Summary for
Policymakers at COP27

CAPTURING ECONOMIC OPPORTUNITIES FROM WIND POWER IN DEVELOPING ECONOMIES

GWEC
GLOBAL WIND ENERGY COUNCIL

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Alexey Kornylyev

Introduction

Objectives of this Summary Note

This Summary for Policymakers at COP27 reflects the preliminary findings from a study of wind energy potential in developing economies around the world over the next five years, with the aim to reflect the vast and largely unexploited socioeconomic and environmental opportunities attached to wind energy, and to communicate the role wind energy can play in energy security. Accelerated deployment of wind projects will not only support a global net zero target, but help countries to realise a range of benefits from job creation, energy self-reliance and cleaner air.

This Summary note was prepared for the COP27 summit in November 2022 and comprises an extract of a fuller report, which is scheduled to publish in English, Spanish and Arabic in early 2023.

This report is the second report of a similar nature, the first being released in early 2021 in English, Spanish and Portuguese, with a focus on five developing economies with high wind energy potential: Brazil, Mexico, South Africa, India and the Philippines.[1]

Scope of this Summary Note

This study focused on the potential security, economic and environmental benefits of wind energy, the potential barriers to deployment in the next five years, and recommendations on how to overcome these barriers. It examined five developing economies in particular, as highlighted in Figure 1. These countries were selected for being home to significant and still untapped wind energy resource, as well as facing particular socio-political and economic challenges which threaten to slow down the clean energy transition, including challenging strategic choices regarding their future energy mix in the current energy crisis.

For each of these countries, this study identified a business-as-usual scenario for installed wind energy capacity, as well as an accelerated transition scenario in which the identified potential barriers are overcome within the next five years. Each scenario was modelled for positive externalities and socioeconomic and environmental benefits at a national level.

1 https://gwec.net/report-capturing-green-recovery-opportunities-from-wind-power-in-emerging-economies/

Figure 1 Map of countries selected for study

Finally, the study includes recommendations on how to overcome these potential barriers, both for the five specific countries selected for study and for developing economies in general. This Summary note covers the general barriers only, with the country-specific barriers following in the main report to be published in early 2023.

An explanation of the methodology and modelling for this study is provided in the Appendix.

Note on offshore wind

Given the countries selected for study and the five-year outlook, no offshore wind installations have been factored into the analysis of the countries discussed in this document. All capacity volumes are onshore wind only. There is still an opportunity to accommodate the recommendations made in this document for the offshore wind sector, particularly for countries like Colombia which are already examining leasing frameworks for offshore wind energy.

Summary for Policymakers at COP27: Capturing economic opportunities from wind power in developing economies

This Summary for Policymakers at COP27 reflects the preliminary findings from a study of wind energy potential in developing economies around the world over the next five years, with the aim to reflect the vast and largely unexploited socioeconomic and environmental opportunities attached to wind energy, and to communicate the role wind energy can play in energy security.

Accelerated deployment of wind projects will not only support a global net zero target, but help countries to realise a range of benefits from job creation, energy self-reliance and cleaner air. The five countries examined in this study are: Argentina, Colombia, Egypt, Morocco and Indonesia.

An increasing number of countries have targets for wind energy installations in the coming decades, recognising that wind energy can play a key part in delivering net zero targets and Nationally Determined Contributions (NDCs) to the Paris Agreement.

It is also widely acknowledged that wind energy can play a key role in improving a country's energy security, increasing self-reliance and providing a sustainable, reliable and affordable source of clean electricity generation. The development of wind energy also can be a major boost to economic activity and form a bedrock for sustainable economic growth beyond this.

This is particularly critical given the current global energy crisis and volatility of energy markets around the world. The International Energy Agency's (IEA) recent World Energy Outlook 2022 asserts that **current events are a reminder of the vulnerabilities of the current global energy system, and will fast-track structural change towards the clean energy transition.**

Wind energy has achieved significant cost reduction and technological excellence over the past two decades, establishing it as a proven, cost-competitive and market-ready alternative to fossil fuels. While costs might initially be higher in developing economies where the wind industry is new – due to factors such as less experienced personnel, start-up costs, investment uncertainty and lack of established supply chain – these costs are quickly reduced with government commitment, policy certainty and strengthening market forces.

