

Is efficiency + sufficiency sufficient for Iran?

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Abstract

The Middle East will be very vulnerable to climate extremes according to different references including World Bank, and this raises urgency for more severe actions in this region, based on the decisions to stay in 1.5° C limit. Many Oil and Gas producers with some common challenges are in this region, Iran being an influential country among them who is and a member of OPEC is increasingly vulnerable to climate change.

On the other hand, Iran's high energy intensity put it as 8th place in the top 10 GHG emitters. Meanwhile economic and energy security concerns made Iran set different policies to improve its energy intensity including flaring reduction, the transition to lower carbon fuels, improvement of efficiency by implementing energy management systems in energy-intensive industries, and development of renewables. These undoubtedly have co-benefits towards reducing carbon footprints and may improve Iran's position in GHG emitting ranking.

Due to the big amount of subsidies that Iran pays for energy, the concept "Efficiency First" has not been sufficiently attractive to make it "First" during the last decades, and the government needs to act to incentivise movement towards low carbon economy. Meanwhile, different barriers like economic blockade have put limits on Iran to access to technology, capacity building facilities (including cooperation with experienced efficiency companies) and finance for improving efficiency.

Despite the barriers, the strong will to combat its carbon footprint and eminent progress in fuel switching from oil products to natural gas in different sectors exists, but political dif-

ficulties could cause a rollback in this way. On the other hand, because of the young and extensive middle class and appetite for using luxury and wasteful use of energy, paying attention to sufficiency is important too.

While being efficient has severe barriers on its way, every effort must be facilitated. The mitigation policies against climate change shall not face hurdles in any way for any country (especially Iran who has a special situation from this point of view) in a way that can adversely influence climate change. The climate impacts are something that won't stay in the borders.

Introduction

The recent years have shown that the Middle East will be very vulnerable to climate extremes and this raises its urgency for more severe actions. Some common challenges which many of important Oil and Gas producers in this region encountered are:

- All have footprints for oil and gas production especially flaring.
- As their economies mainly depend on oil and gas production, they feel climate change issues threat their markets.
- Because of owning fossil resources and resulting incomes, they are highly subsidising fossil fuels (so are involved in wasteful energy consumption severely).
- They are mainly focusing on economic development and do not consider climate change as their first priority (despite all the harms and expenses it imposes to their development – a vicious cycle!).

Iran as an important country in this region and a member of the Organization of Oil Exporting Countries (OPEC) is increasingly vulnerable to climate change and different factors have worsened its vulnerability including wars in the region, lack and mismanagements in water resources, absence of effective policies and weak implementation of the existing ones about energy consumption and lack of access to international assistance because of political sanctions.

The main adverse climate impacts that Iran suffers from are: widely spread drought, soil erosion, scarcity of fresh water, deforestation (because of occasional fires), widespread dust, and floods.

In the last years Iran recorded one of the highest temperatures witnessed on Earth and this has been in line with the strongest heatwave in the world compared with the last decades [1]. If optimistically this was a temporary peak, we can consider it as an aid for our imagination about how violent nature could be.

The world leaders have transmitted their message during the past years about climate change impacts. The key message in 2018 has been that we all need to work together for not reaching the irreversible point. UNFCCC has named 2019 as a critical year and last chance for the international community to take action.

This paper discusses the vulnerability of Iran versus climate change and the economic driver that has made it pursue its en-

ergy policies and presented the results of some efforts. Further, the hurdles to implement the policies and the possible rollbacks will be discussed. As we need all to work together in the near future years, the question that appears here is how the international community should cooperate to facilitate and reinforce the efforts of each other in this way.

Iran's Status on Energy Consumption and Carbon Emission

Iran has been among the countries with high energy intensity, and being on the top of fossil fuel subsidy payers in the world, could be one of the main reasons. Obviously, these subsidies cannot be easily removed due to multiple social and economic problems.

On the other hand, Iran's demographic growth, enhancement of urbanisation, living standards and growth of middle class has raised the demand for energy (especially in the building sector). Therefore, Iran is categorised as a developing country with plans for the development of its economy and because of its extensive middle class, despite involvement in severe economic problems, the appetite for acquisitiveness and luxury and interest for new technologies is growing [11]. This results in an increase in demand for the number of energy consuming devices, size, and duration with the increase of affluence. Improving the efficiency of energy consuming equipment does

