Organization of the Petroleum Exporting Countries (OPEC)

Call for Inputs by the Katowice Committee of Experts on the Impacts of the Implementation of Response Measures (KCI): Workplan Activity 5

OPEC Secretariat
Research Division
March 2022

Summary

The wide deployment of technological innovation – such as the CCS (carbon capture and storage) technologies, blue hydrogen and the CCE (circular carbon economy) platform – is a viable option, without which, the long-term climate goals of the Paris Agreement would be hard to achieve.

Besides combatting climate change, technological innovation offers wider benefits. Innovative solutions can lead to the creation of new jobs and new value-added potential. They can also contribute to the diversification of exports in energy-producing and exporting economies, while reducing the adverse impacts of climate mitigation response measures.

Technological innovation therefore offers an approach to address climate challenges, while contributing to sustainable development and economic diversification. Frameworks such as the CCE encourage countries to use all technologies, forms of energy and mitigation opportunities, in light of resource availability, capacities and national circumstances.

A scenario analysis on alternative future mitigation options shows that there is no one-size-fits-all approach and raises awareness about potential adverse impacts of climate response measures on different economies. Therefore, a coherent and inclusive approach is needed to set the world on a sustainable, more resilient and fair pathway.

The oil and gas industry can foster its resources and expertise to help unlock a low-emissions future, through its role as a powerful innovator in developing more efficient technological solutions.

Moreover, cooperative initiatives and partnerships, as well as adequate financial resources, can play a critical role in promoting technological advancement for climate action and the deployment of innovative technologies, including in developing countries.

The fulfilment of developed countries' commitments on critical issues such as climate finance, technology transfer and capacity-building in developing countries is therefore required for all countries to be able to enhance their mitigation action and reduce vulnerability to the harmful effects of climate change.

Nobody should be left behind, and all viable mitigation and adaptation measures, technological innovation, including CCS technologies, blue hydrogen and the CCE platform, enhanced investment for energy access, and improved energy efficiency must be part of the solution.

OPEC and its Member Countries advocate putting multilateralism at the centre of energy, climate and sustainable development. OPEC remains committed to the UNFCCC process, and subscribes to a sustainable path forward; one that works for all.

Workplan Activity 5: "*Build awareness and understanding of Parties and other stakeholders to assess the economic impacts of potential new industries and businesses resulting from the implementation of response measures with a view to maximizing the positive and minimizing the negative impacts of the implementation of response measures*"

– *Background*

The workplan of the forum on the impact of the implementation of response measures (forum) and its Katowice Committee of Experts on the Impacts of the Implementation of Response Measures (KCI) was adopted at COP25, in Madrid, in December 2019 (Decision 4/CP.25, 4/CMP.15, 4.CMA.2).

To carry out the activities of this six-year workplan, the forum and its KCI uses different modalities, such as receiving inputs from experts, practitioners and relevant organisations. In this context, the KCI has currently issued a call for inputs on three activities of the workplan – namely, activities 5, 9 and 11. The sixth meeting of the KCI is also planned to take place from 2–3 June 2022, in Bonn, Germany, to consider the inputs received on these three activities.

The Organization of the Petroleum Exporting Countries (OPEC) welcomes the call for inputs by the KCI in order to implement the workplan activities, and the OPEC Secretariat would like to provide its input considering activity 5: "*Build awareness and understanding of Parties and other stakeholders to assess the economic impacts of potential new industries and businesses resulting from the implementation of response measures with a view to maximizing the positive and minimizing the negative impacts of the implementation of response measures*".

As per annex II of the subject COP decision, the OPEC Secretariat will provide its input that:

a) Introduce the new/emerging industries and businesses resulting from mitigation policies and measures;

b) Describe the social and economic impacts of the new/emerging industries and businesses including short description of the method or tool used for assessment.

– ***New/emerging industries and businesses resulting from mitigation policies and measures***

Containing the global average temperature rise well below 2°C compared to pre-industrial levels requires a significant reduction of greenhouse gas (GHG) emissions into the atmosphere.

For such efforts, innovative solutions such as the CCS (*carbon capture and storage*) technologies, *blue hydrogen* and the CCE (*circular carbon economy*) platform can provide an integrated approach for emissions management and reduction to support sustainable energy systems and respond to climate targets.

