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The social, economic and employment impacts of decarbonization and green industrial growth scenarios for the Middle East and North Africa region

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Executive Summary

This report sets the MENA region in the context of an accelerating global energy transition which is driven by geopolitical, energy, security and climate concerns. With more than 100 countries having pledged a shift to renewable energy and net zero emissions by 2050, investments in low carbon technology outpaced investments into fossil fuels for the first time 2023. Driven by strong industrial policies around the world, renewable energy investments are set to reach $1.7 trillion, overtaking the $1 trillion in unabated fossil fuels (IEA 2023).

This report sets out the employment and socio-economic impacts of national and global climate policies in the MENA region. Four main findings are drawn.

First, in a global net zero emissions scenario where countries in the MENA region remain passive by-standers in the energy transition, they may face welfare losses. Under such scenario countries implement the declared Nationally Determined Contributions (NDCs) but fall short of climate neutrality. The effect on jobs is negligible but GDP by 2050 is projected to be 2.2% lower relative to a current policy baseline scenario.

Second, however, in a scenario in which MENA countries actively drive the global energy transition, significant gains in jobs and GDP may be achieved. Such scenario implies strong industrial and just transition policies in addition to enhanced climate policies. Industrial policies are in the field of green hydrogen, solar power and electric mobility, combined with Just Transition policies to enable up- and reskilling and skills training for young people in new low-carbon technologies. Social Protection and relocation programs are required for fossil fuel workers. In this scenario, employment and GDP levels are 3.5% and 4.8% higher than baseline, respectively. A net total of 6.6 million jobs are created in MENA.

Third, if in addition to strong industrial policies, MENA countries link climate to development policies and further invest into climate resilience, green water desalination, reforestation and waste management, GDP would accelerate to 7.2 % and employment to 5.3% above baseline by 2050. Such a resilience scenario also relies on strong just transition policies targeting investment in human capital, social protection and unskilled and low-income workers. This translates into just under 10 million new jobs across economic sectors created in MENA.

Fourth, employment and socio-economic impacts vary across MENA countries and sectors. Countries with a high dependency on oil and gas would be the biggest winners in a strong industrial policy scenario, but - in the absence of enhanced industrial, climate and just transition policies - also the most negatively impacted in terms of GDP and job losses. Job gains in a strong industrial policy scenario are largest in the construction and green hydrogen sectors, with some 2.8 and 1.9 million jobs created respectively, followed by motor vehicle manufacturing (1.5 million jobs) and electric engineering (900,000 jobs). Jobs losses would hit sectors in Oil and Gas/Fuel supply and Plastics industry most, with each sector requiring support to some 700,000 and 460,000 jobs respectively to reskill and transition into other occupations.

From the above results following the policy conclusions are sketched.

In the unfolding global energy transition MENA could become a new leader. With strong industrial and just transition policies in place, significant welfare gains could be achieved as compared to a business-as-usual scenario. MENA has the potential to catch up in the energy transition and pull alongside currently leading countries who are harnessing first mover advantages, clean-tech monopolies, export markets and some 13.7 million renewable energy jobs created globally. With their comparative advantage and expertise in fossil fuel energy technology, abundant renewable resources and youthful labour market,

countries in the MENA region have the potential to replicate and enact best practice green industrial and just transition policies.

This would require a shift in gear. A combination of strong industrial and climate policies matched with Just Transition policies are key to enable positive economic and labour market outcomes. The reskilling of fossil fuel workers and their social protection to ensure frictionless industrial restructuring is a precondition. Technical and vocational education and skills training for the young matched with investments into eco-innovation, incubation and green entrepreneurship would enable the restructuring and create a vibrant private sector.

Skills gaps may emerge as the MENA region is currently dominated by medium- and low skilled migrant workers. In a low-carbon transition national and migrant workers need technical and vocational training and reskilling as technologies continue to evolve and new industries which did not exist before emerge in the region. There are likely growing demands for highly skilled workers. All displaced workers in fossil fuel extraction industries, 10% of the remaining workforce in other sectors and 20% of youth are assumed to receive training. This is equivalent to a minimum of 16 million trainees in the ambitious net zero scenarios by 2050 (including 300 thousand fossil fuel workers, 7.9 million workers in other sectors and 8 million young people).

Importantly, significantly higher demands for labour mean increased opportunities for all, including marginalized groups with impacts on the distribution of jobs across sectors, age, gender and citizenship. To address potential mismatches and ensure a frictionless restructuring, targeted active labour market policies are required. They could address the region's high levels of youth unemployment, and low levels of economic participation among women. As a result, potential wage increases will improve pay for existing workers and create incentives for inactive working-age population to join the workforce. This will need to be supported by investment in training as well as additional social protection and active labour market policies.

Financing is crucial as higher productivity levels in 2050 can only be achieved with productive investments into human and clean-tech capital such as modelled in the strong industrial policy scenario. Net capital investment requirements for MENA in cumulative terms over the 2023-50 period are estimated at $10 trillion in the most ambitious net zero scenario, not including other policy costs that also require financing such as training and lost oil royalties. Domestic and international options include fiscally neutral and progressive energy tax and subsidy reforms, royalties from green hydrogen and clean energy exports, sovereign wealth funds' investments into green funds and bonds and redirection of investments from oil and gas into clean tech.

1 Introduction

1.1 Background

The Middle East and North Africa (MENA) region is a critical source of global resources due to its vast abundance of oil and gas reserves. This makes the region a key building block of the global transition towards a low-carbon economy and fulfilling the Paris Agreement to limit global temperature change to below 1.5°C by the end of the century.

Several countries of the region have already committed to being net-zero by 2050, such as United Arab Emirates and Oman, with Saudi Arabia, Kuwait and Bahrain committing to net zero by 2060. The vast majority of other countries, which have not yet committed fully to reaching net-zero, had set NDC targets to reduce carbon emissions by 2030.

There are several factors that are important to reaching the decarbonization targets that have been proposed. On the one hand, managing and setting the portfolio of the energy sector is a major issue. The countries that are part of the Gulf Cooperation Council in particular would need to diversify their energy sectors which are heavily dependent on oil production. On the other hand, to ensure a sustainable economic growth trajectory, industrial policies need to be implemented to complement energy sector policies. They would facilitate the process of economic reform and help offset potential losses linked to reduced global demand for oil and gas (which traditionally has been a critical source of income for the MENA economy).

With the backdrop of recent events, including Covid-19 and the Ukraine war which have created disruptions across the world, it is also increasingly important for countries in the region to develop a socio-economic strategy that improves social welfare and equity for their population, especially minorities and special groups of the labour force. With a diverse and growing workforce, provision of training and support to help prepare workers for the challenges and opportunities of the transition will be a key priority for the governments.

The United Arab Emirates represents the region to host the 2023 United Nations Climate Change Conference (COP28) this year and is facilitating international dialogues to develop towards a more sustainable and resilient global economy. This presents an opportunity for local policymakers to strengthen progress on climate action, map economic and social strategies, as well as to enhance cross-region collaboration in delivering its unique goals and ambitions.

1.2 Objectives

This report provides economic analysis to support the International Labour Organization (ILO) in providing policy guidance and recommendations to the MENA region on the net zero transition. The analysis has the following main objectives:

- Assess the economic and particularly jobs implications of different scenarios of the energy transition in the MENA region.
- Simulate different ‘what-if’ scenarios to indicate the range of possibilities and outcomes, particularly in envisioning a clean energy and green industrial growth trajectory to offset potential losses in oil and gas.
- Provide insights into cross-sector and cross-country dynamics that have significant policy implications.
- Highlight the potential role of policies that do not directly affect the energy system but are critical in supporting the transition, covering several elements of a ‘just’ transition.

This report focuses on the MENA economy as a whole, which is defined by the ILO as consisting of 22 countries: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Occupied Palestinian Authority, Oman, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arabs Emirates (UAE), and Yemen. Additional highlights of impacts are provided on the Arab States aggregate (consisting of 12 of the 22 MENA countries, as defined by the ILO[1]), as well as the economies of Egypt, Saudi Arabia, the UAE and Algeria and Libya.

1.3 Report structure

The rest of the report consists of three chapters describing the methodology, findings and key policy conclusions, supplemented by technical appendices.

Chapter 2 outlines the approach to the analysis, including the modelling framework, scenario narratives and assumptions.

Chapter 3 discusses the results in detail, covering the environmental and GDP impacts of the different scenarios considered in aggregate terms and detailed discussions of sectoral jobs implications for the MENA region.

Chapter 4 summarizes the main conclusions and highlights policy implications from the scenario results.

Detailed policy assumptions and results are provided in the appendices, together with a detailed description of the modelling methodology.

[1] Bahrain, Iraq, Jordan, Kuwait, Lebanon, Occupied Palestinian Authority, Oman, Qatar, Saudi Arabia, Syria, UAE and Yemen.

2 Methodology

2.1 Modelling framework

The modelling analysis is undertaken using a hybrid approach, combining simulations with Cambridge Econometrics' global macroeconomic model E3ME and linked off-model analyses to derive additional details that span outside the scope of the model.

Macroeconomic modelling

E3ME is a macroeconomic model of the world's economic and energy systems and the environment. It is widely used across the world for policy assessment and scenario analysis, particularly on the impacts of environmental and climate mitigation policy on the economy and the labour market.

E3ME allows for detailed analysis of the impact of policies and scenarios across various technologies, fuel types, and economic activities. The model accounts for 71 regions, covering the whole globe and individually modelling all G20 and major world economies. The countries that are not individually modelled are grouped in aggregate regions.

More detailed information can be found in the 1.11.1.1.1.Appendix A, moreover a technical model manual of E3ME is available online at www.e3me.com.

The regional coverage of the model is constrained by model classifications. Out of the 22 MENA countries, only a proportion is explicitly represented as single economies in E3ME. This is due to constraints on data availability and quality, as the approach undertaken in E3ME relies heavily on historical data to populate model parameters (which capture behavioural responses). To complement the modelling exercise, an off-model estimation process is therefore carried out to align the results from E3ME (covering a majority subset of MENA countries) to the full definition of the MENA region.

There are five E3ME regions that explicitly map to countries in the MENA region (which will be referred to in the rest of the report as "native MENA regions"). For these E3ME regions, the model has a representation for 44 industrial sectors (based on the NACE Rev. 2 classifications, of which ISIC Rev.4 is an international equivalent). The final list of countries included in the modelling, and in the final MENA and Arabs aggregates, is included in Table 1.

Table 1: MENA country definitions

Included in the ILO's MENA definition	Included in ILO's Arab states definition	Explicitly modelled in E3ME
Algeria		X
Bahrain	X	
Comoros		
Djibouti		
Egypt		X
Iraq	X	X
Jordan	X	
Kuwait	X	X
Lebanon	X	
Libya		X
Mauritania		
Morocco		
Occupied Palestinian Authority	X	
Oman	X	
Qatar	X	

Saudi Arabia	X	X
Somalia		
Sudan		
Syria	X	
Tunisia		
UAE	X	X
Yemen	X	

Off-model estimation

An off-model estimation process is utilized to calculate MENA and Arab state aggregates, based on the E3ME modelling results.

The calculations involve:

- Taking historical data (external to the model) on GDP, total employment, and employment by sector to estimate the proportion of the MENA region or the Arab States that is represented by the sum of countries modelled explicitly in E3ME (Algeria, Libya, Saudi Arabia, Iraq, Kuwait, Egypt and UAE).
- For GDP and employment, assuming this proportion is fixed between scenarios and over the modelled period and applying it to the E3ME results to estimate the MENA/Arab States totals.
- Total output is estimated in a similar way as GDP (from regional proportions of GDP) and then disaggregated by sector based on the sectoral distribution of employment.

This approach assumes that the countries modelled explicitly in E3ME are a fair representation of decarbonization targets and expected transition responses across the MENA region as a whole.

The external data to conduct the off-model calculations are as follows:

- GDP data are sourced from the World Bank and shares are calculated for the most recent year in which data are available for all MENA countries (2021).
- Total employment and employment by sector are sourced from the Internal Labour Organization's Labour Force Statistics (LFS) and Modelled Estimates. Similar to GDP, the most recent year of data for all MENA countries (2021) is used for the evaluation of shares.
  - For countries which are not available from the LFS dataset for the latest year of history (2021), the Modelled Estimates data (by aggregate sector) are used to adjust the LFS data (by detailed sector) for the most recent year.
  - Sectoral employment data are extracted according to ISIC 4 and ISIC 3 classifications. The broader sectoral classifications are used when ILO sector classifications consist of multiple E3ME sectors.
  - The data take into account paid employment (whether at work or with a job but not at work) and self-employment (whether at work or with an enterprise but not at work).

Scope of analysis

The analysis aims to capture the following impacts by comparing policy scenarios with the reference baseline:

- Direct economic impacts from economy-wide and sector-specific decarbonization policies (through energy system feedbacks), as well as from direct investment stimuli and financing assumptions
- Indirect economic impacts across sectors through supply chain linkages

- Induced economic impacts from household income and consumption being affected by direct and indirect impacts

Direct impacts from decarbonization policies and NDCs, combining social, economic and environmental goals and policies together, are considered as part of the modelled scenarios. The analysis excludes non-CO2 emissions, climate risks and co-benefits.

2.2 Scenario design

The modelling analysis assesses four different policy scenarios, developed in collaboration with the ILO. The scenarios were designed to answer the following questions:

- In which part of the economy (which sector) and to what extent are jobs opportunities and jobs losses likely present as a result of the transition?
- How do these impacts vary according to the level of ambition or the policy package employed?
- Will the opportunities outweigh the losses, if so, to what extent and through which channels?
- What are policy implications for the labour market as a whole and specific groups of workers?

The narrative for each scenario is the following:

1 **Current policies** – This scenario incorporates policies implemented in the MENA countries up to the end of 2022.
   - It is achieved by calibrating the E3ME baseline to external projections that include those policies (according to the IEA World Energy Outlook 2022's Stated Policies scenario).
   - This scenario also includes observed historical impacts and assumptions for recent events including Covid-19 and high energy prices as a result of the Ukraine war.
   - Minor adjustments are made, in addition to the above, to incorporate impacts of new hydrogen facilities opened recently in the region, as domestic hydrogen production capacity is not accounted for in published datasets.

2 **Nationally Determined Contributions (NDC)** – This scenario assumes countries in the MENA region deliver their unconditional NDC targets by 2030 (or conditional targets where no unconditional targets are announced, as in the case of Egypt).
   - This is achieved by implementing policies included in NDC documents into E3ME in the first instance; however, if policy details are not sufficiently provided in the NDC documents, a package of standard E3ME policies are used to mimic the same level of efforts.
   - If policy choices require to be defined outside of available documents, the following policies are combined due to them being already widely deployed as decarbonization measures across other parts of the world: carbon pricing in energy-intensive industries, fossil fuel phase-out and renewable subsidies in the power sector and economy-wide energy efficiency investment.
   - All policies are assumed to continue having an effect after 2030, although no new policy will be introduced after that point. In some regions, this means there will be continued effort towards long-term net-zero emissions targets beyond 2030 if applicable, but such net-zero targets are not achieved.
   - If only conditional targets are announced, international support is assumed (without specifying the source) to help fund policy costs according to the amount of support required as stated in policy documents.

3 **Strong Industrial Policy** – This scenario sees the region deliver net zero emissions by 2050 by scaling up all policies in the NDC scenario and adding stronger measures to facilitate the transition across the region.

- Net zero emissions is defined in terms of CO2 emissions; thus the net zero emission year (2050) is when CO2 emissions is no longer positive. All countries in the region would have different paces of decarbonization, scaled up from their current NDC ambitions. This means some countries will achieve net zero emissions earlier than 2050, and some later.
- In order to achieve net zero emissions, all countries need to overshoot their NDC targets by 2030 and together implement stronger policies immediately. The full package of standard E3ME policy instruments are used to complement existing and NDC policies. These include phasing out fossil fuels in end-use sectors, expanding carbon pricing to all sectors of the economy, increasing innovation to deploy new low-carbon technologies to market (including carbon capture and storage, power grid management and storage solutions and domestic production of green hydrogen).
- In this scenario, the region aims to diversify and replace export revenues from oil and gas by low-carbon exports, including solar-based electricity, green hydrogen and electric vehicles. This goal relies on investment in the relevant industries to build domestic capacity, which supports additional investment in other sectors.
- In addition to the support for conditional NDC targets under the NDC scenario, the region will depend on international financing for some of the required investments and for addressing incidents of stranded assets. As such, it is assumed that this financing will be made available (without specifying exactly the sources) to assist MENA countries in:
  - Compensating lost oil royalties and power sector profits from stranded assets (specifically local fossil fuel reserves and fossil fuel power plants that are forced by regulation to close before their end of life)
  - Investing in reskilling and relocation programs (for fossil fuel supply workers who are likely displaced by the transition, for the workforce to adapt to new low-carbon technologies and practices, and for young people to participate effectively in the labour market)
- All other policy costs and investments (which include renewable subsidies, investment in grid and storage, and green hydrogen production investment) are financed domestically by carbon revenues and other tax raising mechanisms (more detail included in section 2.3).

4 **Climate Resilience** – This scenario follows closely the Strong Industrial Policy scenario, with the addition of policies to build a climate-resilient economy.

- Additional policies include:
  - Enhanced waste management facilities to improve circular economy across all sectors
  - Increased recycling rates for plastics (thus reducing demand for virgin oil inputs)
  - Climate adaptation measures including desalinating seawater and reforestation
- Waste management and recycling policies are financed domestically, in the same way as decarbonization policies in the Strong Industrial Policy scenario.
- To finance climate adaptation policies, a regional fund is established. This fund is funded partly by the international community and partly by the countries in the

region themselves. The distribution of funding across MENA countries corresponds to their GDP per capita, whereas their share of benefits is determined by their level of climate vulnerability.

2.3 Model assumptions

The policy assumptions are inspired by existing policies, targets and pilot projections in the region. Currently, there is no region-wide target on climate action and other targets vary significantly across the region, with large economies being relatively more ambitious. Most quantified targets also only emphasize the decarbonization of the energy system, although some countries have started to explore other areas (e.g. social and industrial policies) and set up pilot projects or country-specific targets. While the majority of policies so far have been implemented at the national level, a few regional policies (e.g. the Middle East Green Initiative) have been set up to facilitate cross-country collaboration.

1.11.1.1.1.Appendix B lists specific targets for each of the MENA constituent countries/regions present in E3ME according to each country's NDCs and other announcements. These targets cover a variety of indicators including emission reductions, energy mix and demand, adoption of electric vehicles, and waste management. An interpretation of the targets for the modelling exercise is also provided in the appendix.

Key policies included in the modelling exercises can be organized by the following groups:

1 Energy policies

- Carbon pricing
- Investment in economy-wide energy efficiency
- Investment in grid improvements and (battery and hydrogen) storage solutions
- Investment in renewable power generation, particularly wind and solar, to replace fossil fuels-based generation
- Government subsidies for renewable and low-carbon technologies in power generation (for wind and CCS) and steel production (for electricity, hydrogen and CCS applications)
- Regulation to phase out fossil fuels from the power sector and to replace fossil fuels with electricity or biofuels in the rest of the economy

2 Industrial policies

- Investment in domestic production and export of green hydrogen and solar-based electricity, to offset lost revenues in oil and gas
- Investment in domestic manufacturing and export of electric vehicles

3 Labour market policies

- Workforce reskilling and upskilling
- Youth training

4 Social and adaptation policies

- Investment in recycling and waste management
- Investment in water desalination
- Reforestation

5 Financing mechanisms

- Recycling of carbon revenues to fund transition-related investments and policy costs borne by governments, with excess revenue being distributed to firms and

households (through employer's social security contribution rate, VAT and income tax) and shortfall in revenues being covered by increases in the same tax instruments

- Private financing, from industries within each country and outside of the region
- International support channels between countries within the MENA region

The detailed assumptions for each scenario including the source of the data and/or information that they are based on are provided in 1.11.1.1.1.Appendix B.

2.4 Strengths and limitations

E3ME's key strengths for supporting this analysis are:

- The close integration of the economy, energy systems and the environment, with two-way linkages between each component
- The econometric approach, which provides a strong empirical basis for the model and means it is not reliant on some of the restrictive assumptions common to Computable General Equilibrium (CGE) models
- The econometric specification of the model, making it suitable for short and medium-term assessment, as well as longer-term trends
- A high level of disaggregation, enabling detailed analysis of sectoral effects across a wide range of scenarios. The model captures individual country dynamics as well as interactions with other regions of the global economy.
- A wide range of climate policy options are available including regulations, taxes, tariffs and subsidies, especially for the largest emitters in the economy (power, steel, road transport and residential buildings) which also feature a detailed representation of technology diffusion
- The shift of focus away from determining a least-cost policy implementation and towards identifying potential opportunities and trade-offs arising from decarbonization.

On the other hand, there are a number of limitations to the analysis:

- As with any modelling tool, E3ME is an imperfect representation of reality. Gaps in the data and an inability to predict the future both contribute to uncertainty in the model results. Given the diverse characteristics of the economy and energy system, it is not technically possible to account precisely for every possible energy source and technology in each sector. For example, the model accounts for seasonal variations, implied demand for backup generation and storage and technological constraints in the MENA context to determine the technology mix, but it does not fully capture detailed power grid balancing requirements (which can only be accounted for using real time hourly data).
- The analysis focuses on evaluating the socioeconomic impacts of increased climate action with some consideration for costs, savings and trade-offs. It does not quantify avoided climate-related physical damages (the cost of inaction) and co-benefits (from improved environmental outcomes), both of which would add more incentives to accelerate the low-carbon transition.
- The quality of the data used in the modelling is very important. Substantial resources are put into maintaining the E3ME database and filling out gaps in the data. However, particularly in countries such as the MENA countries, there is some uncertainty in results due to the data used. In addition, there is uncertainty about the target assumptions used in the scenarios, which are formed outside of the model based on the best available information in the public domain. The modelling results therefore are

simulation results to estimate the range of possible economic outcomes associated with modelled policies or changes in the economy, rather than forecasts of likely scenarios.

3 Findings

3.1 Progress towards decarbonization targets

In the **NDC** scenario, total CO2 emissions for Algeria, Libya, Saudi Arabia, Iraq, Kuwait, Egypt and UAE are expected to fall by 16% by 2030 relative to the Current Policies baseline (45% by 2050). There is a gradual uptake in renewables after 2030, but the region still has heavy reliance on oil and gas (with a small share of gas with CCS before 2030). Saudi Arabia drives renewables deployment in the region, followed by Egypt and UAE.

In this scenario, targets for 2030 are largely met except:

- Saudi Arabia falls short on emissions reductions and renewable targets (implying that current targets may be more ambitious than implied by progress to date).
- UAE falls short on power and transport emissions targets but meets the renewable target. Similar to Saudi Arabia, this may be due to incompatibility between current targets and recent progress.

Error! Reference source not found. provides a high-level assessment of simulated progress towards 2030 decarbonization targets for selected indicators.

Table 2: Assessment of MENA decarbonization targets in 2030

Indicator	Region	Target	Baseline	NDC	Strong Industrial Policy	Climate Resilience
CO2 emissions reduction (2030)	Algeria and Libya	7% reduction relative to baseline	-	10%	32%	33%
	Egypt	7% reduction relative to baseline in transport, 33% in electricity	-	9%	27%	27%
	Saudi Arabia	42% reduction relative to baseline	-	36%	45%	46%
	UAE	40% reduction relative to baseline	-	33%	48%	51%
	Sum of the above	-	-	16%	31%	32%
Renewable shares in electricity supply (2030)	Algeria and Libya	20% of generation	3%	21%	25%	36%
	Egypt	42% of generation by 2035	20% (2035)	42% (2035)	63% (2035)	61% (2035)

Indicator	Region	Target	Baseline	NDC	Strong Industrial Policy	Climate Resilience
	Saudi Arabia	50% of generation	8%	45%	58%	62%
	UAE	30% of capacity	36%	30%	55%	69%
	Native MENA regions	-	Capacity: 15% Generation: 7%	Capacity: 44% Generation: 23%	Capacity: 57% Generation: 32%	Capacity: 62% Generation: 36%
Net zero emissions	Saudi Arabia	Net zero by 2060	-	-	-	Net zero by 2050 (with LULUCF)
	UAE	Net zero by 2050	-	-	-	-
	Sum of the above	-	-	-	-	Net zero by 2050 (with LULUCF)

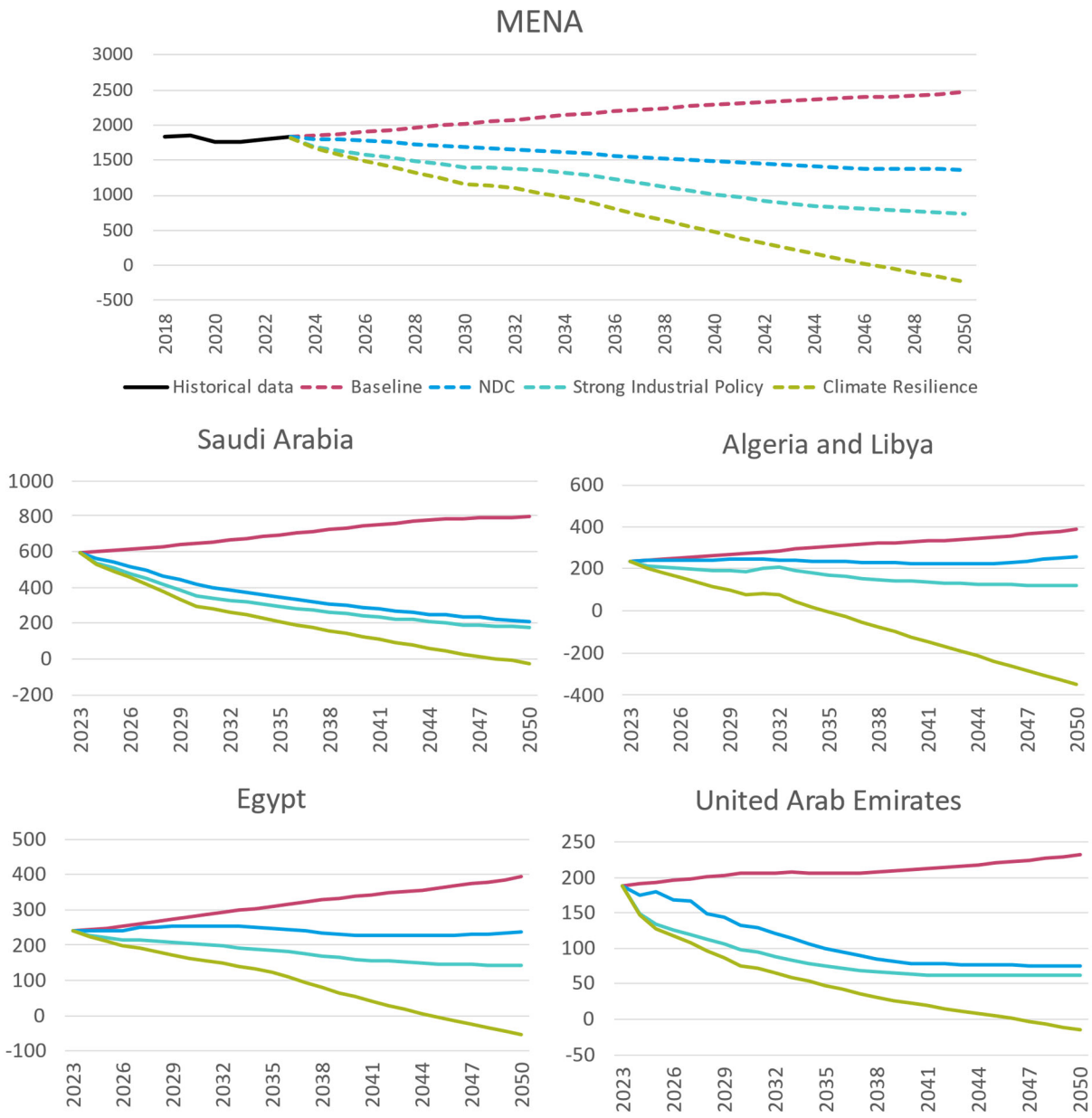
In the **Strong Industrial Policy** scenario, if the rest of the MENA countries follow the trajectory of those modelled explicitly, regional CO2 emissions would fall by 31% relative to baseline by 2030, and 70% by 2050 (at least 64% in Egypt and at most 77% in Saudi Arabia and UAE). However, despite a much stronger phase-out of fossil fuels and rapid deployment of renewables compared to the NDC scenario before 2030, the majority of new low-carbon capacities is still expected to take up only after 2030. In addition, no region reaches net zero emissions by 2050 and neither does the MENA region as a whole.

