

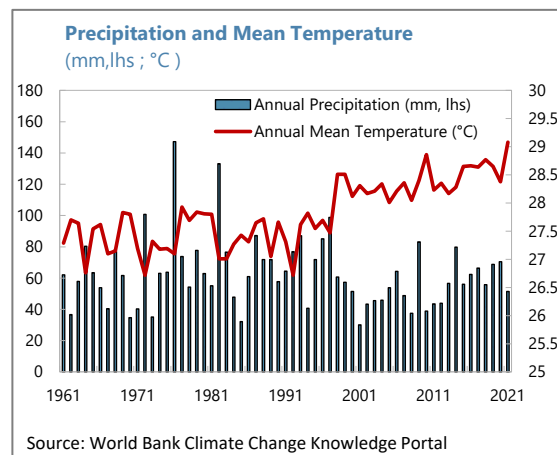
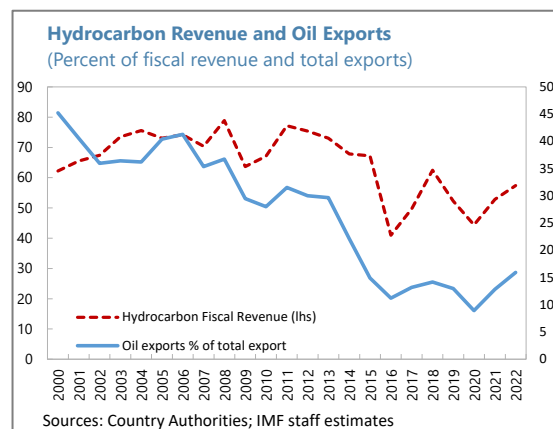
# GROWING GREEN AND SUSTAINABLE<sup>1</sup>

The UAE remains heavily reliant on hydrocarbon activity as a source of income and economic growth. As the global economy decarbonizes, the UAE faces twin challenges of reducing its reliance on hydrocarbon activity and adapting its economy and policy frameworks, including fiscal frameworks, to climate risks. The UAE announced a set of structural reforms and green investments to reduce emissions and energy intensity of the economy while diversifying it away from fossil fuels. Using the IMF's DIGNAR model<sup>2</sup> we show that green investments and reforms undertaken under the 2050 Strategies could almost double potential non-hydrocarbon GDP growth. Despite the UAE's agile approach to the energy transition, the costs are large, and the implementation need is urgent. Developing and scaling up private green and sustainable finance as well as creating an enabling environment for smooth energy transition would reduce direct fiscal costs, increase efficiency of green investments, and preserve public financial wealth while delivering on growth and Net Zero ambitions.

## A. Introduction

**1. The UAE economy is exposed to climate risks, which pose challenges for long-term growth.** As a major oil exporter, the UAE is heavily reliant on hydrocarbon activity as a source of income and economic growth. Hydrocarbon revenues amount to around 60 percent of total fiscal revenues, while oil exports are over 15.9 percent of total exports of goods and services (Text Figure). Moreover, indirect economic effects from hydrocarbon activities have a significant contribution to overall growth. As the global economy decarbonizes and demand for fossil fuels declines, the UAE faces twin challenges of reducing its reliance on hydrocarbon activity and adapting its economy and policy frameworks, including fiscal frameworks, to climate risks.

**2. Additionally, the UAE is vulnerable to the physical impacts of climate change.** With growing heat stress and rising temperatures (Text Figure), the climate risks could have significant impacts on the UAE non-oil economy and infrastructure, human health, and the natural

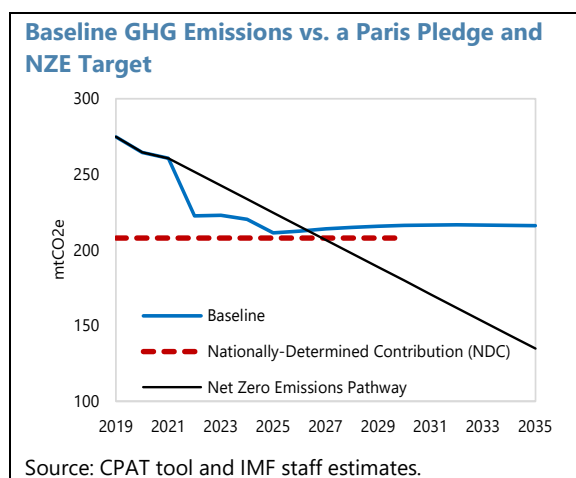


<sup>1</sup> Prepared by Yevgeniya Korniyenko and Dorothy Nampewo.

<sup>2</sup> Aligishiev, Melina and Zanna, 2021.

habitat. For example, both agriculture and urbanization have increased the pressure on non-renewable natural water sources that could result in a growing gap in water availability.<sup>3</sup> Moreover, the UAE's critical infrastructures, such as desalination and power stations, and habitats located on coastal zones, are at risk with rising sea levels. Desertification has also increased the severity of sandstorms.

**3. The authorities have set ambitious climate objectives, including achieving Net Zero emissions by 2050.** The UAE was the first country in the Middle East and North Africa (MENA) region to announce the intention to achieve Net Zero emissions by 2050. In September 2022, the UAE enhanced its voluntary climate commitment under the Paris Agreement to target a 31 percent reduction in greenhouse gas emissions by 2030 (up from 23.5 percent announced previously). The UAE Energy Strategy envisages an investment of AED 600 billion (USD 163 bn, or 52.1 percent of 2021 non-resource



GDP) in clean energy and renewables, efforts to modernize infrastructure capable to support energy transition, and increase energy efficiency to reduce energy demand.<sup>4</sup> However, NDC targets must be accelerated to reach long-term Net Zero targets, while ensuring a smooth energy transition will require sustained commitment to ongoing efforts and forward-looking policies to respond to the risks and challenges that could arise from global decarbonization efforts (UAE 2022 AIV, Box I).

**4. The UAE is committed to climate policies, but the costs are large, and the implementation need is urgent.** The UAE is already investing heavily in clean energy and renewables, implementing green building codes, and building efficient and climate resilient public transportation, among others, as detailed in its updated Second NDCs, the "2030 Agenda for Sustainable Development: Excellence in Implementation - Voluntary National Review", and in the 2021 UAE Article IV.<sup>5</sup> To deliver on climate commitments, the government is working on the UAE Pathway (launched at COP27), which envisages participation of both private and public sectors to cover large implementation needs and reduce direct fiscal costs. The intention is to prioritize low- or zero-carbon investments in projects that have a strong business case, those that require long-term implementation but have potential large gains for energy transition, and the sectors with the highest

<sup>3</sup> Agriculture sector represents about 85 percent of total water consumption.

<sup>4</sup> The UAE Energy Strategy 2050 seeks to bring the contribution of clean energy in the total energy mix from 25 percent to 50 percent by 2050, reduce the UAE's carbon footprint of power generation by 70 percent, and reduce final energy demand by 40 percent. These targets are being revised up by the authorities in line with more ambitious NDCs.