Landmark roadmaps to net zero to 2050 released by the IEA and International Renewable Energy Agency (IRENA) are clear: **Wind energy is a major protagonist of the global clean energy transition, and by the middle of the century, becomes the preeminent source of electricity generation worldwide.**[2]

To reach these targets, the volume of annual global wind energy installations must scale up roughly

2 https://www.iea.org/reports/net-zero-by-2050; https://www.irena.org/publications/2021/Jun/World-Energy-Transitions-Outlook

four times over the next decade, from around 95 GW in 2021 to 390 GW in 2030. It is important that the deployment of wind energy does not face unnecessary delays over this crucial period due to resolvable challenges, such as bureaucratic permitting procedures and market-level barriers to investment.

This Summary was prepared for the COP27 summit in November 2022 and comprises an extract of a fuller report, which is scheduled to publish in English, Spanish and Arabic in early 2023. This will be the second report of a similar nature; the first was released in early 2022 with a focus on five developing economies with high wind energy potential: Brazil, Mexico, South Africa, India and the Philippines.[3]

3 https://gwec.net/report-capturing-green-recovery-opportunities-from-wind-power-in-emerging-economies/

How can investment in wind energy benefit a country?

Based on industry experience to date, a country which installs 1GW of onshore wind energy capacity per year from 2022 to 2027 could unlock a range of socioeconomic and environmental benefits*:

A total of 114,000 jobs during the development, construction, and installation phase of the wind farms

290 million metric tonnes of carbon emissions equivalent saved over the lifetime of the wind farms

12,000 jobs annually during the 25-year operations and maintenance phase of the wind farms

Power 5.9 million homes with clean energy or 5 million electric cars per year from 2027

US$19.3 billion gross value added (GVA) to national economies over the lifetime of the wind farms

34.6 million litres of water saved annually from 2027

6 GW of wind energy mitigates 290 million metric tonnes of CO2 emissions, which is the equivalent of:

80 million return flights from New York to Sharm El-Sheikh

Taking 63 million internal combustion engine cars off the road per year

Planting and maintaining 7.6 million trees for 10 years

** Assuming a cost of £2 million/MW, and 25 years of operation. Assumes all major components are sourced in country, except for the turbine, where we assume only blades and towers manufactured locally. One job is defined as full-time employment for one person for one calendar year.*

General barriers to wind energy deployment

While the benefits of wind energy are tremendous, there are a number of barriers to sector development which are common to the five countries selected for this study, as well as many developing economies around the world.

Lack of clear policy commitment

Lack of policy commitment to consistently promote and enable wind energy is a barrier to wind energy deployment common to many developing economies. In many countries, governments remain committed to conventional fossil fuel-based electricity generation, particularly if it is a good source of foreign investment.

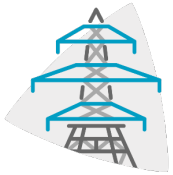
Even in countries where the government is positive towards renewable energy, there can be a lack of enabling policy frameworks and regulation to adequately support investment in wind energy and other renewables.

A clear route to market is needed to decrease investment risk and cost of capital for developers.

Similarly, long-term ambitions for wind energy ease pressures on local investment in a supply chain. Governments must increase wind power ambition and reflect this in updated NDCs and targets, comprehensive national climate strategies, and short- and long-term energy plans.

The Glasgow Climate Pact called upon all Parties to COP to submit updated and strengthened NDCs by COP27, but only 24 countries have done so as of September 2022.[4] Beyond NDCs, **national visions or policies should include concrete wind energy capacity or generation targets, with a clear, detailed timeline and a roadmap to achieve installation volumes.**

4 https://unfccc.int/ndc-synthesis-report-2022



Insufficient transmission system infrastructure and investment

Wind energy projects rely on land availability, wind resource, and grid connection points. This means that projects can't always be developed in areas where the grid is well developed. This is particularly an issue for multi-island nations, in which the country's best wind resources can be found on sparsely populated islands.