In the **Climate Resilience** scenario, energy-related CO2 emissions follow a similar path as in the Strong Industrial Policy scenario. The renewables uptake in this scenario is even stronger than in the Strong Industrial Policy scenario, particularly due to electricity demand for water desalination; there is also a role for gas with CCS in the long term to replace gas-based power generation in providing back-up generation for a predominantly renewables power mix. With additional negative emissions from reforestation announced as part of the Green Middle East initiative, in this scenario, the region reaches net zero emissions by 2050.

In a few cases, the share of renewables in electricity supply is slightly lower in a more ambitious scenario than a less ambitious scenario. This reflects potential strains on the system to deliver higher demands for electricity. In particular, when the share of wind and solar is high, even though the levels of capacity and generation from renewables may increase in line with demand, more backup generation (based on other technologies) may also be needed due to the intermittency of such renewables.

Figure 1 illustrates the emissions pathways simulated for each country or region that is modelled explicitly in E3ME, as well as an extrapolation of the MENA region's CO2 emissions if the rest of the region (i.e. countries that are not explicitly represented in E3ME) follow the same trends.

Figure 1: Total CO2 emissions by region and scenario in MtCO2



Note: The results include emissions from land use and forestry.
Solid lines are used for historical data and model results. Dashed lines are used for extrapolated values.
MENA emissions are extrapolated based on trends of the sum of Algeria, Libya, Saudi Arabia, Iraq, Kuwait, Egypt and UAE.

3.2 Macroeconomic impacts

GDP and employment

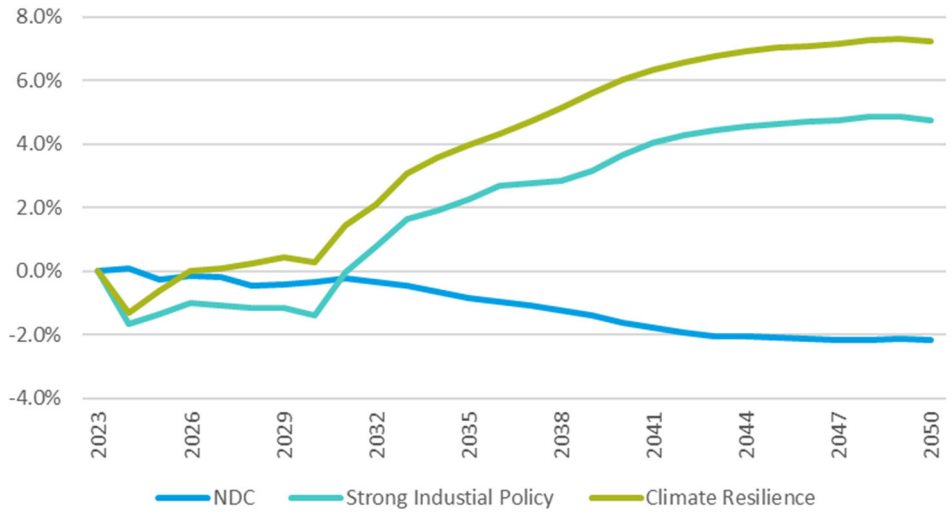
In the **Current Policies** baseline, the MENA region is projected to grow at 3.4% per annum (pa) over 2023-50, mainly powered by consumption and investment. There is a substantial demand for oil and gas at the global level in this scenario, thus the level of investment and production of the oil and gas supply sectors in the MENA region are sustained and continue to grow over the forecast period.

In the **NDC** scenario, GDP by 2050 is projected to be 2.2% lower for the MENA region as a whole, relative to the Current Policies baseline.

Investment is the main driver of GDP impacts. There are significant increases in investment in all regions, particularly in Saudi Arabia and strongest in the years to 2030, reducing thereafter as investment is frontloaded to deploy new technologies and build infrastructures in the medium term. Some of this positive impact, however, is offset by a worsening of the net trade balances relative to baseline, due to losses of oil & gas and manufactured fuels exports which has been a specialisation of the region. This significant reduction in fossil fuel exports is driven strongly by reduced demand for fossil fuels in the rest of the world.

Among countries modelled explicitly in E3ME, Egypt sees a positive impact on GDP in this

Figure 2: GDP impact in the MENA region by scenario (relative to baseline)



scenario due to large increases in investment in power generation to deliver ambitious renewable targets, driving demand for construction and manufacturing sectors as well. In contrast, UAE sees the highest negative impacts in relative terms due to substantial losses of employment in the oil & gas supply chain and increased government expenditure to compensate for stranded oil & gas assets (which are financed by the government and displace other final spending on public services).

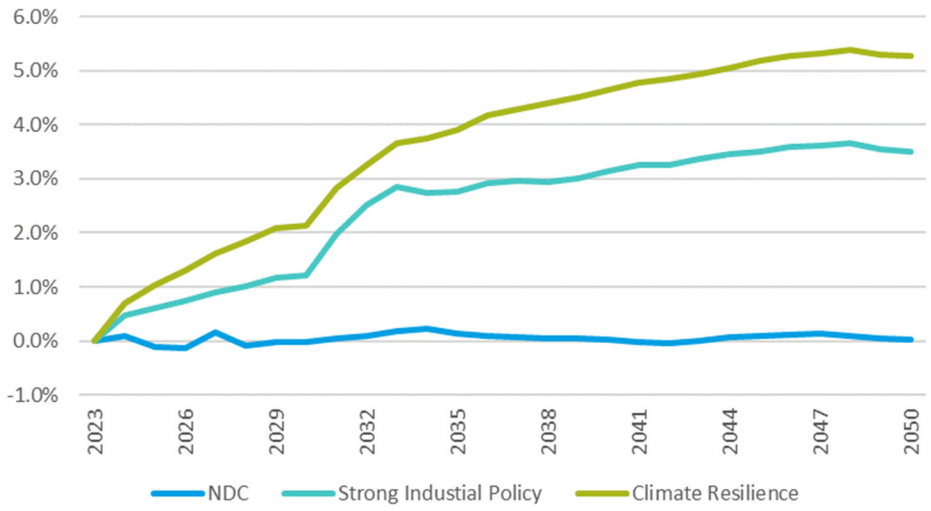
Total employment is marginally higher (0.03%) by 2050 compared to baseline for the MENA region (equivalent to 55,000 jobs). This is driven by a balancing between the more fossil-fuel dependent countries with ambitious NDC targets (concentrated in the Arab States region) in which there are substantial employment losses in the fossil-fuel supply chain, and the more diversified countries in the broader MENA region with less ambitious NDC targets and a slight increase in employment in this scenario (due to stronger presence of industries such as manufacturing and transport which are likely drawn on to support infrastructure building requirements across the whole region, therefore benefiting from decarbonization). This is also a reason why the GDP and employment results for the Arab States aggregate are generally less positive (or more negative) than results for the MENA aggregate.

In the **Strong Industrial Policy** scenario, the MENA region's GDP is 4.8% higher than baseline by 2050, albeit slightly below baseline in the years to 2030. The short-term negative impacts are due to higher prices, which result from increased costs of electricity (as carbon prices are introduced when there is still a noticeable share of fossil fuels in the power mix) and higher costs of production in sectors that are expected to make large investments to create new export industries (power supply, motor vehicles and transport).

The long-term positive impacts are driven by continued investment (27% above baseline by 2050) and prices coming back down over time, with positive effects for household consumption. The easing of price pressures over time is due to endogenous learning-by-doing effects which reduces costs of low-carbon energy and technologies as deployment scales up. After 2035, the model also projects significant gains in export revenues from green hydrogen (also EVs and solar to a lesser extent), which more than offset the loss in fossil fuel exports and contributes to positive GDP impacts. In this scenario, employment levels are 3.5% higher than baseline by 2050, and are higher than baseline in all MENA regions.

In the **Climate Resilience** scenario, GDP and employment move in a similar direction with

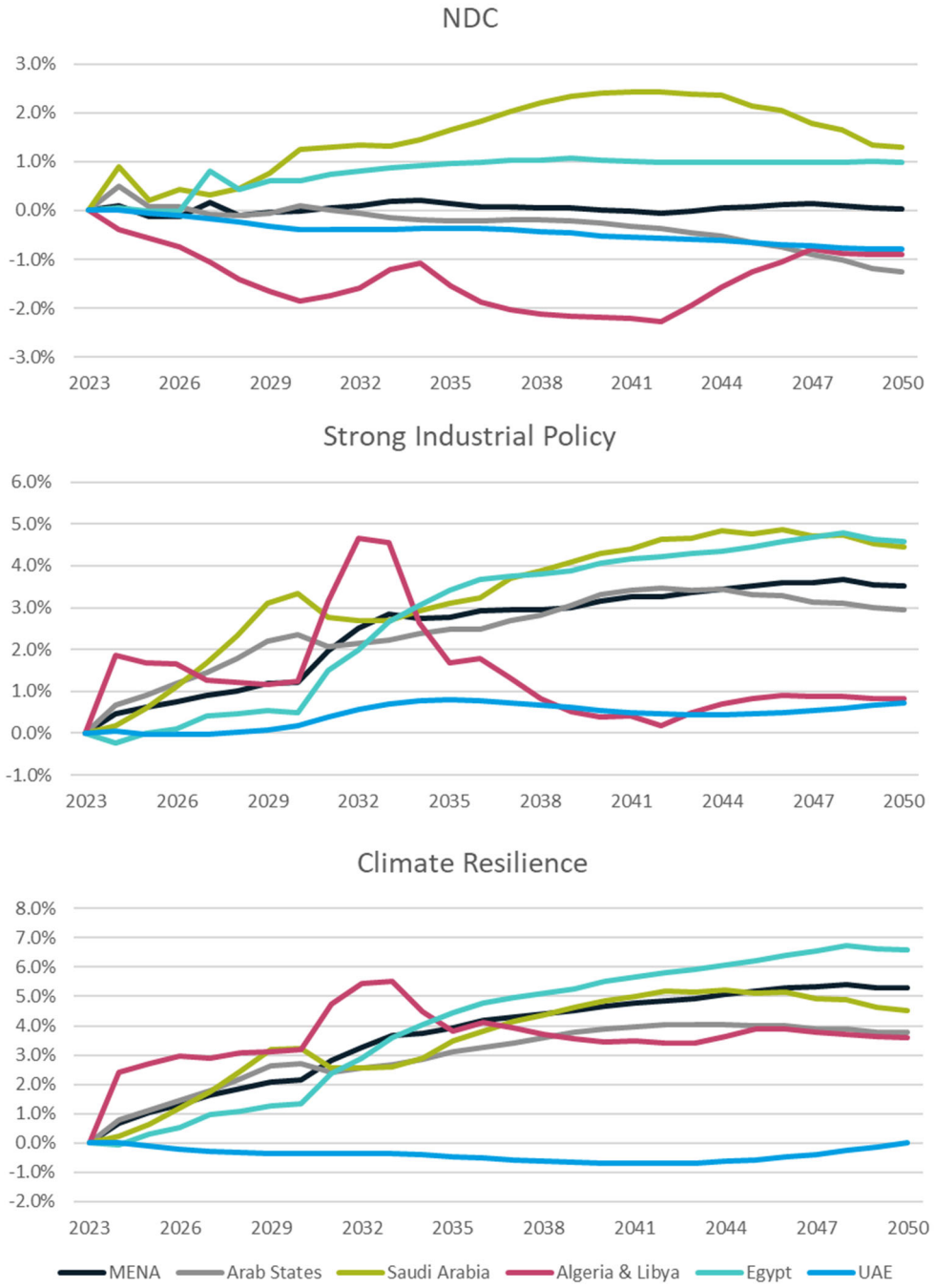
Figure 3: Employment impacts in the MENA region by scenario (relative to baseline)



even higher differences to baseline than in Industrial Policy (7.2% and 5.3% higher than baseline by 2050, respectively). This is mainly due to increased investment in water desalination and reforestation (with relatively small changes to consumption and net trade). In parts of the region with high GDP per capita levels (including UAE, Saudi Arabia, Iraq and Kuwait), contributions to a regional fund for mitigation and adaptation means that tax increases are introduced in these countries, leading to a small negative impact on household consumption relative to the baseline (which however is offset by increases in nominal income due to increased investment).

Figure 4 compares net employment impacts across the sub-regions and scenarios.

Figure 4: Employment impacts by scenario and sub-region (relative to baseline)



Investment financing needs

It is estimated that net capital investment requirements relative to baseline[2] for the MENA region, accumulated over the 2023-50 period, would be $1.3 trillion in the NDC scenario, $5 trillion in the Strong Industrial Policy scenario and $10 trillion in the Climate Resilience scenario.

Table 3 shows the contributions to financing needs by policy, for all additional investments and policy costs that are expected to occur in each scenario relative to the baseline. In the NDC scenario, the majority of financing needs is met by domestic private sources, in contrast with the net zero scenarios where the majority is assumed to originate from international sources (which are likely to be several times what has been put on offer so far by climate negotiations).

[2] Additional investments minus investment reductions, both relative to baseline

The reduction in demand for investment (and therefore financing) in fossil fuel supply industries implies that more funds are available domestically and can be redirected to support low-carbon investments. This can be seen from the negative contributions of fossil fuel supply investment which are offset by investment in low-carbon investments including renewable energy and hydrogen supply. However, the mitigation policies modelled in the net zero scenarios require higher levels of investment in low-carbon measures than the potential reduction in fossil fuel supply investment, in turn leading to strong indirect investment effects (captured in "Other industry investments") as a result of increased demand for intermediate inputs such as machinery and equipment. This implies that the need for financing is higher in the policy scenarios, requiring mechanisms that do not already exist to leverage and channel funds towards the right investments. For example, revenues from carbon pricing can be an important source of domestic finances for green investments and other policy costs incurred by governments.

On the other hand, lost oil royalties is the single largest driver affecting government revenues directly. For example, in the NDC scenario where this is borne by governments, there is a corresponding reduction in government expenditures. In the net zero scenarios, the loss of these oil royalty revenues relative to the baseline are assumed to be compensated by international financial support. This assumption emphasizes the need for the region to transition without harming social welfare, following from the narrative, and is a major contributor to strongly positive GDP results. Without this assumption, the region would see negative GDP and employment impacts similar to the NDC scenario. Cumulative lost oil royalties over 2023-50 are estimated to be equivalent to net investment requirements over the same period.

Table 3: Contribution to financing needs in the MENA region relative to baseline

	NDC		Strong Industrial Policy		Climate Resilience	
	2030	2050	2030	2050	2030	2050
PUBLIC SOURCES	**19%**	**22%**	**7%**	**11%**	**11%**	**18%**
Energy efficiency	26%	54%	6%	11%	6%	8%
Subsidies for low-carbon technologies	1%	0%	0%	0%	3%	7%
Water desalination and reforestation	0%	0%	0%	0%	2%	3%
Government final expenditures	-8%	-32%	0%	0%	0%	0%
PRIVATE SOURCES	**81%**	**78%**	**22%**	**33%**	**21%**	**29%**
Renewable energy	60%	41%	13%	6%	12%	9%
Fossil fuel supply	-6%	-23%	-1%	-2%	-1%	-1%
Solar production	0%	0%	0%	0%	0%	0%
Hydrogen supply	0%	0%	0%	12%	0%	9%
Transport of solar and hydrogen	0%	0%	0%	1%	0%	1%
EV production	0%	0%	1%	3%	1%	2%
Recycling and waste management	0%	0%	0%	0%	0%	1%
Other industry investments	27%	59%	9%	12%	9%	10%
INTERNATIONAL SOURCES	**0%**	**0%**	**72%**	**56%**	**68%**	**53%**
Water desalination	0%	0%	0%	0%	5%	11%
Reforestation	0%	0%	0%	0%	1%	3%
Workforce training	0%	0%	4%	3%	3%	2%
Compensation for loss of oil royalties	0%	0%	67%	54%	58%	37%
Compensation for stranded power assets	0%	0%	1%	0%	1%	0%

3.3 Sector impacts

In the **NDC** scenario, there is an increased demand for electricity supply, construction and manufacturing sectors supplying inputs to infrastructures. This is accompanied with lower demand for oil & gas, manufactured fuels (as a direct result of falling demand for fossil fuels, domestically as well as from the rest of the world also decarbonizing) and consumer goods and services sectors (due to loss income and consumption, partly linked to the negative impact on oil & gas and also driven by higher prices of energy in the medium term given the introduction of carbon pricing into an energy system still dominated by fossil fuels). This is similar in all MENA regions, but the magnitude of impact in different sectors varies.

Employment trends closely follow output. However, job losses are more concentrated in public services sectors, because of reduced public spending in these activities as a result of governments bearing the burden of lost oil royalties (see Figure 5).

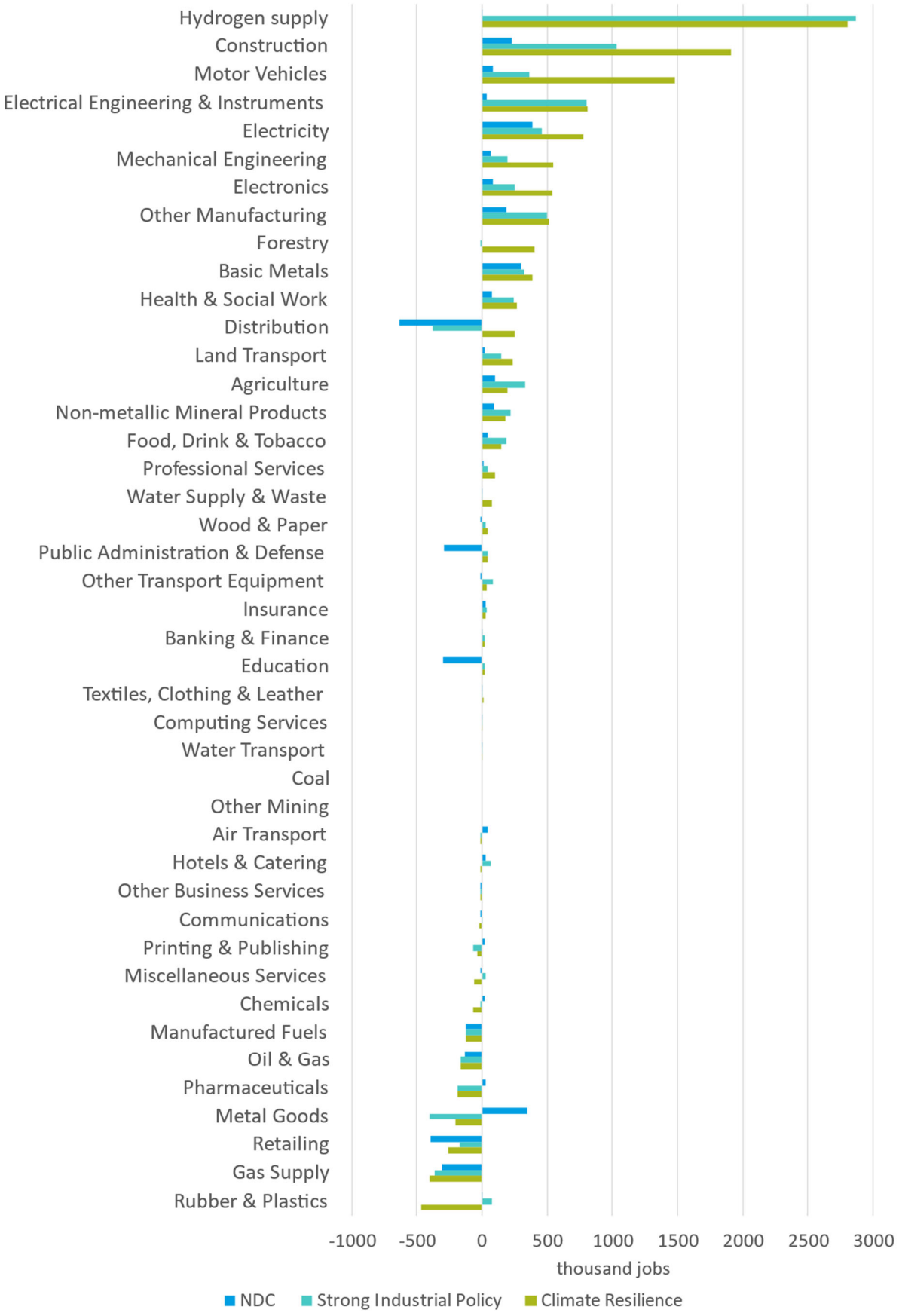
In the **Strong Industrial Policy** scenario, sector employment results are similar to those in the NDC scenario, although one key difference is significant gains in demand and employment in hydrogen supply, power generation and construction as a result of new low-carbon industries being created (hydrogen, solar export, EV export). There are strong employment increases in electrical equipment and land transport which directly support the new industries (electrical equipment provides batteries for EVs, whereas land transport helps distribute the new industries' products to other countries).

Higher employment and output in hydrogen supply is particularly strong after 2030, driven by the region's ambition to significantly scale up production from that point. As a result, higher activity in the electricity and hydrogen sectors offsets losses in oil & gas, manufactured fuels and gas supply.

In the **Climate Resilience** scenario, sectoral impacts are similar to those of the Industrial Policy scenario, yet demand for 'consumer goods and services' is higher due to stronger economic growth. By design, there is also a noticeable shift of activity from rubber & plastics to water supply & waste (to reflect higher recycling rates), though this is small relative to the magnitude of other sectoral impacts.

For each sector, the impact reflects all direct, indirect and induced effects captured by the model in response to the combined policy package. While it is not possible to decompose precisely the number of jobs that each policy is responsible for, based on the model logic and scenario design, it is possible to indicate where (in which sectors) direct impacts of policies (and in some cases also indirect impacts) are most likely to be observed. The results for individual sectors are described in more detail in the rest of this section.

Figure 5: Employment impacts by sector in the MENA region in 2050 (relative to baseline)

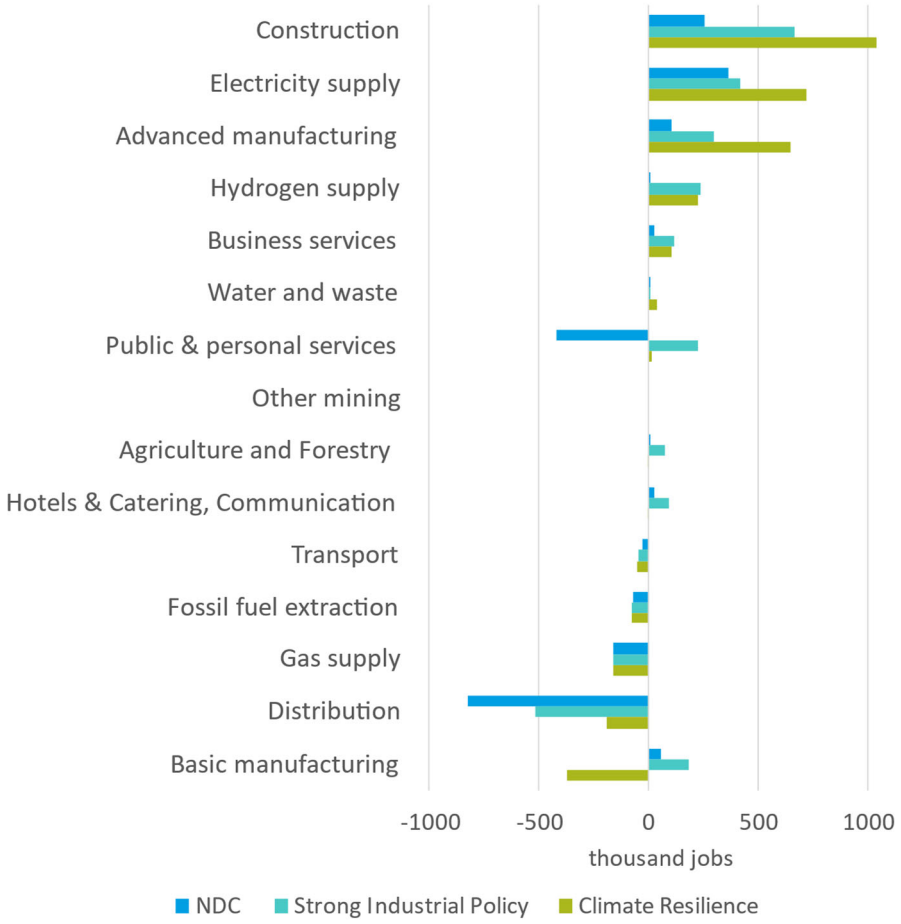


Net winners

The sectors with substantial net employment gains and transformational opportunities are electricity supply, hydrogen supply, vehicle and electrical engineering and construction. These sectors are critical to either providing low-carbon energy or supplying the infrastructure for its supply, particularly in the net zo scenarios.

Electricity supply

Figure 6: Employment impacts by sector in the Arab States in 2050 (relative to baseline)



The electricity sector is expected to gain considerably in the transition, with increasingly higher levels of employment in then sector across the MENA region as the scenarios become increasingly more ambitious (392,000, 462,000, and 780,000 workers by 2050 for each scenario respectively for the MENA aggregate relative to baseline values).

Employment for the electricity sector is derived from the region's power mix, taking into account different rates of employment intensities for different generation technologies. The employment increase is not only due to higher levels of electrification but also the progressively more present renewable-based power system in the more ambitious sectors (and renewables being more labour-intensive). The impacts of the region exporting solar-based electricity in the net zero scenarios are also observed in this sector. This is consistent across all MENA modelled countries.