<sup>5</sup> The UAE 2021 AIV, Annex VI has a detail discussion of UAE progress on climate related SDGs and adaptation policies.

emissions and highest energy intensity.<sup>6</sup> The UAE's current approach to energy transition which maintains investments in traditional energy markets while increasing investments in greening fossil fuel extraction processes and renewables provides the balance required to deliver the desirable results while ensuring energy security.

**5. Managing the UAE's transition to a less carbon-dependent economy is expected to be a key challenge going forward.** While the UAE has made significant progress in reducing dependence on hydrocarbon revenue and exports, its CO<sub>2</sub> emissions per capita are high relative to the OECD average, while energy intensity remains significantly above world average. On the upside, the UAE's low oil extraction costs (Figure 1), substantial public financial buffers, ambitious supportive reforms and the move to facilitate green policies and finance make it more resilient to potential price declines than many other fossil fuel exporters. However, it is important to look beyond current high energy prices, as the required financing need could be larger than assessed by the government and complementary policies and significantly larger investments in clean energy and renewables might be required under a faster-than-expected global decarbonization scenario (see Box 1 and 2022 UAE AIV, Box 1).

#### Box 1. Alternative Policies to Mitigate Climate Change Challenges in UAE

*The UAE energy transition may require significantly larger front-loaded investments in green and renewable energy to stay on track to achieve Net Zero by 2050 (as discussed in 2022 UAE AIV, Box 1). This could put additional pressure on public finances, as attracting larger private capital may prove difficult in the short- to medium-term. To mitigate effects on public finances the UAE may consider alternative and supportive fiscal policies.*

**Tax policies, gradual removal of energy subsidies, and more efficient and green public financial management (PFM) frameworks could further support government efforts to ensure macroeconomic sustainability and meet energy transition challenges.** The IMF Carbon Pricing Assessment Tool (CPAT)<sup>1</sup> indicates that the UAE may need larger than announced investments in renewables by 2030 to stay on track to achieve Net Zero emissions by 2050. To contain pressure on public finances, the implementation of the Net Zero Initiative could also be achieved by a combination of policies, such as continuing investments in green and renewable energy, a gradual removal of energy subsidies, the introduction of climate PIMA, green PFM, and budget tagging system, and consideration of climate taxation.

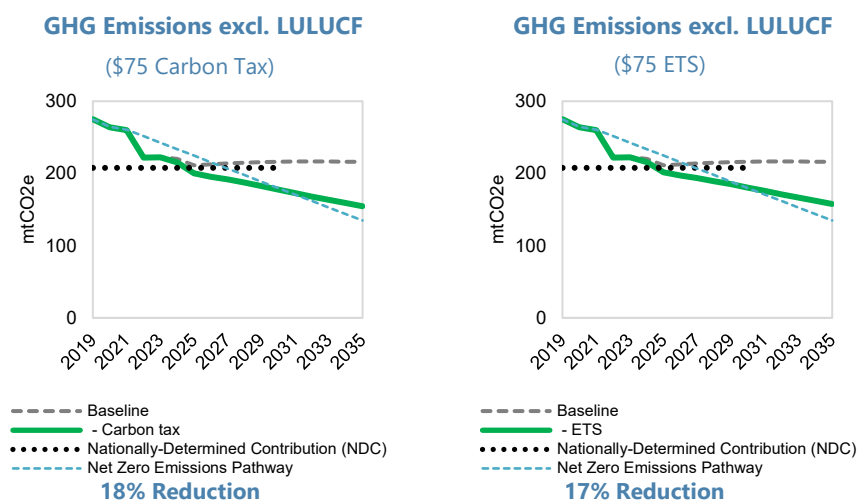
**For example, the CPAT tool shows that a carbon tax and emission trading system would be the most efficient (in addition to investment in renewables) in reducing emissions compared to other instruments.** An estimated carbon tax (or ETS emissions price) of \$75 per ton by 2030 would be consistent with UAE's intermediate emissions objectives, without other mitigation measures (Text Charts). However,

1/ CPAT is a tool which allows for rapid, country-specific analyses of carbon pricing reforms on several metrics, e.g., effects on GDP growth and employment. See Simon Black, Victor Mylonas, Ian Parry, Nate Vernon, and Karlygash Zhunussova, 2022, "Climate Policy Assessment Tool (CPAT): A Tool To Help Countries Mitigate Climate Change," IMF forthcoming.

<sup>6</sup> The highest contributions to reduction of carbon dioxide are expected to come from the electricity generation sector (66.4 percent), industry (16.6 percent), transport (9.7 percent), carbon capture, utilization, and storage (5.3 percent), and waste (2.1 percent).

### Box 1. Alternative Policies to Mitigate Climate Change Challenges in UAE (concluded)

energy subsidies and price reforms would also help to bring electricity and gas prices in line with market prices, reduce fiscal burdens by better targeting subsidies to the most vulnerable, and lower energy demand.<sup>2</sup>



Sources: IMF CPAT tool and IMF staff estimates.

2/ Subsidizing the consumption of fossil fuel has significant negative externalities that can be captured in estimates of the implicit and explicit cost of subsidies [Fossil Fuel Subsidies \(imf.org\)](https://www.imf.org/publications/workingpapers/2020/01/wpr2001).

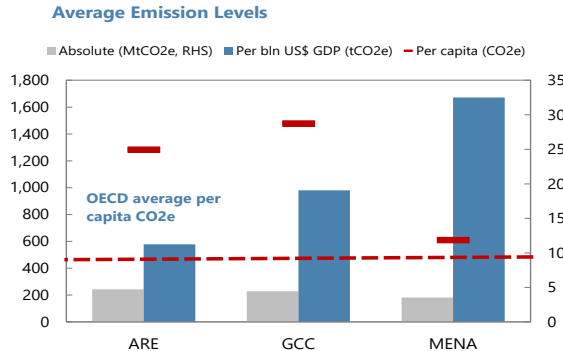
**6. This paper aims to assess the impact of green and sustainable policies on the UAE long-term potential non-oil growth.** Full implementation of announced reforms and targets under the UAE 2050 Strategies is expected to have large positive impacts on growth and diversification.<sup>7</sup> The analysis is a partial equilibrium based on the IMF's DIGNAR-19 model and Carbon Pricing Assessment Tool (CPAT). The analysis suggests that achieving the Net Zero emissions target by 2050 may require large investments in renewables and clean energy by 2030 to stay on track to achieve Net Zero emissions by 2050. This may require a combination of policies, such as those that would help to attract private capital in green projects, gradual removal of energy subsidies, the introduction of green PFM and climate-PIMA<sup>8</sup>, and consideration of climate taxation to support the transition. Investments in green and sustainable policies reinforced by successful supporting reforms' implementation have the potential to almost double the current projected medium-term non-oil GDP growth of about 4 percent and raise potential non-oil GDP growth and economic diversification in the medium -to- long-term.

<sup>7</sup> Among others, these reforms include: (i) achieving CO<sub>2</sub> emissions reduction targets set in the Second NDCs; (ii) developing green and sustainable finance; (iii) fully integrating costs and benefits of climate policies to policy frameworks; and (iv) enhancing disaster risk management strategies to deal with immediate physical risks.