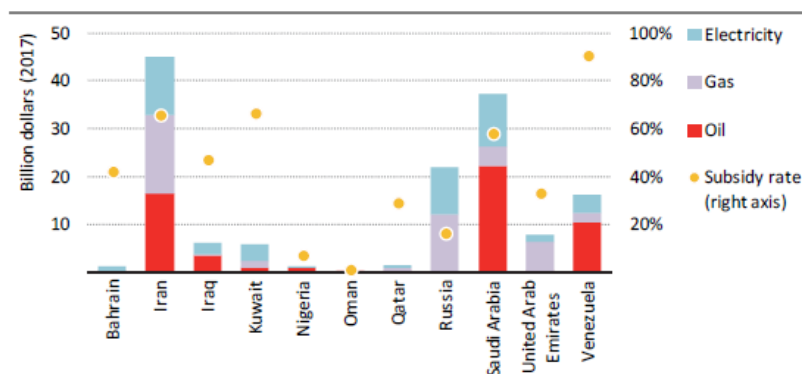


Figure 1. Estimated Value of Fossil fuel Subsidies in selected Oil and Gas producer economies, 2017, IEA [9].

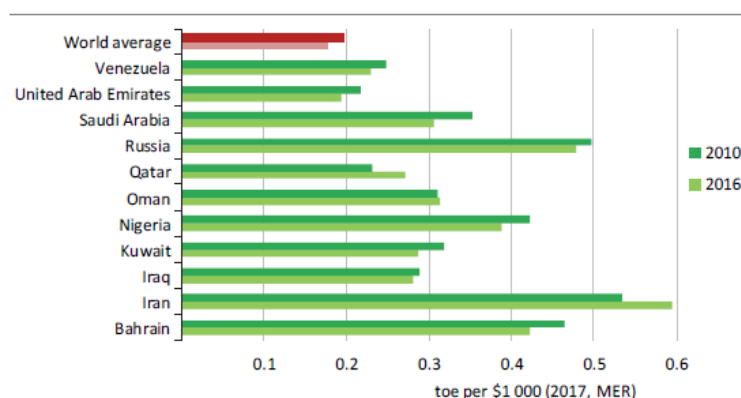


Figure 2. Energy Intensity in selected Oil and Gas producer economies, 2017, IEA [9].

not necessarily mean a reduction in absolute consumption of energy and what the world needs now is a reduction of absolute carbon emissions to stay within the agreed limits. Therefore, if we do not pay attention to sufficiency and conservation issues in the needs of young and middle-class society, all the efforts for efficiency will disappear and we will not reach to the global goals.

IRAN STATUS ON CARBON EMISSIONS AND PARIS AGREEMENT PLEDGES

From the viewpoint of GHGs, Iran ranks as the eighth emitter of GHG gases in the world and has a forecast for emission of 1,540 Mton CO₂ in 2030, so needs significant actions for reduction of its carbon footprints.

Iran has been among the countries who pledged to contribute in climate change combat by producing INDC in which committed 4 % reduction of GHGs in compare with BAU of the year 2030 (with the base year of 2010). This increases to 12 % in case of termination of sanctions against Iran and access to international assistance. This level of unconditional emission reduction has been foreseen to be achieved through the development of combined cycle power plants, transition to renewable energies and nuclear power, reduction of gas flaring emissions, increasing energy efficiency in various sectors, substituting high-carbon fuels with natural gas, strategic planning for utilising low-carbon fuels, intensifying economic diversification and participation in market-based mechanisms at the national and international levels.

UNFCCC ranks Iran under the category of vulnerable countries because of: its geographical location and economic structure. These circumstances include having: one third of the global average precipitation, three times more evaporation than the global average; having deserts per capita three times more than the global average; one-third of global average per capita for forests; high rates of soil erosion; high frequency of extreme climatic events such as floods and droughts; forest fires and outbreaks of pests and diseases such as pastures with drying Oak forests. [7]

Energy Consumption Reduction Efforts: Past, Present and Future

Having an oil-dependent economy has made Iran set different policies and law from the late 90s in terms of energy efficiency and fuel transition to improve its energy intensity. These have planned through flaring reduction, low carbon fuels transition (basically natural gas), improvement of efficiency by energy management systems implementation in energy-intensive Industries, and development of renewables.

Although the key driver for pursuing these plans have been economic and energy security benefits rather than air pollution and climate change, they will have climate co-benefits too. Policymakers believed that with the fast trend of increase in energy consumption, the country will soon reach its break-even point and will become a net importer of energy. Also, being in a position of second possessors of natural gas resources, made the decision-makers to benefit these resources for fuel transition in the transport sector and develop it in other sectors.