Hydrogen supply

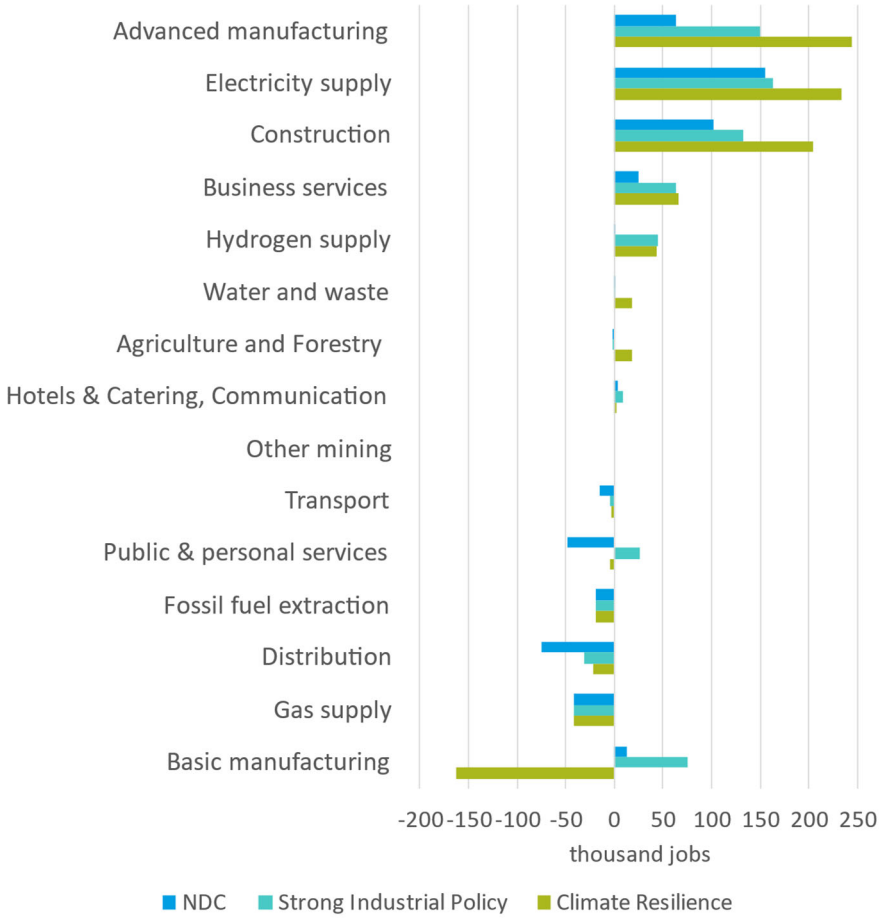
Employment in hydrogen supply is projected to be higher in both the Strong Industrial Policy and the Climate Resilience scenarios. The magnitude of the net effect is 2.9 million and 2.8 million workers added relative to the baseline by 2050 for each scenario respectively. This increase consists of the strongest increase in employment in both scenarios at the MENA regional aggregate level, more than outweighing the employment decrease in fossil-fuel related sectors. This is due to ambitious levels of investment in the

sector coupled with higher exports of hydrogen to foreign markets, allowing for strong growth of the sector and consequently creation of many new jobs across the region.

Saudi Arabia and Egypt are expected to contribute the most hydrogen export revenues in absolute terms, reflecting the potential scale of existing pilot projects in these countries (such as NEOM and Suez Canal Economic Zone). However, the net zero scenarios illustrate other countries in the region (some of which are already developing green hydrogen strategies, while others have not) would also follow in a similar direction. The regional distribution of projected jobs impacts reflects this, as well as relative employment intensity differentials between countries.

Construction

Figure 7: Employment impacts by sector in Saudi Arabia in 2050 (relative to baseline)



The construction sector is projected to see higher employment across all scenarios when compared to the baseline, with the positive effect being larger as the ambition of the scenario intensifies. Ordered by scenario ambition level, the net effect for the aggregate MENA region by 2050 is of 230,000, 1 million, and 1.9 million workers, respectively.

The increase in employment is driven by the deployment of renewable and the ambition of the transition for the economy, which results in higher demand for construction of new and adaption/requalification of already existing infrastructure and buildings. After hydrogen supply, construction is the sector that sees the greatest increase in employment in both the Climate Resilience and the Strong Industrial Policy scenarios for the MENA regional aggregate.

There is an exception, such as in Algeria & Libya in the NDC scenario, where the impact on construction jobs is negative. This is driven by the supply chain implications of reduced demand for oil and gas, which are not compensated by increased activities in green energy supply in this scenario.

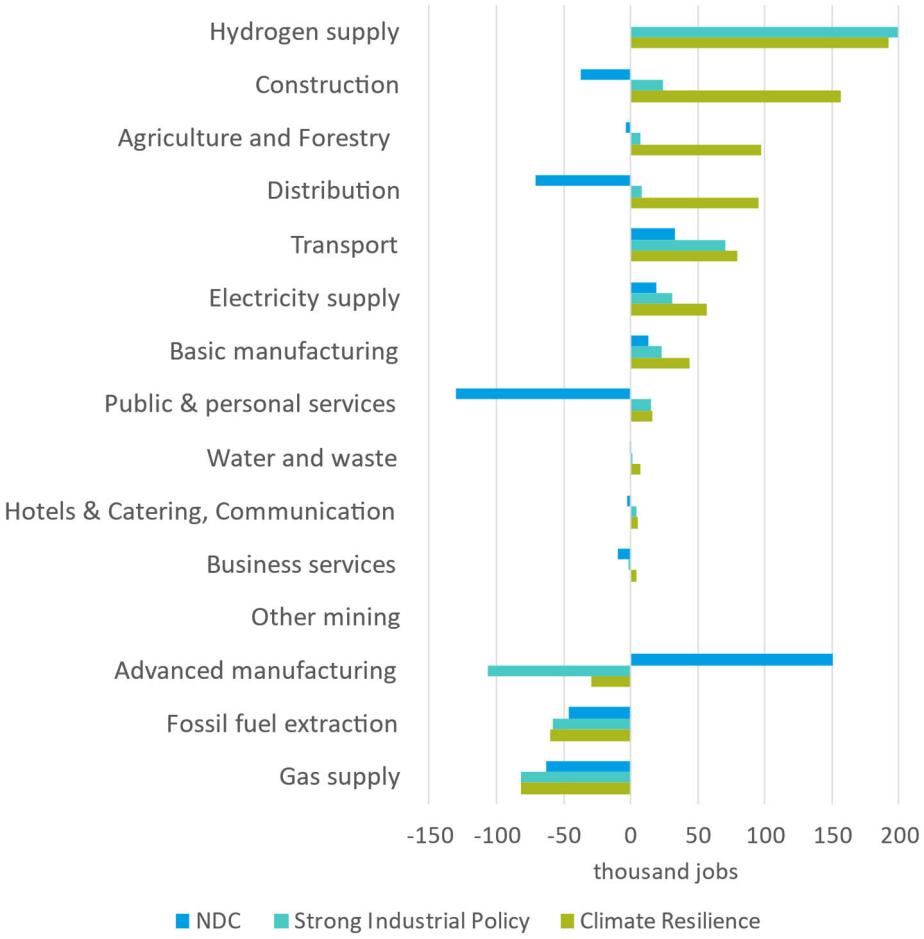
Vehicle and electrical engineering sectors

For the MENA regional aggregate and across the two most ambitious scenarios (Strong Industrial Policy and Climate Resilience), the employment effect in the motor vehicles sector is projected to be between 366,000 and 1.5 million workers more by 2050 relative to the baseline. Similarly, the scenario results suggest between 805,000 and 814,000 more workers for the electrical engineering & instruments sector in the same year.

The positive effects are strongly driven by the EV investment and export assumptions present in the Strong Industrial Policy and Climate Resilience scenarios (and applied to Egypt, Saudi Arabia and the UAE only to reflect these countries' explicit EV production targets). Higher levels of investment in both sectors lead to increased production, which in turn causes greater demand for labour.

Moreover, economic growth as seen in the Climate Resilience scenario induces additional consumer demand, positively impacting motor vehicles for example. This is the reason why the impact on the motor vehicles sector increases in the Climate Resilience scenario relative to the Strong Industrial Policy scenario while the impact on electrical engineering does not differ significantly between the two scenarios.

Figure 8: Employment impacts by sector in Algeria & Libya in 2050 (relative to baseline)



Although the assumptions are designed to create domestic EV industries (largely represented by these two sectors), these two sectors also cover other activities not related to EVs, more generally non-transition-related equipment such as household electrical equipment. This means that a proportion of demand for these activities may still be met by imports when there is an increase in demand. This is dependent on the trade patterns that each country exhibits and implies that the positive impacts of domestic EV production may in some cases be counteracted by increased demand for imports of non-transition-related equipment (which reduces domestic employment). For example, Saudi Arabia is projected to see an increase in employment in motor vehicles but not in electrical engineering and equipment. In contrast, Egypt is project to see an increase of employment in both sectors.

Net losers The sectors which will see major needs for restructuring and reskilling, due to negative impacts of the transition, are fossil fuel supply and rubber & plastics.

Fossil-fuel sectors

The three fossil-fuel sectors ("oil & gas", "manufactured fuels", and "gas supply") are projected to see a consistent decrease in employment across the MENA region throughout the modelling exercise's scenarios. Across the scenarios, oil and gas employment decreases by between 129,000 and 163,000 workers, manufacturing fuels by 125,000 workers, and gas supply by between 309,000 and 405,000 workers, when comparing 2050 values to those of the baseline.

This reduction in employment is mainly due to the effect of decarbonization policies in the region and the rest of the world. These policies indirectly reduce the output of these sectors by lowering the demand for fossil fuels. This translates in lower employment levels for the sectors.

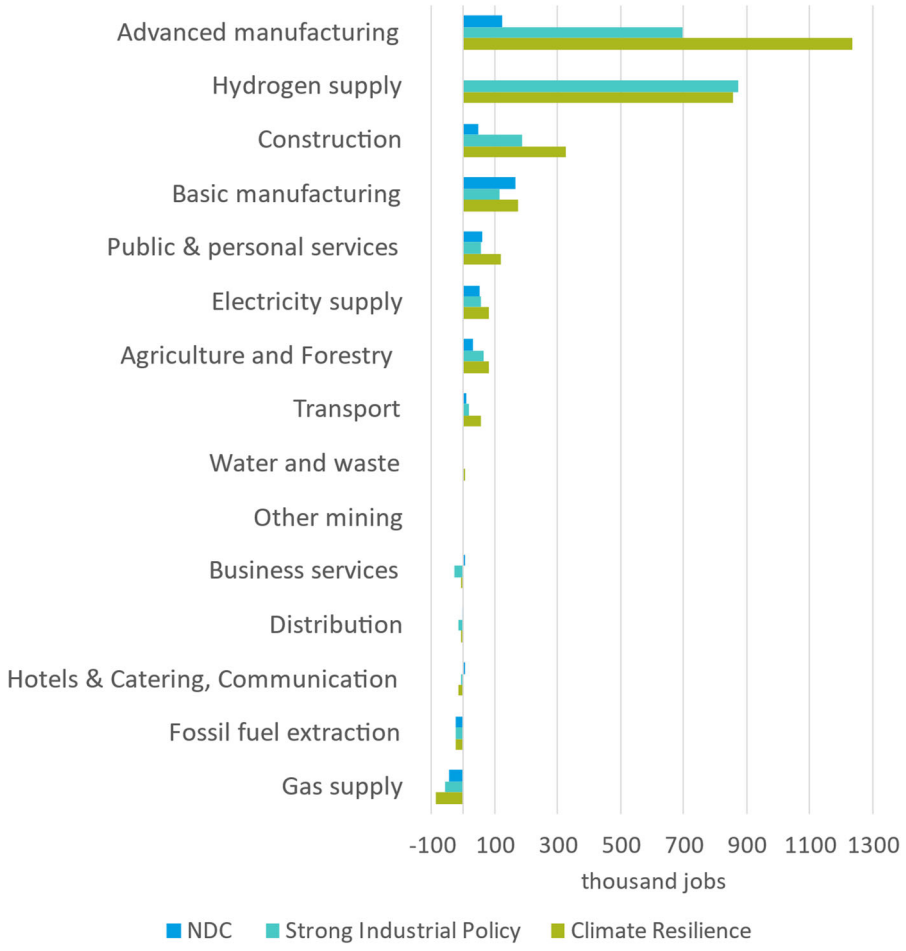
Though the lower employment levels are not dominated by a specific country, the potential employment loss (relative to the baseline) in the oil and gas and gas supply sectors occur mostly outside the Arab States region, whereas lower employment in the manufactured fuels sector is more strongly felt in the Arab States region. This is linked to different specializations within the region as well as differences in labour productivity. For example, given declining oil and gas demand globally, it may still be profitable for the Arab States (which have access to large reserves and can therefore extract oil and gas at low costs) to continue extraction activities for domestic consumption. This is less likely the case for non-Arab States with higher costs, and therefore consumers in these regions are more likely incentivized to switch to imported fuels or non-fossil sources.

Rubber & plastics

The recycling and the waste management policies which enter into effect in the Climate Resilience scenario lead to lower employment in the rubber & plastics sector, reducing it by around 462,000 workers across the whole MENA region in the Climate Resilience scenario relative to the baseline by 2050. The policies are responsible for an economy-wide decrease in demand for rubber and plastics (accompanied by an increase in water supply & waste demand), reducing the sector's output and consequently demand for labour and sectoral employment. The accelerated recycling rate policy is only included in the Climate Resilience scenario, whereas the sector is affected by second order effects transmitted through supply chains in all scenarios. The minor increase in employment in the NDC and Strong Industrial Policy (in contrast with the noticeably negative effects in the Climate Resilience scenario) is therefore due to this difference in assumptions.

Looking at regional level, the MENA region result is dominated by what happens in Saudi Arabia, where it is felt strongest given that, based on historical data, the country has a higher reliance on domestic production to meet its demand, while the other regions present a greater relative weight on imports to meet demand. For this reason, the county's domestic production, and consequently, employment is impacted more strongly in relative terms.

Figure 9: Employment impacts by sector in Egypt in 2050 (relative to baseline)



Followers and adapters

Sectors which are expected to see moderate employment gains from the transition are water supply & waste, forestry, chemicals and land transport. In addition, public services, advanced manufacturing and other sectors are likely to experience supply chain impacts of varying degrees, positive or negative. One thing these sectors have in common is that they are dependent on (thus follow or adapt to the needs of) the sectors mentioned above, as well as the policy environment.

Water supply & waste

Water supply & waste is expected to experience a large positive (78,000 workers) employment effect for the aggregate MENA region by 2050 in the Climate Resilience scenario relative to the baseline. This is due to the effect of increased recycling, investment in waste management and water desalination, which is only simulated in this scenario. The waste management and water desalination policies assume an increase in investment in the water supply & waste sector, resulting in larger output and consequently a higher level of employment in the sector. Moreover, the previously mentioned recycling assumptions are associated with an increase of demand for the water management sector (at the expense of the rubber and plastic sector) also leading to higher sector output and consequently employment.

Saudi Arabia's employment is expected to have the largest relative impact in the sector with a 32% increase by 2050 compared to the baseline. However, the impact in absolute terms (18,000 workers) is not dominant at the MENA level.

Forestry

The forestry sector is projected to see higher employment levels in the Climate Resilience scenario thanks to increased investment in reforestation to reflect policies such as the Middle East Green Initiative. At the MENA aggregate level, additional employment equates

to 406,000 workers by 2050 and relative to baseline values. The increased investment pushes up the demand for labour in the sector.

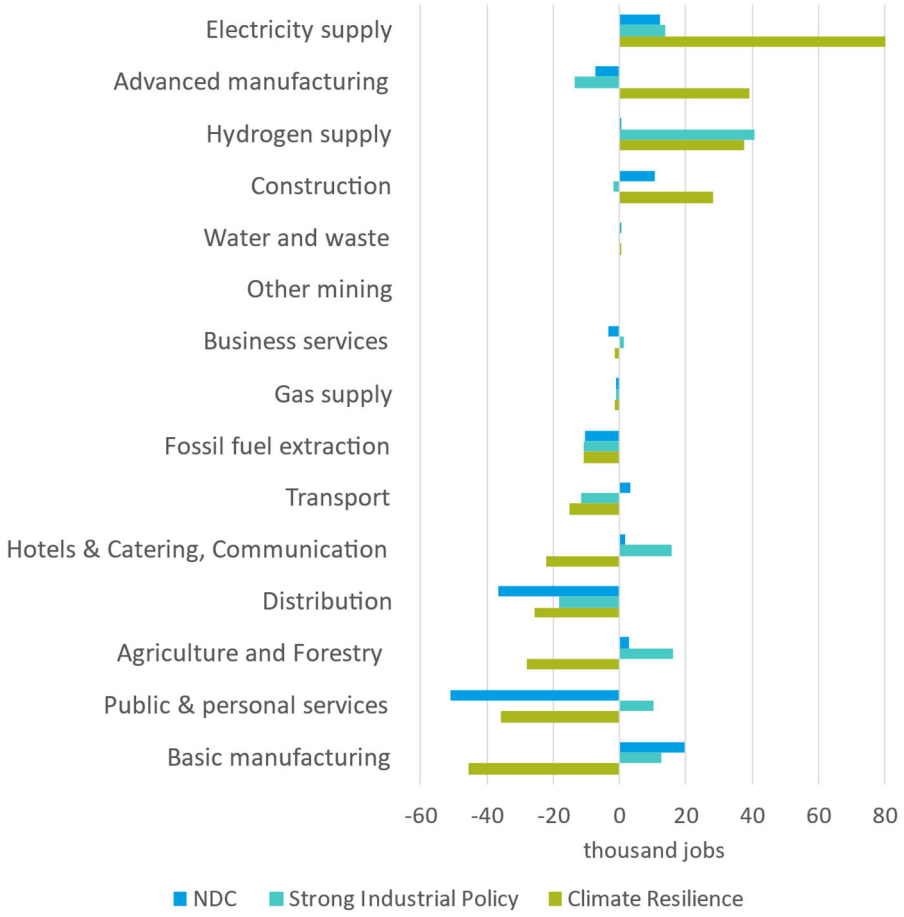
Chemicals

A net positive employment effect is projected for the chemical sector, in both the Strong Industrial Policy and Climate Resilience scenarios relative to baseline values. This decline, dominated by Egypt, is equivalent to 15,000 and 69,000 jobs in each scenario, by 2050.

Two opposite indirect effects are at play. One the one hand, the expansion of hydrogen production (present in both scenarios) creates a larger demand for chemical inputs and consequently increases both the output and employment for the chemical sector. On the other hand, the reduction in demand for rubber and plastics (assumed in the Climate Resilience) results in lower demand for chemical inputs and consequently lower employment in the sector.

Land transport

Figure 10: Employment impacts by sector in UAE in 2050 (relative to baseline)



Land transport is projected to see, by 2050, higher employment relative to the baseline by 240,000 in the Climate Resilience and by 151,000 for the Strong Industrial Policy scenario for the aggregate MENA region. In the NDC scenario, the equivalent increase is by 22,000 only.

The main driver behind these employment gains in the two more ambitious scenarios are land transport infrastructure investments to construct export channels for green hydrogen and solar electricity. On the other hand, as demand for transport of fossil fuels decrease, this sector is likely impacted negatively as a result.

The scenario results suggest that employment gains are concentrated outside the Arab States region whereas the Arab States region sees employment losses in land transport throughout the three scenarios. This suggests that the supply chain of transport activities spans across the MENA region and cross-country coordination is key to developing new export infrastructures benefitting the whole region.

Public sectors

Public services sectors are among the largest employers (by the number of workers employed) in the MENA region, although their shares in employment have been declining.

The scenario results suggest that the three public sector sectors ("Public Administration & Defence", "Education", and "Health & Social Work"), at the MENA regional level, would see higher levels of employment by 2050 in the two more ambitious scenarios. Public administration and defence employment is 45,000 to 43,000 workers above the baseline, education has 19,000 to 18,000 additional jobs relative to the baseline, while health & social work accounts for 245,000 to 266,000 additional workers. In contrast to the ambitious scenarios, the NDC scenario presents, by the same year and relative to the baseline, 290,000 fewer workers in public administration and defence, 299,000 fewer workers in education, and 79,000 additional workers in health & social work.

In the Strong Industrial Policy and Climate Resilience scenarios, MENA countries are assumed to receive international support in the form of compensation for stranded assets, oil royalty losses and training costs. This results in a lower strain on government finances, allowing governments to maintain funding for these sectors and safeguard jobs. In the NDC scenario, a lower level of employment is due to governments bearing the loss of oil royalties, with reduced spending on other services as a result.

Non-consumer-oriented manufacturing sectors

The non-consumer-oriented manufacturing sectors consist of "non-metallic mineral products", "basic metals", "metal goods", "mechanical engineering", and "electronics". For this group of sectors, there are higher employment levels as the scenarios become more ambitious.

For these sectors combined, at the MENA regional level, employment increases by 897,000, 582,000, and 1.4 million for each of the scenarios, relative to the baseline by 2050. Given that these sectors provide materials, components and equipment used in the construction, adaption / requalification, and maintenance of infrastructure and buildings, this increase in employment is linked to the ambition of the transition and the deployment of new renewable energy capacity. For example, a wind-power mill will require metal, electronics, engineering components, and equipment to be built (both for the structure itself and for the construction process) as well as for its continued maintenance.

Agriculture and consumer and business goods and services

The remaining sectors ("agriculture", "other mining", "food, drink & tobacco", "textiles, clothing & leather", "wood & paper", "printing & publishing", "pharmaceuticals", "other transport equipment", "other manufacturing", "distribution", "retailing", "hotels & catering", "water transport", "air transport", "communications", "banking & finance", "insurance", "computing services", "professional services", "other business services", "miscellaneous services") are not subject to any direct impact of the policies. They could nonetheless see more moderate indirect effects from other sectors through supply chains.

The results for the retail sectors are particularly noteworthy here, given its relative size in the overall economy. As a sector predominantly serving consumers, the employment impact in retailing is strongly driven by impacts on overall household consumption. Despite the creation of new employment which increases nominal income, increasing price levels reduce real incomes and consequently consumption levels. This is reflected in the reduction in retail employment, which is the largest for the Climate Resilience scenario, the scenario with highest projected inflation.

Not all sectors that are usually considered consumers-serving, however, see similarly large negative employment impacts as retailing. There are two possible reasons for this. On the one hand, some sectors are likely less sensitive to local price pressures. For example, food and clothing are basic necessities which are demanded regardless of prices, whereas hotels & catering serve high numbers of overseas visitors who are less responsive to local prices than local residents. On the other hand, some sectors which serve households as well as industries are likely to see transition-related activities gaining shares over traditional

goods demands in the net zero scenarios. As such, they are expected to see more benefits from low-carbon activities than potential losses in consumer spending.

3.4 Labour market implications

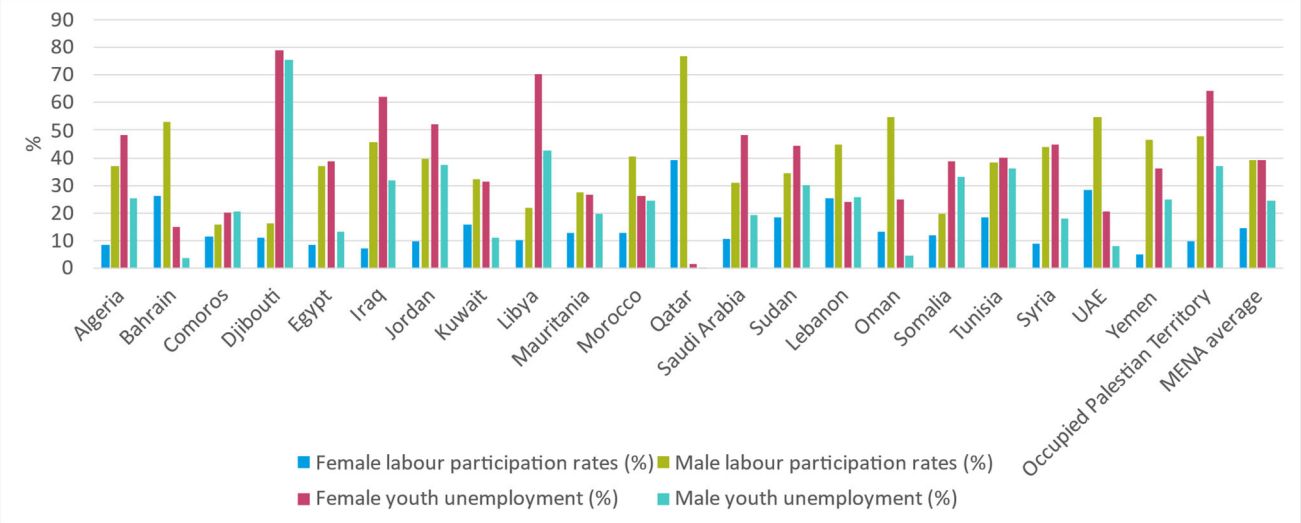
Labour groups

While the analysis is focused on implications for employment for different economic sectors, there are insights for labour groups from these sectoral results which have important policy implications.

First of all, the World Economic Forum (2017) illustrates that the MENA region's employment consists of predominantly medium-skilled workers, with smaller shares of similar magnitudes being attributed to high- and low-skilled workers. In a low-carbon transition, as technologies continue to evolve and new industries which did not exist before emerge in the region, there are likely growing demands for highly skilled workers. For example, International Renewable Energy Agency (2012) argues that jobs in renewable energy are on average highly skilled and require graduates from higher education and vocational degrees to fill positions in engineering, research and development, system design and installation (which correspond to sectors with the highest levels of net job creation as demonstrated by the scenario results).

In addition, the region faces high levels of youth and women unemployment, as well as low levels of economic participation among women (International Labour Organization, 2015b). As shown in Figure 11, female participation rates average around 15% of the female working

Figure 11: Female participation and youth unemployment rates in MENA countries in 2021



Source: ILO modelled estimates.
Note: The MENA average is an arithmetic average of the country-specific rates.

age population and are significantly lower (by at least half) than male participation rates in almost all MENA countries. Youth unemployment rates are also higher for females, on average at 40% compared to around 25% for males.

In the modelled scenarios, significantly higher demands for labour mean increased opportunities for all, including these marginalized groups. The results capture potential wage increases (as a result of increased demand for workers) which not only improve pay for existing workers but also create additional incentives for inactive working-age members of the population to join the workforce. This will need to be supported by investment in training in the ambitious net zero scenarios, as well as additional social protection and active labour market policies not explicitly modelled for this analysis. This is consistent with other research which attributes high rates of youth unemployment in the MENA region to demographic changes in the 1990s and 2000s creating excess labour supply, gaps in education systems and misaligned expectations between workers and available positions (Kabbani, 2019).

Finally, the distribution of jobs across sectors implies that demand for jobs by age, gender and citizenship would shift over the projection period. For example, sectors which are on a growing trajectory due to decarbonization (notably low-carbon industries) will likely be attracting youth more than declining fossil fuel supply industries.

Among sectors expected to see strong positive impacts, energy and manufacturing sectors tend to have relatively low shares of female workers compared to males, whereas consumer and business services and public sectors in particular tend to have a more balanced gender split (according to ILO statistics on employment by sex and economic activity).

Similarly, historically the region (particularly the Arabs States) has had high shares of migrant workers in low-skilled and low-paid jobs in construction and hospitality, which are expected to see different directions and magnitudes of impacts across scenarios depending on the policies being introduced. It is also likely that increased demand for higher-skilled labour in a low-carbon economy will create growing flows of high-skilled labour migration from other parts of the world into MENA.