The wide deployment of technological innovation is a viable option, without which, the long-term climate goals of the Paris Agreement would be hard to achieve.

i. Carbon capture and storage

Article 4.1 of the Paris Agreement refers to achieving "*a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.*"

CCS is an environmentally sound technology, which can be deployed to significantly reduce emissions in a number of energy intensive sectors (e.g. power, cement, iron and steel). The availability of CCS can also reduce the adverse impacts of the implementation of climate mitigation response measures.

CCS entails the capture of CO_2 from facilities in emission-intensive sectors – such as coal-based power generation – followed by its transport and storage in geological formations for long-term isolation from the atmosphere. For instance, three types of CO_2 capture exist for the power sector: pre-combustion, post-combustion, and oxyfuel combustion. Captured CO_2 is mainly transported by pipeline, but also by ship and road tankers.

According to the IPCC reports, the decarbonisation of the power sector is a key component of cost-effective climate mitigation actions. The share of low-emissions electricity production, including CCS, needs to increase significantly to meet a well below 2°C target. Failure to deploy and utilise the mitigation

potential of CCS could lead to increased mitigation cost. On the other hand, combining bioenergy with CCS could lead to negative emissions.

While the global storage capacity for CO_2 is huge, the utilisation of CCS is presently limited and far below what would be needed for achieving the temperature target of the Paris Agreement. Currently, there are 135 CCS facilities in different stages of development, including 27 operational and four under construction.

Different barriers hinder the full deployment of CCS – such as social, technical, institutional and financial. The estimated costs of CCS technologies differ significantly with each project, and depend on location and application. They are subject to a degree of uncertainty as well. Despite these challenges, many opportunities to overcome such barriers exist, which can bring multiple co-benefits.

Overall, CCS is considered a vital option within the range of mitigation approaches that exist for achieving a well below 2°C target. CCS can protect and create new high-value jobs, allowing countries to maintain the diversity of energy supply. Its relative importance within a country's available portfolio of mitigation actions varies depending on national circumstances. Cooperative initiatives and partnerships, as well as adequate financial resources, can play a critical role in promoting technological advancement for climate action and the deployment of CCS, including in developing countries.

CCS is already incorporated in the low GHG emission development strategies (LTSs) and the Nationally Determined Contributions (NDCs) of a number of Parties under the Paris Agreement. OPEC Member Countries, including the Kingdom of Saudi Arabia and the United Arab Emirates (UAE), have CCS in their NDCs. Three facilities in the Kingdom of Saudi Arabia and the UAE already account for 10% of global CO_2 captured each year. OPEC Member Countries are poised for a significant take-off in CCS activity by 2030.

ii. Blue hydrogen

Hydrogen can be a key energy carrier for decarbonisation in various 'hard-to-abate' sectors, particularly in industrial applications. Hydrogen and its derivatives are attractive transport fuel options as well. Hydrogen derivatives can replace fossil feedstocks for chemicals, whereas in the power sector, hydrogen may support seasonal energy storage. Hydrogen transmission can also be used to alleviate electricity grid constraints.

Besides combatting climate change, hydrogen technologies offer wider benefits. They can lead to the creation of new jobs and new value-added potential. Trading hydrogen – for example, via pipelines, chips or trucks – can also contribute to the diversification of exports in energy-producing and exporting economies, reducing the adverse impacts of climate mitigation response measures. Yet, there are some challenges that need to be overcome for every transformative application of hydrogen.

Blue hydrogen – from fossil fuels with CCS – is a novel and competitive low-emissions mitigation option. Fossil fuels are used to produce clean hydrogen, and the CO_2 emissions are captured and permanently stored. Many blue hydrogen projects are currently underway. Hydrogen is also among the key focus topics in research and development (R&D) in major economies. Pilots and research are prioritised to improve technology maturity and lower costs in various industrial sectors.

Building on the extensive experience and expertise in the oil and gas industry, energy-producing and exporting countries, such as OPEC Member Countries, have high potential for further developing hydrogen energy. Key pilot projects are already taking place in the Kingdom of Saudi Arabia and the UAE.

iii. The circular carbon economy

Acknowledging the need to reduce GHG emissions, the G20 Leaders in the Riyadh Summit have endorsed the CCE platform with its 4Rs framework (namely, reduce, reuse, recycle and remove), proposed by the Kingdom of Saudi Arabia.