In many countries, development of transmission system infrastructure is coordinated by a separate organisation to that for the development and planning for electricity generation. In other countries the governance of the transmission system and generation is split into regions. This fragmentation can lead to the transmission system not being efficiently developed in the optimal areas or at the necessary time for connecting wind energy projects, which can delay the deployment of new capacity, raise investment risk and hamper efforts to meet targets.

Greater public and private investment in secure, smart and flexible grids which enable ever-larger shares of renewable energy is necessary to meet the urgent pace of the energy transition.

Forward-planning of transmission network expansion and investment in developing the network should be accelerated to increase the potential sites developers will consider for wind projects, as well as to avoid delays and grid congestion in the future. Through pooling expertise among system operators, regulators and utilities, public authorities can undertake long-term forward-planning on grid expansion and reinforcement, electrification of transport, as well as creating regional markets for power export and trading.

Complex permitting frameworks

Too many countries are unable to leverage the enormous interest from investors to deploy wind energy projects due to inefficient permitting schemes. Frameworks for leasing, permitting, and power procurement can be overly complex and bureaucratic, which can delay wind energy deployment if projects cannot obtain the necessary permits and approvals in a sensible timeframe.

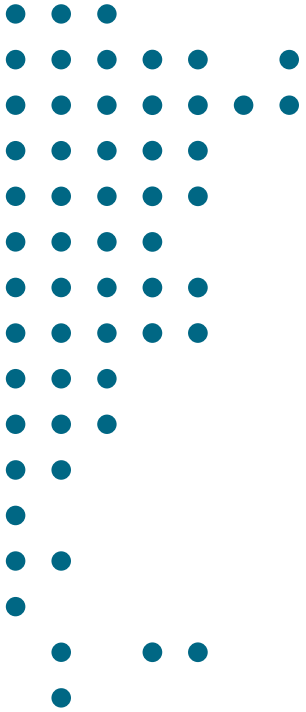
These processes can cover spatial planning, environmental and social impact assessment, planning authorisation, grid connection, and legal challenges to project proposals. In many countries, developers must submit documents and applications to multiple national and local agencies. A lack of clarity on procedures and timelines and poor coordination between agencies and jurisdictions leads to delays, uncertainty, and inefficiencies.

For onshore wind projects, permitting can take more than 8 years in Spain, Italy, Greece, Sweden, Belgium (Flanders) and Croatia, including the time taken by any legal challenges, according to WindEurope. In Japan it can take up to 5 years to complete the complex environmental impact assessment process.

Policymakers must ensure that bureaucracy and red tape are not obstructions to achieving energy and climate goals. Lack of a consistent, clear permitting process adds risk for investors and developers and adversely impacts industry confidence in a country. Frameworks related to permitting, leasing, and auctions should be simplified to increase wind energy deployment. Consider establishing a single agency, or 'one-stop shop', to manage and coordinate all documentation and applications to greatly help simplify processes.

Strong coordination between different framework administrators is key. This includes administrators of leasing, permitting, revenue support, and other frameworks, and ministries responsible for energy and environment. This ensures that processes fit well together, and each can cater for the volumes of projects progressing.

Argentina



Argentina has some of the best wind resources in the world, with strong wind speeds and high potential capacity factors of up to a whopping 70%, as well as large amounts of open space for wind farm development.

The largest contributors to Argentina's electricity mix are currently natural gas and hydropower. On average, Argentina produces 500,000 barrels per day (bpd) of oil, of which around 20% is exported. Despite this, Argentina is a net importer of fossil fuels.

Inflation in Argentina has been rising for several years and is expected to reach 95% by the end of 2022, causing economic uncertainty. These macroeconomic conditions, as well as turbulent financial markets, dampen investor confidence. Appetite for investment is still present, however, due to Argentina's huge technical potential. The move to renewable energy could reduce the dependence on fossil fuels for power generation and the rising costs associated with natural gas and oil, as well as unleash international investor confidence in the growing renewables sector.

