During the truce, distribution costs and commercial profit margins increased by 107%, from USD 0.15/litre between January 2021 and February 2022 to USD 0.31/litre between May–June 2022. This increase is likely from the added costs along the supply chain resulting from the increase in international oil prices. For example, local distributors looking to purchase fuel from importers via a broker or the IRG-run YPC would have had to adjust their own fee structure in accordance with the rise in international oil prices. These added costs are ultimately passed down to the consumer.

Fuel price breakdown per litre (YER)

Figure 10. DFA fuel price scenarios (petrol and diesel): fuel price breakdown per litre (YER).

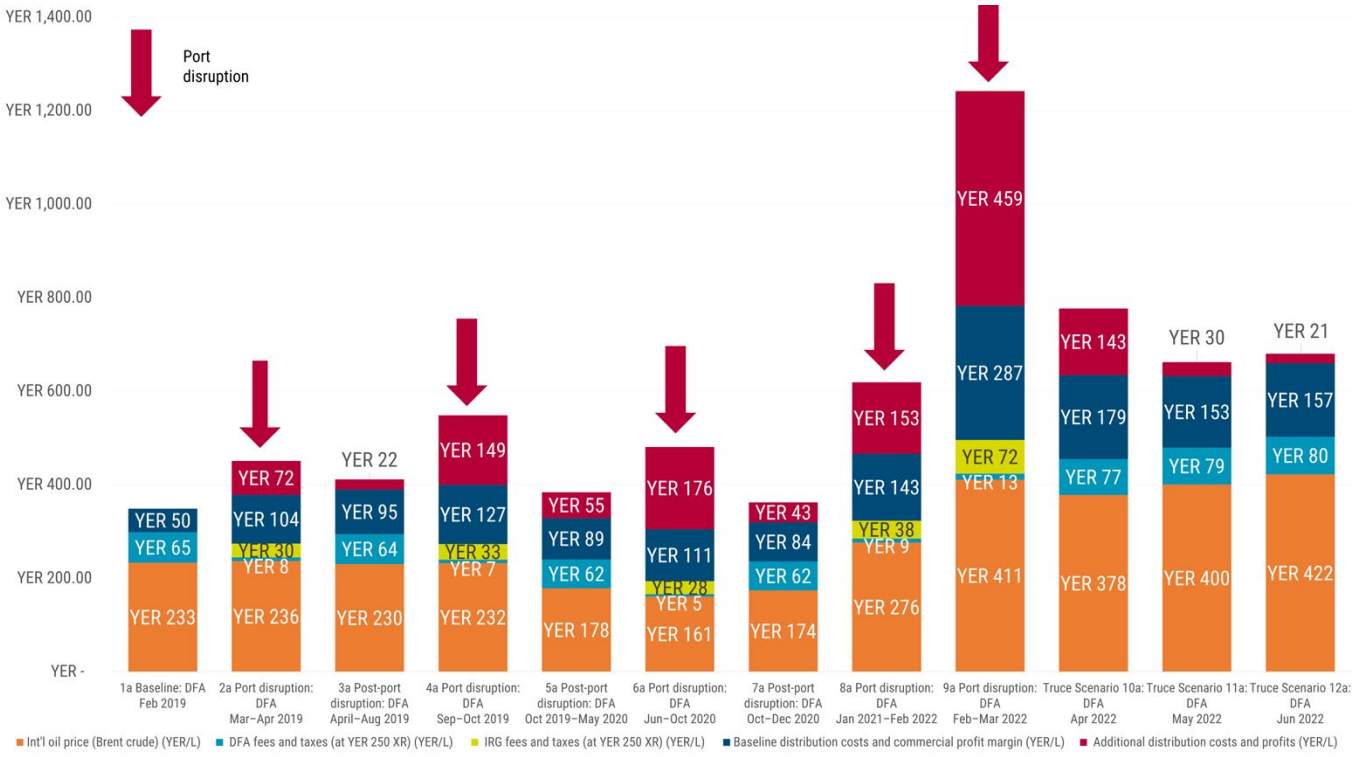
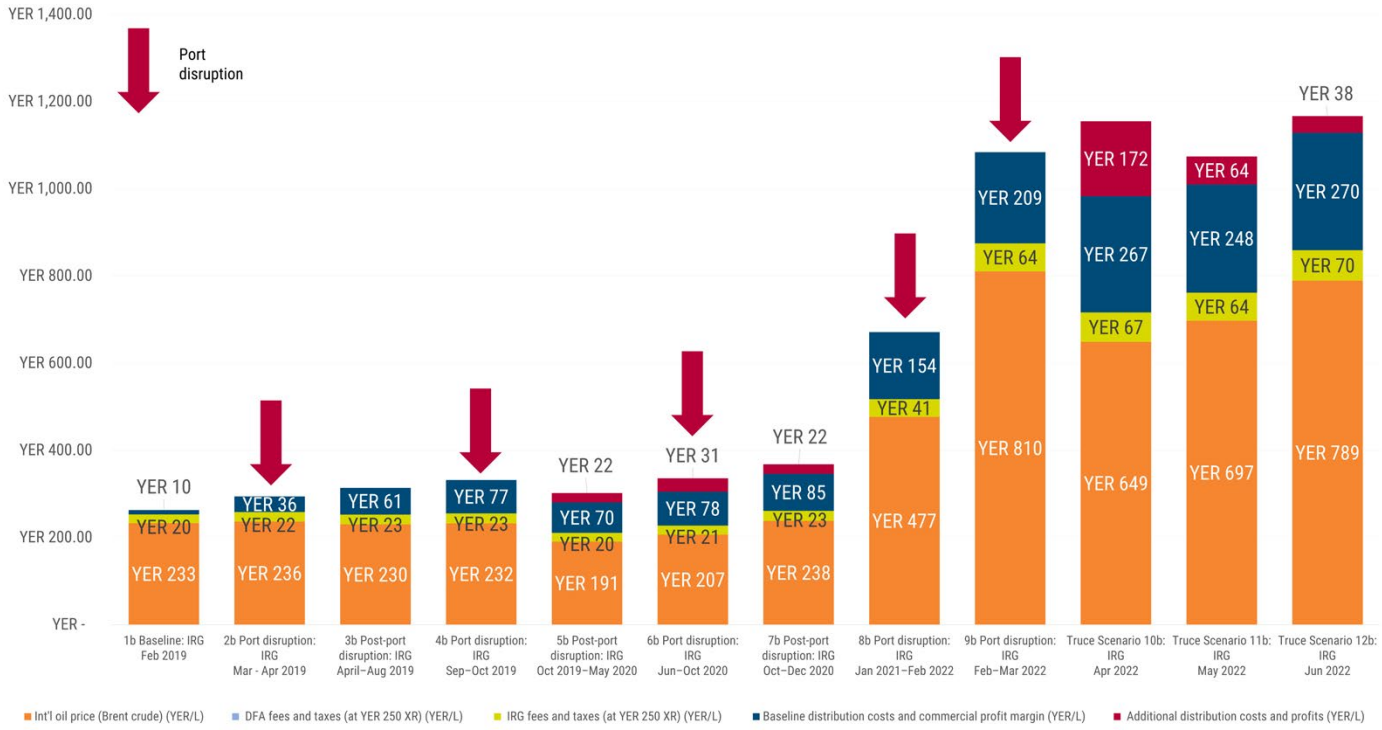


Figure 11. IRG fuel price scenarios (petrol and diesel): fuel price breakdown per litre (YER).