<sup>8</sup> Climate Public Investment Management (PIMA) and green Public Financial Management (PFM) deliver IMF Technical Assistance to incorporate climate considerations into long-term fiscal management. See [Strengthening Governance for Climate-Responsive Public Investment \(imf.org\)](https://www.imf.org/publications/workingpapers/2020/01/wpr2001) for details.

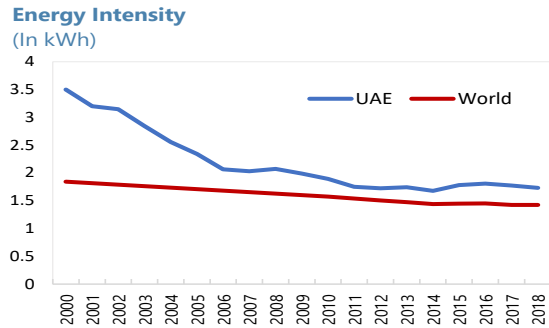
**Figure 1. Energy Transition Exposure and Resilience**

UAE CO2 emissions per capita are high relative to the OECD average...



Source: CAIT.

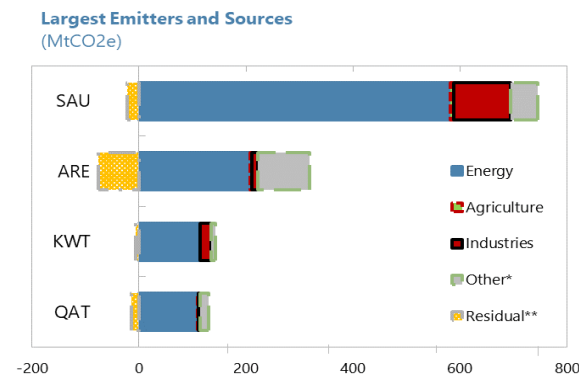
While energy intensity remains significantly above world average.



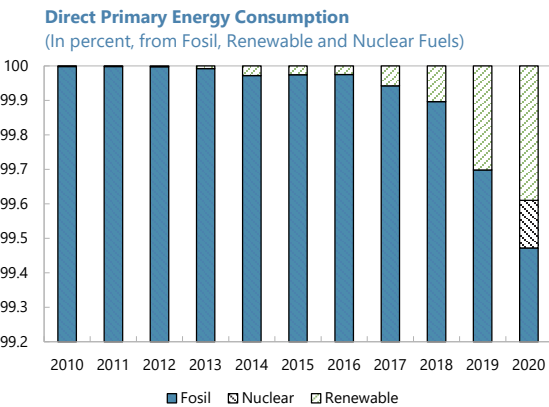
Source: World Bank, BP, and Madison Project Database.

Note: Energy intensity is measured as primary consumption per unit of gross domestic product. This is measured in kilowatt-hours per 2011 \$ (PPP).

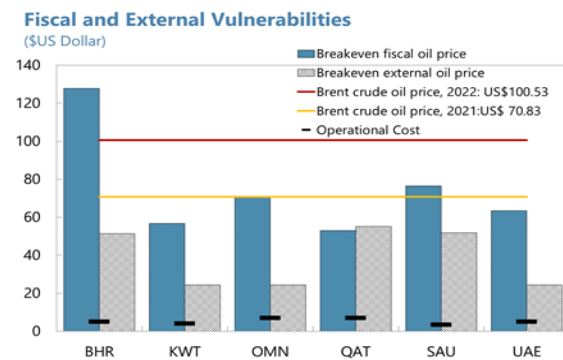
Energy sectors are the largest emitters of CO2.



The UAE's energy consumption has begun to shift toward renewables and nuclear.



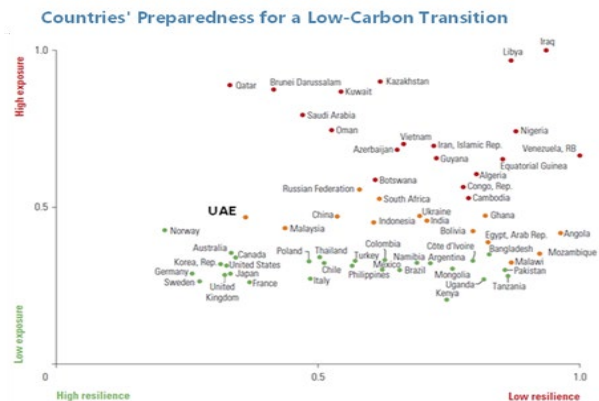
The UAE's extraction costs are low and breakeven prices are favorable.



Sources: National Authorities, Rystad Energy, IMF staff calculations.

Note: Operational Cost includes production costs (i.e., salaries, lease costs and maintenance), transport costs (e.g., processing costs and transport fees), general and administrative costs, and production tax.

The UAE is one of the least exposed to climate transition and comparatively resilient to its impacts.



Source: Based on several databases.

Note: Some likely poorly prepared countries are not in the figure because the full data sets were not available to the authors. Examples include Turkmenistan and Papua New Guinea.

Sources: CAIT, and IMF staff calculations.

**7. The rest of the paper is structured as follows: the next section discusses the literature on modelling green and sustainable policies.** A scenario assessment of the growth impacts of green and sustainable policies on UAE growth is discussed in section C, while fiscal implications of climate policies in UAE is discussed in section D. Developing and facilitating green and sustainable finance in UAE; and conclusions and further policy considerations are discussed in sections E and F, respectively.

## B. Modelling of Green and Sustainable Policies: Literature Overview

**8. Fostering green and sustainable policies helps to tackle climate challenges and contributes to sustainable long-term growth.** This would be accompanied by scaling-up investments in renewables and increasing the share of renewables in the total energy mix. Such investments have been shown to have the strongest prospects both for mitigating climate risks and replacing fossil fuels (Moriarty and Honnery, 2016). In addition, they provide potential solutions to environmental challenges (Dincer, 2000) and improve capacity to provide sustainable, cost effective, and user-friendly energy sources (Dincer and Ronsen, 1998).

**9. Energy transition would require sizeable investment that is supported by enabling policies.** Required significant green investments may necessitate tapping private sector finance (Semieniuk and Mazzucato, 2019; Bergek et al., 2013). Indeed, recent analysis concludes that financing of green polices needs to double or triple over the next years if countries are to achieve the Net Zero targets by 2050, requiring significant buffers, alternative sources of financing (Semieniuk and Mazzucato, 2019), and a supportive and enabling investment environment. However, these investments may not be attractive to private investors given the long lead times and uncertainty in returns to investments (Semieniuk and Mazzucato, 2019, Bergek et al., 2013).

**10. Innovative financing solutions for the private sector and fiscal policies could support green investments.** Alternative policies such as those designed to boost the return on green investments could help attract large scale private investors (Polzin et al, 2015). Innovative financing sources such as the issuance of green bonds (Ando et al., 20229) and carbon pricing or feed-in-tariffs have been found to have a positive and significant impact on green investments (Eyraud, Clements and Wane, 2013). In addition, policies such as boosting domestic revenue mobilization and elimination of subsidies would create fiscal space for green investment (Gurara, Melina and Zanna, 2019).