Some of the efforts for being resilient to these threats were:

DEVELOPMENT OF MEPS¹ STANDARDS FOR DIFFERENT APPLIANCES, EQUIPMENT, VEHICLES

The total savings of gasoline as a result of fuel efficiency standards implementation for motorcycles and light-duty vehicles from 2006 to 2015 has been: 15,017 and 26,210 million litres, respectively. These two standards have the potential to save 1 and 12 MBoe in 2021 respectively. [3]

DEVELOPMENT OF MAXIMUM ENERGY INTENSITY STANDARDS FOR ENERGY-INTENSIVE INDUSTRIES

The development of maximum energy standards include:

- **Metal Industries:** Iron and steel, aluminium, zinc and lead.
- **Oil and Gas Industries:** Oil refineries, utility plants for oil and gas refineries and petrochemicals, gas treatment plants, oil and gas transfer utilities, desalination plants, NGL plants.
- **Petrochemicals:** Petrochemical plants, ammonia, urea, aromatic, olefin, methanol and urea plants.
- **Non-Metal Industries:** cement, brick, ceramic tiles, lime, plaster, glass, tire and tubes.
- **Food Industries:** dairy, beverages and fruit juices, sugar industries, canned food.
- **Industrial Equipment:** Industrial boilers, gasoil industrial heaters, gas industrial heaters.
- **Other:** Commercial greenhouses, poultry breeding.

APPROVAL OF PERFORMANCE-BASED PROGRAMS IN DIFFERENT SECTORS

In 2014, the government decided to put incentives by different performance-based programs by fuel transition and energy efficiency in various sectors for which the investment will be payed-back by the income of selling the saved fuels. Implementation of these programs will result in:

- **Renewal of public passenger and cargo transportation,** (substitution of 17,000 urban buses with NGVs, substitution of 140,000 taxis with NGVs, hybrid or electric vehicles, renewal of 65,000 heavy cargo vehicles, high-efficiency powertrain for light-duty vehicles and replacement of 400,000 motorbikes with electric ones), promotion of rail transport (both urban and suburban).
- **Retrofit of 600,000 boiler powerhouses.**
- **Electrification of agriculture pumps** in order to control water consumption and increasing efficiency and utilising renewables (in some cases).

All these planned with modern, high efficiency, low carbon technologies. The allocated budget for these programs is approximately bUS\$23. The resulting cumulative emission reduction in the lifespan of these programs is approximately 94 Mton CO₂ equivalent.

1. Minimum Energy Performance Standard (MEPS).

IMPROVEMENT IN POWER SECTOR

Iran's average electricity generation efficiency is only 38 % [4]. In addition, transmission losses are around 13 % (some estimates show around 22 %). Iran plans to improve the efficiency of power plants in the Sixth Development Plan up to 60 %. In 2015, 25.5 TWh of savings happened by reduction of transmission losses [3]. In addition, the Ministry of Energy plans to switch to smart meters within 5 years [4].

ZERO FLARING IN OIL AND GAS FACILITIES WITHIN 5 YEARS

Iran flared 17.843 bcm of associated gas in oil and gas facilities in 2017 and was in the third position for flaring after Russia and Iraq [10]. Iran plans to gather and utilise these gasses as feedstock to petrochemical plants and gas to wire (GTW) or other utilisations in the framework of its Sixth Development Plan Act (2017–2022) [6].

Table 1 shows that Iran burned 13 % of world's flare gases in 2017. Thus, success in implementing the program will cut 45 million tonnes of carbon equivalent annually (with the assumption that no increase happens). Although Russia is in the

first rank in flaring, statistics show that it has less flaring intensity than Iran. The trend of five consecutive years in Iran shows a slight rise in flaring intensity (Figure 3).

FUEL SWITCHING TO CNG IN THE TRANSPORT SECTOR

From the year 2002 more than 4 million NGV's added to the transport sector and this put Iran in the second place after China. Therefore, this resulted in accumulated avoided consumption of 62.3 billion litres of liquid fuel, from which 3 million litres correspond to gasoil and the rest for gasoline. Until the end of 2015, Iran had 2,321 CNG refuelling stations and 73 more have been under construction. [4].

POLICIES FOR THE DEVELOPMENT OF RENEWABLE ENERGIES

Renewables are almost one per cent of installed electricity capacity in Iran and in the framework of Sixth Development Plan (which started from last year); Iran has put a program for the ramp-up of renewable, clean power plants to at least 5 % of Iran's electricity capacity. Iran has set the policy for installation of 5,000 MW by Power Purchase Agreements (PPAs) until the

Table 1. Gas Flaring Data, 2013–2017 (billion cubic meters).