Argentina currently has 3,300 MW of installed onshore wind capacity, and is forecast by GWEC Market Intelligence to install around 300 MW per year under a business-as-usual scenario from 2022 to 2027. Under an accelerated transition scenario, if barriers to policy frameworks, transmission infrastructure and permitting schemes were resolved, Argentina could install 26% more onshore wind energy capacity in the next five years.

Argentina 2030 targets	
Reduction of emissions intensity compared to 2007 levels (NDC as of November 2021)	19%
Share of non-fossil fuel sources in installed electricity capacity mix	20% (2025)
Share of wind power in installed electricity capacity mix	13%

Outlook to 2027 in two scenarios

Figure 2 Forecast of installed capacity in Argentina in the business as usual scenario

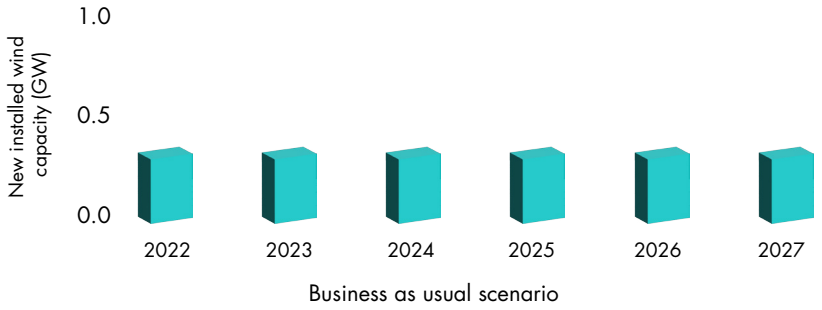
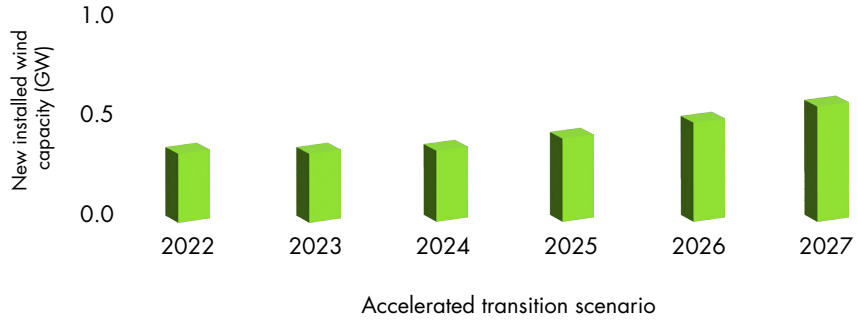


Figure 3 Forecast of installed capacity in Argentina in the accelerated transition scenario



New installed wind capacity (GW)	2022	2023	2024	2025	2026	2027
Business as usual scenario	300	300	300	300	300	300
Wind acceleration scenario	300	300	315	375	450	525

Image courtesy: wikipedia

Colombia

Colombia is unique in Latin America, having developed a robust onshore wind industry, with strong policy frameworks and regulations and a project pipeline for wind projects of over 2 GW as of late 2022. Colombia has large regions of untapped onshore (and offshore) wind potential.

Despite government efforts, Colombia is still a large greenhouse gases (GHG) emitter. The largest contributions to emissions come from the transport sector at 41%, with the industrial sector following behind at 28% and electricity and heating at 10%.

With an energy mix that heavily relies on hydropower, the system is vulnerable to El Niño weather patterns with drier years causing the country to utilise more fossil fuel combustion for power generation. More renewables in the energy mix will provide greater energy security and less reliance on fossil fuels in drier years.

In mid-2022 a new populist political party came into power with strong environmental rhetoric at the centre of its campaign and is likely to boost Colombia's renewable ambitions further. The public and private sector are working collaboratively to make Colombia a leader in wind power in Latin American markets.