**11. Strengthening domestic public investment management policy frameworks is critical to ensuring maximum gains from green investments.** Recent analysis based on the IMF DIG and DIGNAR models, highlights how growth dividends from public investments could be adversely affected by inefficiencies in public investment. This could arise partly from low absorptive capacity due to weak public investment management frameworks (Gurara, Melina and Zanna, 2019). Strengthening public investment frameworks along with proper sequencing of public investments

<sup>9</sup> Sakai, A., Fu, C., Roch, F. and Wiriadinata, U. 2022. "Sovereign Climate Debt Instruments: An Overview of the Green and Catastrophe Bond Markets." IMF Staff Climate Note 2022/004, International Monetary Fund, Washington, DC.

would increase public investment efficiency and ensure maximum gains without exerting pressures on public resources.

**12. Green and sustainable policies are associated with higher medium-term growth and employment.** Investments in green energy are associated with high growth dividends in the medium- to -long-term. Recent analysis suggests that green and sustainable infrastructure investments have output multipliers ranging 1.1-1.5, higher than traditional infrastructure investments multipliers in the range of 0.5-0.6 (IMF, 2021). In addition, investing in low carbon energy seems to be more labor intensive than brown energy investments revealing the potential of green investments to increase employment. Garrett-Peltier (2017) find that each \$1 million shifted from brown to green energy will create a net increase of 5 jobs. Other studies have come to a similar conclusion that investments in green energy are more labor intensive than investing in brown energy (Hepburn et al., 2020; Engel and Kammen, 2009).

### C. Growth Impacts of Green and Sustainable Policies in UAE: Scenario Analysis

**13. Using the IMF’s DIGNAR-19 model, we assess the impact of the AED 600 billion planned investments in green energy under the UAE Energy Strategy 2050.** The IMF’s DIGNAR model is a partial equilibrium model designed to deliver quantitative macroeconomic assessments and policy scenario analysis in open developing economies (Aligishiev, Melina and Zanna, 2021). The modelling framework abstracts from the full input-output structure of the economy and incorporates three sectors of production that include nontraded goods, non-resource traded goods, and traded natural resources. The model also includes financially and non-financially constrained households. The government has access to several fiscal instruments (productive and unproductive expenditures and various taxes), concessional and non-concessional debt, and assumes a natural resource fund that serves as a fiscal buffer which is drawn down to cover a revenue shortfall or accumulates savings from excessive revenues. The summary of the model structure and key assumptions used for the calibration of the UAE economy are provided in Annex A.1. Using these assumptions, we consider three scenarios as detailed below.

**14. Announced green investments are assumed to deliver high growth dividends with successful implementation of the UAE’s massive reform agenda, including the Projects of the “50”.** These projects include reforms of labor and product markets, further trade and FDI liberalization, enhancing digitalization and technology advancement and fostering a sustainable energy transition.

- *Labor market reforms* including enhancement of visa policies, provision of appropriate pension schemes and safety nets (including for expatriates), support of private sector employment, continued support to female labor force participation and more efficient and inclusive investment in education and training in emerging fields would raise human capital, attract, and retain skilled labor force, and contribute to a more dynamic labor market. We assume that these reforms would lead to a 2 percent increase in labor supply relative to the baseline, consistent

with authorities' targets and in line with similar GCC countries (see for example Moreau and Aligishiev, 2022).

- *Trade and FDI liberalization and leveraging the benefits of digitalization and advancement of technology and innovation* would enhance efficiency gains and support total factor productivity while improving the business environment and attract private capital.<sup>10</sup> These combined with *reforms in public expenditure management* such as improved coordination of the fiscal framework with the UAE 2050 Strategy to fully account for green investment needs and costs; introduction of climate-PIMA and green PFM would increase public expenditure efficiency and enhance the returns on green investments. We assume that these gains would increase public expenditure efficiency by 20 percent, relative to the baseline, similar to other GCC countries (see for example Moreau and Aligishiev, 2022 for Saudi Arabia).

**15. The baseline scenario is aligned with the assumptions in the macro-framework underpinning the UAE 2022 Article IV Consultations.**

The scenario assumes that public investment would remain steady at around 10.5 percent of GDP in the long-term. It also assumes a continued implementation of the government's reform agenda, which is expected to contribute to medium-term annual non-oil GDP growth of about 4 percent. The UAE is currently pursuing reforms in the labor and product markets, trade and FDI, and digitalization (as also discussed in Chapters 1 and 2). Although these are expected to deliver gains in the short term, maximum gains would be achieved with full implementation in the medium to long term (Figure 2).

**16. The first alternative scenario considers the impact of additional green investments relative to the baseline.**

Public investment is expected to grow by an additional 2 percent of GDP per year until 2050 under the UAE Energy Strategy.<sup>11</sup> The additional increase in public investment reflects higher investments in renewables and green energy. The additional expenditure combined with partial implementation of the reform agenda is assumed to encompass both investments in renewables and "greening" of the extraction processes of fossil fuels using advanced technologies. The results indicate that this scenario would deliver non-oil GDP growth of around 6 percent in the medium- to long-term.

**17. The second alternative scenario considers the impact of additional green investments combined with full implementation of the authority's reform agenda.**<sup>12</sup>

This scenario assumes that additional investments in green energy are combined with a well-coordinated and full implementation of the reform agenda, including trade liberalization and digitalization reforms

<sup>10</sup> See SIP Chapters 1 and 2 on "Quantifying gains from trade liberalization" and "Assessing the impact of ICT investments on growth".