Table 4: Female and migrant shares of sectoral employment in selected MENA countries

ISIC Rev.4 sector	Share of female workers in 2021 (% of sectoral employment)				Share of migrant workers (% of sectoral employment)		
	Iraq	**Egypt**	**Jordan**	**UAE**	**Lebanon (2019)**	**Jordan (2021)**	**Saudi Arabia (2017)**
A. Agriculture; forestry and fishing	15%	20%	3%	1%	19%	64%	86%
B. Mining and quarrying	3%	1%	2%	9%	0%	12%	72%
C. Manufacturing	8%	16%	11%	9%	23%	32%	
D. Electricity; gas, steam and air conditioning supply	6%	16%	7%	11%	10%	0%	
E. Water supply; sewerage, waste management and remediation activities	10%	4%	4%	7%	21%	21%	
F. Construction	1%	0%	1%	3%	44%	63%	87%
G. Wholesale and retail trade; repair of motor vehicles and motorcycles	15%	2%	5%	17%	16%	30%	80%
H. Transportation and storage	1%	1%	3%	11%	6%	10%	57%
I. Accommodation and food service activities	5%	1%	4%	15%	22%	55%	80%
J. Information and communication	21%	16%	23%	21%	6%	15%	57%
K. Financial and insurance activities	27%	15%	32%	33%	1%	0%	41%
L. Real estate activities	13%	1%	3%	16%	6%	0%	
M. Professional, scientific and technical activities	17%	14%	22%	25%	4%	13%	72%
N. Administrative and support service activities	10%	13%	5%	16%	58%	80%	72%
O. Public administration and defence; compulsory social security	23%	6%	10%	23%	0%	2%	-
P. Education	51%	49%	57%	62%	3%	9%	48%
Q. Human health and social work activities	63%	44%	52%	55%	4%	9%	70%
R. Arts, entertainment and recreation	15%	1%	20%	33%	11%	0%	81%
S. Other service activities	6%	13%	12%	37%	21%	54%	77%

Source: CE's analysis of ILO data and national statistics.

The main implication of these trends is that without supporting policies, a low share of new jobs opportunities that are directly linked to the transition is likely to be taken up by marginalized and vulnerable groups. This is because they currently work in sectors that are only seeing impacts through indirect channels which are strongly linked to underlying economic structures and influenced by the availability and mechanisms of financing for investments. Therefore, there is a need to direct training and support to these groups to create a level-playing field for them to take advantage of emerging low-carbon job opportunities.

Training requirements

The employment impacts discussed in section **Error! Reference source not found.** are assumed to materialize from direct policy interventions as well as indirect economic feedbacks, conditional on training and reskilling being provided across the economy to allow workers to take up relevant job opportunities. Training and reskilling needs account for 2-4% of total financing needs (see Table 3) and are calculated based on the assumptions for numbers of people receiving training and average cost of training per person.

Training requirements would differ for different groups of workers, for example:

- Workers in the fossil fuel supply industries who may be displaced by the energy transition would require reskilling to relocate to a different sector or occupation.
- Existing workers in sectors that are expected to remain unaffected or expand as a result of the transition would require training to adapt to the evolving low-carbon working environment and continued technological progress.
- The youth would require different types of training to prepare them for joining the labour market, including secondary education and vocational training.

All displaced workers in fossil fuel extraction industries, 10% of the remaining workforce in other sectors and 20% of youth are assumed to receive training. This is equivalent to a minimum[3] of 16 million trainees in the ambitious net zero scenarios by 2050 (including 300,000 fossil fuel workers[4], 7.9 million workers in other sectors and 8 million young people). This is equivalent to around 8-10% of the projected workforce in 2050, across the scenarios.

In the modelled scenarios, training is implicitly assumed to be administered by governments. However, in practice, training activities are likely to be delivered by a combination of private and public entities.

The collaboration between private and public sectors helps ensure inclusion and equity are taken into account in policy and investment decisions. For example, although training was not differentiated across labour groups in the modelling, historical data indicate that there is an existing gap in educational attainment between genders in many MENA countries, at all levels of education (see

Table 5). Policies should therefore consider improved access and provision for female workers as a key priority, alongside upskilling the youth. This is echoed by survey results compiled by PwC (2022) which show that tailored training and development opportunities are one of the top characteristics that attract women (particularly young women) in the workplace.

[3] This is a minimum estimate, as it only covers workers in Algeria, Libya, Saudi Arabia, Iraq, Kuwait, Egypt and UAE.

[4] Only jobs that are displaced directly by the transition are considered. In reality, there are likely existing jobs that would naturally exit the labour market due to automation and retirements, as well as jobs that will remain to serve a small number of sectors and activities where fossil fuels cannot be replaced completely even in the net zero scenarios.

Table 5: Attainment of advanced education in selected MENA countries in 2021

	% of female working-age population with basic education	% of male working-age population with basic education	% of female working-age population with intermediate education	% of male working-age population with intermediate education	% of female working-age population with advanced education	% of male working-age population with advanced education
Comoros	28	45	43	50	70	84
Egypt	5	51	16	74	44	81
Iraq	4	52	11	53	63	83
Jordan	5	64	9	60	50	73
Qatar	54	96	53	91	69	98
Saudi Arabia	24	65	31	79	54	93
Oman	27	83	24	78	61	92
UAE	53	86	41	88	56	96
Occupied Palestian Territory	4	68	11	65	61	85

Source: World Bank – World Development Indicators.
Note: "Basic education" includes primary education or lower secondary education.
"Intermediate education" includes upper secondary or post-secondary non tertiary education.
"Advanced education" includes short-cycle tertiary education, a bachelor's degree or equivalent education level, a master's degree or equivalent education level, or doctoral degree or equivalent education level.

It is also noteworthy that there must be an inter-industry coordination effort to mobilize and redistribute local human capital through systematic linking of existing and new green initiatives (which so far have been undertaken by isolated industries). Failing to implement this effectively may result in skills mismatches and other labour market frictions such as inability to fill vacancies (for firms), underemployment and low productivity (for workers).

If training was not available, the net employment gains discussed in previous sections, particularly in new industries, are likely to be constrained. This impacts the scale of the overall positive macroeconomic results. In addition, the modelling also assumes all training is effective. If this is not the case, the cost of training may be higher than assumed or the productivity of trained workers may be reduced, both of which will also reduce the magnitude of overall impacts.

Detailed assumptions and calculations of training costs are as set out in detail in 1.11.1.1.1.Appendix B.

4 Conclusions

4.1 Summary of results

The global energy transition poses potential opportunities and risks to economic welfare of the MENA region, depending on today's policy choices. Due to high dependency on fossil fuel use and exports, and the potential negative effects of climate policies enacted outside the MENA region, there is a need for the region to adapt and invest in its own low-carbon economy in order to take advantage of the transition.

The analysis demonstrates that:

- As a passive by-stander to the global energy transition, MENA faces potential losses in jobs and welfare. This is shown in the NDC scenario which features only modest emission reduction ambitions and is not accompanied by any employment and industrial policies.
- Higher decarbonisation ambition and corresponding investments would lead to positive economic benefits for the MENA region in the medium and long term, creating low-carbon industries to diversify and eventually replace the oil and gas industry at a higher level of economic and social development.
- In all scenarios, each country and sector are impacted differently with winners and losers from the transition. Notably, the fossil fuel value chain would be restructured towards growth opportunities in clean electricity and hydrogen supply and export, electric vehicle manufacturing and construction, to name but a few. In the net zero scenarios, potential gains in opportunities in new low-carbon industries and their supply chains can outweigh potential losses in fossil fuel related sectors.
- The cost of investment and the cost of stranded assets are high (in the region of $10 trillion in cumulative terms over 2023-50) but are paying off and yield higher productivity and employment levels in 2030 and 2050. This implies that outcomes are sensitive to the financing assumptions made. In a scenario with substantial international financing the benefits are high while the costs for the local population low. Without such funding the transition would put higher strain on governments' financial balances, and outcomes are most likely less positive.

4.2 Policy implications

The economic and employment outlook for MENA countries will be determined by the following overarching trends of the global energy transition.

- Geopolitical, energy security and climate concerns are fast tracking the global energy transition. With more than 100 countries having pledged to net zero, investments in low carbon technology outpaced investments into fossil fuels for the first time 2023. Driven by strong industrial policies around the world renewable energy investments are set to reach $1.7 trillion overtaking the $1 trillion in unabated fossil fuels (IEA 2023).
- Leading countries in the energy transition are harnessing first mover advantages, clean-tech monopolies, export markets and some 13.7 million renewable energy jobs created globally. Countries in the MENA region – with their comparative advantage and expertise in energy technology, abundant renewable resources and youthful labour market – have the potential to catch up and enact best practice green industrial and just transition policies. MENA could become a new leader in the energy transition. Significant welfare gains could be achieved as compared to a business-as-usual scenario. This would require a shift in gear.

The main policy implications for MENA countries to catch up and become active drivers in the accelerating global energy transition are following:

Integrated climate, industrial and just transition policies.

- Strong industrial and climate resilient policies, matched with just transition policies, will yield significant positive results in terms of social, employment and welfare. Thus, integrated climate, industrial and social policies which are bold enough to fast track and leapfrog the energy transition in MENA would make it a winner in the energy transition to net zero 2050.
- This reflects export potentials and new job opportunities for the local population and the private sector, who will require training to address ongoing labour market challenges as well as upskilling to adapt to an evolving low-carbon environment. In MENA countries where the labour demand cannot be met nationally due to population constraints, labour mobility may be a complement.
- Skills needs assessment system are required to target green sectors, provide career guidance and employment services and upgrade market relevant skills delivery for green sector occupations with flexible skills training and certification systems.

Just transition policies

- To ensure a just transition that brings about the most employment and economic benefits, policies should include a combination of climate, energy, industrial, economic and social elements. A mixed industrial and economic policy basket that includes incentives for low-carbon technologies and industries, disincentives for fossil fuels, public investments, redirection of investments from oil and gas into clean-tech and regulatory measures are recommended.
- To achieve social and employment gains, the economic and industrial policies need to be matched with strong just transition policies. Key to enable positive labour market outcomes are the reskilling of fossil fuel workers and their social protection to ensure frictionless industrial restructuring. Technical and vocational education and skills training for the young matched with investments into eco-innovation, incubation and green entrepreneurship would create a vibrant private sector.
- Skills gaps may emerge and need to be addressed with technical and vocational training and reskilling to match the likely growing demands for highly skilled workers. Importantly, significantly higher demands for labour mean increased opportunities for all, including marginalized groups with impacts on the distribution of jobs across sectors, age, gender and citizenship. To address potential mismatches and ensure a frictionless restructuring, targeted active labour market policies are required. They could address the region's high levels of youth unemployment, and low levels of economic participation among women.
- To address existing structural inequalities in the labour market, inclusion, and equity with a particular focus on gender, migrant workers and most vulnerable groups may be required. Dedicated programs may link disadvantaged workers to big green initiatives.

Financing and Just Transition Fund

- A key question exists around the financing of new clean tech investments, and offsetting of losses in oil & gas revenues and asset values. Alternative options to reduce reliance on international sources of funding may include royalties from green hydrogen and solar exports, progressive environmental taxes (in addition to progressive carbon prices), energy subsidy reforms matched with social transfers to those most impacted, IMF special drawing rights, Central Bank Green Bonds at reduced or no interest rates and sovereign wealth funds investments into green and climate funds. Each option would impact the results in different directions which need to be assessed.

- A Just Transition Fund could be set to up channel national and international revenues into specific just transition programs, notably low-carbon investments, skills, social protection and economic diversification and enterprise development.

Regional integration

- There are noticeable benefits from regional collaboration, as increased decarbonization in one part of the region will support cost reductions in others. The establishment of a regional investment and just transition fund for financing skills training and entrepreneurship, reskilling and social protection, mitigation and adaptation measures would facilitate this process.
- A just transition emphasizes a participatory approach to environmental and social sustainability through social dialogue. Social dialogue gives voice to the concerns and needs of workers, employers, and communities affected by the transition towards net zero emissions, helps build trust, and form consensus. Social dialogue among ministries and organizations representing both workers and employers is crucial in drafting decarbonization strategies and plans to address the labour issues inherent in decarbonization.

Appendices

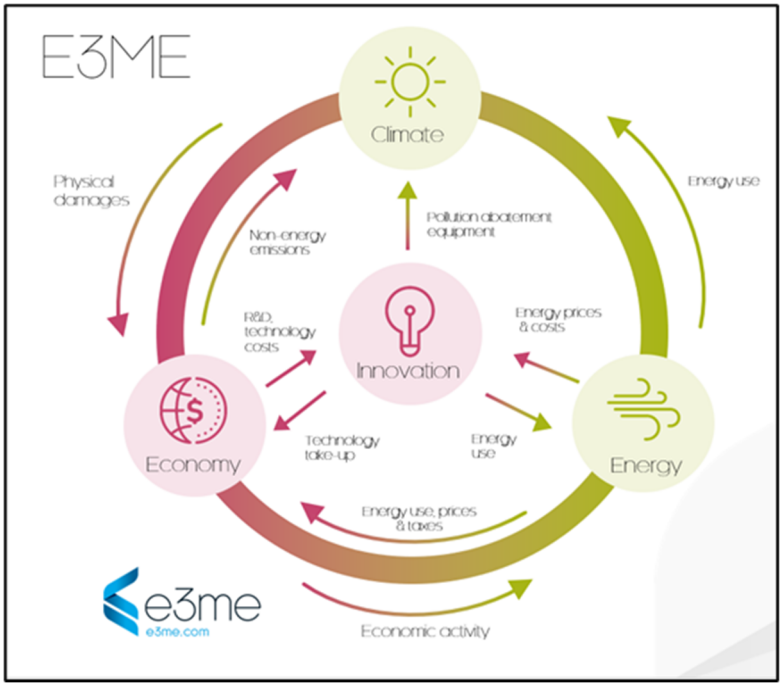
Appendix A E3ME description

As a global E3 model, E3ME can provide comprehensive analysis of policies:

- direct impacts, for example reduction in energy demand and emissions, fuel switching and renewable energy;
- secondary effects, for example on fuel suppliers, energy price and competitiveness impacts;
- rebound effects of energy and materials consumption from lower price, spending on energy or higher economic activities;
- overall macroeconomic impacts; on jobs and economy including income distribution at macro and sectoral level.

The basic structure of the model shows the linkages and feedbacks between the economy, the energy system and the environment, underpinned by technological progress.

Figure 0.1: Schematic of the E3ME model



Source(s): Cambridge Econometrics.

Theoretical underpinnings

Economic activity undertaken by persons, households, firms and other groups in society has effects on other groups (possibly after a time lag), and the effects may persist into future generations. But there are many actors and the effects, both beneficial and damaging, accumulate in economic and physical stocks.

The effects are transmitted through the environment, through the economy and the price and money system (via the markets for labour and commodities), and through global transport and information networks. The markets transmit effects in three main ways: through the level of activity creating demand for inputs of materials, fuels and labour; through wages and prices affecting incomes; and through incomes leading in turn to further demands for goods and services. These interdependencies suggest that an E3 model should be comprehensive and include many linkages between different parts of the economic and energy systems.

Basic structure and data

The structure of E3ME is based on the system of national accounts, with further linkages to energy demand and environmental emissions. The labour market is also covered in detail, including both voluntary and involuntary unemployment. In total there are 33 sets of econometrically estimated equations, also including the components of GDP (consumption, investment, international trade), prices, energy demand and materials demand. Each equation set is disaggregated by country and by sector.

E3ME's historical database covers the period 1970-2018 and the model projects forward annually to 2050. The main data sources for European countries are Eurostat and the IEA, supplemented by the OECD's STAN database and other sources where appropriate. For regions outside Europe, additional sources for data include the UN, OECD, World Bank, IMF, ILO and national statistical agencies. Gaps in the data are estimated using customised software algorithms.

The main dimensions of E3ME are:

- 71 countries – all G20 and major world economies, the EU28 and candidate countries plus other countries' economies grouped.
- 44 (or 70 in Europe) industry sectors, based on standard international classifications
- 28 (or 43 in Europe) categories of household expenditure.
- 25 different users of 12 different fuel types.
- 14 types of air-borne emission (where data are available) including the 6 GHG's monitored under the Kyoto Protocol.

Linking E3ME to bottom-up technologies submodules (FTTs)

Since 2012, the power sector in E3ME has been represented using a novel framework for the dynamic selection and diffusion of innovations, initially developed by J.-F. Mercure (Mercure, 2012), called FTT:Power (Future Technology Transformations for the Power sector). This is the first member of the FTT family of technology diffusion models. The current E3ME model version is also linked up to FTT:Transport, FTT: Steel and FTT:Heat.

Drawing on an evolutionary approach, the FTT models use a decision-making core for investors or households facing several options in their purchasing decisions. The model is based on theories of technology diffusion, with rates of diffusion affected by relative market shares and

technology prices. The detailed technology representation allows for a range of policy options.

Many of the policies are characterised by long lag times due to the lifetimes of the technologies that are built. However, the model can show rapid transitions as technologies gain market penetration, reinforced by cost reductions that result from learning rates.

The resulting diffusion of competing technologies is constrained by a global database of renewable and non-renewable resources (Mercure & Salas, 2012, 2013).

Appendix B Detailed assumptions

The region's combined GDP is projected to be 4% above the baseline scenario by 2030, according to a study done by IMF (Anderson et. al., 2022).

It is estimated that the region will witness around $700 billion investment in renewable energy transition between 2020 and 2050 (Zawya, 2022). They expect to reach 300 million electric vehicles by 2040, and more the 60% of the total active vehicles by 2050. In the region's power sector, total investment shall be more than $250 billion (including $60 billion in Saudi Arabia and $37 billion in Egypt).

Besides meeting energy demand through affordable and sustainable solutions, the MENA countries need to pay attention to the wider socio-economic effects of the transition. Policy making must keep in mind the perspective and incentives of smaller minorities and special groups of the labour force. It is crucial for both enabling the policies to reach their full potential and the set targets while also relevant for the safety of these social groups.

Grid infrastructure

Electricity grids are the backbone of the energy transition; however, the current infrastructure is not yet ready to facilitate electricity flow required to reach net-zero scenarios by 2050. It is estimated that at least $21.4 trillion needs to be invested by 2050 globally according to BloombergNEF (2023).

The Middle East is also expected to speed up and spend heavily on smart electricity grids. Total investment is on track to reach $17.6 billion by 2027 (Malek, 2021). The unit rate for solar energy investment is reducing year-on-year. This doesn't mean that a capital decline suggests a slowdown of the industry, on the contrary it indicates that the number of gigawatts installed remain high. It is expected that stationary battery storage market size will surpass $170 billion by 2030, according to Global Market Insights (REGlobal, 2020). Furthermore, the GCC countries' grid interconnectivity is expected to generate US$ 33 billion in investments, economic and energy savings over the next 25 years.

Energy export

Many of the regional countries rely heavily on oil production and export as a major part of their GDP. This poses a huge economic threat to them in the future. Most governments have already recognized this and are aiming to prepare for it by building alternative solutions. One potential option is to build renewable energy capacities, which can replace oil export in the future. Solar energy is one of the most promising and abundant types of renewables globally, and it is especially relevant in the MENA region as well.

There are several papers which examine the potential of solar energy export from the region (Zubair, 2019, 2021). There are three major factors

that determine the economic viability of it: energy production capabilities, transmission channel, energy demand of potential buyers. Firstly, the production capabilities of the region are ideal for solar energy generation because of the relatively high number of sunny hours in a day. The second issue is to find whether exporting is still economically feasible, even after accounting for the energy loss during transmission and calculating with the demand and energy prices of the buyer country. Studies have empirically shown that exports to Europe, North-Africa and Asia have a positive NPV (net present value) from even the furthest parts of the MENA region. The highest potential countries are Iran, Saudi Arabia, and Egypt.

The Institute of Engineering Thermodynamics at the German Aerospace Center (Müller-Steinhagen et. al., 2008) estimates that, based on solar potential in the region and the potential shortfall in capacity to meet demand in Europe, by 2050 interconnection between the EU and the MENA region could reach a maximum capacity of 100GW, transferring 700TWh per year, with investment of around $450bn over 2020-50. Researchers in the region foresee economically-viable solar energy export using a multi-terminal transmission from Saudi Arabia to Greece via Kuwait, Iraq, Iran, and Turkey with the net present value of $2.5bn for a power purchase agreement of $0.11/kWh (Zubair, 2019, 2021). Furthermore, the TuNur project in Tunisia is expected to generate 9.4MWh per year with the first phase involving 85 million euros of investment for 250MW of capacity and a further 1.6 billion euros for the cable between the Saraha Desert and Europe.

Hydrogen production

Green hydrogen is considered a crucial solution to decarbonize “hard-to-abate” sectors and therefore forecasting its future price is crucial and is of big interest to many. Some say it will be available for ~$0.5/kg, while others estimate it to be available for ~$3/kg, in 2022 real terms. The $3 price would be equivalent to ~$80/MWh, higher than natural gas prices today. (Wan, L., Butterworth, P., 2023)

The region hopes to build its own infrastructure in hydrogen production which could serve both the purpose of becoming independent of foreign markets (Europe) and as an investment opportunity for further future exports, mostly to Asia. It is estimated that all announced hydrogen plants in the region is worth over $70bn (MEED, 2022).

Altogether nine projects were announced at the COP27 conference in 2022, with Egypt, the conference’s host country presenting most of the plans. If all these projects are turned into final investment and are fully implemented, they’re supposed to be worth $83 billion and to produce collectively 7.6 million tons of green ammonia and 2.7 million tons of green hydrogen per year (Wan & Butterworth, 2023). Egypt’s green hydrogen plan aims to achieve 1.4GW of production capacity by 2030 and requires $40bn of investment (Energy & Utilities, 2022). Egypt has potential to reduce the cost of hydrogen from under $3/kg to $1.7/kg (Ivanova, 2022), comparable to estimates by the IEA (IEA, 2019b) for green hydrogen production costs in resource-rich countries.

Saudi Arabia launched a "Saudi Green Initiative" in 2021 and is planning the development of green hydrogen and green ammonia production around "NEOM" (a new city area currently being built by the country), together with thirteen renewable energy projects with a combined capacity of 11.3 GW that could reduce 20 million tons of carbon emission per year (Saudi & Middle East Green Initiatives, 2021).

Oman has also launched a strategic plan on green hydrogen, estimated around $140 billion in investment by 2050, targeting an annual production of 1-1.25 MT of green hydrogen by 2030, rising to 3.25-3.75 MT by 2040 and 7.5-8.5 MT by 2050. Furthermore, Oman is working on building a green steel plant fed by hydrogen, with an annual production of 5 million tons and to be exported to other MENA countries (International Energy Agency, 2023c).

Electric vehicle production

The region has been pushing domestic production electric vehicles, with facilities opened in Saudi Arabia, Egypt and the UAE recently aiming to produce 420,000, 20,000 and 55,000 units per year by 2025, respectively (Arabian Business, 2023; Arab News, 2022). Saudi Arabia in particular is expected to drive the regional EV market, having bought a majority stake in the US-based EV manufacturer Lucid Group secured through the Public Investment Fund (PIF), Saudi Arabia's sovereign wealth fund (Economist Intelligence Unit, 2023). It also targets to produce 500,000 EVs by 2030, export 150,000 units by 2026 and is expected to invest $50bn in production facilities over the next decade.

Just transition

Just transition is an element that has been increasingly recognized in importance across the region. However, out of all countries in the region, few mention just transition in existing NDC plans and none includes detailed targets or implementation policies.

The impact of changes in climate indicators on labour supply in the region poses a great threat to every aspect of societies including labour market and general living conditions. The most important are changes in temperature and humidity which can significantly reduce safe and healthy working hours of the region, and in effect it has a negative effect on day-to-day business operations by altering the labour supply. The ILO is leading the region's programme in transitioning to a green future of work, and submitted a document that globally outlines the principles of a just transition to environmentally sustainable economies and societies.

The low- and middle-income countries such as Algeria, Djibouti, Egypt, Iran, Iraq, Jordan. Lebanon, Libya, Morocco, Syria, Tunisia, and Yemen are particularly vulnerable to the direct and indirect effects of global warming. On the other hand, countries such as Oman, Qatar, Saudi Arabia pose lower limits to adaptive capacity building.

Training and reskilling

A problem of the region is its high dependence on fossil fuel jobs. In most places of the world, the ratio of fossil-fuel works among all energy related jobs compared to the ratio of renewable energy works is relatively low. However, in the MENA region the fossil fuel jobs take up a much higher proportion of all energy jobs which creates additional vulnerabilities. Furthermore, the skill needs of the energy sector is relatively high compared to other sectors which creates a sectoral employment issue.

An important economic question is how much it will cost to reskill fossil fuel workers and prepare them for working in the renewable energy or in other sectors. A study by the European Commission (Vandeplas et. al., 2022) suggests that the skills gaps that require relocation training are overall small and mainly concentrated in extraction workers whose skills profiles are highly unique and significantly different from other occupations. The cost of retraining mining workers is estimated to be 10,000 euros. The study also assumes smaller training costs for workers in non-mining sectors to adapt to a low-carbon work environment, roughly 1500 euros for jobs in manufacturing and agriculture sectors and 500 euros for all other jobs. Furthermore, a study by Greenpeace (2021) shows that there's a high level of support among oil industry workers to alter their careers to green sectors. However, their reskilling is too costly for them, reportedly having to spend around 2100 euros yearly on average. They support the idea of an "offshore passport" that allows them to work across sectors if they hold a certificate of minimum requirements.

Youth unemployment

The MENA has the highest total and youth unemployment rates worldwide. The youth is especially vulnerable compared to other regions which creates social conflict and also a great underutilization of the workforce's potential in the national economy. The ILO (2022) modelled a scenario of green policy measures and found that by 2030, an additional 8.4 million jobs worldwide could be added for young people aged 15-29. Out of those jobs, the Arab States could account for 437,000 jobs. This is substantial to the youth population of the region compared to the rest of the world and can be explained by the region's high dependency on fossil fuels and higher costs of investments required for green adaptation.

The United Nations (2020) reported that 20% of the youth population in the Arab region (which makes up the majority of the MENA region) is not in employment, education or training. Among member countries, Egypt has been running a Technical and Vocational Education and Training Reform Programme (TVET) funded by the government and the European Union to address issues such as youth unemployment, which is reported to cost 50,000 Egyptian pounds (equivalent to around $1600) per person (Dailynews Egypt, 2019).

Climate adaptation

The MENA region is highly vulnerable to physical change impacts, putting human activities and natural systems at high risk. There are specific sectors which are especially relevant within the region and at the same time highly sensitive to climate changes, such as agriculture and coastal areas. The

region has managed to set up both mitigation and adaptation strategies, however most of them are highly dependent on international support in financing.

Due to rapid population growth, urbanization and industrialization, the MENA is at risk of water scarcity. However, with an abundance of solar, the potential for desalination is vast. Initiatives such as the MENA Desalination Projects Forum have been established to address water risks and invest in desalination facilities particularly in Saudi Arabia, Egypt and the UAE (TradeArabia, 2022).

In addition, the Middle East Green Initiative aims to plant 50 billion trees (including 10 billion in Saudi Arabia) in the coming decades across the region (Saudi & Middle East Green Initiatives, 2021).

Error! Reference source not found. describes the announced targets in detail and **Error! Reference source not found.** sets out the assumptions made for each scenario.