Colombia currently has 23 MW of installed onshore wind capacity, and is forecast by GWEC Market Intelligence to install around 300-800 MW per year under a business-as-usual scenario from 2022 to 2027. Under an accelerated transition scenario, if barriers to policy frameworks, transmission infrastructure and permitting schemes were resolved, Colombia could install 40% more onshore wind energy capacity in the next five years.

Colombia 2030 targets	
Level of deforestation	Zero deforestation
Reduction of emissions intensity compared to 2014 levels (NDC as of November 2021)	**51%**
Share of non-fossil fuel sources in installed electricity capacity mix	**70%**

Outlook to 2027 in two scenarios

Figure 4 Forecast of installed capacity in Colombia in the business as usual scenario

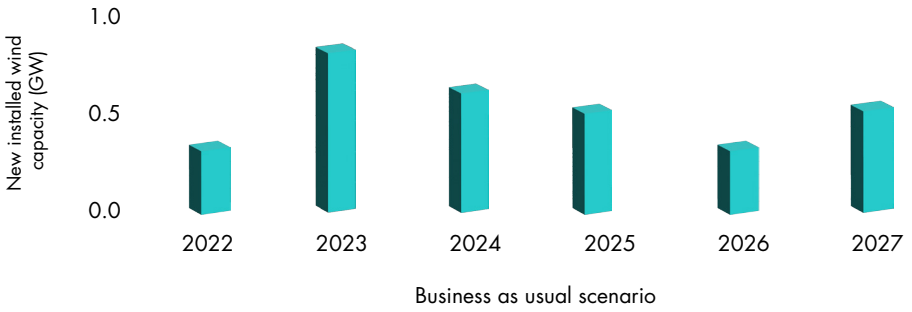
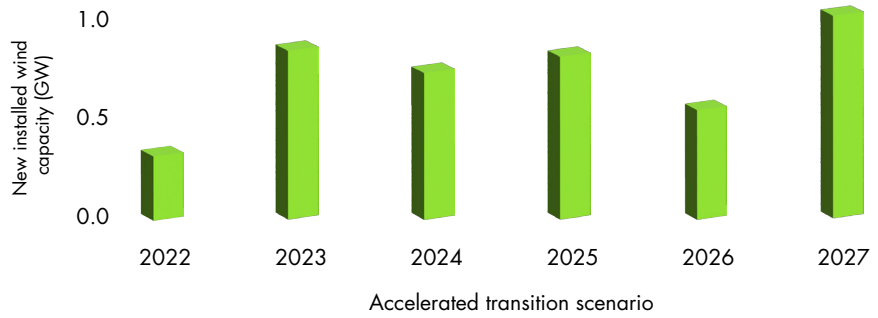


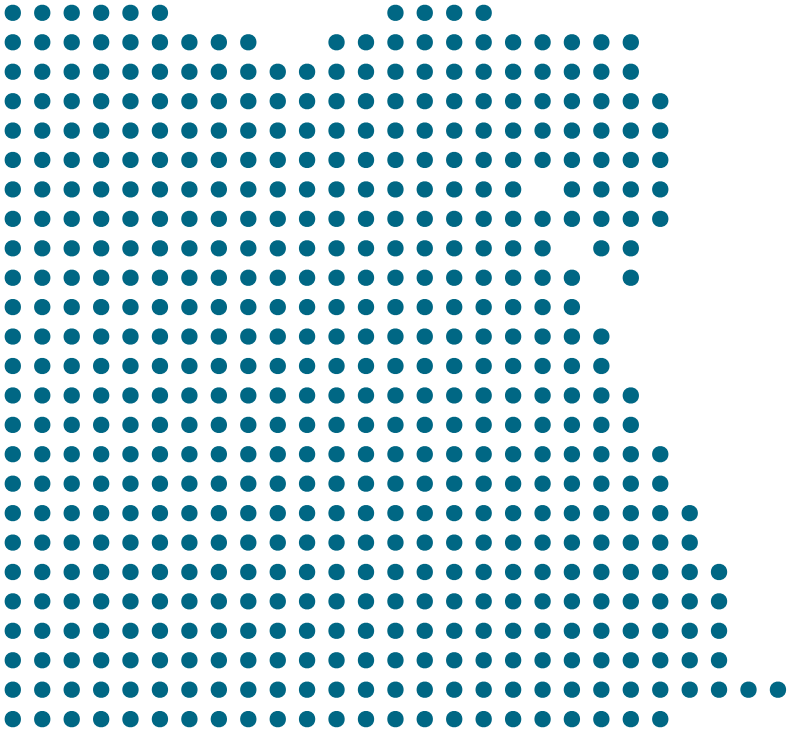
Figure 5 Forecast of installed capacity in Colombia in the accelerated transition scenario