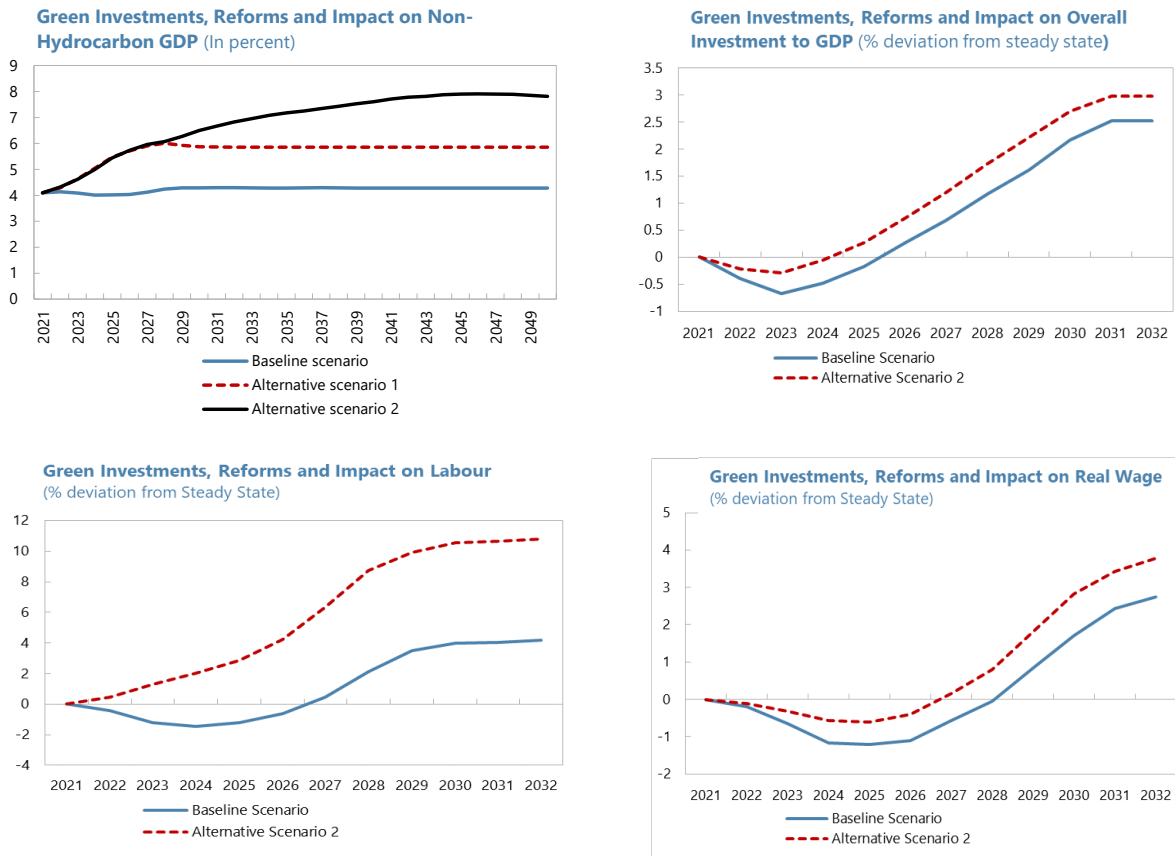
<sup>11</sup> In nominal terms, this corresponds to the AED 600 billion (USD\$ 163 billion) cumulative new investments by 2050.

<sup>12</sup> For example, in 2021-22, the UAE announced ambitious national strategies including the set of new projects and initiatives "The Project of the 50", the national plan "We The UAE 2031", Digital Strategy and the Industrial Strategy "Operation 300 bn". The UAE aims to more than double the manufacturing value added from AED 133 bn to AED 300 bn, double nominal GDP from AED 1,490 bn to AED 3,000 bn, double the contribution of the digital economy to GDP to 20 percent by 2031, generate AED 800 bn in non-oil exports, and attract over USD 150 bn FDI by 2031.



discussed in Chapters 1 and 2. The results reveal that the growth dividends under this scenario would double non-oil growth to around 8 percent by 2050. While high, the results are consistent with the relatively small share of the non-oil sector in total GDP and with findings for other GCC countries (see for example Moreau and Aligishiev, 2022 for Saudi Arabia). Our findings are also consistent with recent IMF analysis which confirms high output multipliers associated with green investments (well within the 1.1 - 1.5 range (Batini et al, 2021)).

**Figure 2. Green Investments, Reforms, and Impact on Non-Hydrocarbon GDP**



Source: IMF staff calculations.

Notes:

**Baseline Scenario:** Is aligned with the assumptions in the macro-framework underpinning the UAE 2022 Article IV consultations.

**Alternative Scenario 1:** Assumes that additional investments in green energy are expected to grow by an additional 2 percent of GDP per year until 2050 under the UAE Energy Strategy.

**Alternative Scenario 2:** Assumes that additional investments in green energy are combined with a well-coordinated and full implementation of the reform agenda. Full implementation implies that reforms are fully implemented leading to a 20% increase in public investment efficiency & return on investments, increase in skilled labor supply & private investments.

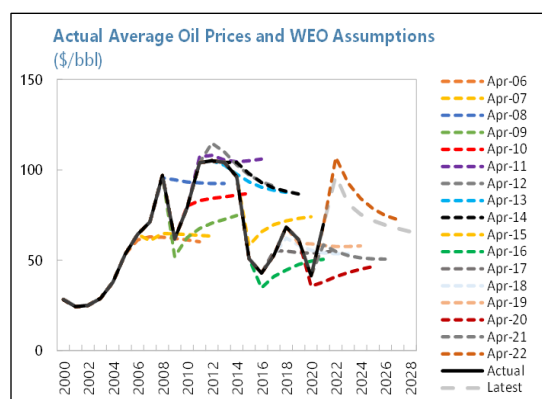
**18. Labor market reforms would enhance productivity and real wages.** Full implementation of the current labor reforms as one of the assumptions in the second alternative scenario, combined with a scale up of green energy investment would lead to an increase in labor supply by around 10 percent by 2027. At the same time real wages would increase by around 4 percent over the same period, reflecting potential gains in productivity. These findings are consistent with the literature suggesting a labor productivity payoff from low carbon energy investments (Garrett-Peltier, 2017 and Hepburn et al., 2020). The findings are also consistent with recent IMF analysis that shows a 7 percent wage premium associated with green-intensive job earns in comparison to pollution-intensive jobs (IMF 2022).

**19. A well-coordinated and prioritized reform agenda would support the growth dividend of larger green investments.** While the growth impact of additional investments would be hump-shaped, implying higher productive gains of public investments in the short-term with diminishing returns, successful implementation of the UAE's ambitious 50-year reform agenda would improve the investment climate for green energy, attract more private investment and skilled labor. The overall improvement in public investment efficiency would transform into a higher rate of return of green investment projects. These findings are consistent with the literature that reform policies would help to improve the investment climate for green energy and boost domestic and foreign investments as well as increase opportunities for growth and employment (see for example Gurara, Melina and Zanna 2019; Hepburn et al., 2020; and Engel and Kammen, 2009).

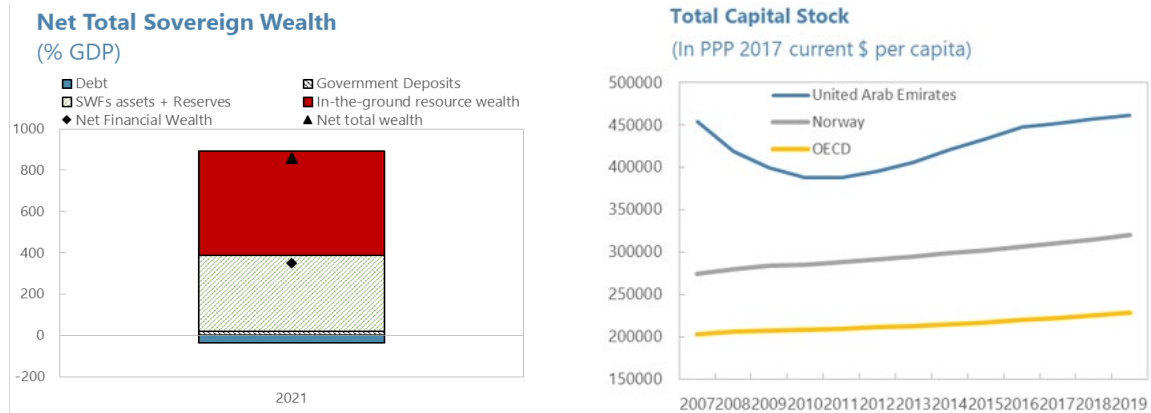
## D. Fiscal Implications of Climate Policies in UAE

**20. The UAE pursued countercyclical fiscal policy after the GFC, helping to build large fiscal buffers to support ambitious reform agenda.** The UAE has amassed significant sovereign financial assets, estimated at around 350 percent of GDP in 2021 (comparable only to Norway), while also scaling-up investments in infrastructure (Figure 3). Fiscal and structural reforms have also improved fiscal and external breakeven oil prices and led to associated improvements in fiscal vulnerabilities to oil price volatility (Figure 1). Maintaining adequate financial (stabilization) buffers should help the UAE to withstand any large and persistent shocks, including related to global decarbonization efforts. These buffers also allow for a countercyclical fiscal policy and provide ample support to the government 2050 Strategy and UAE Green Agenda.