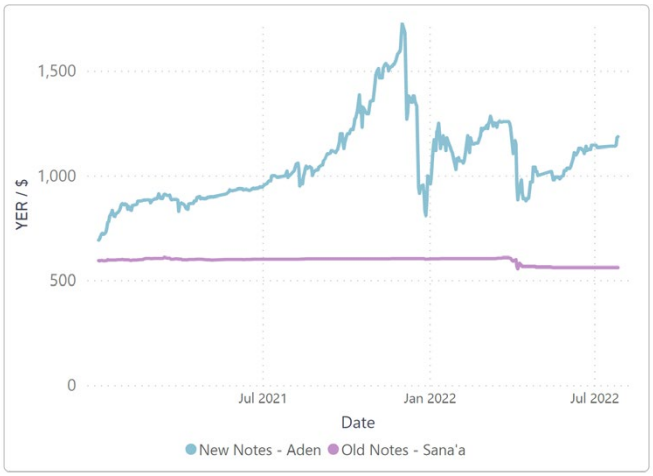
Fuel price breakdown per litre (YER)

Figures 10 and 11 show the average fuel price breakdown per litre in YER between February 2019 and June 2022.

DFA areas

The Yemeni rial in DFA areas has been relatively stable against the USD (see figure 12). One significant factor is because of the ban on new YER banknotes in DFA areas, which has prevented the depreciation of the rial as seen in IRG areas (ACAPS 26/07/2022). As a result, the YER price of fuel tends to track the USD price. During the truce period, although distribution costs and commercial profit margins decreased by 39%, from YER 296/litre between January 2021 and February 2022 to YER 181/litre between May–June 2022, the overall consumer price increased by 8%, from YER 619 to YER 671 per litre over the same period, mainly because of the 30% increase in international fuel prices. Similarly, over the same period there was a 83% decrease in additional distribution costs and profits as a result of the easing of restrictions at Al Hodeidah port from YER 153/litre to YER 26/litre.

Figure 12. YER to USD exchange rate.



Source: ACAPS YETI (accessed 30/08/2022)

IRG areas

In IRG areas, during the truce period, there has been an appreciation and stabilisation of the Yemeni rial as supported by the KSA-UAE USD 2 billion pledge package. Despite the currency stabilisation, however, the 30% increase in international oil prices increased consumer prices by 67%, from YER 672 per litre between January 2021 and February 2022 to YER 1,121 per litre in May–June 2022.

Since the start of the truce, distribution costs and commercial profit margins had increased by 102%, from YER 154/litre between January 2021 and February 2022 to YER 311/litre between May–June 2022. This increase was likely an attempt by local distributors and owners of private stations to offset the increased costs incurred from the rise in international oil prices and the reduced import into Aden and Mukalla.

CONCLUSIONS AND OUTLOOKS

Fuel import, distribution, and price dynamics in Yemen have shifted significantly since the start of the truce on 2 April 2022. The easing of disruptions to fuel imports via Al Hodeidah port saw a sudden and huge increase in import volumes via the port, with import activity returning to pre-disruption period levels. This specific component of the truce offered a key opportunity for the easing of supply constraints and the reduction of commercial fuel prices in DFA-controlled areas. Conversely, Aden port saw a 67% reduction in monthly average fuel imports from January–March 2022 to April–June 2022.

The shift in import activity during the truce influenced fuel distribution dynamics, as the demand and need for fuel to be trucked overland from IRG to DFA areas significantly decreased. As a result, there was less fuel truck activity along major overland supply routes previously used to truck fuel from IRG to DFA areas, as illustrated by the reduction in fuel truck activity at Rouwaik passage.

In DFA areas, shorter distances from the port of entry to distribution locations reduced distribution costs by 35%, from USD 0.49/litre between January 2021 and February 2022 to USD 0.32/litre in May–June 2022. Over the same period, a similar trend was seen for additional distribution costs and profits with a 80% decrease from USD 0.25/litre to USD 0.05/litre. A 30% increase in international oil prices, however, resulted in a 17% increase in the consumer price of fuel in DFA areas, from USD 1.02/litre between January 2021 and February 2022 to USD 1.19/litre between May–June 2022. To an extent, the truce and the resumption of significant fuel import activity at Al Hodeidah port helped cushion the impact of increased international oil prices following the Russian military intervention in Ukraine. In the absence of the truce and increased import activity via Al Hodeidah port, prices in DFA areas would be much higher. The current consumer price of fuel would have been around 14% higher had the Al Hodeidah disruption continued with prices rising from YER 671 per L to YER 783 per L (USD 1.19 to USD 1.37) in DFA areas.

In IRG areas, international oil prices and the Yemeni rial exchange rate continued to influence fuel price dynamics. The truce and the combined $2 billion pledges made by KSA and the UAE resulted in the appreciation and stabilisation of the IRG Yemeni rial, but the potential reduction in consumer prices had not materialised. The consumer price of fuel instead increased by 67%, from YER 672 (USD 0.65) per litre between January 2021 and February 2022 to YER 1,121 (USD 1.10) per litre in May–June 2022. Both the international oil price and distribution costs increased in IRG areas during the truce. The increase in distribution costs is likely a result of local distributors and owners of private stations looking to recover increased costs incurred from the rise in international oil prices. Similarly, there is likely a drive to recover revenue because of the reduction of imports into Aden and Mukalla. Over the same period formal monthly IRG fees and taxes reduced.

Although the reopening of Al Hodeidah port for fuel imports did mitigate against the increase in the consumer price of fuel, whilst the international oil price remains high, the consumer price of fuel will unlikely decrease as traders attempt to recover from increased costs. Were international oil prices to drop, the consumer price of fuel would be lower in both IRG and DFA areas.

METHODOLOGY

This report is based on the following:

- secondary data review
- interviews with stakeholders
- satellite imagery truck monitoring
- fuel price modelling.

For more details on the fuel price modelling and satellite monitoring methodologies, see the Annexes I, II, III and V.

LIMITATIONS

The availability of data and information is limited given the politically and commercially sensitive nature of the topic. Stakeholders interviewed during the research have to remain anonymous because of the sensitivity and potential politicisation of the information provided.

Quantitative analysis only calculates total import costs for petrol and diesel. Fuel and diesel account for 83.5% of total imports, with other fuel accounting for 16.5%. The report excluded other fuel as understanding the price structure requires further investigation. For further details, see Annex I.

ACAPS is aware that some changes have occurred to the fuel price structure for fuel entering via Al Hodeidah in regard to the premium paid by DFA-run YPC to the fuel traders in exchange for selling the fuel to YPC. ACAPS is currently conducting follow-up research and triangulation checks on data it has received with regard to the breakdown of cost for fuel imported via Al Hodeidah (specifically petrol and diesel) that is then sold to consumers in DFA areas. It would at this stage appear, however, that the tax and customs rates applied by DFA on fuel entering via Al Hodediah remains the same. For the purposes of this study, and to ensure consistency in terms of the price structures applied after previous periods of disruption, the decision was taken to use the previous price structure

ANNEX I. FUEL PRICE STRUCTURE BREAKDOWN: PORT DISRUPTION PERIODS

The fuel price dynamic modelling for port disruption periods was calculated using the following methodology.