Table 0.1: Interpretation of NDC and other decarbonization targets

MENA countries present natively in E3ME	Announced target (NDC)	Other targets (non-NDC)	Target Interpretation
Algeria and Libya	**Emissions reduction** Algeria: "Reduction of greenhouse gases emissions by 7% to 22%, by 2030, compared to a business as usual -BAU- scenario, conditional on external support in terms of finance, technology development and transfer, and capacity building. The 7% GHG reduction will be achieved with national means". Libya: no target		A target of 7% reduction in CO2 emissions was assumed for the North Africa OPEC aggregate, by 2030, relative to the Current Policies baseline. This is in line with Algeria's target, assuming that Libya adopts a similar unconditional target and that non-CO2 emissions reduce in line with CO2 emissions.
	Energy Targets Algeria: "Reach 27% of electricity generated from renewable sources of energy by 2030".	**Energy Targets** Libya: Renewable Energy Strategic Plan launched to achieve 7% by renewables in 2020 and 10% in 2025. (Target set by the Libyan government in 2013)	A target of 20% was assumed for the share of electricity generation from renewable sources by 2030, an average of Algeria and Libya's targets. Renewable sources include nuclear, biomass, hydro, wind and solar.
Egypt	**Emissions reduction** "GHG emission reduction for the below three sectors by 2030 relative to the BAU emission levels. The sectoral emission reduction targets as a result of implementing mitigation measures are as follows:" • Electricity (33% below BAU) • Transport (7% below BAU) • Oil & gas (65% below BAU)		The sector-level targets were assumed as indicated for transport and electricity sectors, for 2030 relative to the level of CO2 emissions in the Current Policies baseline (Oil & gas emissions is not explicitly tracked in E3ME).
	Energy Targets "Electric power contribution target of 42% by 2035 as per Egypt's Integrated Sustainable Energy Strategy 2035."	**Energy Targets** By 2035, electricity mix goals (according to Egypt's 2035 Integrated Sustainable Energy Strategy – ISES 2035): - 55% thermal power	A target of 42% was assumed for the share of electricity generation from renewable sources by 2035 (including 3% CSP, 22% solar PV, 14% wind, 2% hydro and 3% nuclear).

MENA countries present natively in E3ME	Announced target (NDC)	Other targets (non-NDC)	Target Interpretation

		- 42% renewable energy
		  ○ 3% CSP
		  ○ 22% PV
		  ○ 14% wind
		  ○ 2% hydro
		  ○ 3% nuclear
		
		Hydrogen targets
		Egypt aims to scale up the green hydrogen facilities on the Suez canal economic zone to produce 15,000 tonnes of green hydrogen per year as feedstock for green ammonia.
		EV Targets
		Only EVs in operation by 2040
		Investing 2 billion Egyptian pounds to produce 20,000 EVs per year by 2025, at 315,000 Egyptian pounds ($20,000) per vehicle. (Target set by the Egyptian government in 2021)
			The green hydrogen plant on the Suez canal economic zone (with 100 MW electrolysis capacity) is accounted for in the baseline. Once operational the capacity level does not change in the baseline given that it is a pilot schemes and the potential to scale up is planned but not yet implemented.
			The EV target is simulated by a phase-out of ICE vehicles and EV production target is assumed as indicated.

Iraq and Kuwait	**Emissions reduction** Iraq: 15% (below BAU) Conditional mitigation target, unconditional target is 2% by 2030 (below BAU). Kuwait: "Reduction of 7.4% in 2035 relative to BAU, with total GHG emissions capped to 131,715,950 MTCO2e in 2035, with amount of reduction of 10,574,800 MTCO2e". **Energy Targets** Iraq: Plan to install 12GW of renewable energy power (including private sector investments).	**Emissions reduction** Kuwait: Net zero by 2060 (COP). **Energy Targets** Kuwait: Renewable energy target by 2030: supply 15% of peak electricity	A target of 5% reduction in CO2 emissions was assumed for the Rest of OPEC aggregate, by 2030, relative to the Current Policies baseline. By 2050, CO2 emissions reduce significantly by at least 25% relative to the Current Policies baseline, due to net zero being achieved in Kuwait by 2060 but no target in Iraq and Kuwait accounts for one-third of their combined emissions currently. This is an average of Iraq and Kuwait's targets and assumes that non-CO2 emissions reduce in line with CO2 emissions. More than 12GW of renewable energy power capacity is added by 2030 (Iraq's target) and 15% of electricity generation is from renewable sources by

MENA countries present natively in E3ME	Announced target (NDC)	Other targets (non-NDC)	Target Interpretation
		from renewable energy (Part of New Kuwait Vision 2035).	2030 (Kuwait's target). Renewable sources include nuclear, biomass, hydro, wind and solar.
Saudi Arabia	**Emissions reduction** "The Kingdom aims at reducing, avoiding, and removing GHG emissions by 278 million tons of CO2eq annually by 2030".	**Emissions reduction** Net zero by 2060 (COP).	The 2030 emissions reduction target translates to around 42% reduction in CO2 emissions relative to the Current Policies baseline. By 2050, CO2 emissions will be near zero (on track to reach zero by 2060).
	Energy Targets "The renewable energy ambition aims to reach around 50% of the energy mix by 2030".	**Energy Targets** Renewable energy target by 2030: 58.7 GW (target set by the Saudi Arabia's Renewable Energy Project Development Office in 2019) **Hydrogen targets** The NEOM green hydrogen project is expected to produce 650 tons of green hydrogen per day.	A target of 50% was assumed for the share of electricity generation from renewable sources by 2030. In addition, renewable capacity will be no less than 58.7 GW. Renewable sources include nuclear, biomass, hydro, wind and solar. The NEOM green hydrogen project is included in the model's baseline. Once operational the capacity level does not change in the baseline given that it is still being constructed and the potential to scale up is planned but not yet implemented.
		EV Targets 30% of EVs among vehicles on the road by 2030 (100% by 2060) Producing 420,000 units of EVs domestically from 2025 and 500,000 units a year by 2030, exporting 150,000 EVs by 2026. Investment in EV production is expected to reach $50bn in the next decade. (Economist Intelligence Unit, 2023)	The EV target is simulated by a phase-out of ICE vehicles and EV production target is assumed as indicated.

MENA countries present natively in E3ME	Announced target (NDC)	Other targets (non-NDC)	Target Interpretation
UAE	**Emissions reduction** "2030 net GHG emissions will be reduced (…) to 182 MtCO2e. (…) If expressed in terms comparable to the Updated Second NDC — as a reduction from business-as-usual scenario — this represents a 40% decrease from the estimated 2030 emissions".	**Emissions reduction** Net zero by 2050 (COP)	A target of 40% reduction in CO2 emissions was assumed by 2030, relative to the Current Policies baseline. By 2050, CO2 emissions will no longer be positive. This assumes that non-CO2 emissions reduce in line with CO2 emissions.
	Energy Targets "The UAE Energy Strategy 2050 targets a 30% clean energy capacity mix by 2031 (and 50% by 2050), as well as a reduction of final energy demand through individual and institutional consumption efficiency of 42% to 45% by 2050."	**Energy Targets** Note: Dubai's solar powered green hydrogen powerplant opened in 2023 is taken into account in the baseline of the model. It produces 20.5kg per hour currently, becoming fully operational in 2030. Once operational the capacity level does not change in the baseline given that it is a pilot schemes and the potential to scale up is planned but not yet implemented.	A target of 50% was assumed for the share of electricity capacity from renewable sources by 2050 (30% by 2030). Renewable sources include nuclear, biomass, hydro, wind and solar. In addition, final energy demand will be 42-45% lower than the Current Policies baseline by 2030.
		EV Targets 42,000 EVs on the streets by 2030 (50% by 2050). Invested $408 million in EV production facilities with expected capacity of 55,000 cars per year. (UAE's 'Global EV Market' project launched in 2023)	The EV target is simulated by a phase-out of ICE vehicles and EV production target is assumed as indicated.

Table 0.2: Modelling assumptions by scenario

Policy / Captured Effect	Source	NDC	Strong Industrial Policy	Climate Resilience
Decarbonization target	NDC documents and plans	Algeria: 7% below BAU Egypt: • Electricity (33% below BAU) • Transport (7% below BAU) • Oil & gas (65% below BAU) Iraq: 2% below BAU Kuwait: 7.4% by 2035 below BAU Libya: no change Saudi Arabia: avoid 278 million tons of CO2eq annually by 2030 UAE: 40% below BAU Note: These assumptions are used for checking and calibrating of policies.	Net zero 2050 for the region as a whole Note: These assumptions are used for checking and calibrating of policies.	
Carbon price	Own assumptions based on CE's standard 1.5C scenario	A carbon price applies in energy-intensive industries. The rate of carbon pricing increases over time and varies by country according to their climate ambitions. Carbon prices in the MENA region are set to start at around $7/tCO2 in 2024, in line with the cost of carbon credits currently sold in Saudi Arabia (Reuters, 2023) (no carbon pricing is in place elsewhere in the region), rising to around $150/tCO2 by 2050.	A regional carbon price applies in all sectors and all MENA-E3ME regions. The rate of carbon pricing increases over time and is higher than in the NDC scenario. Carbon prices the MENA region are set to start at around $50/tCO2 in 2024, increasing to around $250-300/tCO2 by 2050.	
Energy efficiency investments	Own assumptions based on CE's standard 1.5C scenario	Governments invest in best available technologies to reduce energy dependency. This represents economy-wide investment into efficiency improving measures that do not relate to fuel or technology switching, for example building insulation and productivity-enhancing process redesign.		

Policy / Captured Effect	Source	NDC	Strong Industrial Policy	Climate Resilience
Energy substitution regulation	Own assumptions based on CE's standard 1.5C scenario	-	A regulation to phase out fossil fuels from the energy mix in industry sectors by 2050 (allowing for fossil fuel use with CCS and unabated feedstocks to remain)	
Biofuel blending mandate	Own assumptions based on CE's standard 1.5C scenario	Blending mandates on the remaining middle distillates after electrification is accounted for in transport, industry and agriculture. Biofuel mandate increases from baseline according to countries' climate ambitions.	Biofuel mandate increases to 100% by 2050 across all MENA-E3ME regions.	
Green hydrogen	Own assumptions and literature	-	Increase production of green hydrogen from electrolysis to replace all fuel imports and meet domestic demand, according to projections of: - $1.5/kg by 2050 from $3/kg currently, modelled as a cost to production for domestic industries that likely require hydrogen (steel, non-metallic minerals, chemicals, transport services and power generation) - in addition to existing capacity, additional regional production of 625 toe by 2030 and 14 mtoe by 2050, based on Egypt's production estimates (ranging between 125 toe by 2030, and 2.7 mtoe by 2050) and scaled up by Egypt's share of the region's oil and gas production (20%, from E3ME data) - capital investment to fall from $900/kW currently (or $2/kg, based on data for Saudi Arabia) to $450/kW by 2050 (or $1/kg, according to IEA), implying total investment of around $170bn over 2023-50 (more than double what has already been announced) – this is supported by further investment of $70bn in transport and export facilities and $16bn for water facilities (based on PwC's global ratios of these investments relative to electrolysis investment) - energy intensity of 50kW of electricity per kg of hydrogen produced (Saudi Arabia's estimate)	

Policy / Captured Effect	Source	NDC	Strong Industrial Policy	Climate Resilience
			This level of production will significantly exceed domestic oil and gas demand in the region (according to a BAU trajectory). Therefore, a conservative assumption was made such that hydrogen production output increases up to a level that sufficiently offsets oil & gas losses. To estimate wider supply chain and employment impacts of hydrogen production, average model parameters between manufactured fuels and chemicals will be used to proxy hydrogen's intermediate demand for inputs from other sectors and labour intensity.	
Hydrogen export	Own assumptions and literature	-	Potential hydrogen exports are derived from the difference between total production and domestic consumption volumes, multiplied with hydrogen prices to give export values. Any shortfall in hydrogen export revenues to compensate for lost export revenues from oil & gas (after taking into account solar export revenues) will be made up for by scaling up production (and investment) inputs accordingly.	
Solar export	Own assumptions and literature	-	Export of 100GW of solar capacity (700TWh) (Müller-Steinhagen et. al., 2008) by 2050 at $0.11/kWh (Zubair, 2019, 2021) (generating revenues of $77bn). In addition to investment in building solar capacity (which is estimated within the model), capital investment equivalent to 2% of revenues will be needed for transport infrastructures (based on metrics from existing projects and external projections).	
EV production	Own assumptions and literature	-	Producing 600,000 EVs/year by 2030 (mainly in Saudi Arabia, with some from Egypt and UAE), a third of which will be exported at $20,000/vehicle (based on Saudi Arabia's target and newly opened facilities in Egypt and UAE). Required investment in production facilities is assumed at $30bn over 2024-30, based on Saudi Arabia's targets. Targets will be extrapolated after 2030. (Arabian Business, 2023; Arab News, 2022; Economic Intelligence Unit, 2023)	
Phase-out regulation of ICE vehicles	NDC documents and plans	Egypt – 100% EVs in fleet by 2040 Saudi Arabia – 30% of EVs in fleet by 2030 (100% by 2060)	No explicit target but aiming for more than NDC with the ramp-up of other policies	

Policy / Captured Effect	Source	NDC	Strong Industrial Policy	Climate Resilience
		UAE – 50% EVs in fleet by 2050		
Power generation renewable targets	NDC documents and plans	To be delivered by policies listed below: Algeria – 27% by 2030 Egypt – 42% by 2035 Iraq – 12GW of renewable energy power by 2030 Kuwait – 15% by 2030 Libya – 10% in 2025 Saudi Arabia – 50% by 2030 UAE – 50% in the power capacity by 2050	No explicit target but aiming for more than NDC with the ramp-up of other policies	
Power generation subsidies	Own assumptions based on CE's standard 1.5C scenario	A subsidy (either on capital investment or as feed-in-tariffs) can be applied on specific technologies e.g. wind, solar. Subsidy rates are set according to countries' NDCs, up to 50%.		
Phase-out regulation of new capacity in power generation	Own assumptions based on CE's standard 1.5C scenario	A phase-out regulation on new unabated capacity (those without CCS), in line with countries' NDCs	No new unabated fossil fuel capacity is allowed from 2024.	
Phase-out regulation of existing stock in power generation	Own assumptions based on CE's standard 1.5C scenario	-	All remaining unabated power plants are shut down by 2050	
Government procurement or innovation in power generation	Own assumptions based on CE's standard 1.5C scenario	Governments invest to bring CCS and BECCS to market. The initial rate of deployment varies according to countries' NDCs.		
Grid and storage for power generation	Own assumptions, based on previous work	Investment in grid and storage is borne by investors, to support renewable generation. The exact amount of investment is captured endogenously, based on the level of renewable capacity.	In addition to NDC, additional investment of $500/GW of new annual electricity capacity addition is made for enhancing grid connectivity and performance.	

Policy / Captured Effect	Source	NDC	Strong Industrial Policy	Climate Resilience
Energy subsidies for the steel sector	Own assumptions based on CE's standard 1.5C scenario	A subsidy on energy expenditures is applied on electricity and hydrogen. Subsidy rates vary according to countries' NDCs, up to 50%.		
Subsidies for the steel sector	Own assumptions based on CE's standard 1.5C scenario	A subsidy on capital investment is applied on CCS, in accordance with NDCs, up to 50%.		
Labour force training	Own assumptions and literature	-	Workers in fossil fuel supply industries receive training to take up new jobs in low-carbon industries, at a cost of $11,000 per worker (EU-based estimates), whereas other sectors will also invest in training for 10% of their workforce to adapt to a low-carbon environment, at the cost of $1650 per worker for manufacturing industries and $550 per worker in other sectors (Vandeplas et. al., 2022). The number of fossil fuel supply workers receiving training is determined by the number of jobs at risk of being displaced by the transition. The total cost of training per year is determined by the number of workers receiving training multiplied by the average cost of training. In addition, 20% of all 15-24 years-olds in the region will receive higher education or vocational training at the cost of $1600 per person (based on the training gap in Arab regions and average cost of training in Egypt) (Dailynews Egypt, 2019).	
Recycling and waste management	Own assumptions and literature	-	-	Investment of $85bn by 2040 in recycling technologies and waste management infrastructure, to deliver 87% recycling and composting rates across all work streams by 2040, up from 20% currently according to BCG's estimates (Meyer zum Felde et. al., 2022). As part of this, raising the regional average plastics recycling rate to 40% (from 10%), similar to developed economies according to PwC (Ozeir, 2020). This will be assumed to cover the same timeframe.

Policy / Captured Effect	Source	NDC	Strong Industrial Policy	Climate Resilience
				Assumptions are extrapolated beyond 2040.
Water desalination	Own assumptions and literature	-	-	Water desalination capacity to increase by 37% over the next 5 years, requiring $100bn investment, 20GW of solar capacity and 5-6GW of wind by 2025 (TradeArabia 2022). Assumptions will be extrapolated beyond this period, to reach 14-fold by 2040 (according to the IEA).
Reforestation	Own assumptions and literature	-	-	The Middle East Green Initiative aims to plant 50 billion trees (including 10 billion in Saudi Arabia) in the coming decades across the region and reduce emissions by up to 2.5% of global emissions. Tree planting costs are assumed to be $3900 per hectare (based on costs of mangroves restoration, (World Bank, 2022)) and density is assumed at 1500 trees/hectare.
Stranded assets	Own assumptions based on CE's standard 1.5C scenario	Lost oil royalties and compensation for stranded power plants are borne by governments, which reduce final expenditures on public services	Lost oil royalties and compensation for stranded power plants are funded by international support to maintain provision of public services	
International support in financing	Own assumptions	If only conditional NDC targets are announced, renewable subsidies and energy efficiency investments are financed by international support.	In addition to NDC, costs of reskilling and training are also funded by international support.	Same as Strong Industrial Policy, but 50% of climate mitigation measures will also be funded by international support. The remaining 50% will be funded by MENA countries according to their GDP per capita, whereas their share of benefits will be driven by their level of climate vulnerability

Policy / Captured Effect	Source	NDC	Strong Industrial Policy	Climate Resilience
				according to the ND-GAIN index (University of Nortre Dame, 2023).
Revenue recycling	Own assumptions based on CE's standard 1.5C scenario	Carbon revenues are used to fund transition-related investments and policy costs borne by governments. Any excess revenue is distributed to firms and households through employer's social security contribution rate, VAT and income tax. Any shortfall in revenues to fund the transition (after taking into account international support) is met by raising the same tax instruments.		

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Appendix D Detailed results

Table 0.3: GDP by region and scenario

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												$2023bn
MENA	5123.3	6476.5	12737.2	5123.3	6453.3	12459.9	5123.3	6386.6	13343.1	5123.3	6493.4	13657.5
Arab States	1855.3	2251.2	3957.3	1855.3	2230.8	3803.2	1855.3	2275.9	4119.0	1855.3	2296.2	4157.1
Saudi Arabia	687.0	847.4	1590.0	687.0	850.7	1550.6	687.0	869.8	1638.7	687.0	874.6	1633.2
Algeria and Libya	318.6	445.3	1017.6	318.6	454.1	1039.2	318.6	397.9	1080.1	318.6	416.0	1149.8
Egypt	393.2	505.1	949.6	393.2	493.1	890.9	393.2	499.4	988.7	393.2	501.5	997.7
United Arab Emirates	223.9	280.2	638.1	223.9	275.2	627.4	223.9	278.7	681.7	223.9	286.9	705.8

Table 0.4: Employment by sector in the MENA region

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												thousands
Agriculture	28439.5	26939.1	22068.9	28439.5	26939.3	22166.2	28439.5	26936.7	22397	28439.5	26929.6	22268.8
Coal	0	0	0	0	0	0	0	0	0	0	0	0
Oil & Gas	704.4	773.2	909.6	704.4	718.9	781.1	704.4	696.8	750.8	704.4	696	746.9
Other Mining	527.3	611.7	855.5	527.3	611.7	855.5	527.3	611.7	855.5	527.3	611.7	855.5
Food, Drink & Tobacco	1465.1	1818.5	2646	1465.1	1822.7	2690	1465.1	1564.3	2836.8	1465.1	1577.8	2798
Textiles, Clothing & Leather	894.1	1064.7	1457.1	894.1	1061.4	1461.9	894.1	1059.4	1461.6	894.1	1057.3	1466.8
Wood & Paper	1002.3	1189.3	1909.5	1002.3	1200.8	1899.9	1002.3	1182.1	1934.8	1002.3	1183.4	1954.2
Printing & Publishing	1127.6	1389.6	2373	1127.6	1390.5	2390.5	1127.6	1320.7	2307.5	1127.6	1327.1	2336.6
Manufactured Fuels	79.3	91.5	128.2	79.3	34.9	3	79.3	20.7	3.1	79.3	20	3.1

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Pharmaceuticals	969.7	1706.6	3846.1	969.7	1717.1	3876.8	969.7	1649	3656.5	969.7	1647.3	3656.1
Chemicals	1214.6	1713.1	4094.7	1214.6	1708.8	4112.2	1214.6	1723.8	4079.7	1214.6	1726.7	4025.6
Rubber & Plastics	1118	1589.9	3869.2	1118	1455.2	3874.6	1118	1631	3946.3	1118	1454.9	3406.9
Non-Metallic Mineral Products	997.3	1270.3	2251.4	997.3	1280	2346.2	997.3	1329.9	2469	997.3	1327.8	2433.1
Basic Metals	430	627.4	1736.1	430	894.3	2036.9	430	946.2	2064.1	430	963.3	2126.6
Metal Goods	1286.5	1767.3	4029.1	1286.5	1875.1	4374.7	1286.5	1681.4	3623.3	1286.5	1709.9	3824.9
Mechanical Engineering	1290.9	1733.9	3866.9	1290.9	1763.4	3934.5	1290.9	1841.1	4059.5	1290.9	1927.5	4418.3
Electronics	1145.6	1605.2	3831.4	1145.6	1708.1	3919.4	1145.6	1820	4081	1145.6	1895.4	4367.6
Electrical Engineering & Instruments	1120.6	1549.4	3844.2	1120.6	1578.3	3877.7	1120.6	1639	4649.2	1120.6	1657.2	4657.9
Motor Vehicles	1141.2	1544.7	3546.4	1141.2	1572.2	3629.7	1141.2	1650.6	3912.9	1141.2	1977.8	5027.7
Other Transport Equipment	813.4	1196.9	3100.7	813.4	1199.4	3086.9	813.4	1203.5	3187.8	813.4	1200.4	3138.8
Other Manufacturing	1701.2	2281.8	4826.6	1701.2	2380.3	5019	1701.2	2746	5326	1701.2	2759.3	5340.1
Electricity	1000.7	1143.6	1448.2	1000.7	1221.6	1839.7	1000.7	1282.5	1910.5	1000.7	1312.8	2227.9
Gas Supply	304.8	385.5	582.2	304.8	261.3	272.9	304.8	152.9	223.5	304.8	149.5	177.6
Water Supply & Waste	448.3	546.4	922.3	448.3	547	926.4	448.3	549.6	923.7	448.3	603.1	1000.1
Construction	19087.9	16616.3	11704.6	19087.9	17064.5	11934.2	19087.9	17685.1	12739.4	19087.9	18120	13618.1
Distribution	10068.2	11239.5	11756.9	10068.2	11139.3	11119.7	10068.2	11279.4	11379.4	10068.2	11615.8	12005.6
Retailing	10773.4	11065.4	9867.8	10773.4	10955.4	9475.7	10773.4	10844	9698.6	10773.4	10812.4	9609.9
Hotels & Catering	3100.6	3841.3	5395.6	3100.6	3846.7	5425.3	3100.6	3913.7	5468.1	3100.6	3870.6	5392
Land Transport	5271.1	5964.1	7597.8	5271.1	5886.4	7619.6	5271.1	6403.3	7749.1	5271.1	6444.8	7837.8
Water Transport	458.3	535.5	863.8	458.3	535.8	864.6	458.3	534.6	871.6	458.3	535.4	868.7
Air Transport	1370.6	1653.1	2843.2	1370.6	1649.8	2888.2	1370.6	1651.7	2833.2	1370.6	1651.7	2843.1
Communications	3109.4	3844.5	6048.3	3109.4	3833.9	6040.1	3109.4	3841.8	6056	3109.4	3842.2	6031.8
Banking & Finance	1224.3	1535	2589.3	1224.3	1531.4	2595.7	1224.3	1536.3	2614.1	1224.3	1535.3	2613.5

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Insurance	950.9	1141.2	1894.9	950.9	1126.3	1924.3	950.9	1125.9	1934.6	950.9	1102.9	1922.4
Computing Services	98.6	120.4	238	98.6	120.7	239.1	98.6	121.6	242.2	98.6	121.9	244.1
Professional Services	3025.3	3818	6368.4	3025.3	3864.8	6379.8	3025.3	3895.5	6412.5	3025.3	3935	6465.3
Other Business Services	2513.1	2989	4565	2513.1	2986	4561.2	2513.1	3002.7	4562.7	2513.1	3003.6	4550.3
Public Administration & Defense	12666.9	13204.7	11389.2	12666.9	12969.9	11099.1	12666.9	13190.6	11433.9	12666.9	13191.6	11432
Education	10628.6	10952	9674.7	10628.6	10749.6	9375.6	10628.6	10898.4	9693.8	10628.6	10898.2	9692.4
Health & Social Work	4636.5	5386.3	6816.5	4636.5	5388.7	6895	4636.5	5395.4	7061.9	4636.5	5394.1	7082.8
Miscellaneous Services	8821	8687.1	8656.9	8821	8511.9	8655.6	8821	8479.2	8681.8	8821	8385.5	8594.6
Forestry	325.9	264.1	209.1	325.9	263.8	209.1	325.9	256.8	207.8	325.9	579.9	614.9
Hydrogen supply	0	1.5	1.5	0	1.8	1.8	0	10.7	2869	0	10.5	2803.6

Table 0.5: Employment by sector in the Arab States region

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												thousands
Agriculture	2537.6	2895.5	3426.7	2537.6	2892.7	3437.1	2537.6	2924.5	3501.7	2537.6	2909.8	3350.6
Coal	0	0	0	0	0	0	0	0	0	0	0	0
Oil & Gas	285.3	309.9	331.5	285.3	302	312	285.3	298.9	308.6	285.3	298.8	308.2
Other Mining	297.2	352.7	510.4	297.2	352.7	510.4	297.2	352.7	510.4	297.2	352.7	510.4
Food, Drink & Tobacco	386	474.9	782.2	386	470.8	792.9	386	465.4	817.3	386	465.5	770
Textiles, Clothing & Leather	294.3	378.6	599.8	294.3	378.8	602.9	294.3	379.1	605.7	294.3	375.5	591.8
Wood & Paper	215.4	272.1	479.2	215.4	272.5	471.7	215.4	272.6	487.4	215.4	270.8	465
Printing & Publishing	240.5	314.4	583.5	240.5	315.2	590.2	240.5	312.3	574.4	240.5	311.6	578.6
Manufactured Fuels	37.5	41.3	53.9	37.5	21.6	0.5	37.5	11.7	0.5	37.5	11.7	0.5