**21. Nevertheless, volatility and unpredictability of oil prices have increased in recent years,** while fiscal buffers were tapped to first respond to the COVID-19 crisis and then provide targeted support to the most vulnerable households to shield them from recent commodity prices shock.



**Figure 3. Financial Wealth and Capital Stock**

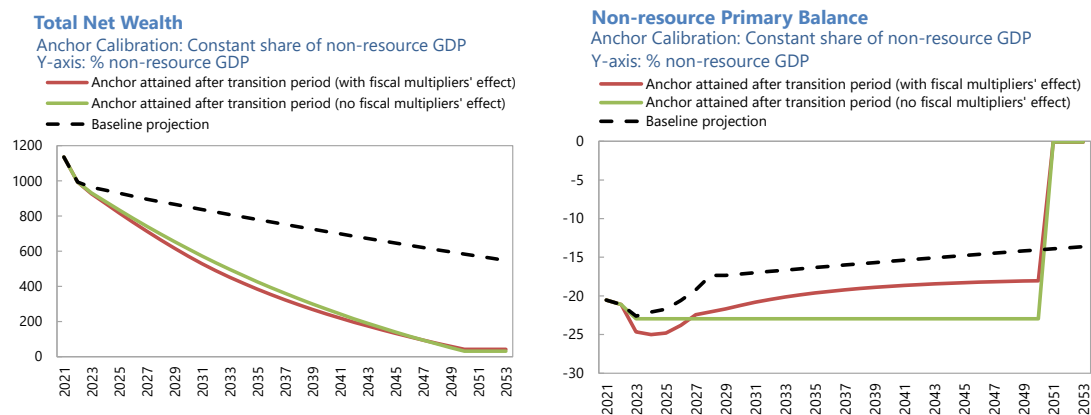


Sources: Bloomberg, Penn World Table 10.0, and IMF staff estimates.

Note: Net financial wealth is estimated based on publicly available information for total assets of CBUAE, UAE SWFs and Developmental Funds, such as Abu Dhabi Investment Authority, Investment Corporation of Dubai, Mubadala Investment Company, Abu Dhabi Developmental Holding Company, Emirates Investment Authority, Sharjah Asset Management, and Fujairah Holding.

**22. Accelerating energy transition reforms would put additional pressures on public finances.** Frontloading investments in adaptation and mitigation would mean higher non-oil primary deficits during the transition period, resulting in lower net public financial wealth (Figure 4). Alternative financing strategies (including relying more on green and sustainable private finance) would help to preserve net public financial wealth (2022 UAE AIV, Annex III). Mainstreaming private sector green finance and alternative and supporting fiscal policy options for meeting emissions goals, as well as appropriate design of these policies, could mitigate impacts on public finances.

**Figure 4. Public Finance and Energy Transition**



Sources: Country authorities and IMF staff estimates.

Note: Constant share of non-resource GDP estimates nonhydrocarbon primary balance NHPB target consistent with consumption of a constant share of non-resource GDP overtime. The frontloading scenario shown on the charts assumes additional AED 600 bn investments in renewables by 2050 that are financed by exhausting existing public financial wealth, while the NHPB adjustment is postponed to 2050. No growth benefits beyond the fiscal multiplier effects are assumed.

## E. Developing and Facilitating Green and Sustainable Finance in UAE to Support Energy Transition

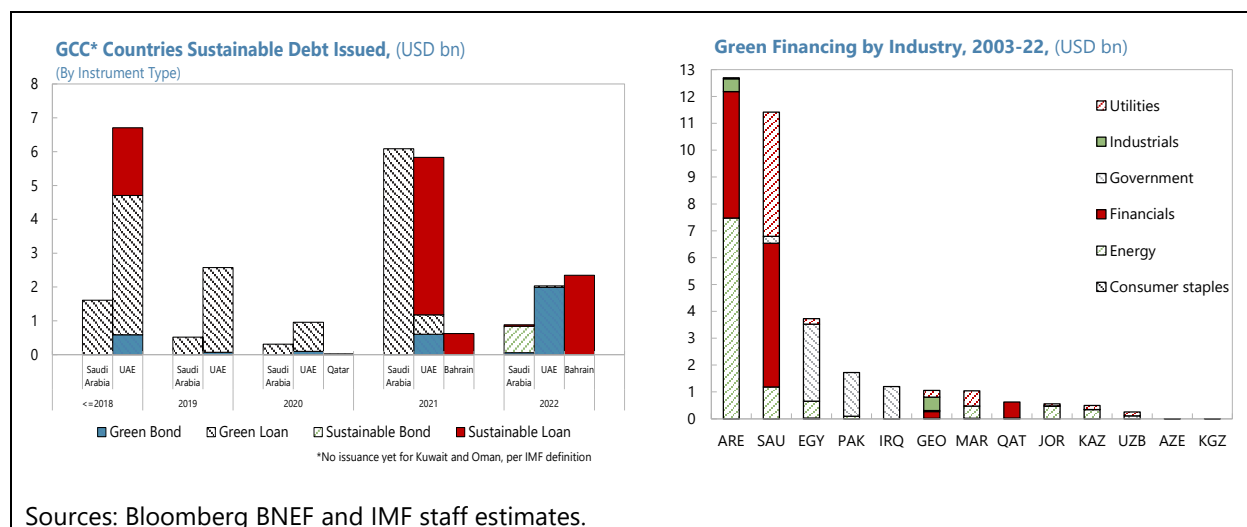
**23. The UAE has the most advanced sustainable finance framework in MENA.** The UAE Sustainable Finance Framework (SFF) 2021-2030 envisages enhancing both supply and demand of sustainable finance and strengthening the enabling environment for diversified and innovative sustainable finance products. The UAE Sustainable Finance Working Group (SFWG)<sup>13</sup> identified three actions to support the development of the nation-wide SFF: (i) strengthening consistent sustainability disclosures across UAE, (ii) fostering sustainability focused corporate governance, and (iii) developing UAE taxonomy of sustainable activities. To operationalize the SFF, the UAE Ministry of Climate Change and Environment (MoCCA) is working on defining a common green taxonomy at the sectoral level, identifying eligible green projects, and matching them with the least-cost financing instruments. Additionally, the authorities are assessing the need for targeted incentives and enhancing federal and local regulations to facilitate public-private collaboration (including PPP laws) for green projects. The UAE is also developing green finance capacity building programs to facilitate green projects implementation and setting a mechanism to monitor the initiatives, including in the financial sector.