		2013 bcm	2014 bcm	2015 bcm	2016 bcm	2017 bcm	2016-17 change bcm	2013-17 change bcm
1	Russia	19.9	18.3	19.6	22.4	19.9	-2.5	0.0
2	Iraq	13.3	14.0	16.2	17.7	17.8	0.1	4.6
3	Iran	11.1	12.2	12.1	16.4	17.7	1.3	6.6
4	United States	9.2	11.3	11.9	8.9	9.5	0.6	0.3
5	Algeria	8.2	8.7	9.1	9.1	8.8	-0.3	0.6
6	Nigeria	9.3	8.4	7.7	7.3	7.6	0.3	-1.7
7	Venezuela	9.3	10.0	9.3	9.3	7.0	-2.4	-2.3
8	Libya	4.1	2.9	2.6	2.4	3.9	1.6	-0.2
9	Angola	3.2	3.5	4.2	4.5	3.8	-0.7	0.6
10	Mexico	4.3	4.9	5.0	4.8	3.8	-1.0	-0.5
28	Qatar	1.4	1.3	1.1	1.1	1.0	0.0	-0.4
29	Vietnam	1.1	1.1	1.0	0.9	1.0	0.1	-0.1
30	UAE	1.2	0.9	1.0	0.8	1.0	0.1	-0.3
	Rest of world	12.5	12.8	11.1	10.0	8.4	-1.6	-4.0
	Global total	139.6	143.9	145.6	147.6	140.6	-7.1	1.0

Source: NOAA, GGFR. Rounded numbers.

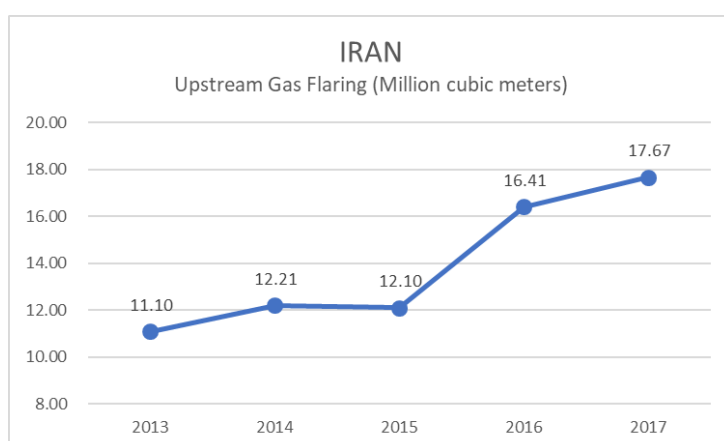


Figure 3. Upstream gas flaring trend (million cubic meters).

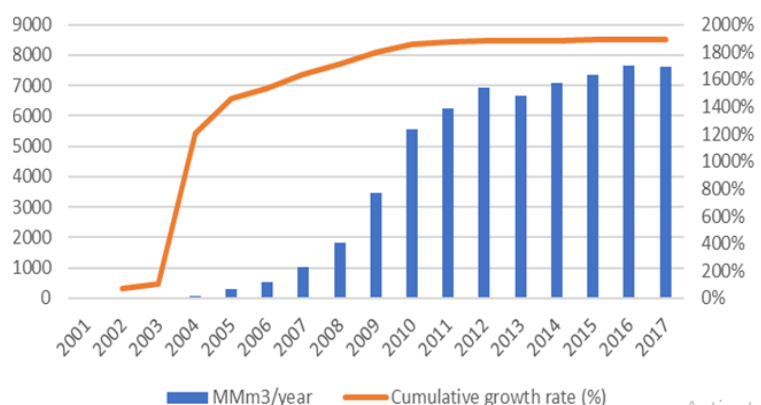


Figure 4. Status of CNG consumption and its growth in the transportation sector.

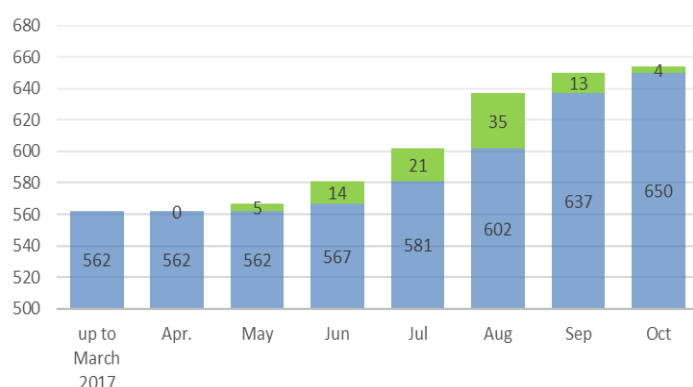


Figure 5. The trend of installation of renewables from 2017, MW.

year 2022 to profit investment of the private sector (especially foreign investors) and has increased the duration of these PPAs from five to 20 years. Until November 2018 only 654 MW of this program has been realised and 424 MW is under construction and the trend for growth has been a success.