Table 4. Port disruption periods.

PERIODS
March (week 1) to April (week 3) 2019
September (week 1) to October (week 2) 2019
June (week 1) to October (week 3) 2020
January (week 1) 2021 to February (week 3) 2022
February (week4) to March (week4) 2022 (Ukraine conflict)

Table 5. Scenarios 2, 4, 6, 8 and 9 fuel price structure breakdown.

SCENARIO	FUEL TYPE	TAX OR FEE TYPE	DFA OR IRG	VALUE
Port disruption DFA estimated fuel trucked overland – parallel market	**Petrol**	Customs tax	IRG	10% fuel price*
		Fuel import tax	IRG	Consumer price × 5/105
		Customs tax	DFA	10% fuel price*
	Diesel	Customs tax	IRG	5% fuel price*
		Fuel import tax	IRG	Consumer price × 5/105
		Customs tax	DFA	5% fuel price*
Port disruption IRG	**Petrol**	Customs tax	IRG	10% fuel price*
		Fuel import tax	IRG	Consumer price × 5/105
	Diesel	Customs tax	IRG	5% fuel price*
		Fuel import tax	IRG	Consumer price × 5/105

*The table uses an exchange rate of YER 250 per USD 1. For IRG areas, the table uses an exchange rate of YER 500 per USD 1 for July 2021 onwards.

Fuel price dynamics during port disruption periods were estimated based on a percentage of IRG imports being trucked overland to DFA areas. Port disruption period imports were estimated based on the table below (table 6).

Table 6. Distribution of imported fuel in Yemen between IRG and DFA areas from January–August 2021.

	QUANTITY (MT)	PERCENTAGE
Fuel to IRG areas	428,859.92	41%
Fuel trucked overland to DFA areas	624,517.86	59%
Total	1,053,377.78	100%

Source: Supreme Economic Council Yemen (as at July 2021)

Sources:

- International oil price: Business Insider
- Exchange rate: Yemen Economic Tracking Initiative
- Consumer price: REACH JMMI, Boqash
- Tax or fee type: discussions with stakeholders
- Import quantities: analysis using Supreme Economic Council Yemen and discussions with stakeholders

ANNEX II. FUEL PRICE STRUCTURE BREAKDOWN: POST-PORT DISRUPTION PERIODS

The fuel price dynamic modelling for post-port disruption periods was calculated using the following methodology.

Table 7. Post-port disruption periods.

PERIODS
February 2019
April (week 4) to August (week 4) 2019
October (week 3) 2019 to May (week 4) 2020
October (week 4) to December (week 4) 2020
April 2022 (truce)
May 2022 (truce)
June 2022 (truce)

Table 8. Scenario 1, 3, 5, 7 ,10, 11 and 12 fuel price structure breakdown.

SCENARIO	FUEL TYPE	TAX OR FEE TYPE	DFA OR IRG	VALUE
Post-port disruption DFA	**Petrol**	Customs tax	DFA	10% fuel price*
		Fuel import sales tax	DFA	5% fuel price*
		Fuel import other returned tax	DFA	5% fuel price*
		Fuel import profit tax	DFA	1.4% fuel price*
		Yemen Red Sea Port Corporation fee	DFA	USD 50/MT
		Importer profit and YPC profit	DFA	USD 30/MT
	Diesel	Customs tax	DFA	5% fuel price*
		Fuel import sales tax	DFA	5% fuel price*
		Fuel import other returned tax	DFA	5% fuel price*
		Fuel import profit tax	DFA	1.4% fuel price*
		Yemen Red Sea Port Corporation fee	DFA	USD 50/MT
		Importer profit and YPC profit	DFA	USD 30/MT
Post-port disruption IRG	**Petrol**	Customs tax	IRG	10% fuel price*
		Fuel import tax	IRG	Consumer price × 5/105
	Diesel	Customs tax	IRG	5% fuel price*
		Fuel import tax	IRG	Consumer price × 5/105

*The table uses an exchange rate of YER 250 per USD 1. For IRG areas, it uses a YER 500 per USD 1 exchange rate for July 2021 onwards.

Sources:

- International oil price: Business Insider
- Exchange rate: Yemen Economic Tracking Initiative
- Consumer price: REACH JMMI, Boqash
- Tax or fee type: discussions with stakeholders
- Import quantities: discussions with stakeholders

NOTE: ACAPS continues to monitor changes to fees, taxes, and premiums. Future research will focus on the more detailed cost drivers behind these latest fuel price dynamics.

ANNEX III. FUEL TRUCK SATELLITE MONITORING

FS01 Mukalla port truck loading point

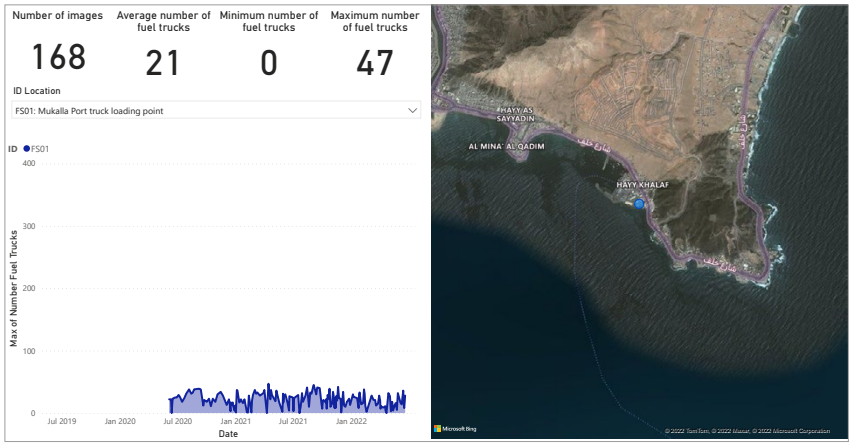
Description

- From June 2020 till April 2022, the IRG disruption of fuel imports through Al Hodeidah port resulted in increased import activity at Aden and, to a lesser extent, Mukalla.
- Fuel imports via Mukalla decreased from November 2021 to May 2022, which key informants indicated was consistent with fuel traders' preference then to import via Aden and truck overland to DFA areas via Rouwaik passage.
- Vessels either unloaded at sea, via a pipeline connected to the onshore fuel storage tanks, or they proceeded to Berth 1 and unloaded to the onshore storage tanks via a pipeline.
- Fuel trucks loaded fuel from the storage tanks and lined up at an area located immediately south of the storage tanks.

Key findings

- The presence of fuel trucks was consistent between July 2020 and June 2022.
- There was a relatively low presence of fuel trucks, averaging 21 per image (lower than at Al Hodeidah and Aden).
- No significant anomalies were detected.
- The truce had not affected the number of fuel trucks present.