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Pharmaceuticals	59.7	72.9	119.2	59.7	73.8	117.1	59.7	72.8	117	59.7	72.4	112
Chemicals	182.5	230.1	420.7	182.5	229.7	420.2	182.5	233.3	439.3	182.5	230.5	424
Rubber & Plastics	299.1	401.4	770.5	299.1	296	796	299.1	429	859.5	299.1	311.3	440.2
Non-Metallic Mineral Products	236.2	296.6	516.3	236.2	298.4	529.5	236.2	300.7	546.4	236.2	298.9	516.9
Basic Metals	73.2	102.4	228.4	73.2	153.2	235.5	73.2	163.6	234.7	73.2	168	227.1
Metal Goods	333.3	399.8	629.9	333.3	406.8	638.7	333.3	411	659.8	333.3	412.6	677.7
Mechanical Engineering	439	537.3	852.7	439	534.7	848.9	439	534	861.4	439	535.6	954.6
Electronics	233	276.5	434	233	355.2	506.8	233	409.9	636.2	233	472.2	870.8
Electrical Engineering & Instruments	135.8	137.4	265.2	135.8	138.2	272.2	135.8	112.1	211.7	135.8	113.8	217.9
Motor Vehicles	396.5	493.4	812.5	396.5	494.5	814	396.5	491.7	836	396.5	490.2	844.1
Other Transport Equipment	19.6	31.5	67.1	19.6	31.5	67.2	19.6	31.6	68.4	19.6	31.4	68
Other Manufacturing	361.5	453	739.6	361.5	459.5	757.7	361.5	468.1	824.5	361.5	466.1	819
Electricity	459.9	539.9	705.1	459.9	629.2	1072.7	459.9	694.5	1123.1	459.9	719.8	1427.6
Gas Supply	125.4	149.6	190.6	125.4	52.8	30.6	125.4	26.1	30.5	125.4	25.6	29.7
Water Supply & Waste	50.5	65.2	118.5	50.5	66	120.9	50.5	68.7	118.9	50.5	101.9	159.9
Construction	8824.4	6972.4	4399.9	8824.4	7520.3	4655.5	8824.4	7780.5	5065.1	8824.4	7950.5	5440.2
Distribution	2777.3	3182.5	3725.9	2777.3	3124.4	3201.5	2777.3	3211.4	3419.6	2777.3	3433.3	3910.8
Retailing	3705.3	3718.5	3140.7	3705.3	3668.6	2843.2	3705.3	3721.7	2931.9	3705.3	3685.2	2766.3
Hotels & Catering	1767	2087.7	2408.8	1767	2093.4	2430.1	1767	2118.2	2481.7	1767	2067.7	2393.4
Land Transport	1992.7	2217.3	2667.7	1992.7	2226.1	2601.9	1992.7	2301.1	2607.2	1992.7	2296.5	2608.5
Water Transport	83.6	116.7	254.2	83.6	115.6	250.6	83.6	130	250.3	83.6	128.3	243.7
Air Transport	379.5	463.3	805.7	379.5	460.3	849.8	379.5	469	827.2	379.5	468.1	826.3
Communications	502.5	649	1002	502.5	647.5	1006.3	502.5	652	1023.4	502.5	651	1012.4
Banking & Finance	336.1	421.8	696.7	336.1	420.6	698.5	336.1	423.4	708.8	336.1	422.7	708.4

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Insurance	294.3	353	564	294.3	346.7	579.2	294.3	346.3	587.3	294.3	334.7	579.6
Computing Services	31.3	36.7	59.7	31.3	37	60.3	31.3	37.4	61.8	31.3	37.6	63
Professional Services	1464.2	1539.1	1743.2	1464.2	1579.5	1760.1	1464.2	1606.2	1819.9	1464.2	1629.7	1843.6
Other Business Services	1339.5	1471.7	1818.8	1339.5	1470.6	1813.6	1339.5	1480.9	1822.3	1339.5	1480.7	1795.5
Public Administration & Defense	5388.4	5857.4	4578.3	5388.4	5752.2	4397	5388.4	5875.1	4604.6	5388.4	5874.4	4598.1
Education	4041.9	4052.1	3228.8	4041.9	3948.4	3017.2	4041.9	4053.5	3243.3	4041.9	4048.4	3231.1
Health & Social Work	2168.4	2337.1	2547.2	2168.4	2337.6	2578.5	2168.4	2365.3	2628.4	2168.4	2360.9	2586
Miscellaneous Services	6687.1	5870.6	4262	6687.1	5643.5	4202.3	6687.1	5728.2	4366.9	6687.1	5595.9	4213.4
Forestry	49	56	55.8	49	55.6	55.6	49	55.2	56.2	49	88	131.2
Hydrogen supply	0	1.1	1.1	0	1.3	1.4	0	1.8	237.2	0	1.8	229.9

Table 0.6: Employment by sector in Saudi Arabia

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												thousands
Agriculture	366.4	475.5	623.2	366.4	476.2	622.8	366.4	477.4	622.5	366.4	478.1	623.7
Coal	0	0	0	0	0	0	0	0	0	0	0	0
Oil & Gas	61.6	66.8	69.4	61.6	65.5	65.9	61.6	65	65.4	61.6	65	65.3
Other Mining	66.9	87.4	144.6	66.9	87.4	144.6	66.9	87.4	144.6	66.9	87.4	144.6
Food, Drink & Tobacco	106.9	133.5	224.1	106.9	132	223.8	106.9	129.7	231.9	106.9	127.1	226.4
Textiles, Clothing & Leather	81.5	107.1	174.7	81.5	107	176.1	81.5	106.8	178.4	81.5	106	177.1
Wood & Paper	58.8	75.5	137.3	58.8	75.4	133.1	58.8	74.3	140.9	58.8	74.6	138.8
Printing & Publishing	65.4	86.6	168	65.4	86.6	168	65.4	86.6	168	65.4	86.6	168
Manufactured Fuels	10.4	11.7	15.1	10.4	7.2	0.2	10.4	5.8	0.2	10.4	5.8	0.2

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Pharmaceuticals	16.3	20.1	34	16.3	20	33.7	16.3	20.1	34.5	16.3	20.1	33.7
Chemicals	50.4	62.5	115.3	50.4	62.1	116.7	50.4	63	119.7	50.4	62.8	116.3
Rubber & Plastics	80.8	109.5	214.5	80.8	52	227.8	80.8	123	257.9	80.8	62.2	43.8
Non-Metallic Mineral Products	64.3	80.8	143.6	64.3	81.7	151.3	64.3	83.3	162.5	64.3	83.5	154.8
Basic Metals	20.1	28.6	66	20.1	48.7	60.2	20.1	53.7	59.5	20.1	56.2	56.2
Metal Goods	89.9	106	165.5	89.9	106.9	167.8	89.9	107.7	171.5	89.9	107.8	173
Mechanical Engineering	115.8	142.1	230.8	115.8	142.1	230.5	115.8	142.5	230.9	115.8	142.5	230.2
Electronics	63	74.9	120	63	117.8	161.8	63	145.2	228.9	63	165.5	314.5
Electrical Engineering & Instruments	36.8	36.3	75	36.8	36.6	77.2	36.8	23.9	51.4	36.8	23.9	49.6
Motor Vehicles	108.9	133.2	223.5	108.9	134.5	225.2	108.9	138.3	239.8	108.9	139.9	245.6
Other Transport Equipment	5.5	9.2	20.4	5.5	9.3	20.5	5.5	9.2	20.9	5.5	9.2	20.8
Other Manufacturing	97.6	123.4	207.8	97.6	128.2	223.8	97.6	133.1	249.2	97.6	136	253.5
Electricity	116.5	140.3	187.4	116.5	182.7	342.9	116.5	206.7	351.1	116.5	212.7	421.2
Gas Supply	31.3	36.1	42.6	31.3	0.4	0.4	31.3	0.4	0.4	31.3	0.4	0.4
Water Supply & Waste	23.6	30.1	56	23.6	30.2	57.2	23.6	30	56.9	23.6	37.9	74.1
Construction	1702.4	1423.8	959.5	1702.4	1653.1	1062.2	1702.4	1708.6	1092.1	1702.4	1756.6	1163.5
Distribution	748.6	771.5	754.3	748.6	775.6	700.8	748.6	790.5	725.1	748.6	799.5	745.8
Retailing	993.4	965.2	772.9	993.4	953.9	751.2	993.4	960.1	771	993.4	953.7	759.3
Hotels & Catering	442.7	536.2	657.9	442.7	535.3	661.2	442.7	540.5	664.3	442.7	538.1	660.2
Land Transport	332.5	400.5	566.6	332.5	404.5	555.1	332.5	409.2	567.3	332.5	408.5	569.3
Water Transport	14.2	20.6	47.7	14.2	20.1	46	14.2	26.1	45.4	14.2	25.7	44.6
Air Transport	62.7	86.6	186.3	62.7	86.1	184.8	62.7	85.2	183.9	62.7	85	183.2
Communications	150.7	191.3	355.3	150.7	190.3	355	150.7	190.8	357.3	150.7	190	355.6
Banking & Finance	77.7	98.2	182	77.7	98.5	183.5	77.7	99.7	186.1	77.7	99.3	186.3

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Insurance	65.9	80.3	139.3	65.9	77.2	147.7	65.9	75.6	149.7	65.9	72.7	147
Computing Services	9.1	11.5	23.1	9.1	11.7	23.6	9.1	11.9	24.4	9.1	11.9	25.2
Professional Services	353.9	389.4	542.4	353.9	417.6	557.2	353.9	419.1	590.2	353.9	420.4	595
Other Business Services	345.1	394.3	573.4	345.1	394.3	573.4	345.1	394.3	573.4	345.1	394.3	573.4
Public Administration & Defense	1939.7	1805.6	1019.6	1939.7	1799	1015.4	1939.7	1803.7	1021.5	1939.7	1802.6	1020.9
Education	1396.4	1353.4	815.8	1396.4	1339	795.4	1396.4	1352.6	816.3	1396.4	1352.3	816
Health & Social Work	743.6	785.8	802.4	743.6	786.5	812.6	743.6	795.4	826.2	743.6	790.8	818.9
Miscellaneous Services	1344.4	1200.9	883.5	1344.4	1119.5	850.2	1344.4	1139.4	883.3	1344.4	1101	860.8
Forestry	8.5	10.4	10.6	8.5	10.3	10.6	8.5	10	10.6	8.5	17.6	27.7
Hydrogen supply	0	0.4	0.4	0	0.4	0.5	0	0.5	45.1	0	0.5	44.1

Table 0.7: Employment by sector in Algeria and Libya

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												thousands
Agriculture	1467.3	1480.3	1400.2	1467.3	1479	1396.5	1483.9	1483.9	1407.7	1467.3	1483.7	1408.1
Coal	0	0	0	0	0	0	0	0	0	0	0	0
Oil & Gas	127.8	146.1	191.8	127.8	126.5	145.6	118.5	118.5	134	127.8	118.1	132.5
Other Mining	83.9	91.6	115.4	83.9	91.6	115.4	91.6	91.6	115.4	83.9	91.6	115.4
Food, Drink & Tobacco	134.2	162	216.5	134.2	161.4	216.1	165	165	223.4	134.2	164.9	223
Textiles, Clothing & Leather	127.4	140.8	160.8	127.4	139.7	157	140.2	140.2	159.7	127.4	140.7	163.1
Wood & Paper	86.1	99.4	153.8	86.1	102	150.4	101.2	101.2	156.5	86.1	95.2	156.9
Printing & Publishing	61.9	75	130.6	61.9	74.3	129.8	75.5	75.5	131.7	61.9	75.7	133
Manufactured Fuels	0.5	0.6	1.1	0.5	0.5	0.7	0.5	0.5	0.8	0.5	0.5	0.8
Pharmaceuticals	27.1	49.8	143.2	27.1	53.6	156.2	44.1	44.1	136.4	27.1	43.6	144.4
Chemicals	70.6	103.3	286.4	70.6	98.6	297.6	104.2	104.2	301.1	70.6	105.4	291.4
Rubber & Plastics	86.1	125.5	338.2	86.1	128.4	326.6	129.5	129.5	324.5	86.1	121.8	338.1
Non-Metallic Mineral Products	75.9	111	304.7	75.9	111.8	310.7	113.3	113.3	312.5	75.9	113.3	312.4
Basic Metals	27.4	40.4	121.9	27.4	37.7	125.1	38.7	38.7	133.7	27.4	39.3	137.6
Metal Goods	161	232	553	161	268.8	705.3	163.5	163.5	433	161	169.6	503.8
Mechanical Engineering	123.8	177.4	455.2	123.8	178.7	453.8	180.3	180.3	454.5	123.8	186.3	444.6
Electronics	81.1	116.7	323.2	81.1	116.2	323.7	117.5	117.5	330.5	81.1	116.4	330.8
Electrical Engineering & Instruments	102.3	149	391.1	102.3	151.6	390.7	154	154	394.3	102.3	160.1	409.1
Motor Vehicles	105.7	151.5	401.2	105.7	150.3	398.7	152.8	152.8	407.2	105.7	160.4	412.4
Other Transport Equipment	41.2	60.9	177.6	41.2	60.8	177.3	61.2	61.2	179.3	41.2	61.1	178.6

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	105	151.9	397.9	105	149	400.1	159.2	159.2	393.5	105	159.7	390.4
Electricity	173.7	189.8	208.9	173.7	194.6	228.4	195	195	240.1	173.7	199	265.5
Gas Supply	41.5	52.8	82.8	41.5	38.5	20.2	0.5	0.5	0.8	41.5	0.5	0.8
Water Supply & Waste	24.2	29.5	53.2	24.2	29.2	53.1	29.4	29.4	53.4	24.2	32.9	60.1
Construction	2077.8	1787.7	1147.5	2077.8	1755.8	1109.8	1811.7	1811.7	1171.6	2077.8	1912.1	1304.2
Distribution	886.3	978.9	931.7	886.3	966.7	903.3	985.4	985.4	917.7	886.3	1038.8	981
Retailing	1276.5	1251.9	931.5	1276.5	1223.2	888.8	1276.5	1276.5	953.3	1276.5	1276	977.3
Hotels & Catering	212.6	273.4	479.2	212.6	273.5	480.4	279.1	279.1	484.2	212.6	279	483.4
Land Transport	493.6	548.6	691.5	493.6	501.6	725	765	765	769.1	493.6	776.4	776.8
Water Transport	23.6	26.5	39.8	23.6	26.3	40.1	27.6	27.6	40.3	23.6	27.6	40.3
Air Transport	76.2	91.5	169.3	76.2	91.2	168.5	89.5	89.5	161.4	76.2	89.5	162.8
Communications	210.6	256	446.1	210.6	252.3	442	256.1	256.1	445	210.6	257.8	447.1
Banking & Finance	45.9	53.6	92.9	45.9	53.2	93.6	53.4	53.4	94.7	45.9	53.6	94.1
Insurance	47.2	55	95.1	47.2	54.4	95.4	54.6	54.6	96.2	47.2	54.8	96.3
Computing Services	24.7	30.6	66.5	24.7	30.6	66.4	30.7	30.7	66.9	24.7	30.7	67
Professional Services	136.1	182.6	388.7	136.1	181.7	381.8	187.1	187.1	377.5	136.1	194.4	386.6
Other Business Services	131.9	177	365.1	131.9	175.6	361.9	181.7	181.7	371.3	131.9	181.3	368.5
Public Administration & Defense	1856.4	1644.5	1184.9	1856.4	1572.2	1122.4	1645.1	1645.1	1189.6	1856.4	1645.1	1189.3
Education	1431	1428.8	1085.7	1431	1368.4	1026.5	1424.5	1424.5	1089.3	1431	1425	1089.4
Health & Social Work	498.1	593.2	781.4	498.1	592.5	774.7	595.9	595.9	783	498.1	596	785.1
Miscellaneous Services	397.8	458.5	636.4	397.8	457	635	461.1	461.1	641.4	397.8	461.1	640.6
Forestry	10.2	9	3.6	10.2	9	3.5	9	9	3.6	10.2	85.2	93.1
Hydrogen supply	0	0	0	0	0	0	0.3	0.3	199	0	0.3	191.7

Table 0.8: Employment by sector in Egypt

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												thousands
Agriculture	6120.3	5557.5	4045.1	6120.3	5559.8	4074.2	6120.3	5544.6	4111.4	6120.3	5547.2	4119
Coal	0	0	0	0	0	0	0	0	0	0	0	0
Oil & Gas	40	39.7	43.7	40	39.5	43.2	40	39.4	43.2	40	39.4	43.2
Other Mining	0.8	0.9	1.2	0.8	0.9	1.2	0.8	0.9	1.2	0.8	0.9	1.2
Food, Drink & Tobacco	269.4	340.2	464.4	269.4	344.8	477.1	269.4	236.8	517.2	269.4	242.4	527.2
Textiles, Clothing & Leather	87.6	99.3	122.8	87.6	99	126.7	87.6	97.4	122.4	87.6	98.1	128.6
Wood & Paper	216.1	249.9	383.2	216.1	251.9	386.7	216.1	244.8	386.2	216.1	252.2	405.7
Printing & Publishing	279.2	335.2	542.9	279.2	335.9	547.3	279.2	307.3	519.8	279.2	310.2	528.2
Manufactured Fuels	12.6	15.5	23.6	12.6	2.7	0.3	12.6	1.7	0.3	12.6	1.4	0.3
Pharmaceuticals	344	620.3	1390.5	344	620.3	1391.4	344	602.1	1319.7	344	602.1	1314.4
Chemicals	337	486.1	1190	337	489.1	1186.4	337	488.3	1160.1	337	489.8	1156.3
Rubber & Plastics	220.2	322.4	860.2	220.2	321.7	860	220.2	320.4	858.3	220.2	319.5	849.7
Non-Metallic Mineral Products	213.3	259.4	355.7	213.3	261.6	381.8	213.3	279.6	421.9	213.3	279.7	423.5
Basic Metals	112.4	165.7	476.7	112.4	251	594.2	112.4	265.9	597.9	112.4	270.2	625
Metal Goods	197.3	291.5	789.9	197.3	295.7	776.3	197.3	318.5	726.3	197.3	323.6	731.5
Mechanical Engineering	181.5	260.3	701.5	181.5	272.6	733.2	181.5	304	779.8	181.5	334.8	894.8
Electronics	271.5	403.8	1038	271.5	403.5	1033.7	271.5	418.2	1022.6	271.5	416	1011.3
Electrical Engineering & Instruments	291.3	422.3	1064	291.3	431.2	1074.7	291.3	468.5	1425.9	291.3	469.4	1412.4
Motor Vehicles	158.4	228.6	639.4	158.4	240.7	675.7	158.4	272.6	773.6	158.4	402	1228.2
Other Transport Equipment	286.2	419.2	1073.7	286.2	420.4	1068.3	286.2	421.7	1107.6	286.2	420.6	1088.1

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	410.6	556.1	1213.5	410.6	596.2	1281.1	410.6	733.8	1379.2	410.6	740.2	1391.5
Electricity	216.5	250.3	340.8	216.5	252.2	391.6	216.5	259	395.9	216.5	262	423.7
Gas Supply	84.7	111.2	181.7	84.7	96.4	136.5	84.7	83	124.9	84.7	81.1	96.4
Water Supply & Waste	146.7	176.3	286.5	146.7	176.3	286.5	146.7	176.2	286.5	146.7	177.9	287.5
Construction	3698.6	3547.8	2823.3	3698.6	3574.6	2869.6	3698.6	3712.5	3010.6	3698.6	3757.1	3151.2
Distribution	2167.3	2405.4	2441.4	2167.3	2399.9	2432	2167.3	2402.2	2431.2	2167.3	2395.4	2419.2
Retailing	1624.1	1775	1861.2	1624.1	1779.3	1867.1	1624.1	1652.6	1857.1	1624.1	1658.5	1875.1
Hotels & Catering	711.2	924.7	1475.7	711.2	924.9	1480.4	711.2	945.7	1474.4	711.2	945.7	1475.2
Land Transport	1015	1175.9	1577.5	1015	1183.4	1583.7	1015	1122.3	1596.5	1015	1132	1628.8
Water Transport	148.2	165.6	240.3	148.2	166.5	242	148.2	158.1	245.1	148.2	159.2	246.9
Air Transport	378.9	455.1	767.6	378.9	455.2	769.1	378.9	453.9	761.2	378.9	454.2	764.8
Communications	911.6	1100.3	1666.7	911.6	1100.2	1664.9	911.6	1097.8	1660.3	911.6	1097.2	1652.7
Banking & Finance	134.6	168.7	283.6	134.6	168.7	283.7	134.6	168.6	283.5	134.6	168.7	283.8
Insurance	75.9	92.8	159.5	75.9	92.7	159.5	75.9	93.3	158.1	75.9	93.2	158.2
Computing Services	0	0	0	0	0	0	0	0	0	0	0	0
Professional Services	678	1061.4	2256.9	678	1062	2258.7	678	1058.7	2241.3	678	1060.9	2249.4
Other Business Services	315.4	456.5	929.8	315.4	456.7	933.9	315.4	454.4	920.2	315.4	455.4	931.5
Public Administration & Defense	1957.4	2217.5	2461.9	1957.4	2218.6	2464.7	1957.4	2199.5	2467.3	1957.4	2200.7	2470.5
Education	2447.2	2628.2	2671.4	2447.2	2629.5	2675	2447.2	2601.1	2670.5	2447.2	2603.2	2676.1
Health & Social Work	964.8	1207.3	1726.1	964.8	1209.2	1760.7	964.8	1194.1	1820.3	964.8	1195.4	1853.5
Miscellaneous Services	1171.8	1354	1765.3	1171.8	1357	1783.5	1171.8	1304	1724.1	1171.8	1308.6	1742.6
Forestry	70.8	51.8	41.1	70.8	51.8	41.2	70.8	49.8	40.6	70.8	58.7	48
Hydrogen supply	0	0	0	0	0	0	0	3.2	872.7	0	3.1	856.9

Table 0.9: Employment by sector in United Arab Emirates

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												thousands
Agriculture	113.2	156.2	260.1	113.2	155	263	113.2	154.9	276.1	113.2	149.8	232
Coal	0	0	0	0	0	0	0	0	0	0	0	0
Oil & Gas	29.4	31.6	30.7	29.4	31.1	29.8	29.4	30.9	29.6	29.4	30.9	29.6
Other Mining	31.2	40.9	69.2	31.2	40.9	69.2	31.2	40.9	69.2	31.2	40.9	69.2
Food, Drink & Tobacco	72.5	91.3	151	72.5	90.7	157.5	72.5	89.9	163.2	72.5	92.6	144.1
Textiles, Clothing & Leather	55.8	73.3	116.9	55.8	73.6	117.5	55.8	73.9	116.8	55.8	72.6	111.6
Wood & Paper	40.4	51.6	92.3	40.4	52	92.7	40.4	53.2	94.3	40.4	52.5	86.5
Printing & Publishing	44.7	59.4	112.5	44.7	59.8	116.3	44.7	58.1	107.3	44.7	57.7	109.4
Manufactured Fuels	6.8	7.4	9.8	6.8	1.9	0.1	6.8	0.1	0.1	6.8	0.1	0.1
Pharmaceuticals	11.2	13.8	23	11.2	14.5	22.1	11.2	13.6	21.5	11.2	13.5	19.7
Chemicals	33.8	44.5	84	33.8	44.8	82.2	33.8	44.2	84.3	33.8	42.9	77.4
Rubber & Plastics	55	74.5	142	55	73.9	142.3	55	75.1	141.4	55	73.2	134.7
Non-Metallic Mineral Products	43.8	55.8	98.5	43.8	55.9	98.2	43.8	55.6	95.5	43.8	54.4	86.6
Basic Metals	13.7	19.6	45.1	13.7	28.4	56	13.7	28.5	53.8	13.7	27.7	49.9
Metal Goods	61.5	72.9	111.9	61.5	75.8	114.4	61.5	75.7	116.2	61.5	75.4	116.2
Mechanical Engineering	79.5	96.6	152.1	79.5	95.4	150.1	79.5	92.9	147.2	79.5	87.1	168.8
Electronics	43.1	51.3	80.5	43.1	51.9	79.3	43.1	55.6	83.4	43.1	70.7	128.6
Electrical Engineering & Instruments	25.2	24.9	51.1	25.2	25.1	51.8	25.2	22.8	40.1	25.2	22.6	41.4
Motor Vehicles	72.9	94.2	158.2	72.9	93.6	157.1	72.9	86.7	151	72.9	83.1	144.7
Other Transport Equipment	3.8	6.3	14	3.8	6.3	14	3.8	6.4	14.1	3.8	6.3	13.9

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	66.8	84	138.6	66.8	83	132.4	66.8	80.2	140.8	66.8	75.7	132.1
Electricity	37.9	45.6	65.9	37.9	45.2	78.3	37.9	51.4	79.7	37.9	57.3	146.5
Gas Supply	10.2	12.3	14.7	10.2	12.1	13.7	10.2	11.7	13.7	10.2	11.5	13.3
Water Supply & Waste	7.7	9.9	18.9	7.7	10.2	19.6	7.7	10.2	18.5	7.7	10.8	19.3
Construction	1441.9	1052	548.8	1441.9	1057.1	559.4	1441.9	1065.7	546.9	1441.9	1076.9	577.1
Distribution	343.1	369.9	384.8	343.1	359.9	359.4	343.1	361.7	366.5	343.1	378.3	400.3
Retailing	460	466.7	398.2	460	464.3	387.2	460	463.3	398.4	460	447.9	357.1
Hotels & Catering	321.1	374.1	407.1	321.1	377.8	408.6	321.1	380.8	422.7	321.1	357.6	385.2
Land Transport	290.2	331.5	391.2	290.2	331.7	373.1	290.2	340.8	368.5	290.2	339	366.4
Water Transport	12.3	18	40.8	12.3	17.9	40.7	12.3	18	40.9	12.3	17.6	38.7
Air Transport	54.2	74.5	150.3	54.2	74	171.6	54.2	75.7	161.5	54.2	75.6	162.3
Communications	134.7	202	332.1	134.7	202	332.1	134.7	202.1	332.1	134.7	201.9	332
Banking & Finance	98.4	130.1	209	98.4	129.1	208.7	98.4	129.1	209.2	98.4	128.9	209.4
Insurance	84.5	100.1	155.6	84.5	99.4	155	84.5	99.5	155.3	84.5	95.3	155.1
Computing Services	7.9	9.9	19.8	7.9	9.9	19.9	7.9	9.9	19.8	7.9	9.9	19.5
Professional Services	518.3	501.7	433.7	518.3	501.9	431.2	518.3	502.4	435.1	518.3	502.2	432.7
Other Business Services	462.7	463.7	477.4	462.7	463.7	477.4	462.7	463.7	477.4	462.7	463.7	477.4
Public Administration & Defense	327.6	360.1	314.3	327.6	358.7	311.2	327.6	359.9	314.4	327.6	358.7	311.8
Education	200.1	250.8	289.9	200.1	228.6	239.9	200.1	250.4	290.3	200.1	247.9	285.4
Health & Social Work	163.5	196.2	303	163.5	196.5	308.8	163.5	196.9	310	163.5	195.9	295.7
Miscellaneous Services	805.6	688.4	504.1	805.6	687.5	500.4	805.6	686.8	506.7	805.6	677.3	482.6
Forestry	0.3	0.3	0.8	0.3	0.3	0.8	0.3	0.3	0.8	0.3	0.5	1.1
Hydrogen supply	0	0.2	0.2	0	0.3	0.3	0	0.4	40.8	0	0.4	37.7