**24. Efforts are being undertaken to green the financial system.** The CBUAE has added climate change to the list of its strategic priorities and is promoting standards in line with international best practices, focusing on risk management, stress testing, and data collection, as well as on deliverables related to the UAE taxonomy of sustainable activities. The CBUAE also supports the inter-agency work on the comprehensive response of the insurance industry to climate-related risks and opportunities. Abu Dhabi Global Market (ADGM) and DFS participate in the Network for Greening the Financial System (NGFS).<sup>14</sup>

**25. Despite the authorities' actions, sustainability considerations have only been partially mainstreamed into key businesses activities and the level of green finance remains low.** Although issuances of green and green-linked bonds and loans in the UAE have increased, volumes remain quite low relative to estimated USD 163 billion financing need. Moreover, issuances have been mostly undertaken by the energy and financial sectors, and most of the pioneering green projects in the UAE are government funded or led, with limited private-sector participation.

<sup>13</sup> The Group includes the Ministry of Finance, the Ministry of Economy, the CBUAE, the MoCCA, the Securities and Commodities Authority, the DFS Authority and the ADGM amongst others.

<sup>14</sup> The NGFS is a group of central banks and supervisors that share best practices and contribute to developing environment and climate risk tools. The ADGM Financial Services Regulatory Authority and the DFS Authority both joined NGFS in 2019. The NGFS group has 95 members with 16 observers.



## 26. The UAE could strengthen private green and sustainable finance through a number of avenues.

- *The UAE has diverse green finance products and services, with the total amount of green investments amounting to 6.8 percent of GDP (AED 80 billion<sup>15</sup>). The 2016 State of Green Finance Report identified 16 types of products and services, ranging from green transition and project financing to green auto loans, sukuks, and credit lines, among others. The UAE was the first Gulf country to issue bank and company green sukuk. In 2017, First Abu Dhabi Bank issued a green bond valued at USD 587 million; in 2019, Majid Al Futtaim, a Dubai real estate company, issued successive USD 600 million green sukuk. Since 2003, the UAE has attracted USD 13 billion in green bonds and loans.*
- *There is significant potential for the UAE SWFs to catalyze green investments. SWFs are well-suited to support green investments given their substantial assets and inter-generational focus. UAE SWFs are investing in green infrastructure assets directly or via commitments on green infrastructure funds. In 2015, the Dubai Green Fund was established to support the implementation of viable green economy projects and programs, deploying about USD 27 billion. The fund serves as seed capital to encourage private finance to climate and green energy related activities, including energy efficiency and green energy power generation. Among other examples, Abu Dhabi's Mubadala and its subsidiaries support many wind and solar projects, including in developing countries, while Mubadala's Masdar is developing the first sustainable real estate investment trust in the UAE, with the Masdar Green REIT established at ADGM. SWFs could be further used to catalyze green investments by integrating national climate strategies into their long-term investment strategies. SWFs, PPPs, and joint investments in climate-friendly projects with institutional investors and multilateral development banks could further expand financing options.*

<sup>15</sup> As identified by the 2016 State of Green Finance Report.

- *GREs, including ADNOC, could also play a key role in driving sustainable finance.* Given the prominent role of UAE GREs in the 2050 Strategies, they could offer opportunities to advance green transition.<sup>16</sup> For example, ADNOC is committed to supporting the national drive to achieve Net Zero emissions by 2050. To further reduce the intensity of its GHG emissions by 25 percent by 2030, ADNOC is investing to diversify outside its core business in new energy solutions and low carbon technologies and establishing partnerships to support the global energy transition. For example, Mubadala, ADNOC, and ADQ, established the Abu Dhabi Hydrogen Alliance to develop low-carbon green and blue hydrogen markets. ADNOC is also investing in CO<sub>2</sub> utilization capabilities and providing solutions with a broader impact by strengthening Carbon Capture Utilization and Storage (CCUS) infrastructure in the UAE.
- *Supportive climate policies, including carbon pricing, could further enhance green finance options.* A carbon trading platform is being explored by the Dubai Carbon Centre of Excellence, while ADGM is working on carbon credit markets. Market mechanisms like cap-and-trade systems and voluntary carbon markets have been shown to reduce the overall cost of emission reductions and help develop private finance. There is also an opportunity for developing a regional carbon market, potentially building on the methodologies and framework of Qatar's Global Carbon Council or the proposed Riyadh Voluntary Exchange Platform initiative.
- *Other tools, like government guarantees and risk insurance, as well as investment mechanisms could also play a role but should remain targeted.* Guarantees could support private sector investments, while risk insurance would ensure risk sharing mechanism in case of project failure.

**27. The UAE's participation in internationally coordinated platforms could further promote and scale-up green finance internationally.** For example, IRENA and the UAE announced the Energy Transition Accelerator Financing (ETAF) Platform, a new global climate finance facility to accelerate the transition to renewable energy in developing countries. To grow green finance portfolio in the context of international cooperation, the UAE might also consider enhanced participation in Debt-for-Nature and Debt-for-Climate Swaps.

## F. Conclusions and Other Policy Considerations

**28. Managing climate change challenges and energy transition policies will be key to ensuring sustainable long-term growth.** The UAE is committed to climate adaptation and mitigation policies that would ensure necessary transition of its economy away from fossil fuels. Our analysis shows that scaling up investments in clean energy and renewables while continuing to invest in the development of diversified and greener traditional energy products and markets under the UAE 2050 Energy Strategy would increase potential non-oil GDP in the medium- to long-term to 6 percent. The growth benefits could increase to about 8 percent in the medium- to long-term with

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<sup>16</sup> The 30 UAE companies are committed to stepping up their efforts to combat climate change by measuring their carbon footprint and taking concrete steps to reduce it, and by integrating sustainability principles across their operations.

full and successful implementation of the UAE ambitious reform agenda as discussed also in Chapters 1 and 2. Nevertheless, the global decarbonization could happen faster and might require additional substantial financing.

**29. Accelerating energy transition reforms could put pressure on public finances.**

Frontloading investments in adaptation and mitigation would require alternative financing strategies, including relying more on green and sustainable private finance to help preserve net public financial wealth. Mainstreaming private sector green finance, energy transition enabling environment, and alternative and supporting fiscal policy options for meeting emissions goals, as well as appropriate design of these policies, could mitigate impacts on public finances.

**30. The UAE authorities are working on addressing the identified financing challenges to mainstreaming green finance in UAE.**

This includes resolving bottlenecks such as: (i) no universal definition of ESG finance; (ii) absence of nation-wide taxonomy; (iii) the lack of adequate enforcement of policies and regulations; (iv) scarce ESG financial disclosures at the company level<sup>17</sup>; (v) high risk of green sectors; (vi) long payback period and lack of long-term finance; and (vii) lack of profitability and clarity in benefits. Lack of data and standard methodology for measurement, reporting and verification (MRV) were also considered as barriers, since it affects decision-making such as due diligence and risk assessment. Developing and disseminating consistent climate related dashboards and unified databases will promote growth of green private finance, while education and training programs will enable finance providers to better identify, assess, price, and mitigate ESG risks. A sufficient base of well-qualified lawyers and accountants would further support the growing sustainable finance sector.