Figure 13. Number of fuel trucks present at Mukalla port.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS02 Mukalla truck stop near Ar Rayan Hotel

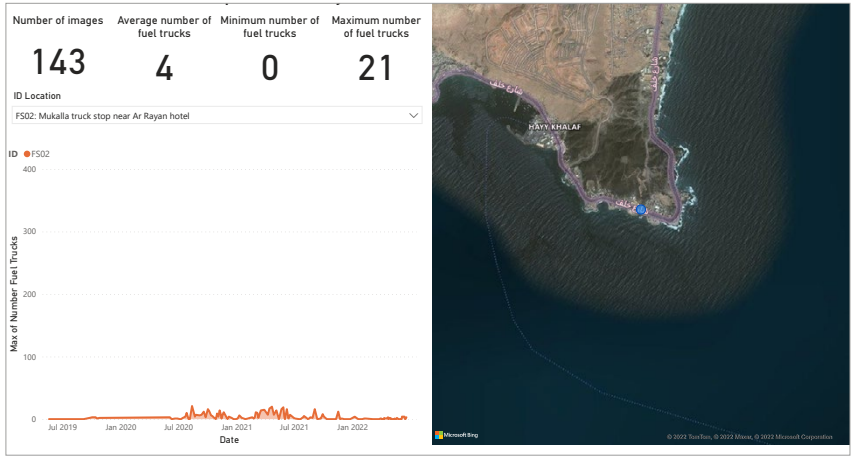
Description

- Fuel trucks would occasionally wait on a stretch of coastal road located near and southeast of Mukalla port that runs up to Ar Rayan Hotel.
- Fuel trucks from Mukalla wanting to travel to DFA areas and avoid the plateau (northeast of Mukalla port) travelled southwest down the coastal road, past Balhaf in Shabwah governorate, before turning north towards Wadi Mayfah, past Habban, and into Ataq. They then took the route via Al Uqlah towards Rouwaik passage.

Key findings

- Consistently low volumes of fuel trucks were present at Mukalla truck stop.
- There were no significant anomalies detected.
- The truce had not affected the number of fuel trucks present.

Figure 14. Number of fuel trucks present at Mukalla truck stop.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS03 Truck stop south of Burum, Hadramawt

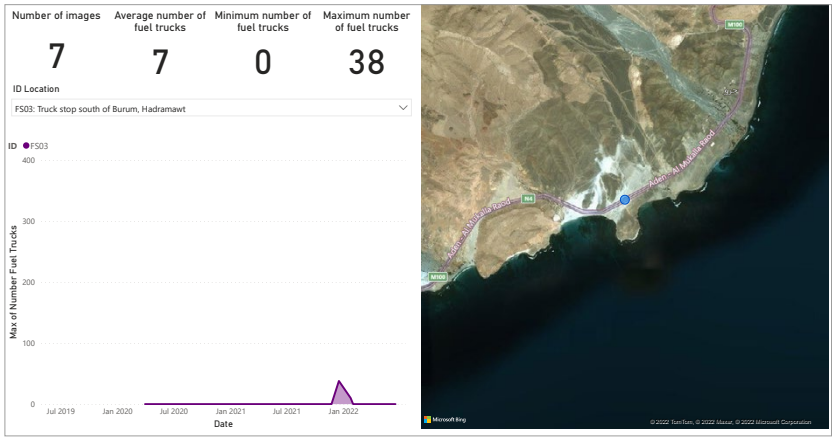
Description

- Fuel trucks from Mukalla wanting to travel to DFA areas and avoid the plateau (northeast of Mukalla port) travelled southwest down the coastal road, past Balhaf in Shabwah governorate, before turning north towards Wadi Mayfah, past Habban, and into Ataq. They then either drove past Beyhan or took the route via Al Uqlah onto Rouwaik passage.
- In January 2022, fuel trucks waited at an area identified online as Burum, located southwest of Mukalla along the coastal road. The fuel trucks could be waiting to provide fuel to Shabwah governorate or looking to transport fuel to DFA areas using the route shown above.
- Using the footage previously circulated on YouTube (December 2021) (now removed) and then cross-referencing with Google Earth, the location is likely 14°15'58.38 "N; 48°54'54.60 "E.
- Analysis shows social media reports were likely exaggerated. 1,000 trucks were reported on social media, but only 38 fuel trucks were detected using satellite imagery.

Key findings

- Fuel trucks were not usually present at the truck stop.
- An anomaly was detected in January 2022 verifying the existence of queues reported on social media.
- That said, the social media reports were likely exaggerated (1,000 trucks reported, 38 fuel trucks detected).
- The truce had not affected the number of fuel trucks present.

Figure 15. Number of fuel trucks present at the truck stop south of Burum.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS04 Aden Oil Harbour truck loading point

Description

- The area served as the loading point for fuel entering Aden port.
- From June–October 2020 and January 2021 until April 2022, fuel was largely imported via Aden port (and, to a lesser extent, Mukalla port).

Key findings

- This truck loading point was the highest usage port (followed by Al Hodeidah), with an average of 137 and a maximum of 253 fuel trucks present.
- The number of trucks peaked in October 2020, February 2021, March 2021, May 2021, and June 2021.
- The truce had resulted in a significant decrease in the number of fuel trucks present:
- pre-truce fuel truck average = 142
- truce fuel truck average = 43.

Figure 16. Number of fuel trucks present at Aden Oil Harbour.

Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS05 Affar, Al Bayda – inland customs checkpoint

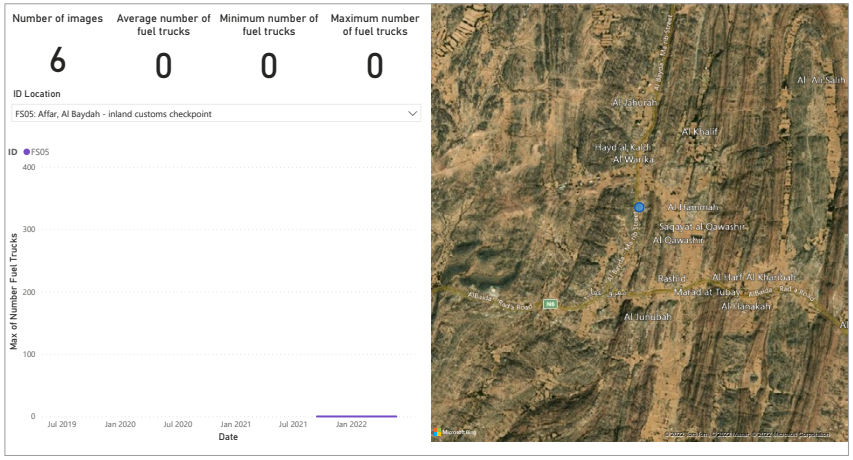
Description

- In June 2020, there were reports of fuel trucks being held up at the Affar inland customs checkpoint and not allowed to advance from IRG to DFA areas.

Key findings

- There was a truck stop present, but there was also a lack of trucks.
- The lack of fuel trucks suggests that the route via Shabwah onto Al Jawf was the preferred route for fuel trucked from Aden to DFA areas. This finding matches ACAPS discussions with stakeholders.
- The truce had not affected the number of fuel trucks present.