New installed wind capacity (GW)	2022	2023	2024	2025	2026	2027
Business as usual scenario	300	800	600	500	300	500
Accelerated transition scenario	300	840	720	800	540	1,000

Image courtesy: Eduardo Zárate/Flickr

Egypt



As country host of COP27 in late 2022, governments worldwide will be looking to Egypt to demonstrate leadership and initiative on climate change, including wind power acceleration and progress towards its NDCs, most recently updated in July 2022.

Egypt is currently responsible for over one-third of Africa's total natural gas consumption, and has a predicted increase in emissions of 50% from 2022 levels by 2030. The government is committed to renewable energy expansion however, to ensure the country's continuous energy security and stability of energy supply.

Egypt has a long history with wind energy, having first developed projects in the early 1990s. Its wind industry was boosted through the World Bank and foreign government support in 2014, with Denmark and Japan providing wind turbines and expertise.

Egypt has large wind energy potential, with high wind speeds along the Red Sea coast and the Gulf of Suez. Its wind capacity is expected to reach 7 GW by the end of 2022, with a number of projects coming online, making it an important contributor to the electricity energy mix.

Egypt currently has 1,700 MW of installed onshore wind capacity, and is forecast by GWEC Market Intelligence to install around 250-700 MW per year under a business-as-usual scenario from 2022 to 2027. Under an accelerated transition scenario, if barriers to policy frameworks, transmission infrastructure and permitting schemes were resolved, Egypt could install 41% more onshore wind energy capacity in the next five years.

Egypt 2030 targets	
Reduction of emissions intensity compared to BAU scenario (NDC as of July 2022)	33% (in power generation, transmission and distribution)
Share of non-fossil fuel sources in installed electricity capacity mix	**42% (2035)**
Share of wind capacity in electricity mix	**14% (2035)**

Outlook to 2027 in two scenarios

Figure 6 Forecast of installed capacity in Egypt in the business as usual scenario

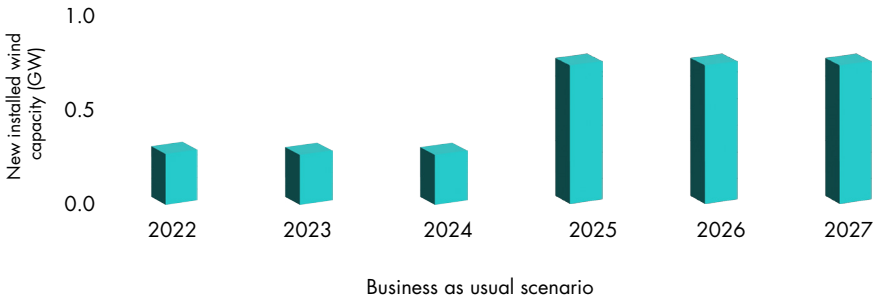
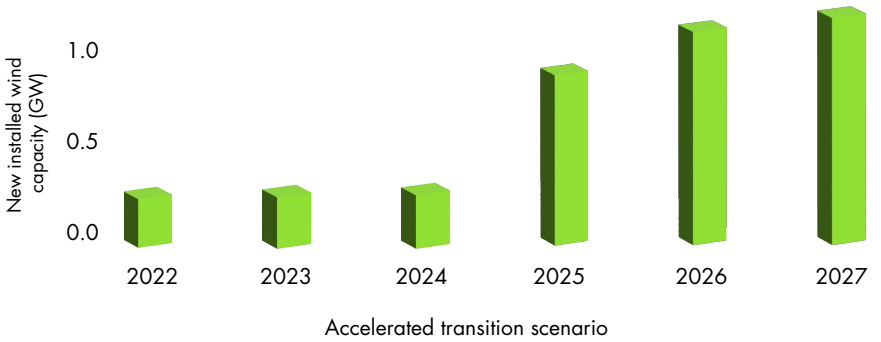