**31. The UAE should continue strengthening its governance, legislative and regulatory frameworks and their enforcement to create an enabling environment for private green finance markets.**

The focus should remain on setting a coherent UAE wide set of standards for ESG products to guide investors and avoid “greenwashing.” The UAE’s nation-wide taxonomy for ESG finance, along with pipeline of well-defined green projects, will help inform investors and set a path for economic transition. The UAE’s regulators could help reinforce this initiative by enhancing legislations, removing financial and non-financial barriers, enforcing green finance rules and guidelines, boosting the capacity of the financial sector, and considering offering incentives such as preferential rates and credit allocation policies. Additionally, the nation-wide company level ESG disclosure standards should be followed, while ESG scoring methodology to assess ESG performance, industry practices, and corporate performance developed to support the industry.

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<sup>17</sup> Only few organizations headquartered in the UAE currently support Taskforce for Climate-related Financial Disclosures (TCFD).

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## Annex I. The DIGNAR-19 Model

**1. The Debt Investment Growth Natural Resources and COVID-19 (DIGNAR-19) model** is an extension of the DIGNAR model by Melina, Yang and Zanna (2014, 2016) that accommodates the effects of the COVID-19 pandemic. The model has helped inform policy analysis, based on qualitative and quantitative scenario analysis, on issues such as public investment surges, fiscal consolidations, PFM reforms and the collapse of commodity prices, among others. The model has features of the debt model of Buffie et al. (2012) and the natural resource model of Berg et al. (2013). It includes a resource fund and a range of fiscal tools, such as consumption tax, income tax, and government spending, which is further divided into consumption, investment, and transfers. The model also contains resource-abundant developing economy features, such as absorptive capacity constraint and public investment inefficiency, which makes the model suitable for analysis in resource rich countries such as the UAE (see Gurara, Melina and Zanna ,2019 for an overview of the model application).

**2. The model consists of two types of households and three production sectors.** The intertemporal optimizing households who have access to capital and financial markets and are able make future savings and the “hand to mouth” households who are poor, financially constrained and consume all their earnings. The production sectors include a nontraded good sector, a (non-resource) traded good sector, and a natural resource sector. The model further assumes that the natural resource sector is exogenous with all production in the sector assumed to be exported.

**3. The government uses revenue** from taxes, resource revenues; bond sales, and the principal and interest earnings from the resource fund to finance public consumption, public investment, transfers to households, debt service payments, and savings in the resource fund.

**4. The model also includes a resource fund** that serves as a fiscal buffer which is drawn down to cover a revenue shortfall or accumulates savings from excessive revenues. The resource fund can also be used in combination with other available fiscal tools in the model such as changing the rate of consumption or income tax, cutting, or expanding public consumption, and reducing or expanding transfers to households to cover the required public expenditure needs including public investments in line with fiscal rules there in, that allow to control the speed of fiscal adjustments needed to close the fiscal gap.

**5. The model further incorporates three main economic mechanisms for the analysis of public investment scale-up:** (i) a growth-investment nexus, (ii) a fiscal response required to maintain debt sustainability, (iii) the potential for both crowding-in and crowding-out of private investment (iv) and the potential to increase labor supply. Higher public capital is assumed to raise productivity of private factors and increases real output as specified in the equation below<sup>1</sup>:

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<sup>1</sup> See IMF (2022) for Saudi Arabia and Melina, Yang and Zanna, (2016) for details.

$$y_t = A_t(K_t^G)^{\alpha_g}(L_t)^{\alpha_N}(K_{t-1})^{1-\alpha_N}$$

where  $y_t$  is the real output of the economy;  $A_t$  is the total factor productivity;  $L_t$  is labor;  $K_t$  and  $K_t^G$  are private and public capital stock respectively.  $\alpha_g \in (0,1)$  and  $\alpha_N \in (0,1)$  are elasticities with respect to public capital and the labor share in production, respectively. The level of public capital at any given year is a sum of the stock of capital in the previous year, net of depreciation, and the new effective public investment expenditure:

$$\underbrace{K_t^G}_{\text{New public capital stock}} = \underbrace{(1-\delta)K_{t-1}^G}_{\text{Old capital after depreciation}} + \underbrace{\epsilon I_t^G}_{\text{New investment after waste}}$$

where  $I_t^G$  is the total public investment expenditure;  $\delta \in (0,1)$  is the depreciation rate; and  $\epsilon \in (0,1]$  governs the efficiency of public investment. Higher investment expenditure translates into higher capital stock, which in turn increases the marginal product of private capital. Higher marginal product of capital incentivizes the private sector to match higher public expenditure with more private investments. The strength of this crowding in effect depends on the size of the private investment adjustment costs:

$$\underbrace{K_t^G}_{\text{New public capital stock}} = \underbrace{(1-\delta)K_{t-1}^G}_{\text{Old capital after depreciation}} + \underbrace{I_t}_{\text{New investment after waste}} + \frac{\kappa}{2} \left( \frac{I_t}{I_{t-1}} - 1 \right)^2 I_t$$

*Adjustment cost*

where  $I_t$  is private investment expenditure and  $\kappa \in [0,1)$  governs the size of the adjustment cost. Higher values of  $\alpha_g$  and  $\epsilon$  increase the size of the investment multiplier, while higher values of  $\kappa$  decrease it.

**6. Calibrating DIGNAR-19 for UAE.** The DIGNAR-19 model is calibrated at an annual frequency using recent data capturing salient features of the UAE's economy. The key parameter values necessary to pin down the initial steady state are presented in Annex 1. Table 1. In some cases, parameters are calibrated in line with data provided by the IMF country team. The initial efficiency of public investment is set at 50 percent in line with the IMF's average score for the Middle East and Central Asia countries in 2017. Additional parameters are as in Aligishiev, Melina and Zanna (2021).

**Table 1. United Arab Emirates: Calibrated Parameters and Initial Values for the Steady State**  
(In percent)

Potential real non-oil GDP growth rate	4.0
Exports to GDP ratio	71.9
Imports to GDP ratio	68.7
Private investment to GDP ratio	10.5
Public investment to GDP ratio	10.5
Public consumption to GDP	11.4
Total public revenues to GDP ratio	31.0
Share of government natural resource revenues in total government revenues	55.0
Public debt to GDP ratio	29.2
Private foreign debt to GDP ratio	76.9
Share of the natural resource sector to GDP	30.0
Implied interest rate on domestic debt	5.0
Public investment efficiency	50.0/70.0
Depreciation rate of public capital	7.0
Inverse of the Frisch elasticity of labor supply (skilled)	0.5
Inverse of the Frisch elasticity of labor supply (low skilled)	0.5

Source: IMF staff calculations.