Figure 17. Number of fuel trucks present at Affar.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS06/FS07 Ar Rahidah, Ta'iz – inland customs checkpoint

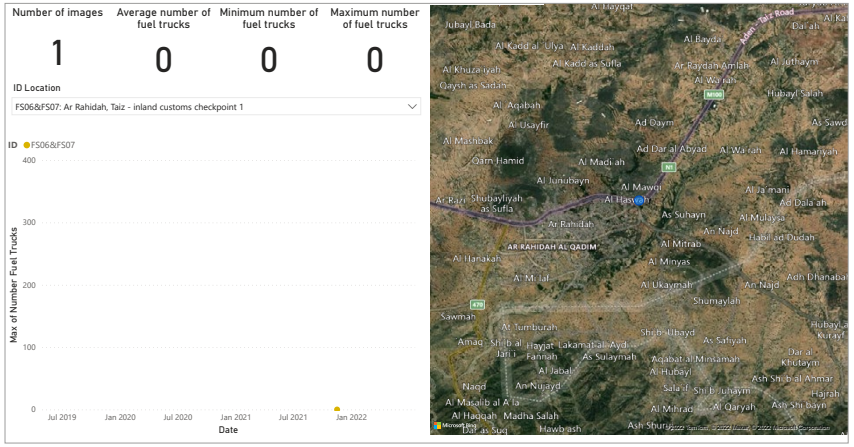
Description

- This area was the customs checkpoint that used to regulate and tax goods moving between North and South Yemen.
- Akin to Affar, Ar Rahidah, it was identified to be a location where fuel trucks were held up in June 2020.

Key findings

- Other trucks could be seen in the truck park and on the roads to the northeast and southeast.
- It was not possible to see any obvious fuel trucks, but 254 other trucks were present.
- There was not enough imagery to draw conclusions.

Figure 18. Number of fuel trucks present at Ar Rahidah.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS08 Junction before Shabwah desert crossing

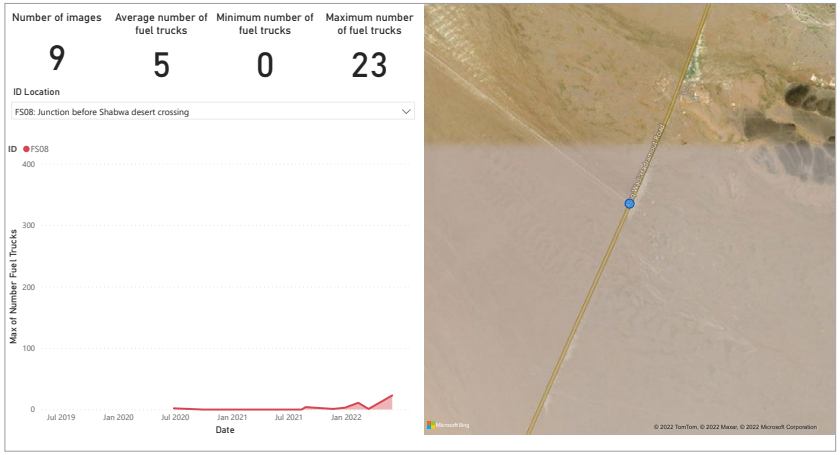
Description

- The junction is on the fuel distribution route to Rouwaik passage and DFA areas but has not been a significant holdup point.
- There is a service station present at the junction.

Key findings

- There was no significant presence of static fuel trucks.
- As expected, fuel trucks were not held up at this junction.
- There had been a slight increase in the number of fuel trucks in the May 2022 truce period.

Figure 19. Number of fuel trucks present at the junction before Shabwah desert crossing.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS09 Al Alam Mountains

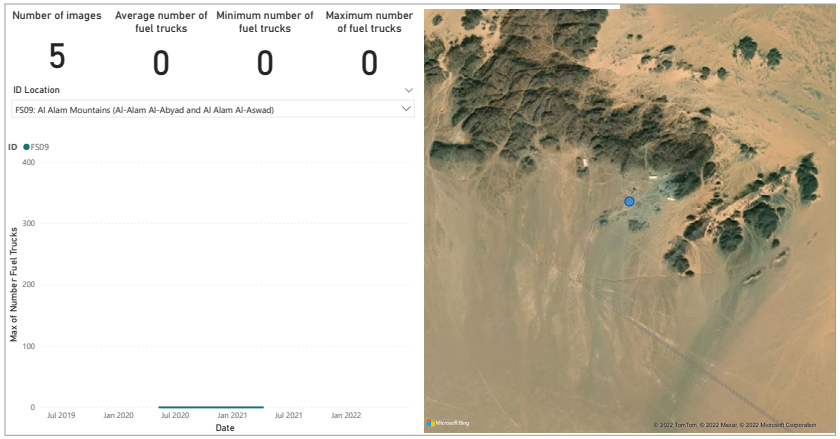
Description

- The area is located at the start of Rouwaik passage towards Al Hazm and DFA areas.
- Stakeholders indicated that fuel trucks passed via Al Alam Mountains to cross from IRG- to DFA-controlled territory.

Key findings

- There were several buildings, structures, and sand barriers but no sign of fuel trucks.
- The area had seen development over the past few years, likely a result of increased over-land fuel trucking because of the disruption at Al Hodeidah port.

Figure 20. Number of fuel trucks present at Al Alam Mountains.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS10 Rouwaik passage

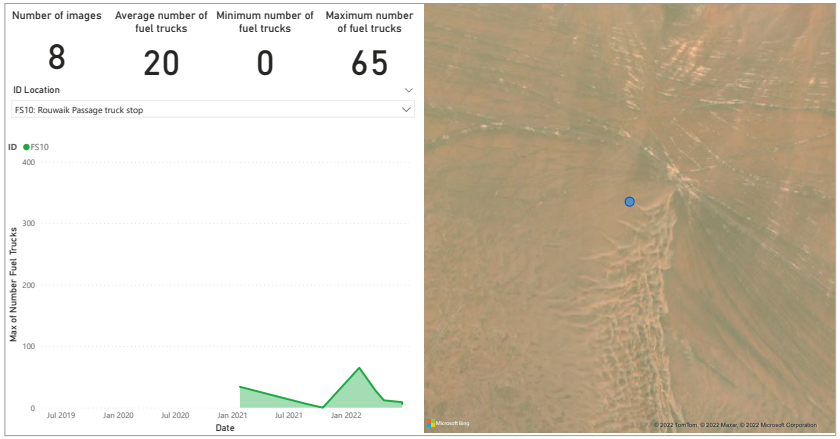
Description

- Fuel trucks travelling from Aden and Mukalla ports to DFA areas predominantly headed towards and intersected at Rouwaik passage – i.e. transiting via Al Alam Mountains before proceeding through the desert track (Rouwaik) and onto Al Hazm district, Al Jawf governorate. Fuel trucks then continued their journey from Al Hazm to Sana'a.

Key findings

- This truck stop is located in an area where DFA and IRG areas of control meet.
- Anomalies detected in January–March 2022 appeared to validate social media reports of fuel trucks being held up in Rouwaik and subsequently affecting fuel supplies and prices in DFA areas.
- There are likely other truck stops and holdups along the route. This location presents the largest detected truck stop.
- There had been a reduction in the number of fuel trucks detected since the start of the truce, but fuel trucks continued to be present in Rouwaik passage.
- Fuel trucks entering and departing from Ma'rib city also appeared to use Rouwaik passage.