Table 0.10: Output by sector in the MENA region

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												$2023bn
Agriculture	575.6	862.0	2274.4	575.6	865.0	2291.3	575.6	839.5	2293.2	575.6	840.0	2295.1
Coal	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Oil & Gas	1611.1	1722.4	1917.5	1611.1	1676.3	1802.6	1611.1	1659.4	1786.0	1611.1	1659.8	1786.9
Other Mining	74.3	81.3	107.0	74.3	83.4	109.0	74.3	84.2	111.2	74.3	84.9	114.6
Food, Drink & Tobacco	187.8	240.8	412.5	187.8	243.0	421.7	187.8	180.1	437.5	187.8	178.4	436.0
Textiles, Clothing & Leather	65.0	81.4	131.7	65.0	81.5	132.3	65.0	75.4	132.4	65.0	75.2	132.4
Wood & Paper	40.8	49.9	89.3	40.8	50.8	89.9	40.8	50.1	89.9	40.8	50.7	92.7
Printing & Publishing	64.5	84.5	174.5	64.5	85.3	175.6	64.5	81.7	177.1	64.5	82.4	180.0
Manufactured Fuels	198.0	222.1	303.7	198.0	121.6	32.4	198.0	86.9	33.7	198.0	87.0	34.1
Pharmaceuticals	43.1	77.5	218.6	43.1	77.8	220.3	43.1	78.2	219.9	43.1	78.1	219.3
Chemicals	297.0	386.0	839.5	297.0	382.7	840.7	297.0	384.7	839.1	297.0	382.5	836.6
Rubber & Plastics	56.2	80.2	211.9	56.2	63.9	216.2	56.2	84.0	226.4	56.2	63.4	155.3
Non-Metallic Mineral Products	127.8	163.8	314.8	127.8	165.9	314.8	127.8	160.8	312.6	127.8	162.1	316.6
Basic Metals	32.3	46.7	128.4	32.3	61.7	143.4	32.3	64.8	145.9	32.3	66.9	156.8
Metal Goods	92.8	125.2	312.4	92.8	133.8	317.2	92.8	133.4	322.9	92.8	139.3	349.5
Mechanical Engineering	49.8	68.6	191.7	49.8	73.6	198.3	49.8	86.0	207.2	49.8	111.8	254.9
Electronics	112.6	165.1	485.4	112.6	172.8	494.3	112.6	179.7	509.9	112.6	191.0	556.9
Electrical Engineering & Instruments	54.3	69.0	190.7	54.3	76.7	196.8	54.3	83.6	199.9	54.3	93.7	235.9
Motor Vehicles	302.4	391.6	830.4	302.4	394.5	834.1	302.4	400.2	821.1	302.4	413.0	864.8
Other Transport Equipment	53.7	82.8	241.5	53.7	82.8	241.9	53.7	82.9	241.1	53.7	82.8	241.4

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	55.0	77.1	199.4	55.0	77.5	201.1	55.0	76.8	201.1	55.0	77.5	203.6
Electricity	113.7	151.7	262.9	113.7	148.1	301.7	113.7	174.0	390.0	113.7	174.9	424.1
Gas Supply	84.8	106.2	152.1	84.8	90.8	109.5	84.8	76.8	101.6	84.8	75.3	90.2
Water Supply & Waste	96.9	120.0	214.0	96.9	120.7	217.3	96.9	120.5	215.0	96.9	139.2	252.4
Construction	691.8	842.6	1611.2	691.8	900.5	1684.8	691.8	938.2	1757.8	691.8	983.6	1937.2
Distribution	402.4	516.1	1036.2	402.4	518.7	954.4	402.4	505.4	988.5	402.4	535.9	1115.8
Retailing	404.6	497.6	872.4	404.6	491.7	821.3	404.6	453.2	840.9	404.6	448.3	831.0
Hotels & Catering	164.9	216.1	424.7	164.9	217.2	428.6	164.9	208.2	442.0	164.9	205.5	433.6
Land Transport	185.9	231.9	455.5	185.9	232.4	444.6	185.9	220.9	450.4	185.9	222.6	467.8
Water Transport	63.3	88.6	199.2	63.3	89.0	198.7	63.3	90.0	199.2	63.3	90.1	199.7
Air Transport	61.7	75.1	143.9	61.7	75.0	145.9	61.7	73.9	145.3	61.7	74.0	145.9
Communications	472.6	668.6	1587.1	472.6	672.3	1598.4	472.6	675.5	1628.3	472.6	676.1	1635.3
Banking & Finance	648.8	842.1	1702.1	648.8	842.0	1704.3	648.8	833.3	1725.2	648.8	836.8	1745.5
Insurance	121.0	146.9	263.0	121.0	146.8	265.4	121.0	138.1	268.3	121.0	139.7	278.4
Computing Services	58.3	69.4	131.3	58.3	73.1	133.4	58.3	75.6	138.0	58.3	77.2	144.2
Professional Services	437.7	627.4	1681.6	437.7	635.3	1686.5	437.7	628.7	1713.2	437.7	638.5	1750.1
Other Business Services	123.9	170.7	380.3	123.9	172.6	389.2	123.9	157.3	389.2	123.9	163.6	416.5
Public Administration & Defense	568.2	760.6	1466.6	568.2	755.5	1452.1	568.2	760.8	1472.1	568.2	760.3	1471.3
Education	301.6	393.6	713.3	301.6	388.2	694.2	301.6	392.7	715.1	301.6	392.6	715.5
Health & Social Work	220.7	276.3	562.7	220.7	276.7	568.3	220.7	268.2	580.8	220.7	266.8	578.2
Miscellaneous Services	219.3	251.9	460.3	219.3	251.3	465.3	219.3	245.0	473.3	219.3	243.4	468.0
Forestry	8.2	10.4	23.2	8.2	10.4	23.2	8.2	10.0	22.9	8.2	21.4	64.8
Hydrogen supply	0.0	2.6	2.6	0.0	2.6	2.6	0.0	3.3	418.5	0.0	3.3	418.7

Table 0.11: Output by sector in the Arab States region

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												$2023bn
Agriculture	107.5	144.4	303.9	107.5	144.3	304.1	107.5	144.4	306.3	107.5	144.2	304.3
Coal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil & Gas	740.1	808.1	906.0	740.1	788.5	855.0	740.1	780.5	850.7	740.1	781.4	852.2
Other Mining	46.6	48.8	57.7	46.6	49.9	58.6	46.6	50.3	60.3	46.6	50.9	62.5
Food, Drink & Tobacco	35.2	45.4	90.9	35.2	44.9	90.8	35.2	43.9	92.9	35.2	42.0	88.3
Textiles, Clothing & Leather	16.9	22.7	42.3	16.9	22.6	42.4	16.9	22.6	42.9	16.9	22.4	42.2
Wood & Paper	8.7	11.1	21.5	8.7	11.3	21.6	8.7	11.3	21.6	8.7	11.4	21.8
Printing & Publishing	23.5	31.4	66.7	23.5	31.6	66.9	23.5	31.7	67.5	23.5	31.8	67.8
Manufactured Fuels	81.7	91.2	121.4	81.7	47.4	1.2	81.7	30.0	1.2	81.7	30.1	1.2
Pharmaceuticals	3.8	4.5	6.9	3.8	4.5	6.9	3.8	4.5	7.0	3.8	4.5	7.1
Chemicals	123.7	158.9	324.8	123.7	157.0	323.3	123.7	160.2	323.8	123.7	158.6	321.6
Rubber & Plastics	15.8	21.7	48.8	15.8	14.3	50.7	15.8	23.5	55.9	15.8	15.4	24.3
Non-Metallic Mineral Products	43.4	55.9	110.8	43.4	56.8	111.8	43.4	56.7	111.4	43.4	57.1	112.4
Basic Metals	8.7	12.1	28.0	8.7	15.3	28.8	8.7	16.7	31.0	8.7	17.7	33.6
Metal Goods	22.6	27.5	49.4	22.6	30.7	51.2	22.6	31.3	53.3	22.6	32.5	59.3
Mechanical Engineering	8.2	10.4	19.7	8.2	10.5	19.8	8.2	10.9	20.8	8.2	12.9	28.5
Electronics	8.6	10.4	17.9	8.6	13.5	21.0	8.6	15.6	26.7	8.6	18.5	39.3
Electrical Engineering & Instruments	10.9	11.0	23.6	10.9	13.8	25.2	10.9	16.0	25.4	10.9	18.7	34.5
Motor Vehicles	127.3	163.5	329.5	127.3	164.3	330.3	127.3	166.6	322.0	127.3	168.6	330.0
Other Transport Equipment	4.3	7.1	15.9	4.3	7.1	15.9	4.3	7.1	16.2	4.3	7.0	16.0

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	12.7	16.4	31.1	12.7	16.4	31.3	12.7	16.7	32.9	12.7	16.9	33.7
Electricity	17.7	32.6	76.2	17.7	29.7	89.9	17.7	49.3	155.5	17.7	49.8	159.7
Gas Supply	40.0	48.6	60.6	40.0	42.0	48.0	40.0	39.7	47.9	40.0	39.0	46.5
Water Supply & Waste	8.3	10.7	20.9	8.3	10.9	21.9	8.3	10.9	21.0	8.3	16.8	32.5
Construction	396.8	470.9	897.2	396.8	510.0	949.0	396.8	531.2	996.2	396.8	552.9	1080.8
Distribution	137.6	172.8	358.3	137.6	172.9	312.3	137.6	177.1	330.0	137.6	187.4	373.2
Retailing	144.7	174.9	310.2	144.7	171.4	282.5	144.7	170.5	291.6	144.7	167.1	280.2
Hotels & Catering	90.7	114.2	202.8	90.7	114.3	204.4	90.7	115.1	210.6	90.7	113.1	203.3
Land Transport	67.3	80.8	152.3	67.3	81.5	147.2	67.3	80.0	150.8	67.3	80.1	156.7
Water Transport	33.4	48.6	115.4	33.4	48.7	114.8	33.4	49.7	115.1	33.4	49.7	115.2
Air Transport	23.2	26.4	43.4	23.2	26.4	44.8	23.2	26.3	44.7	23.2	26.3	44.5
Communications	145.3	206.1	483.5	145.3	206.8	486.7	145.3	211.1	498.4	145.3	210.7	497.1
Banking & Finance	148.6	194.7	407.7	148.6	194.2	407.5	148.6	195.2	413.1	148.6	195.4	414.7
Insurance	11.4	14.0	23.3	11.4	13.8	23.8	11.4	14.0	24.5	11.4	13.9	24.4
Computing Services	17.3	18.3	17.3	17.3	19.5	17.9	17.3	20.6	20.3	17.3	21.4	23.5
Professional Services	120.7	147.1	283.1	120.7	149.9	282.1	120.7	151.6	295.6	120.7	154.0	303.7
Other Business Services	34.2	41.9	64.1	34.2	41.9	63.7	34.2	41.9	64.6	34.2	42.0	65.3
Public Administration & Defense	242.3	328.6	616.5	242.3	326.0	609.2	242.3	328.0	617.5	242.3	327.8	616.3
Education	124.9	156.9	256.4	124.9	153.3	243.6	124.9	156.6	256.9	124.9	156.6	256.5
Health & Social Work	112.7	135.4	258.1	112.7	135.2	259.9	112.7	135.7	265.9	112.7	134.7	262.1
Miscellaneous Services	138.2	152.9	261.5	138.2	152.1	263.7	138.2	152.4	268.9	138.2	150.8	262.0
Forestry	2.5	3.1	5.1	2.5	3.1	5.0	2.5	3.0	5.1	2.5	5.0	12.3
Hydrogen supply	0.0	1.2	1.2	0.0	1.2	1.2	0.0	1.4	138.2	0.0	1.4	138.1

Table 0.12: Output by sector in Saudi Arabia

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												$2023bn
Agriculture	26.6	37.4	82.8	26.6	37.5	82.8	26.6	37.6	82.7	26.6	37.6	82.9
Coal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil & Gas	204.9	224.6	252.6	204.9	220.1	239.8	204.9	218.5	238.0	204.9	218.4	237.8
Other Mining	3.8	5.1	9.4	3.8	5.7	10.0	3.8	5.9	10.3	3.8	6.0	10.9
Food, Drink & Tobacco	15.5	19.9	39.3	15.5	19.6	39.6	15.5	19.1	40.3	15.5	18.8	39.7
Textiles, Clothing & Leather	7.0	9.4	17.5	7.0	9.4	17.6	7.0	9.4	17.9	7.0	9.3	17.7
Wood & Paper	2.9	3.8	7.6	2.9	3.9	7.7	2.9	3.9	7.8	2.9	4.0	7.9
Printing & Publishing	9.1	12.2	26.5	9.1	12.4	26.7	9.1	12.4	26.9	9.1	12.4	27.1
Manufactured Fuels	34.0	38.3	50.0	34.0	23.7	0.5	34.0	18.8	0.5	34.0	18.9	0.5
Pharmaceuticals	0.5	0.6	1.0	0.5	0.6	1.0	0.5	0.6	1.0	0.5	0.6	1.0
Chemicals	54.9	68.8	137.5	54.9	68.3	138.0	54.9	70.0	139.0	54.9	69.1	137.9
Rubber & Plastics	6.0	8.2	18.6	6.0	3.9	19.8	6.0	9.3	22.4	6.0	4.7	3.8
Non-Metallic Mineral Products	18.7	23.8	46.7	18.7	24.3	47.6	18.7	24.5	47.9	18.7	24.6	48.4
Basic Metals	3.0	4.2	10.2	3.0	6.4	10.8	3.0	7.0	11.1	3.0	7.4	11.3
Metal Goods	9.3	11.2	19.7	9.3	12.6	20.5	9.3	12.8	21.3	9.3	13.1	23.2
Mechanical Engineering	2.7	3.4	6.6	2.7	3.4	6.6	2.7	3.4	6.6	2.7	3.4	6.6
Electronics	2.9	3.5	6.1	2.9	5.4	8.2	2.9	6.7	11.6	2.9	7.7	15.9
Electrical Engineering & Instruments	4.5	4.5	9.7	4.5	6.0	10.6	4.5	6.9	11.1	4.5	7.3	13.0
Motor Vehicles	56.4	70.7	139.4	56.4	71.3	140.5	56.4	73.3	149.5	56.4	74.2	153.2

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Transport Equipment	1.7	2.8	6.3	1.7	2.8	6.4	1.7	2.8	6.5	1.7	2.8	6.4
Other Manufacturing	4.4	5.7	11.1	4.4	5.8	11.5	4.4	5.9	12.1	4.4	6.0	12.4
Electricity	6.2	11.7	27.7	6.2	8.2	25.4	6.2	13.6	41.0	6.2	13.7	42.4
Gas Supply	2.4	2.8	3.4	2.4	0.0	0.0	2.4	0.0	0.0	2.4	0.0	0.0
Water Supply & Waste	6.5	8.3	16.0	6.5	8.3	16.7	6.5	8.2	16.5	6.5	12.9	27.5
Construction	105.2	121.2	242.7	105.2	140.7	268.7	105.2	145.4	276.3	105.2	149.5	294.3
Distribution	46.0	55.2	110.7	46.0	57.0	95.6	46.0	58.9	101.6	46.0	61.3	112.7
Retailing	47.6	56.3	101.6	47.6	55.0	91.5	47.6	54.4	94.8	47.6	54.1	94.6
Hotels & Catering	16.7	22.3	48.2	16.7	22.2	48.4	16.7	21.9	48.9	16.7	21.7	48.4
Land Transport	11.5	14.8	33.0	11.5	15.2	33.1	11.5	15.5	33.7	11.5	15.5	33.9
Water Transport	9.8	14.2	33.9	9.8	14.3	33.6	9.8	14.8	33.7	9.8	14.9	33.8
Air Transport	3.4	4.8	11.7	3.4	4.8	11.6	3.4	4.7	11.4	3.4	4.7	11.4
Communications	65.8	86.4	205.3	65.8	86.5	206.3	65.8	86.3	207.2	65.8	86.2	207.3
Banking & Finance	65.7	84.4	177.5	65.7	85.0	179.2	65.7	85.3	181.0	65.7	85.3	181.9
Insurance	1.8	2.2	4.2	1.8	2.1	4.5	1.8	2.1	4.5	1.8	2.0	4.5
Computing Services	1.1	1.4	2.8	1.1	2.7	3.6	1.1	3.4	4.7	1.1	3.8	6.2
Professional Services	33.0	39.0	83.6	33.0	41.9	85.9	33.0	42.0	90.9	33.0	42.2	91.7
Other Business Services	2.7	3.4	7.6	2.7	3.4	7.6	2.7	3.4	7.6	2.7	3.4	7.6
Public Administration & Defense	121.3	164.9	327.8	121.3	164.3	326.4	121.3	164.7	328.4	121.3	164.6	328.2
Education	58.1	74.2	119.3	58.1	73.4	116.4	58.1	74.2	119.4	58.1	74.1	119.4
Health & Social Work	41.5	51.1	110.0	41.5	51.0	110.9	41.5	50.7	112.1	41.5	50.5	111.5
Miscellaneous Services	31.2	36.1	69.3	31.2	35.8	70.3	31.2	35.6	71.0	31.2	35.3	70.2
Forestry	0.6	0.8	1.4	0.6	0.8	1.4	0.6	0.8	1.4	0.6	1.4	3.7
Hydrogen supply	0.0	0.6	0.6	0.0	0.6	0.6	0.0	0.6	52.5	0.0	0.6	52.5

Table 0.13: Output by sector in Algeria and Libya

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												$2023bn
Agriculture	21.3	27.0	83.1	21.3	27.0	83.0	21.3	27.1	83.1	21.3	27.0	83.2
Coal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil & Gas	39.5	40.1	48.3	39.5	34.7	36.6	39.5	32.5	33.7	39.5	32.4	33.4
Other Mining	5.3	5.9	8.0	5.3	5.9	8.0	5.3	5.9	8.0	5.3	5.9	8.0
Food, Drink & Tobacco	8.5	10.5	16.3	8.5	10.5	16.3	8.5	10.5	16.3	8.5	10.5	16.3
Textiles, Clothing & Leather	1.4	1.6	2.0	1.4	1.6	2.0	1.4	1.6	2.0	1.4	1.6	2.1
Wood & Paper	1.4	1.6	2.8	1.4	1.7	2.7	1.4	1.6	2.6	1.4	1.5	2.7
Printing & Publishing	2.1	2.6	4.9	2.1	2.6	4.8	2.1	2.6	4.9	2.1	2.6	5.1
Manufactured Fuels	6.4	7.6	13.1	6.4	6.8	9.0	6.4	6.5	9.4	6.4	6.6	9.5
Pharmaceuticals	2.5	4.5	13.9	2.5	4.6	14.3	2.5	4.5	14.4	2.5	4.5	14.1
Chemicals	1.9	2.9	9.2	1.9	2.8	9.4	1.9	2.8	9.1	1.9	2.8	9.1
Rubber & Plastics	1.8	2.7	8.6	1.8	2.8	8.4	1.8	2.8	8.2	1.8	2.6	8.4
Non-Metallic Mineral Products	1.7	2.5	8.1	1.7	2.5	8.1	1.7	2.5	7.7	1.7	2.6	7.9
Basic Metals	2.6	3.8	12.3	2.6	3.7	12.2	2.6	3.4	11.8	2.6	3.4	12.2
Metal Goods	2.5	3.6	11.7	2.5	3.7	11.5	2.5	3.7	11.5	2.5	4.0	12.5
Mechanical Engineering	6.1	9.0	29.0	6.1	9.3	28.2	6.1	9.6	27.7	6.1	11.4	23.4
Electronics	7.0	10.2	33.0	7.0	10.2	32.9	7.0	10.2	33.0	7.0	10.1	33.5
Electrical Engineering & Instruments	2.8	4.1	13.2	2.8	4.2	13.2	2.8	4.3	13.3	2.8	4.4	13.8
Motor Vehicles	6.3	9.2	30.0	6.3	9.2	29.7	6.3	8.9	29.9	6.3	10.0	31.9
Other Transport Equipment	0.8	1.2	3.8	0.8	1.2	3.8	0.8	1.2	3.8	0.8	1.2	3.8

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	2.8	4.1	13.2	2.8	4.1	13.4	2.8	3.9	12.5	2.8	3.9	12.6
Electricity	5.7	8.1	14.6	5.7	8.6	22.1	5.7	9.3	23.5	5.7	9.3	24.1
Gas Supply	3.6	4.6	7.5	3.6	3.3	1.8	3.6	0.0	0.1	3.6	0.0	0.1
Water Supply & Waste	0.9	1.1	2.1	0.9	1.1	2.0	0.9	1.1	2.1	0.9	1.4	2.6
Construction	16.6	19.3	41.2	16.6	18.6	38.6	16.6	19.6	41.6	16.6	22.2	52.3
Distribution	11.6	14.9	30.5	11.6	14.7	29.2	11.6	14.8	29.6	11.6	15.9	33.6
Retailing	9.4	11.2	19.7	9.4	11.0	18.8	9.4	11.3	19.9	9.4	11.3	20.5
Hotels & Catering	4.5	6.0	14.3	4.5	6.1	14.5	4.5	6.2	14.6	4.5	6.2	14.6
Land Transport	7.2	8.7	18.1	7.2	8.0	16.5	7.2	7.7	16.1	7.2	7.8	16.6
Water Transport	0.7	0.8	1.2	0.7	0.8	1.2	0.7	0.7	1.2	0.7	0.7	1.2
Air Transport	3.2	3.9	8.1	3.2	3.8	7.9	3.2	3.7	7.7	3.2	3.7	7.8
Communications	8.5	10.7	24.3	8.5	10.5	23.7	8.5	10.6	24.1	8.5	10.7	24.6
Banking & Finance	9.7	11.4	20.9	9.7	11.2	20.3	9.7	11.2	20.7	9.7	11.3	21.2
Insurance	7.7	9.0	16.5	7.7	8.9	16.1	7.7	8.8	16.0	7.7	8.9	16.4
Computing Services	13.4	16.6	37.4	13.4	16.6	37.4	13.4	16.6	37.4	13.4	16.6	37.4
Professional Services	13.0	17.9	47.2	13.0	17.9	46.4	13.0	18.1	47.5	13.0	18.9	49.7
Other Business Services	12.8	17.6	44.5	12.8	17.6	44.5	12.8	17.6	44.5	12.8	17.6	44.5
Public Administration & Defense	19.2	22.4	50.9	19.2	21.4	48.2	19.2	22.4	51.1	19.2	22.4	51.1
Education	6.8	8.5	17.5	6.8	8.1	16.6	6.8	8.4	17.6	6.8	8.4	17.6
Health & Social Work	9.5	12.3	28.3	9.5	12.2	28.3	9.5	12.4	29.3	9.5	12.4	29.2
Miscellaneous Services	10.4	12.8	27.6	10.4	12.6	27.5	10.4	12.7	28.3	10.4	12.7	28.4
Forestry	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.1	1.6	5.5
Hydrogen supply	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2	0.0	0.0	12.2

Table 0.14: Output by sector in Egypt

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												$2023bn
Agriculture	65.0	106.9	295.6	65.0	298.8	298.8	298.8	298.8	298.8	298.8	298.8	298.8
Coal	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Oil & Gas	77.2	75.5	81.6	77.2	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7
Other Mining	0.8	0.9	1.2	0.8	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Food, Drink & Tobacco	25.1	32.6	49.6	25.1	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0
Textiles, Clothing & Leather	7.3	8.3	10.7	7.3	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
Wood & Paper	5.9	7.0	11.7	5.9	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Printing & Publishing	3.0	3.8	6.8	3.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Manufactured Fuels	1.3	1.7	2.5	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pharmaceuticals	9.0	17.0	49.1	9.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0
Chemicals	6.8	10.1	34.7	6.8	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5
Rubber & Plastics	5.6	8.4	26.0	5.6	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Non-Metallic Mineral Products	8.8	11.0	16.3	8.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
Basic Metals	2.2	3.3	10.2	2.2	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Metal Goods	11.1	16.7	51.7	11.1	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9
Mechanical Engineering	4.3	5.9	17.7	4.3	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5
Electronics	22.0	33.6	103.0	22.0	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9
Electrical Engineering & Instruments	6.6	9.7	29.3	6.6	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
Motor Vehicles	1.9	2.8	8.7	1.9	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Other Transport Equipment	12.6	19.1	58.7	12.6	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	6.4	9.7	28.8	6.4	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1
Electricity	36.2	42.8	63.1	36.2	82.9	82.9	82.9	82.9	82.9	82.9	82.9	82.9
Gas Supply	12.6	16.7	28.4	12.6	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1
Water Supply & Waste	23.1	28.2	48.5	23.1	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9
Construction	41.2	56.6	107.0	41.2	126.9	126.9	126.9	126.9	126.9	126.9	126.9	126.9
Distribution	34.9	48.4	95.0	34.9	109.3	109.3	109.3	109.3	109.3	109.3	109.3	109.3
Retailing	34.3	44.5	76.0	34.3	77.9	77.9	77.9	77.9	77.9	77.9	77.9	77.9
Hotels & Catering	18.4	25.9	56.6	18.4	59.9	59.9	59.9	59.9	59.9	59.9	59.9	59.9
Land Transport	23.3	30.2	58.3	23.3	61.9	61.9	61.9	61.9	61.9	61.9	61.9	61.9
Water Transport	2.8	3.2	4.9	2.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Air Transport	7.3	9.1	18.0	7.3	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4
Communications	20.4	27.2	59.2	20.4	62.2	62.2	62.2	62.2	62.2	62.2	62.2	62.2
Banking & Finance	28.3	36.0	64.3	28.3	68.8	68.8	68.8	68.8	68.8	68.8	68.8	68.8
Insurance	14.5	17.9	31.8	14.5	34.8	34.8	34.8	34.8	34.8	34.8	34.8	34.8
Computing Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Professional Services	84.3	142.4	467.5	84.3	479.0	479.0	479.0	479.0	479.0	479.0	479.0	479.0
Other Business Services	23.3	34.6	84.4	23.3	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9
Public Administration & Defense	37.5	52.3	108.9	37.5	109.2	109.2	109.2	109.2	109.2	109.2	109.2	109.2
Education	43.6	60.4	125.2	43.6	125.4	125.4	125.4	125.4	125.4	125.4	125.4	125.4
Health & Social Work	17.3	24.1	50.8	17.3	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1
Miscellaneous Services	6.6	8.7	17.2	6.6	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7
Forestry	0.8	1.0	3.0	0.8	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Hydrogen supply	0.0	0.0	0.0	0.0	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3