Figure 7 Forecast of installed capacity in Egypt in the accelerated transition scenario



New installed wind capacity (GW)	2022	2023	2024	2025	2026	2027
Business as usual scenario	252	250	250	700	700	700
Accelerated transition scenario	252	263	275	910	1,050	1,260

Image courtesy: Hatem Moushir/wikipedia

Morocco

Morocco hosted COP22 in 2016 and has since launched further reforms to develop its renewable energy sector. This involves a target of producing over half of its energy requirements from renewable sources by 2030, up from around 15% today. As a developing country with a low per capita emissions, Morocco is already implementing measures to achieve its updated 2021 NDC targets.

Morocco remains largely dependent on the international energy market, as it imports more than 90% of its energy needs. Achieving energy security has been a top priority for Morocco over the last decade, and current high gas prices have greatly increased national energy costs, underscoring the need for Morocco to adopt a more self-sufficient energy policy. The Government of Morocco seeks to increase security of supply by reducing dependence on energy imports, including through the expansion of renewable sources for electricity production.

Morocco has excellent wind resources, and currently has one of the largest onshore wind fleets on the African continent, after South Africa and Egypt. Installed capacity is forecast to reach 5 GW by 2035, supported by aggressive renewable energy targets, particularly for solar energy.

Morocco currently has 1,512 MW of installed onshore wind capacity, and is forecast by GWEC Market Intelligence to install around 200-510 MW per year under a business-as-usual scenario from 2022 to 2027. Under an accelerated transition scenario, if barriers to policy frameworks, transmission infrastructure and permitting schemes were resolved, Morocco could install 32% more onshore wind energy capacity in the next five years.

Morocco 2030 targets	
Reduction of emissions intensity compared to BAU scenario (NDC as of July 2021)	29% unconditional 45% conditional
Share of non-fossil fuel sources in installed electricity capacity mix	52%
Wind capacity in electricity mix	4.3 GW

Outlook to 2027 in two scenarios

Figure 8 Forecast of installed capacity in Morocco in the business as usual scenario

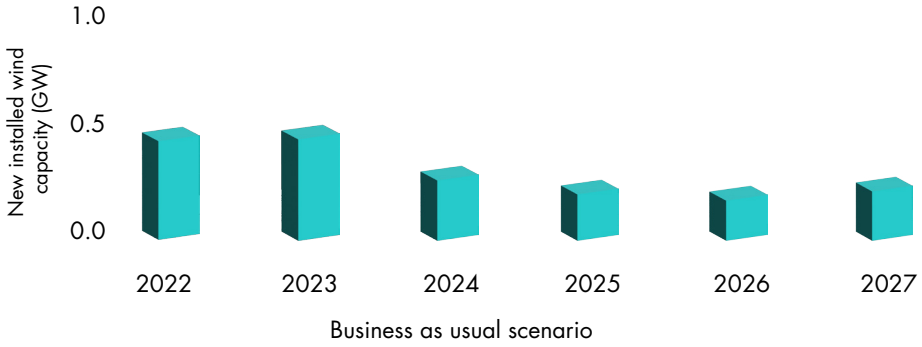
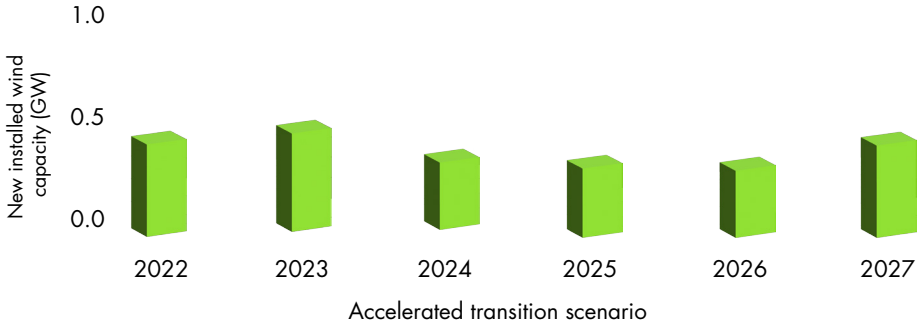