Figure 21. Number of fuel trucks present at Rouwaik passage.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS11 Al Hazm truck stop

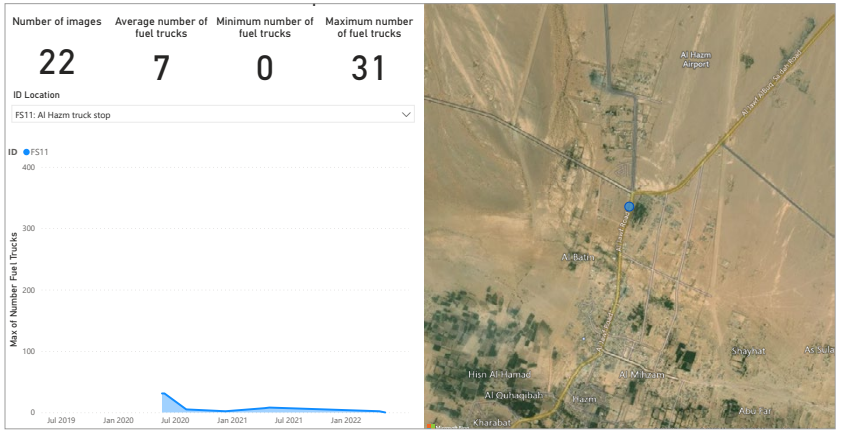
Description

- Al Hazm is the first DFA-controlled town after fuel trucks cross from IRG to DFA territory in Al Jawf. Al Hazm represents a key cog on the main overland fuel distribution routes from Aden and Mukalla to DFA areas.
- Fuel from Al Hazm would be transported to DFA-controlled Sana'a City via Amran governorate.

Key findings

- Al Hazm did not appear to be a consistent location for fuel trucks to stop at, which correlates with discussions with stakeholders.
- Between January–March 2022, it may not have been possible to see trucks at Al Hazm as anecdotal and online imagery suggests trucks were waiting at Rouwaik passage, which acted as a bottleneck.
- This information suggests that fuel trucks were held up at Rouwaik passage before reaching Al Hazm.
- The truce had not affected the number of fuel trucks present.

Figure 22. Number of fuel trucks present at Al Hazm.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS12 Sana'a storage facility truck loading area

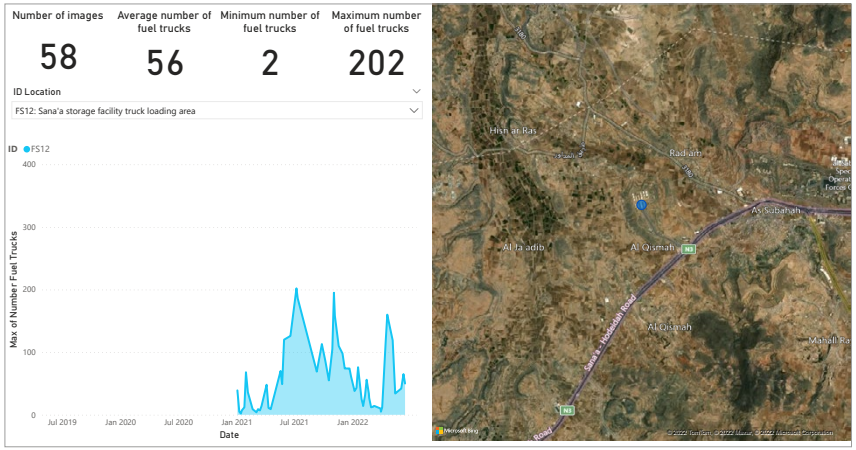
Description

- The area is the main fuel storage facility in Sana'a.
- The Sana'a storage facility was used for distribution in Sana'a city/Aminat al-Asimah and governorate.
- Fuel trucked overland from IRG to DFA areas would be sent to this storage facility, which also operated as a key sorting and onward distribution facility to other northern governorates.

Key findings

- Fuel truck peaks were detected in July and December 2021.
- The start of the truce period saw a significant increase in fuel truck activity, specifically on 20 April, likely because of fuel trucks arriving from Al Hodeidah.
- There was a decrease in fuel truck activity from May–June. This decrease may be unusual as the presence of fuel trucks during the truce period was expected to remain high because of increased imports into Al Hodeidah port.

Figure 23. Number of fuel trucks present at Sana'a storage facility.



Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)

FS13 Al Hodeidah port loading/offloading fuel depot

Description

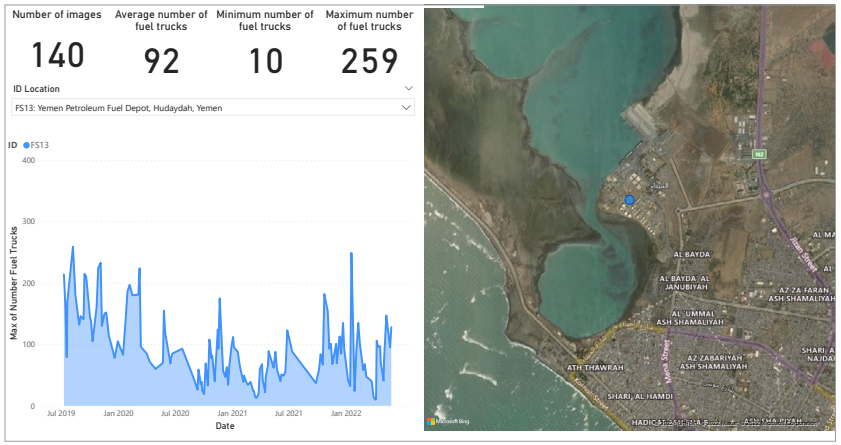
- Since 2016, a historical average of 70% of imports and 80% of humanitarian assistance have passed through the Red Sea ports of Al Hodeidah and Saleef.
- From June–October 2020 and January 2021 to April 2022, the IRG issued clearances for a limited number of fuel shipments through Al Hodeidah port.

Key findings

- Al Hodeidah port was the second-highest used port after Aden, with an average of 94 and a maximum of 259 fuel trucks present.
- There was a decline in fuel truck activity from January 2020 because of the disruption at Al Hodeidah port.
- There was an increase in fuel trucks towards the end of 2021.
- The truce period had seen an increase in fuel truck activity, but not enough to return to 2019–2020 peak levels.

Figure 24. Number of fuel trucks present at Al Hodeidah fuel depot.

Sources: Satellite Applications Catapult (accessed 11/07/2022) , Maxar (accessed 11/07/2022)



ANNEX IV. FUEL TRUCK TYPES

A number of fuel truck types are present in Yemen. Usually, large truck types are used in Yemen to move fuel between ports and governorates. The following table gives an overview of the types of trucks that have been monitored for this analysis.