Table 0.15: Output by sector in United Arab Emirates

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
	2023	2030	2050	2023	2030	2050	2023	2030	2050	2023	2030	2050
												$2023bn
Agriculture	5.5	8.1	19.1	5.5	8.0	19.3	5.5	8.0	20.0	5.5	7.8	19.2
Coal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil & Gas	117.9	130.2	142.1	117.9	128.2	137.5	117.9	127.4	136.8	117.9	127.4	136.7
Other Mining	1.6	2.1	3.9	1.6	2.1	3.9	1.6	2.1	3.9	1.6	2.1	3.9
Food, Drink & Tobacco	7.0	9.2	18.6	7.0	9.2	18.3	7.0	9.1	18.9	7.0	8.1	16.6
Textiles, Clothing & Leather	3.6	4.8	9.1	3.6	4.8	9.0	3.6	4.9	9.1	3.6	4.7	8.8
Wood & Paper	1.4	1.8	3.6	1.4	1.8	3.6	1.4	1.8	3.6	1.4	1.9	3.7
Printing & Publishing	4.1	5.5	12.2	4.1	5.5	12.2	4.1	5.6	12.2	4.1	5.6	12.2
Manufactured Fuels	16.0	17.4	23.4	16.0	4.4	0.2	16.0	0.2	0.2	16.0	0.2	0.2
Pharmaceuticals	0.2	0.3	0.5	0.2	0.3	0.4	0.2	0.3	0.4	0.2	0.3	0.4
Chemicals	24.9	33.4	70.0	24.9	32.8	68.8	24.9	33.1	67.5	24.9	33.0	67.1
Rubber & Plastics	2.6	3.7	8.4	2.6	3.2	8.5	2.6	3.7	8.7	2.6	3.3	7.7
Non-Metallic Mineral Products	8.6	11.2	22.4	8.6	11.3	22.3	8.6	11.1	21.6	8.6	11.2	21.7
Basic Metals	1.3	1.8	4.4	1.3	1.6	4.0	1.3	1.6	4.2	1.3	1.7	4.3
Metal Goods	4.6	5.6	9.9	4.6	6.3	10.3	4.6	6.3	10.6	4.6	6.7	12.0
Mechanical Engineering	1.2	1.6	3.0	1.2	1.6	3.1	1.2	1.7	3.2	1.2	2.1	4.9
Electronics	1.3	1.6	2.8	1.3	1.7	2.8	1.3	1.9	3.0	1.3	3.0	7.0
Electrical Engineering & Instruments	2.2	2.2	4.9	2.2	2.5	5.1	2.2	3.0	4.5	2.2	4.3	8.2
Motor Vehicles	25.3	33.8	70.2	25.3	33.8	69.8	25.3	33.2	54.8	25.3	33.4	55.6
Other Transport Equipment	1.0	1.7	3.8	1.0	1.7	3.8	1.0	1.7	3.8	1.0	1.7	3.8

	Baseline			NDC			Strong Industrial Policy			Climate Resilience		
Other Manufacturing	2.0	2.6	5.2	2.0	2.6	4.9	2.0	2.6	5.2	2.0	2.5	5.2
Electricity	2.6	5.3	12.9	2.6	6.3	13.5	2.6	10.8	29.8	2.6	10.9	29.9
Gas Supply	19.2	23.3	28.5	19.2	22.8	26.6	19.2	22.2	26.5	19.2	21.8	25.8
Water Supply & Waste	2.3	3.0	5.9	2.3	3.2	6.3	2.3	3.2	5.6	2.3	3.5	6.1
Construction	75.6	98.1	185.6	75.6	98.7	186.4	75.6	99.9	189.4	75.6	104.9	206.4
Distribution	32.6	41.2	82.0	32.6	40.1	76.6	32.6	40.3	78.1	32.6	42.1	85.3
Retailing	33.8	42.2	75.5	33.8	41.7	72.2	33.8	41.4	74.0	33.8	39.5	68.1
Hotels & Catering	14.2	19.3	41.1	14.2	19.4	41.3	14.2	19.6	42.7	14.2	18.4	38.9
Land Transport	11.2	14.6	31.9	11.2	14.7	29.4	11.2	14.2	29.4	11.2	14.0	31.6
Water Transport	6.9	10.2	24.3	6.9	10.2	24.3	6.9	10.2	24.3	6.9	10.2	24.2
Air Transport	2.3	3.2	7.8	2.3	3.3	8.6	2.3	3.4	8.4	2.3	3.3	8.2
Communications	62.2	99.6	252.7	62.2	100.5	254.8	62.2	104.4	262.7	62.2	103.9	262.1
Banking & Finance	37.1	51.4	110.1	37.1	50.7	108.3	37.1	50.7	109.4	37.1	50.5	109.2
Insurance	1.0	1.2	2.4	1.0	1.2	2.4	1.0	1.2	2.4	1.0	1.1	2.3
Computing Services	0.2	0.2	0.5	0.2	0.2	0.5	0.2	0.2	0.5	0.2	0.2	0.5
Professional Services	52.3	64.0	121.3	52.3	63.7	118.4	52.3	64.2	122.1	52.3	65.2	124.5
Other Business Services	0.6	0.7	1.7	0.6	0.7	1.7	0.6	0.7	1.7	0.6	0.7	1.7
Public Administration & Defense	42.7	54.8	83.6	42.7	54.6	82.8	42.7	54.8	83.6	42.7	54.6	82.9
Education	7.4	10.3	19.0	7.4	9.4	15.7	7.4	10.3	19.0	7.4	10.1	18.7
Health & Social Work	8.5	11.0	26.0	8.5	11.1	25.8	8.5	11.1	26.4	8.5	10.4	24.6
Miscellaneous Services	13.1	15.8	31.4	13.1	15.7	30.9	13.1	15.7	31.7	13.1	15.2	29.6
Forestry	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.2
Hydrogen supply	0.0	0.2	0.2	0.0	0.2	0.2	0.0	0.3	32.8	0.0	0.3	32.8

Table 0.16: Employment and output impacts by scenario for the MENA region

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	Main drivers of impact
	Absolute employment differences from baseline in 2050 (thousand jobs)			% differences from baseline in 2050 (employment)			Absolute output differences from baseline in 2050 ($2023bn)			% differences from baseline in 2050 (output)			
Agriculture	97.3	328.1	199.9	0.4%	1.5%	0.9%	16.9	18.8	20.8	0.7%	0.8%	0.9%	Indirect (supply chain) and induced effects
Coal	0	0	0	0.0%	0.0%	0.0%	0.0	0.0	0.0	0.1%	0.1%	0.2%	Indirect (supply chain) and induced effects
Oil & Gas	-128.5	-158.8	-162.7	-14%	-17%	-17.9%	-114.9	-131.5	-130.6	-6.0%	-6.9%	-6.8%	Decarbonization policies
Other Mining	0	0	0	0.0%	0.0%	0.0%	2.0	4.1	7.6	1.8%	3.9%	7.1%	Indirect (supply chain) and induced effects
Food, Drink & Tobacco	44	190.8	152	1.7%	7.2%	5.7%	9.2	25.0	23.5	2.2%	6.1%	5.7%	Indirect (supply chain) and induced effects
Textiles, Clothing & Leather	4.8	4.5	9.7	0.3%	0.3%	0.7%	0.6	0.7	0.7	0.5%	0.5%	0.5%	Indirect (supply chain) and induced effects
Wood & Paper	-9.6	25.3	44.7	-0.5%	1.3%	2.3%	0.6	0.6	3.4	0.7%	0.7%	3.8%	Indirect (supply chain) and induced effects
Printing & Publishing	17.5	-65.5	-36.4	0.7%	-2.8%	-1.5%	1.0	2.6	5.5	0.6%	1.5%	3.1%	Indirect (supply chain) and induced effects

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	Main drivers of impact
Manufactured Fuels	-125.2	-125.1	-125.1	-97%	-97%	-97.6%	-271.2	-269.9	-269.6	-89.3%	-88.9%	-88.8%	Decarbonization policies
Pharmaceuticals	30.7	-189.6	-190	0.8%	-4.9%	-4.9%	1.7	1.3	0.7	0.8%	0.6%	0.3%	Indirect (supply chain) and induced effects
Chemicals	17.5	-15	-69.1	0.4%	-0.4%	-1.7%	1.1	-0.4	-2.9	0.1%	0.0%	-0.3%	Indirect (supply chain) and induced effects, particularly linked to rubber & plastics (negative impacts) and hydrogen supply (positive impacts)
Rubber & Plastics	5.4	77.1	-462.3	0.1%	2.0%	-11.9%	4.4	14.6	-56.5	2.1%	6.9%	-26.7%	Recycling and waste management policy
Non-Metallic Mineral Products	94.8	217.6	181.7	4.2%	9.7%	8.1%	0.0	-2.3	1.8	0.0%	-0.7%	0.6%	Indirect (supply chain) and induced effects, particularly linked to renewables deployment (positive effects) and fossil fuel phase-out (negative effects)
Basic Metals	300.8	328	390.5	17.3%	18.9%	22.5%	15.0	17.5	28.4	11.7%	13.6%	22.1%	Indirect (supply chain) and induced effects, particularly linked to renewables deployment (positive effects) and fossil fuel

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	Main drivers of impact
													phase-out (negative effects)
Metal Goods	345.6	-405.8	-204.2	8.6%	-10.1%	-5.1%	4.8	10.5	37.2	1.5%	3.4%	11.9%	Indirect (supply chain) and induced effects, particularly linked to renewables deployment (positive effects) and fossil fuel phase-out (negative effects)
Mechanical Engineering	67.6	192.6	551.4	1.7%	5.0%	14.3%	6.6	15.5	63.2	3.4%	8.1%	33.0%	Indirect (supply chain) and induced effects, particularly linked to renewables deployment (positive effects) and fossil fuel phase-out (negative effects)
Electronics	88	249.6	536.2	2.3%	6.5%	14.0%	8.9	24.5	71.5	1.8%	5.0%	14.7%	Indirect (supply chain) and induced effects, particularly linked to renewables deployment
Electrical Engineering & Instruments	33.5	805	813.7	0.9%	20.9%	21.2%	6.1	9.2	45.3	3.2%	4.8%	23.7%	EV export investment
Motor Vehicles	83.3	366.5	1481.3	2.3%	10.3%	41.8%	3.7	-9.3	34.4	0.4%	-1.1%	4.1%	EV export investment

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	Main drivers of impact
Other Transport Equipment	-13.8	87.1	38.1	-0.4%	2.8%	1.2%	0.4	-0.4	-0.1	0.2%	-0.2%	0.0%	Indirect (supply chain) and induced effects
Other Manufacturing	192.4	499.4	513.5	4.0%	10.3%	10.6%	1.7	1.8	4.3	0.9%	0.9%	2.1%	Indirect (supply chain) and induced effects
Electricity	391.5	462.3	779.7	27%	31.9%	53.8%	38.7	127.0	161.1	14.7%	48.3%	61.3%	Renewables deployment measures and solar export investment
Gas Supply	-309.3	-358.7	-404.6	-53%	-61.6%	-69.5%	-42.6	-50.6	-61.9	-28.0%	-33.2%	-40.7%	Decarbonization policies
Water Supply & Waste	4.1	1.4	77.8	0.4%	0.2%	8.4%	3.4	1.0	38.4	1.6%	0.5%	18.0%	Recycling and waste management policy and water desalination investment
Construction	229.6	1034.8	1913.5	2.0%	8.8%	16.3%	73.6	146.6	326.0	4.6%	9.1%	20.2%	Indirect (supply chain) and induced effects, particularly linked to renewables deployment (positive effects) and fossil fuel phase-out (negative effects)
Distribution	-637.2	-377.5	248.7	-5.4%	-3.2%	2.1%	-81.8	-47.7	79.6	-7.9%	-4.6%	7.7%	Indirect (supply chain) and induced effects

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	Main drivers of impact
Retailing	-392.1	-169.2	-257.9	-4.0%	-1.7%	-2.6%	-51.1	-31.4	-41.3	-5.9%	-3.6%	-4.7%	Indirect (supply chain) and induced effects
Hotels & Catering	29.7	72.5	-3.6	0.6%	1.3%	-0.1%	3.9	17.3	8.9	0.9%	4.1%	2.1%	Indirect (supply chain) and induced effects
Land Transport	21.8	151.3	240	0.3%	2.0%	3.2%	-10.9	-5.1	12.3	-2.4%	-1.1%	2.7%	Investment in transport to support hydrogen and solar export
Water Transport	0.8	7.8	4.9	0.1%	0.9%	0.6%	-0.5	0.0	0.5	-0.3%	0.0%	0.3%	Indirect (supply chain) and induced effects
Air Transport	45	-10	-0.1	1.6%	-0.4%	0.0%	2.1	1.4	2.0	1.4%	1.0%	1.4%	Indirect (supply chain) and induced effects
Communications	-8.2	7.7	-16.5	-0.1%	0.1%	-0.3%	11.4	41.2	48.3	0.7%	2.6%	3.0%	Indirect (supply chain) and induced effects
Banking & Finance	6.4	24.8	24.2	0.2%	1.0%	0.9%	2.1	23.1	43.3	0.1%	1.4%	2.5%	Indirect (supply chain) and induced effects
Insurance	29.4	39.7	27.5	1.6%	2.1%	1.5%	2.4	5.2	15.4	0.9%	2.0%	5.8%	Indirect (supply chain) and induced effects
Computing Services	1.1	4.2	6.1	0.5%	1.8%	2.6%	2.0	6.7	12.9	1.6%	5.1%	9.8%	Indirect (supply chain) and induced effects

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	Main drivers of impact
Professional Services	11.4	44.1	96.9	0.2%	0.7%	1.5%	4.8	31.6	68.5	0.3%	1.9%	4.1%	Indirect (supply chain) and induced effects
Other Business Services	-3.8	-2.3	-14.7	-0.1%	-0.1%	-0.3%	8.9	8.9	36.1	2.3%	2.3%	9.5%	Indirect (supply chain) and induced effects
Public Administration & Defense	-290.1	44.7	42.8	-2.5%	0.4%	0.4%	-14.5	5.5	4.7	-1.0%	0.4%	0.3%	Induced effects and oil royalty losses to governments
Education	-299.1	19.1	17.7	-3.1%	0.2%	0.2%	-19.0	1.9	2.2	-2.7%	0.3%	0.3%	Induced effects and oil royalty losses to governments
Health & Social Work	78.5	245.4	266.3	1.2%	3.6%	3.9%	5.5	18.0	15.5	1.0%	3.2%	2.8%	Induced effects and oil royalty losses to governments
Miscellaneous Services	-1.3	24.9	-62.3	0.0%	0.3%	-0.7%	5.0	13.0	7.7	1.1%	2.8%	1.7%	Indirect (supply chain) and induced effects
Forestry	0	-1.3	405.8	0.0%	-0.6%	194.1%	0.0	-0.3	41.6	0.1%	-1.1%	179.8%	Reforestation investment
Hydrogen supply	0.3	2867.5	2802.1	20%	191167%	186807%	0.0	415.8	416.1	0.1%	15843%	15851%	Hydrogen production investment
Total	54.6	6545	9857.2	0.0%	4%	5%	-357.8	462.2	1126.3	-1.5%	2%	5%	-

Table 0.17: Employment and output impacts by scenario for the Arab States region

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience
	Absolute employment differences from baseline in 2050 (thousand jobs)			% differences from baseline in 2050 (employment)			Absolute output differences from baseline in 2050 ($2023bn)			% differences from baseline in 2050 (output)		
Agriculture and Forestry	10.2	75.4	-0.7	0.3%	2.2%	0.0%	0.2	2.5	7.6	0.1%	0.8%	2.5%
Fossil fuel extraction	-72.9	-76.3	-76.7	-18.9%	-19.8%	-19.9%	-171.2	-175.5	-174.0	-16.7%	-17.1%	-16.9%
Other mining	0	0	0	0.0%	0.0%	0.0%	0.8	2.6	4.7	1.4%	4.4%	8.2%
Basic manufacturing and Engineering	161.2	478.9	276.9	1.9%	5.8%	3.3%	10.2	23.4	32.7	0.8%	1.9%	2.7%
Electricity supply	367.6	418	722.5	52.1%	59.3%	102.5%	13.7	79.4	83.5	18.0%	104.2%	109.6%
Gas supply	-160	-160.1	-160.9	-83.9%	-84.0%	-84.4%	-12.6	-12.7	-14.1	-20.8%	-21.0%	-23.2%
Hydrogen supply	0.3	236.1	228.8	27.3%	21463.6%	20800%	0.0	137.0	136.9	-0.1%	11243.0%	11239.5%
Water and waste	2.4	0.4	41.4	2.0%	0.3%	34.9%	1.0	0.2	11.6	4.8%	0.8%	55.5%
Construction	255.6	665.2	1040.3	5.8%	15.1%	23.6%	51.8	99.0	183.6	5.8%	11.0%	20.5%
Distribution	-821.9	-515.1	-189.5	-12.0%	-7.5%	-2.8%	-73.7	-46.8	-15.1	-11.0%	-7.0%	-2.3%
Transport	-25.3	-42.9	-49.1	-0.7%	-1.2%	-1.3%	-4.4	-0.6	5.2	-1.4%	-0.2%	1.7%
Hotels & Catering, Communication	25.6	94.3	-5	0.8%	2.8%	-0.1%	4.9	22.8	14.1	0.7%	3.3%	2.1%
Business services	29.3	117.7	107.7	0.6%	2.4%	2.2%	-0.8	22.4	36.1	-0.1%	2.8%	4.5%
Public & personal services	-421.3	226.9	12.3	-2.9%	1.6%	0.1%	-16.1	16.8	4.4	-1.2%	1.2%	0.3%
Total	-649.2	1518.5	1948	-1.3%	2.9%	3.8%	-196.1	170.2	317.4	-2.6%	2.3%	4.2%

Table 0.18: Employment and output impacts by scenario of Saudi Arabia

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience
	Absolute employment differences from baseline in 2050 (thousand jobs)			% differences from baseline in 2050 (employment)			Absolute output differences from baseline in 2050 ($2023bn)			% differences from baseline in 2050 (output)		
Agriculture and Forestry	-0.4	-0.7	17.6	-0.1%	-0.1%	2.8%	0.0	-0.1	2.3	-0.1%	-0.1%	2.8%
Fossil fuel extraction	-18.4	-18.9	-19	-21.8%	-22.4%	-22.5%	-62.3	-64.1	-64.3	-20.6%	-21.2%	-21.3%
Other mining	0	0	0	0.0%	0.0%	0.0%	0.7	0.9	1.5	7.0%	9.4%	16.0%
Basic manufacturing and Engineering	77.2	225.4	81.8	3.3%	9.7%	3.5%	9.2	29.0	21.6	1.8%	5.8%	4.3%
Electricity supply	155.5	163.7	233.8	83.0%	87.4%	124.8%	-2.3	13.3	14.6	-8.3%	48.1%	52.9%
Gas supply	-42.2	-42.2	-42.2	-99.1%	-99.1%	-99.1%	-3.4	-3.4	-3.4	-99.0%	-99.0%	-99.0%
Hydrogen supply	0.1	44.7	43.7	25.0%	11175.0%	10925.0%	0.0	51.9	51.9	0.0%	9331.4%	9331.4%
Water and waste	1.2	0.9	18.1	2.1%	1.6%	32.3%	0.7	0.5	11.5	4.2%	3.0%	71.9%
Construction	102.7	132.6	204	10.7%	13.8%	21.3%	26.0	33.5	51.6	10.7%	13.8%	21.3%
Distribution	-75.2	-31.1	-22.1	-4.9%	-2.0%	-1.4%	-25.2	-16.0	-5.1	-11.9%	-7.5%	-2.4%
Transport	-14.7	-4	-3.5	-1.8%	-0.5%	-0.4%	-0.2	0.3	0.7	-0.3%	0.4%	0.8%
Hotels & Catering, Communication	3	8.4	2.6	0.3%	0.8%	0.3%	1.2	2.6	2.2	0.5%	1.0%	0.9%
Business services	25.2	63.6	66.7	1.7%	4.4%	4.6%	5.0	13.1	16.2	1.8%	4.7%	5.9%
Public & personal services	-47.7	26	-4.7	-1.4%	0.7%	-0.1%	-2.5	4.4	2.8	-0.4%	0.7%	0.4%
Total	166.3	568.4	576.8	1.3%	4.5%	4.5%	-53.2	66.0	104.3	-2.0%	2.5%	4.0%

Table 0.19: Employment and output impacts by scenario of Algeria and Libya

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience
	Absolute employment differences from baseline in 2050 (thousand jobs)			% differences from baseline in 2050 (employment)			Absolute output differences from baseline in 2050 ($2023bn)			% differences from baseline in 2050 (output)		
Agriculture and Forestry	-3.8	7.5	97.4	-0.3%	0.5%	6.9%	-0.1	0.0	5.4	-0.1%	0.0%	6.5%
Fossil fuel extraction	-46.6	-58.1	-59.6	-24.2%	-30.1%	-30.9%	-15.7	-18.2	-18.5	-25.6%	-29.7%	-30.2%
Other mining	0	0	0	0.0%	0.0%	0.0%	0.0	0.0	0.0	0.0%	0.0%	0.0%
Basic manufacturing and Engineering	164.5	-83.5	14.3	3.6%	-1.8%	0.3%	-0.9	-3.1	-2.6	-0.4%	-1.5%	-1.2%
Electricity supply	19.5	31.2	56.6	9.3%	14.9%	27.1%	7.5	8.8	9.5	51.1%	60.3%	64.7%
Gas supply	-62.6	-82	-82	-75.6%	-99.0%	-99.0%	-5.7	-7.5	-7.5	-75.6%	-99.0%	-99.0%
Hydrogen supply	0	199	191.7	-	-	-	0.0	12.2	12.2	-	-	-
Water and waste	-0.1	0.2	6.9	-0.2%	0.4%	13.0%	0.0	0.0	0.6	-0.6%	0.8%	26.8%
Construction	-37.7	24.1	156.7	-3.3%	2.1%	13.7%	-2.6	0.4	11.1	-6.3%	1.0%	27.0%
Distribution	-71.1	7.8	95.1	-3.8%	0.4%	5.1%	-2.2	-0.7	3.9	-4.5%	-1.4%	7.7%
Transport	33	70.2	79.3	3.7%	7.8%	8.8%	-1.8	-2.3	-1.8	-6.4%	-8.5%	-6.5%
Hotels & Catering, Communication	-2.9	3.9	5.2	-0.3%	0.4%	0.6%	-0.4	0.2	0.6	-1.1%	0.4%	1.6%
Business services	-9.2	-1.7	4.2	-0.9%	-0.2%	0.4%	-1.7	-0.4	2.8	-1.0%	-0.2%	1.7%
Public & personal services	-129.8	14.9	16	-3.5%	0.4%	0.4%	-3.8	1.9	1.9	-3.1%	1.6%	1.5%
Total	-146.8	133.5	581.8	-0.9%	0.8%	3.6%	-27.5	-8.6	17.5	-3.3%	-1.0%	2.1%

Table 0.20: Employment and output impacts by scenario of Egypt

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience
	Absolute employment differences from baseline in 2050 (thousand jobs)			% differences from baseline in 2050 (employment)			Absolute output differences from baseline in 2050 ($2023bn)			% differences from baseline in 2050 (output)		
Agriculture and Forestry	29.2	65.8	80.8	0.7%	1.6%	2.0%	3.2	2.3	4.3	1.1%	0.8%	1.4%
Fossil fuel extraction	-23.8	-23.8	-23.8	-35.4%	-35.4%	-35.4%	-3.3	-3.4	-3.4	-3.9%	-4.0%	-4.0%
Other mining	0	0	0	0.0%	0.0%	0.0%	0.0	0.0	0.1	2.0%	2.7%	9.4%
Basic manufacturing and Engineering	288.5	812.1	1410	2.3%	6.6%	11.5%	12.6	21.0	61.3	2.4%	4.1%	11.9%
Electricity supply	50.8	55.1	82.9	14.9%	16.2%	24.3%	4.1	7.2	19.8	6.5%	11.4%	31.4%
Gas supply	-45.2	-56.8	-85.3	-24.9%	-31.3%	-46.9%	-7.1	-8.9	-13.3	-24.9%	-31.3%	-46.9%
Hydrogen supply	0	872.7	856.9	0.0%	872.0%	856.0%	0.0	26.3	26.3	0.0%	6587250.0%	6587250.0%
Water and waste	0	0	1	0.0%	0.0%	0.3%	0.0	0.0	0.3	0.0%	0.0%	0.7%
Construction	46.3	187.3	327.9	1.6%	6.6%	11.6%	2.8	5.9	19.9	2.6%	5.5%	18.6%
Distribution	-3.5	-14.3	-8.3	-0.1%	-0.3%	-0.2%	-1.1	-0.4	16.1	-0.7%	-0.3%	9.4%
Transport	9.4	17.4	55.1	0.4%	0.7%	2.1%	0.6	1.4	4.1	0.7%	1.8%	5.0%
Hotels & Catering, Communication	2.9	-7.7	-14.5	0.1%	-0.2%	-0.5%	1.4	3.4	6.4	1.2%	2.9%	5.5%
Business services	6	-26.7	-6.9	0.2%	-0.7%	-0.2%	8.3	9.1	33.6	1.3%	1.4%	5.2%
Public & personal services	59.2	57.5	118	0.7%	0.7%	1.4%	2.3	2.6	5.4	0.8%	0.9%	1.8%
Total	419.8	1938.6	2793.8	1.0%	4.6%	6.6%	23.6	66.5	180.8	1.0%	2.7%	7.3%

Table 0.21: Employment and output impacts by scenario of UAE

	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience	NDC	Strong Industrial Policy	Climate Resilience
	Absolute employment differences from baseline in 2050 (thousand jobs)			% differences from baseline in 2050 (employment)			Absolute output differences from baseline in 2050 ($2023bn)			% differences from baseline in 2050 (output)		
Agriculture and Forestry	2.9	16	-27.8	1.1%	6.1%	-10.7%	0.2	0.9	0.2	1.2%	4.7%	0.8%
Fossil fuel extraction	-10.6	-10.8	-10.8	-26.2%	-26.7%	-26.7%	-27.6	-28.4	-28.5	-16.7%	-17.2%	-17.2%
Other mining	0	0	0	0.0%	0.0%	0.0%	0.0	0.0	0.0	0.0%	0.0%	0.3%
Basic manufacturing and Engineering	12.3	-0.8	-6.1	0.8%	-0.1%	-0.4%	-2.1	-17.5	-9.6	-0.8%	-7.0%	-3.9%
Electricity supply	12.4	13.8	80.6	18.8%	20.9%	122.3%	0.6	16.9	16.9	4.3%	130.2%	130.7%
Gas supply	-1	-1	-1.4	-6.8%	-6.8%	-9.5%	-1.9	-2.0	-2.7	-6.6%	-6.9%	-9.4%
Hydrogen supply	0.1	40.6	37.5	50.0%	20300.0%	18750.0%	0.0	32.5	32.5	0.0%	13910.6%	13910.6%
Water and waste	0.7	-0.4	0.4	3.7%	-2.1%	2.1%	0.4	-0.3	0.2	7.3%	-4.4%	4.2%
Construction	10.6	-1.9	28.3	1.9%	-0.3%	5.2%	0.8	3.8	20.8	0.4%	2.0%	11.2%
Distribution	-36.4	-18.1	-25.6	-4.6%	-2.3%	-3.3%	-8.8	-5.4	-4.1	-5.6%	-3.4%	-2.6%
Transport	3.1	-11.4	-14.9	0.5%	-2.0%	-2.6%	-1.7	-1.9	0.1	-2.7%	-2.9%	0.1%
Hotels & Catering, Communication	1.5	15.6	-22	0.2%	2.1%	-3.0%	2.2	11.5	7.1	0.8%	3.9%	2.4%
Business services	-3.3	1.3	-1.4	-0.3%	0.1%	-0.1%	-4.7	0.0	2.2	-2.0%	0.0%	0.9%
Public & personal services	-51	10.1	-35.8	-3.6%	0.7%	-2.5%	-4.8	0.8	-4.2	-3.0%	0.5%	-2.6%
Total	-58.7	53	1	-0.8%	0.7%	0.0%	-47.4	10.9	30.9	-3.0%	0.7%	2.0%