Possible Rollbacks of Efforts

Despite all the policies and plans, during the last decades, different barriers like economic blockade have put limits on Iran to access to technology, capacity building and finance for implementing, so the progress has not realised as planned.

The McKinsey's report about One trillion opportunities in Iran [11] extensively elaborated the enhanced positive visions towards Iran for investment after Iran's nuclear deal (JCPOA²), part of which has been pointed to improvement of efficiency (specially in power generation sector), renewable energy and diversify, modernise and expand electric systems. Early exiting of the United States from this agreement put significant difficulties and risks in the way of interested investors for entering Iran's profitable market. The imposed barriers in the way of mentioned efforts could result in nullifying much of their

positive consequences and would result in possible rollbacks. This not only undoes the climate efforts but also causes frustration for contributing to global society for solving the problems. Here are some examples:

- 1. Failing in renewal of passenger and cargo transport and other performance-based programs.** In the previous section, several approved programs mentioned with significant climate, social, economic impacts and sustainable development importance. Failure in implementing these programs due to hurdles in equipment procurement and access to interested investors will have clear adverse impacts in access to these ambitious goals.
- 2. Fuel switching rollback.** Power plant sector is the top gas-oil consumer in Iran (and the top emitter of GHG). Fuel switching to natural gas, which has reached a significant point from the year 2014, caused a 40 % reduction in gas-oil consumption. If the selling of gas condensates (the by-products of natural gas production) and liquid products of oil faces difficulty because of limitations of economic blockade, it will be no choice other than decreasing natural gas production and rolling back to consumption of more carbon-intensive oil products in the power generation and energy-intensive industries. This would result in a signifi-

2. Joint Comprehensive Plan of Action (JCPOA).

cant increase in GHG emissions release and would nullify much of the former low carbon transitions.

3. **Renewable development.** Figure 5 shows the satisfactory ramp-up of renewable implementation in the framework of the Sixth Development Plan Act in shade of positive visions of foreign investors towards Iran. After JCPOA hopes existed that this trend would reach to a tipping point and realisation of the plan would happen, but economic blockade caused different foreign investors (Including the UK's Quercus and Norwegian SAGA) who planned for investment and implementation of 2.6 GW and found Iran's PPA attractive, decide to leave their former agreements. On the other hand, big fluctuation in the exchange rate of foreign currencies raised financial risk for investors that expected to gain from these PPAs and shifted the feasibility of installations.

Conclusion

Iran's demographic, social, economic and environmental structure shows its importance to take significant steps towards low carbon economy and clean energies, in form of a reduction in fossil fuel consumption and energy intensity. The main driver for Iran has been economic concerns and energy security. Iran has put ambitious policies in place to move to this direction during the last 20 years and meanwhile has been involved in combat against economic pressures and blockade. Several policies including energy efficiency, fuel transition and conservation have implemented (though not all the goals have realised). If the current plans succeed, they could blossom their immense impacts in near future.

Being the first subsidy-payer country in the world and recent economic and social pressures makes it difficult to readily remove subsidies for Iran. Therefore, expecting remarkable market-based movements towards a low carbon economy would not be feasible. In this way, the role of government will be bolder to compensate for the low energy prices and devise attractive incentives for energy consumption (and emission) reduction programs. Some of these programs have already mentioned as performance-based and renewable programs. As sanctions mainly target Iran's government, barriers for such programs will be more significant

Iran has shown a strong commitment to global society for being part of the Paris agreement and has contributed to global efforts against climate change despite all the pressures. However, the lag of realisation of policies has made barriers to sat-

isfying its commitments. For reaching climate goals, we need to reduce the absolute consumption of energy. Iran needs to reach both efficiency and sufficiency results but now is one step behind, as the recent efforts for improving efficiency and reducing GHG emissions have not fulfilled.

Recent discussions in COP24 for staying in the 1.5 degree limit requires working of all the nations together to defeat the threats against nature and life on Earth. Being efficient is necessary but surely not sufficient for combat against the adverse effects that the world encounters. If efforts of any member of global community nullifies by others in shape of hurdles like sanctions and economic blockade (with any rightful or un-rightful pretext), this not only will cause frustration but will cause failure of the global endeavours and will result in consequences that will result in suffering of all the present and future generations.

Our time is limited, the world will reach to its carbon budget in 12 years and we need to peak global emission before 2030, so we need all to work together.

We are the last generation that can stop climate change. [UN Summit.]

The impacts of failure do not stay on the borders and the world cannot afford to fail.

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