Baby tankers (8,000 litres)

Make/model	DAF LF45
Plated weight (kg)	12,000
Capacity, L (g)	8,000 (1,760)
Configuration	4×2
Dimensions (L x W x H) (m)	5.88 x 2.3 x 3.2

Small tankers (12,500 litres)

Make/model	DAF LF55
Plated weight (kg)	18,000
Capacity, L (g)	12,500 (2,750)
Configuration	4×2
Dimensions (L x W x H) (m)	7.07 x 2.46 x 3.23

Six-wheel fuel tankers (18,000 litres)

Make/model	DAF FAN 75
Plated weight (kg)	26,000
Capacity, L (g)	18,000 (3,950)
Configuration	6×2 rear steer
Dimensions (L x W x H) (m)	8.84 x 2.56 x 3.5

Eight-wheel fuel tankers (23,000 litres)

Model	DAF CF85 FAD/X
Plated weight (kg)	32,000
Capacity, L (g)	23,000 (5,500)
Configuration	8×4 & 8×2
Dimensions (L x W x H) (m)	10.54 x 2.59 x 3.6

GP fuel tanker (35,000 litres)

Make/model	DAF FAD FTP
Plated weight (kg)	44,000
Capacity, L (g)	35,000 (7,698)
Configuration	6×2 + semi-trailer
Dimensions (L x W x H) (m)	15.5 x 2.59 x 3.6

The Arctics (36,000 litres)

Make/model	DAF FAD FTP
Plated weight (kg)	44,000
Capacity, L (g)	36,000 (7,918)
Configuration	6×2 + semi-trailer
Dimensions (L x W x H) (m)	15.5 x 2.59 x 3.6

Source: Extracted from Crown Oil (accessed 25/06/2022)

ANNEX V. SYNTHETIC APERTURE RADAR (SAR) DETECTION OF FUEL TRUCKS ON FS10 ROUWAIK PASSAGE

Satellite Applications Catapult used SAR satellite imagery to identify the potential routes fuel trucks were taking along Rouwaik passage.

- SAR is an active satellite sensor that transmits and receives radar pulses.
- SAR works by day and night and can penetrate clouds.
- SAR can be used to pick out large man-made objects (it especially spots ships easily as they contrast with the water that appears black).
- Copernicus Sentinel-1 SAR data is freely available and has a return period of 5–7 days, while many other optical providers are not imaging this region.

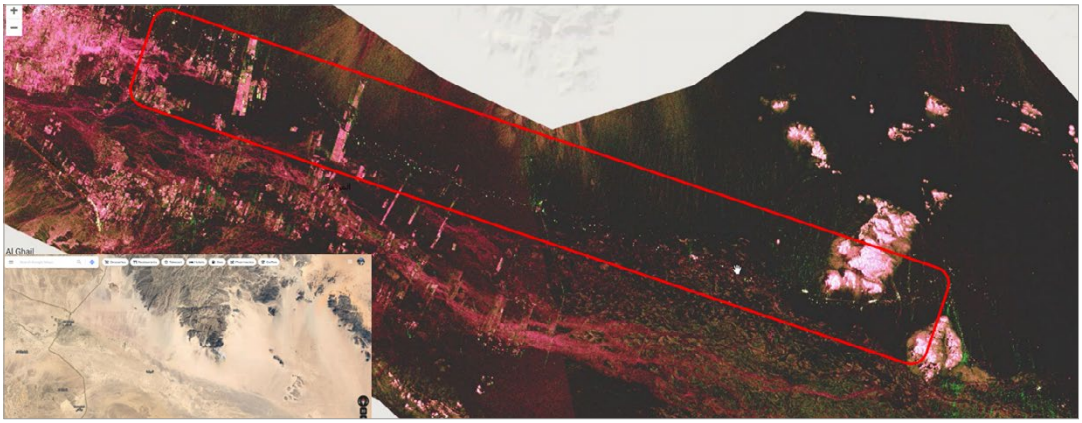
Using Google Earth Engine, it was possible to quickly investigate whether large trucks could be seen using Sentinel-1 SAR data. The methodology used is as follows:

- Using Google Earth Engine, images were filtered to include the first four months of 2022.
- By combining images, it was possible to view four months of data in one image.
- Bright white mostly depicted the rocky outcrops but also (along with bright green and magenta) the combined signal of trucks over the last four months.
- Both of the images below are from the same region.
- The high returns in this area helped locate the fuel trucks in the image below (Figure 25).
- There are a number of locations that have been confirmed as truck stops for fuel trucks, including those circled below.
- Many of these locations are not imaged regularly using high-resolution optical imagery.
- It would be beneficial to acquire some further imagery of these locations.

Figure 25. Rouwaik passage fuel stop location detected using SAR imagery.

Sources: Image date: 30th June 2022, Satellite Image © 2022 Planet Labs PBC.

Figure 26. Rouwaik passage viewed using SAR imagery.



Sources: SAR: modified Copernicus Sentinel-1 data [2022]. Optical: © CNES (2022), Distribution AIRBUS DS. Inset: Google Earth.

ANNEX VI. ROUWAIK PASSAGE MEDIA REPORTS

Before the truce, a number of media and social media reports detailed holdups within Rouwaik passage:

NAME	LINK
Rouwaik passage holdup video	https://twitter.com/alashwaly1/status/1499399191298134030
Rouwaik passage holdup article	https://alsahil.net/news17488.html
Rouwaik passage holdup article	https://almasdaronline-com.cdn.ampproject.org/c/s/almasdaronline.com/articles/245576/amp/
Rouwaik passage truck driver death	https://almasdaronline-com.cdn.ampproject.org/c/s/almasdaronline.com/articles/245801/amp/
Head of YPC Sana'a tweet	https://twitter.com/ammaraladrai/status/1498397933649154053?s=21
Head of YPC Sana'a interview	https://www.facebook.com/ypcye.OilNews/videos/533794138013715
Houthis and the fuel game	https://almasdaronline-com.cdn.ampproject.org/c/s/almasdaronline.com/articles/246090/amp/
Al Hazm holdup	https://almasdaronline-dotcom.gateway.web.tr/articles/246584

ANNEX VII. AL HODEIDAH FUEL IMPORT TIMELINE AND PERIODS OF INTEREST

PERIOD	DESCRIPTION
Pre-conflict	The price of fuel before the conflict was YER 3,500 per 20 litres, a price maintained through the subsidisation of fuel prices.
July 2015	The DFA announced the removal of fuel subsidies and liberalisation of fuel imports and distribution.
July 2018	The DFA reinstated the DFA-run YPC as the main authorised distributor in DFA areas.
October 2018	The IRG started implementing new fuel import regulations per Decree 75, announced in September 2018.
March–April 2019	There was a build-up of fuel vessels in the Coalition Holding Area after the DFA instructed Al Hodeidah fuel importers against submitting fuel import applications to the IRG Technical Office in response to Decree 75. In exchange, the DFA-run YPC covered importers' demurrage costs. There was a disruption to fuel supplied to local markets in DFA areas and a notable increase in diesel and petrol prices in weeks two and three of April 2019. The pressure that the DFA applied did not yield the desired results – i.e. the rolling back or removal of Decree 75 and continued entry of fuel via Al Hodeidah. The DFA and the YPC coordinated the increased supply of fuel to local markets in DFA areas and lower fuel prices.
July 2019	The IRG introduced Decree 49, making it obligatory for fuel importers to pay fuel import taxes and customs.
August 2019	The IRG started implementing Decree 49 alongside Decree 75 but was unable to enforce Decree 49 for Al Hodeidah fuel imports.
September 2019	There was a reduction in fuel import activity via Al Hodeidah as the YPC encouraged fuel importers to respond to Decree 49 (which the IRG implemented in August 2021).
October 2019	Following OSESGY mediation efforts, the IRG issued clearances for fuel shipments to Al Hodeidah without the imposition of Decree 49 (and without the need for payment of import taxes and customs to IRG), easing the disruption at the beginning of October 2019. Fuel prices in some DFA areas increased in weeks one and two of October 2019. OSESGY continued mediation efforts between the IRG and the DFA.
November 2019 to May 2020	OSESGY brokered the Al Hodeidah fuel import mechanism in November 2019 and saw fuel traders that imported via Al Hodeidah paying import taxes and customs into a 'special account' at the CBY branch in Al Hodeidah.
March–May 2020	Global fuel prices plummeted from March–April 2020. On 16 April 2021, the DFA announced withdrawing funds deposited in the 'special account', and the OSESGY Al Hodeidah fuel import mechanism unravelled.
June 2020	IRG suspended issuing clearances for fuel shipments via Al Hodeidah in response to DFA withdrawing funds from the 'special account' at CBY Al Hodeidah.