The CCE is a voluntary, holistic, integrated, inclusive, pragmatic and complementary approach towards more comprehensive, resilient, sustainable and climate-friendly energy systems that support and enable sustainable development, ensuring energy access and enhancing climate action. The CCE framework encourages countries to use all technologies, forms of energy and mitigation opportunities, in light of resource availability, capacities and national circumstances.

In the CCE, the 4Rs help to develop a strategy for managing carbon. The amount of carbon that needs to be managed is reduced using energy resources that do not emit carbon (e.g. nuclear power) as well as energy efficiency measures. Biomass resources, such as trees and plants recycle carbon by drawing it from the atmosphere. These resources also derive bioenergy, whereas carbon capture and direct air capture (DAC) technologies can remove carbon from the

atmosphere. Moreover, carbon can be reused and converted to feedstock for chemicals, concrete and other building aggregates, or even fuels.

Overall, the CCE offers an approach to address climate challenges, while contributing to economic growth, sustainable development and economic diversification. It utilises all available levers to address emissions while generating value. Focusing on energy and emissions, it takes a holistic view on emissions reduction technologies, recognising the economic value of carbon and emphasising the diversity of national circumstances.

– *Socio-economic impacts of the new/emerging industries and businesses*

Taking into account the critical role of innovative technologies (e.g. CCS) for the world to achieve the long-term goals of the Paris Agreement in the context of equity and sustainable development, alternative energy transition pathways are herewith assessed focusing on efforts related to addressing the social and economic consequences and impacts of response measures.

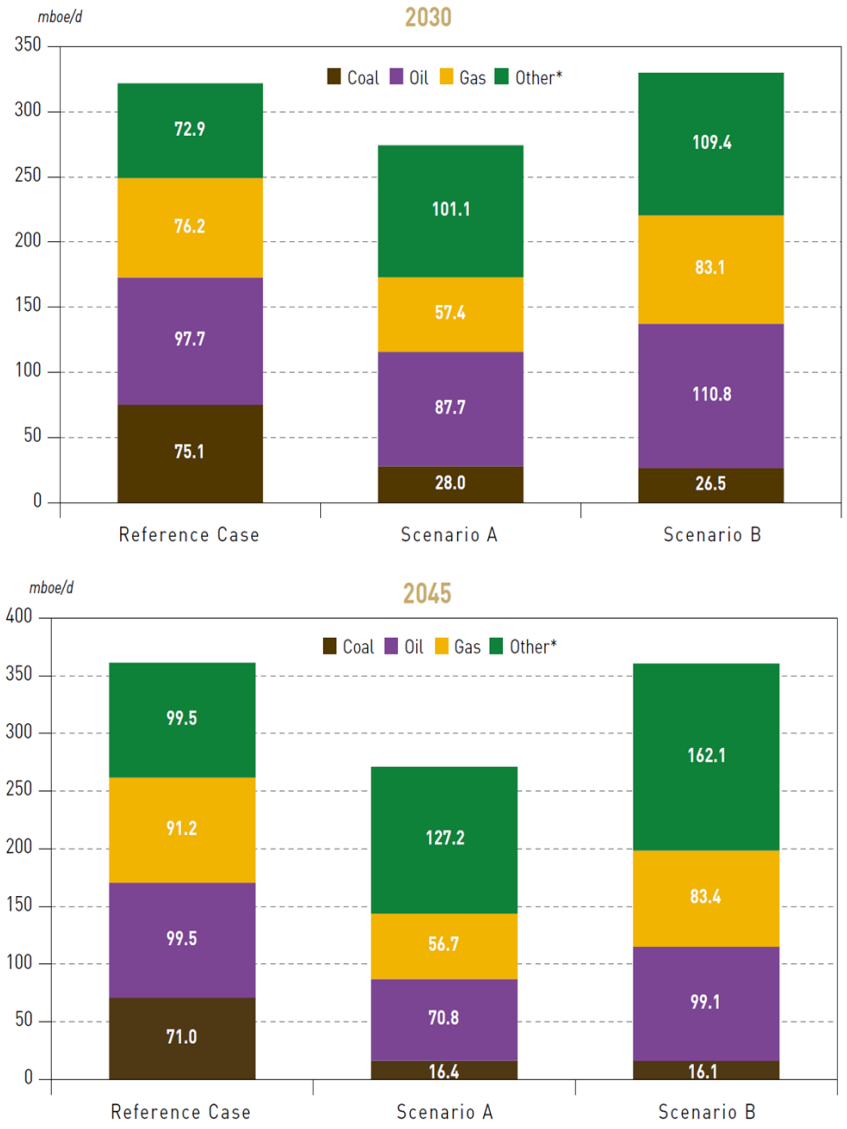
Using the Reference Case of the OPEC World Oil Outlook (WOO) as baseline, alternative scenarios are analysed, considering a portfolio of mitigation policies and measures, including improvement of energy efficiency, electrification and fuel switching with an enhanced role for renewable energy sources, material efficiency, and especially use of fossil fuels with CCS technology. The respective scenario narratives are as follows:

