ireema NEWSLETTER

*January 2022*

Supported by:

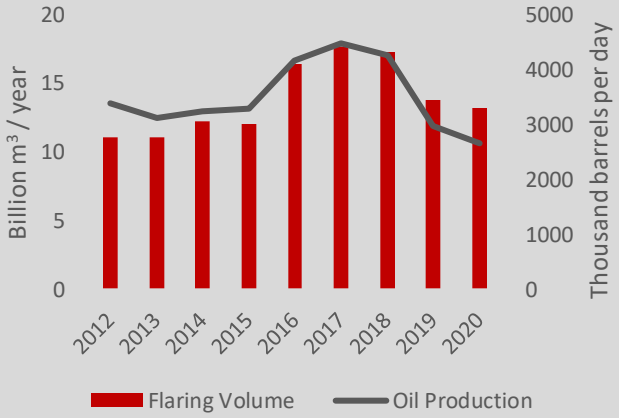
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

Supporting Iran in implementation of an integrated energy efficiency market

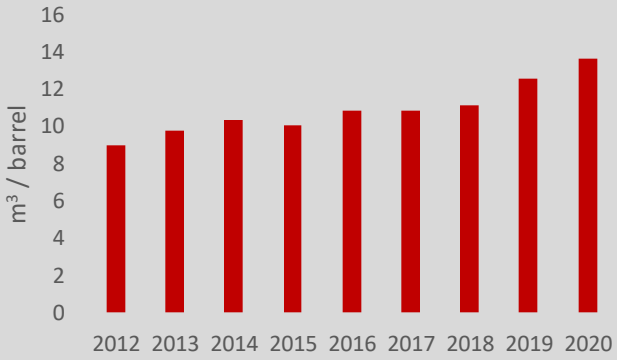
# The environmental and economic costs of gas flaring

**Figure 1: Flaring volume and oil production in Iran, 2012-2020**




Source: World Bank's 2020 Global Gas Flaring Tracker

**Figure 2: Gas Flaring Intensity in Iran, 2012-2020**




Source: World Bank's 2020 Global Gas Flaring Tracker

## Gas flaring in Iran

Routine gas flaring is a method and current practice of disposing of large unwanted amounts of associated petroleum gas (APG) during crude oil extraction. The controlled burning of gas occurs for safety, operational or commercial reasons. In 2020, Iran flared approximately 13.26 billion cubic meters of gas, placing Iran among the world's top three gas flaring countries. Only Russia and Iraq caused higher gas flaring volumes in 2020, with approximately 24.6 billion cubic meters and 17.4 billion cubic meters respectively.

While the total volume of gas flaring in Iran declined in recent years after peaking in 2018 (figure 1), gas flaring intensity increased at the same time. Between 2012 and 2020, gas flaring intensity (figure 2) increased by almost 52.1 %, from 8.96 to 13.63 cubic meters of gas per barrel of oil produced. Put differently, for every barrel of oil produced in Iran in 2020, 13 cubic meters of gas were flared. This implies that the decline in the total amount of gas flared is mainly driven by the decline in Iranian oil production in 2019 and 2020 rather than by gas flare reduction initiatives.[1]

## Environmental and health costs of gas flaring

Gas flaring causes significant environmental costs, as it releases large amounts of GHG emissions, and thus contributes to climate change. For every cubic meter of gas burnt, around 2.5 kg of $CO_2$ equivalents are emitted.[2] Iranian gas flaring accounted for approximately 33.15 million tons of $CO_2$ equivalents in 2020.

Moreover, the burning of non-refined gas is associated with the emission of sulfur oxides, which cause acid rain and thus pose a threat to the environment. Acid rain generally not only harms trees and vegetation but can also acidify the groundwater.[3] Negative environmental impacts caused by gas flaring, such as increased air pollution, can also lead to health problems in the population, which in turn translate into higher health care costs.

**Economic costs of gas flaring**

In addition to the environmental and health costs, gas flaring entails substantial economic costs. The economic costs of gas flaring are mainly opportunity costs due to lost revenue: Instead of burning the natural gas that is produced as a by-product of oil extraction, it could be collected, processed and used, thereby realizing financial and economic benefits. A recent study finds that if the annual amount of gas lost due to gas flaring would instead be used to generate electricity it could have covered almost a third of Iran's annual power demand or, put differently, it could have covered the electricity demand of roughly 25 million Iranians. [4]

Alternatively, natural gas could be used as an important raw material in the petrochemical industry or it could be conserved.[5] Compared to the environmental and health costs, the economic costs of gas flaring are easier to quantify: In 2017, for example, the value of flared gas amounted to 4.5 billion USD, under the assumption that Iran could have exported the gas to regional markets it already serves.[6]

**Technical solutions to reduce gas flaring**

Several technical solutions to reduce gas flaring already exist or are currently in development.

The traditional solution is to collect the associated gas and then feed it into the natural gas market via gas pipelines. However, this solution is typically only economically viable for operators if they can realize economies of scale by collecting large amounts of associated gas from multiple flare sites, which should be close to each other.[7]

If the flaring sites are rather remote or if no local gas market is in place, a number of small-scale technologies exist that can effectively reduce gas flaring and that are also economically viable for operators. Some of the small-scale technologies entail converting the gas directly on site. For example, the gas could be converted into electricity onsite, which could either be consumed directly or be fed into the electricity grid. Portable CNG facilities are another promising small-scale technology of converting gas onsite. The CNG technology makes it possible to compress the gas in such a way that it can be transported by trucks for short distances. Other technologies, such as small-scale gas-to-methanol or gas-to-liquids conversion plants, are currently under development.[8]

**Gas Flaring Initiatives in Iran**

There is growing awareness in Iran of the problems of gas flaring, as shown, for example, by reports from the Parliamentary Research Service and interviews with the Parliamentary Energy Commission.[9] More recently, a number of gas flaring reduction projects have been launched, which are financially supported by the government. For example, the gas flaring reduction project at the Maroon 6 site, where associated gas is transported to petrochemical factories instead of being flared, has received 36 billion IRR (850,000 USD) in funding.[10] In addition to the use of recovered gas for petrochemical plants, projects are currently being implemented in Iran in which the gas is transported to natural gas liquids factories.[11]

**Economic incentives for the reduction of gas flaring**

To reduce gas flaring in Iran, it is crucial to provide operators with economic incentives to adopt new technologies that enable them to use or convert the gas. However, energy prices are so low in Iran that there is currently little incentive for operators. Participation in the M3E could improve the economic viability of investments in these technologies, by offering operators the opportunity to sell saved energy at a higher cost. The M3E could thus play an important role in developing the huge energy efficiency potential in the PSEEZ in Assaluyeh.

*Footnotes*

1. World Bank's 2020 Global Gas Flaring Tracker
2. World Bank |Gas Flaring Explained
3. IranWire | Revealed: The True Cost of Gas Flaring to Iran's Economy
4. https://iranopendata.org/gas_flaring
5. IranWire | Revealed: The True Cost of Gas Flaring to Iran's Economy
6. Iran´s Environmentally Dangerous Gas Flaring Hits A Record High
7. World Bank |Gas Flaring Explained
8. IEA Flaring Emissions
9. See, e.g., IranWire | Revealed: The True Cost of Gas Flaring to Iran's Economy, https://khabarban.com/a/33846967
10. https://khabarban.com/a/33991766
11. IFCO, September 2021

**Authors:**
Maryam Bakhshi, Octavio Morales
**Editor:**
Dr. Lars Handrich, service@ireema.com
IREEMA c/o DIW Econ GmbH, Mohrenstraße 58, 10117 Berlin