PERIOD	DESCRIPTION
July 2020	IRG started issuing clearances again for fuel shipments via Al Hodeidah but also encouraged fuel traders to import fuel via Aden and Mukalla. From early July to the end of September 2020, IRG adopted a strategy of issuing additional clearances for fuel imports via Aden and Mukalla ports to offset the reduced import activity via Al Hodeidah. The strategy assumed fuel would then be trucked overland from Aden and Mukalla to DFA areas. Consumers faced difficulties accessing fuel at the lower official price in DFA areas, with fuel more readily available at privately owned stations at a higher 'commercial rate'.
October–December 2020	Increased fuel volumes were imported via Al Hodeidah compared to June–September 2020. OSESGY tried to make the IRG and the DFA agree on a new Al Hodeidah fuel import mechanism.
January 2021	The IRG re-enforced its strategy of additional import clearances given to fuel traders seeking to import via Aden and Mukalla while reducing the number of clearances for fuel shipments via Al Hodeidah. The IRG enforced this strategy from January 2021 to April 2022.
December 2021	Local governing authorities in Hadramawt introduced a new diesel subsidy programme in coordination with state-run oil company PetroMasila, which operated crude oil production blocks 10, 14, 51, and 53 in Hadramawt. The diesel subsidy programme, which began on 27 December, saw a daily quota of 350,000L allocated by PetroMasila and then sold at a subsidised rate of YER 205 per litre or YER 4,100 per 20 litres at YPC-run stations across Hadramawt. (Note that the price was later lowered to YER 160 per litre but became less available in subsequent months, with consumers having to purchase diesel at a much higher commercial rate above YER 200 per litre.) IRG introduced a new import and distribution mechanism at the end of December 2021 aiming to instate the IRG-run YPC as the main distributor in IRG areas. The goal was to increase its level of oversight and management capacity for fuel imported via seaports located in IRG areas (i.e. Aden, Mukalla, and Nishtun).
January 2022	The introduction and enforcement of the new IRG fuel import and distribution mechanism saw resistance from certain importers that refused to unload shipments at Aden port. This initial resistance later subsided in the second half of January and subsequent months.
February 2022	On 24 February, Russia launched its military intervention in Ukraine. The price of crude oil (Brent crude and West Texas Intermediate [WTI]) on the international market significantly increased immediately. Following the beginning of the Russian invasion of Ukraine, the price of both petrol and diesel significantly rose in Sana'a city immediately. The fuel price hikes, however, were likely an attempt to extract additional profit from existing supplies – as opposed to being a direct result of events in Ukraine. The price of petrol and diesel also increased in IRG areas, such as Aden, but the price hikes were relatively modest compared to those in Sana'a city.
March 2022	The price of crude oil on the international market (Brent crude and WTI) surpassed USD 100 per barrel on 1 March and then peaked at USD 127.98 (Brent crude) and USD 123.70 (WTI) per barrel on 8 March 2022. In March, fuel became significantly less available in DFA areas for Yemeni households as well as for industrial and humanitarian use. This reduced availability was tied to the disruption to the overland supply route, which saw fuel trucked from Aden and (to a lesser extent) Mukalla via Rouwaik passage and Al Hazm district (both in Al Jawf governorate) and then onto Sana'a city via Amran governorate. DFA and IRG entities traded accusations on who was responsible for the disruption at Rouwaik passage and the reduced availability of fuel in DFA areas. Import data shows that high volumes of fuel continued entering the country via Aden, Mukalla, and Nishtun. Following consultations between the IRG-run YPC-Aden and fuel traders, the former indicated that it would lower its initial criteria of purchasing 100% of fuel entering via seaports in IRG areas (which was then either distributed and sold by respective YPC branches in IRG areas or sold to private distributors through local fuel brokers). Instead, they agreed for the IRG-run YPC-Aden to purchase 50% instead of 100% of each fuel shipment entering via Aden.
April–May 2022	On 2 April, a two-month UN-brokered truce came into effect – as agreed upon by the DFA, the IRG, and the Saudi-led coalition. A key component of the truce included the receipt of 18 fuel shipments via Al Hodeidah during the initial truce period (i.e. until 2 June 2022). As fuel importers looked to capitalise on the window of opportunity presented by the truce and an easing of the disruption of commercial fuel imports via Al Hodeidah, increased volumes of fuel were subsequently imported via Al Hodeidah. In contrast, imports via Aden notably decreased during April–May. The price of petrol and diesel decreased in DFA areas, with fuel becoming more available at a lower official price and the decreased disparity between the official price and commercial rate. The initiation of the truce, i.e. the honouring of the agreement to allow 18 shipments to arrive at Al Hodeidah during the initial truce period, shaped the decrease of volumes of fuel entering via Aden. The shift in import dynamics and the presence of large quantities of fuel held in storage facilities (particularly petrol or gasoline) no longer being transported overland to DFA areas led to the drop in import volumes in Aden. Another factor behind this decrease in import volumes is the reduced consumer demand as households became less able to afford the higher petrol and diesel prices resulting from the rise in international oil prices.

PERIOD	DESCRIPTION
June 2022	The UN-sponsored truce was extended for an additional two months, and fuel continued to be imported via Al Hodeidah at a much higher rate from January 2021 to April 2022 and before the truce was announced. Protests were staged in Aden in late June, in opposition to the high commercial rate of petrol and diesel in the southern coastal city and wider governorate. YPC-Aden maintained a lower official price of petrol, but this supply was scantly available for consumers.
July 2022	The DFA-run YPC raised the 'official' price of petrol (gasoline) sold at YPC stations (and privately owned stations operating as YPC agents) on 3 July 2022, from YER 12,800 per 20 litres or YER 640 per litre to YER 14,000 per 20 litres or YER 700 per litre. YPC-Sana'a also raised the price of diesel in Sana'a city from YER 15,000 per 20 litres or YER 750 per litre (USD 26.834 per 20 litres or USD 1.342 per litre] on 29 June 2022 to YER 17,500 per 20 litres or YER 875 per litre (USD 31.306 per 20 litres or USD 1.565 per litre) on 2 July 2022. In Aden, low quantities of petrol were available at the official price of YER 19,800 per 20 litres or YER 990 per litre at YPC-run stations (and agents of YPC), with consumers having to pay a higher commercial rate of YER 26,000 per 20 litres or YER 1,300 per litre. Diesel was only available at a commercial rate of YER 29,000 per 20 litres or YER 1,450 per litre.

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