Scenario A assumes emission reductions are achieved by implementing mitigation actions across all sectors of the economy. Besides the development and deployment of renewable energy technologies, a global carbon price is assumed that covers all industrial sectors and power generation. In the transport sector, the current stock of vehicles is assumed to be replaced by advanced-efficiency combustion engines, hybrids and battery electric vehicles. In the industry sector, regulations lead to substantial investments in energy efficiency.

Scenario B assumes a relatively high use of hydrocarbons in the first half of the century, with the exception of coal as demand falls. Nuclear power plays a more significant role compared to Scenario A, and regulatory policies are assumed to phase out coal use in the industry sector. Advancement of CCS technologies is also assumed, with large-scale deployment of bioenergy with CCS in the second half of the century.

Mitigation actions such as those assumed in Scenarios A and B would have a differentiated impact on global primary energy demand, as illustrated in Figure 1.

Figure 1: Global primary energy demand and the energy mix in 2030 and 2045



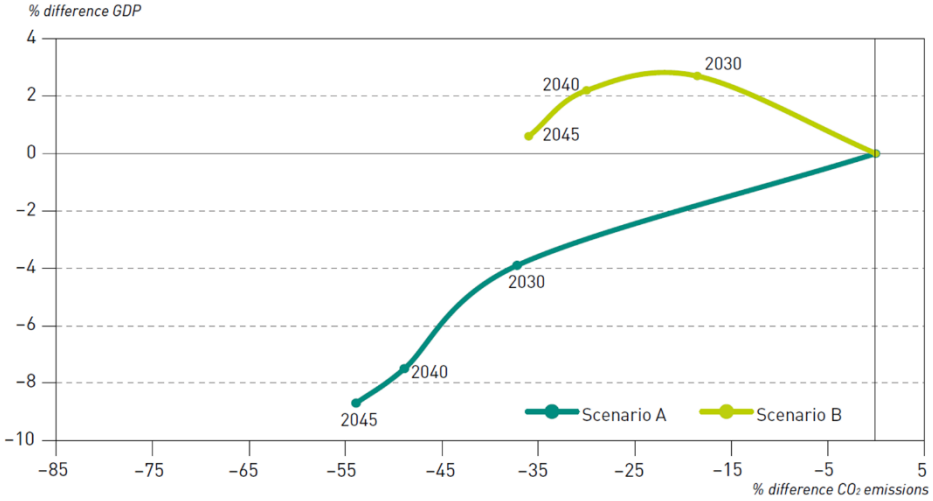
** including nuclear, hydro, biomass and other renewables (e.g. wind, solar, geothermal).*

Source: OPEC.

Given the above estimated impacts on future energy demand and the energy mix, the associated impacts on global energy-related CO_2 emissions and the GDP[1] of selected energy-exporting developing countries are presented in Figure 2 (next page).

[1] Gross domestic product.

Figure 2: Impacts on global CO_2 and GDP of selected energy-exporting developing countries, % deviation from the Reference Case



Source: OPEC.

It appears that under Scenario A, global energy-related CO_2 emissions are reduced by about 54% in 2045 compared to the Reference Case. Emissions reduction under Scenario B is at 36% in 2045. At the same time, energy-exporting developing countries could face negative impacts on their economies, owing to lower oil demand and, therefore, lower export revenues. The reduction of their GDP is observed under Scenario A, whereas a higher share of fossil fuel sources in the energy mix under Scenario B owing to innovative technologies, such as CCS, could help alleviate these potential adverse economic impacts.

Creating an enabling environment for investment in innovative technologies such as CCS, through appropriate policy and sufficient funding, should therefore be a high priority for the world to achieve the long-term goals of the Paris Agreement in the context of equity and sustainable development.

– *Concluding remarks*

The specific role of innovative solutions, such as the CCS technologies, within the broader transition to a low-emissions pathway results from their capacity to deliver timely and large-scale emission reductions and a lowering of the total abatement cost and challenges through a more effective utilisation of the existing and established asset base.

Available science acknowledges that climate mitigation action will have an impact on devaluing the natural resource endowments of energy-producing

and exporting countries, and highlights that new approaches and strategies, including CCS technologies, can help to mitigate such adverse impacts.

Similarly, the above analysis shows that there is no one-size-fits-all approach to mitigate climate change. Energy-exporting developing countries are likely to experience significant socio-economic consequences due to climate change and mitigation responses, particularly in countries whose access to finance and technology is limited. In view of such vulnerabilities, it is essential to establish or restore the very foundations of resilience and stability in their societies.

The Paris Agreement is highly relevant for the establishment of partnerships, and for providing potential cooperation modalities based on the specific needs and capabilities of every country – including countries endowed with natural resources. The SDGs[2] of the 2030 Agenda for Sustainable Development also set out a desired state of societies so that no one is left behind. Scenario analysis serves as a guide for enhancing climate action, seizing the awareness of the inequalities in terms of potential adverse impacts of climate response measures and vulnerability within societies and among countries.

A global challenge such as climate change requires a global response, while a coherent approach is needed to set the world on a sustainable, more resilient and fair pathway. Determined leadership, adequate finance, utilisation of all relevant technologies and collaboration among countries will be needed to reduce emissions, while also eliminating any adverse impacts of mitigation measures on livelihoods and societies.

The fulfilment of developed countries' commitments on critical issues such as climate finance, technology transfer and capacity-building in developing countries is therefore required for all countries to be able to enhance their mitigation action and reduce vulnerability to the harmful effects of climate change. As there is a vast gap between the support required and support provided, climate finance, in particular, should be scaled up and take into account funding requirements for both mitigation and adaptation, as well as the significant role of public finance.

Climate finance should be new, additional, adequate and predictable, ensuring a balance between support for mitigation and for adaptation in developing countries. Technology transfer and capacity-building are needed too. Capacity-building – including in the energy sector – is critical, through integrating climate change and support action to reduce emissions, adapting to its negative

[2] Sustainable development goals.

consequences, and eliminating the impacts of the implementation of response measures. Innovative solutions such as the CCS technologies, blue hydrogen and the CCE platform could provide an integrated approach for emissions management and reduction to support sustainable energy systems and respond to climate targets, while it is critical to provide support to scale up their deployment to enhance their contributions to address climate change.

Overall, inclusive processes and approaches, as well as comprehensive strategies that allow just transition and sustainable development for all, leaving no one behind, should be important components of climate mitigation action.

OPEC and its Member Countries welcome coordinated actions and inclusive approaches for all nations to collectively tackle climate change. International cooperation and identification of mitigation options that could lead to win-win solutions with environmental and socio-economic benefits are vital to ensure a fair and just transition.

Nobody should be left behind, and all viable mitigation and adaptation measures, technological innovation, including CCS technologies, blue hydrogen and the CCE platform, enhanced investment for energy access, and improved energy efficiency must be part of the solution.

This brief note presents a case study that relates to the workplan activities of the KCI on the impacts of the implementation of response measures and efforts to enhance potential synergies and reduce trade-offs. The OPEC Secretariat expresses its willingness and preparedness to collaborate with the UNFCCC Secretariat and other stakeholders supportive of the UNFCCC process on issues related to addressing the social and economic consequences and impacts of climate response measures.