Figure 9 Forecast of installed capacity in Morocco in the accelerated transition scenario



New installed wind capacity (GW)	2022	2023	2024	2025	2026	2027
Business as usual scenario	505	510	305	235	200	250
Accelerated transition scenario	505	536	366	376	360	500

Image courtesy: wikimedia

Indonesia

Home to the fourth-largest population in the world, Indonesia is a net contributor of GHG emissions, with coal being its biggest energy export and accounting for about 37% of its energy mix. This contrasts its stated Paris Agreement commitments, which outline a long-term strategy of peak GHG emissions by 2030 and net-zero emissions by 2060.

Indonesia consists of several large land masses and islands. As a result, an interconnected grid system would be challenging. This, combined with the best wind resources located away from large population centres, makes it difficult to accelerate wind deployment. However, renewables expansion is necessary for energy security – in addition to coal dependency, Indonesia imports a large amount of oil, and is vulnerable to volatile market prices.

To partly address energy security, the National Economic Recovery (PEN) programme ringfenced 3.5% of its budget for support of renewables. This has been overshadowed by the continued expansion of fossil fuel use, highlighting a missed opportunity for wind acceleration and boosting Indonesia's reliance on imported fossil fuels.

Indonesia aims to meet a large share of its emission reductions by reducing deforestation. This is expected to contribute to almost 60% of the reductions necessary to meet both conditional and unconditional NDC targets.

Indonesia currently has 150 MW of installed onshore wind capacity, and is forecast by GWEC Market Intelligence to install around 75-100 MW per year under a business-as-usual scenario from 2022 to 2027. Under an accelerated transition scenario, if barriers to policy frameworks, transmission infrastructure and permitting schemes were resolved, Indonesia could install 26% more onshore wind energy capacity in the next five years.

Indonesia 2030 targets	
Reduction of emissions intensity compared to BAU scenario (NDC as of July 2021)	32% unconditional 43% conditional
Share of non-fossil fuel sources in installed electricity capacity mix	23%
Wind capacity in electricity mix	1.8 GW

Outlook to 2027 in two scenarios

Figure 10 Forecast of installed capacity in Indonesia in the business as usual scenario

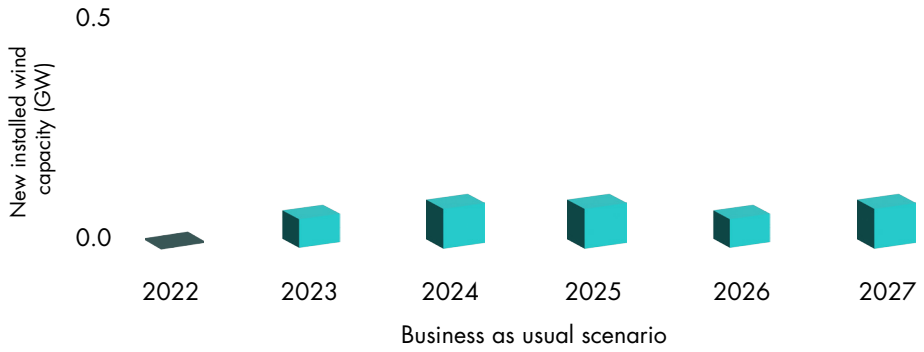
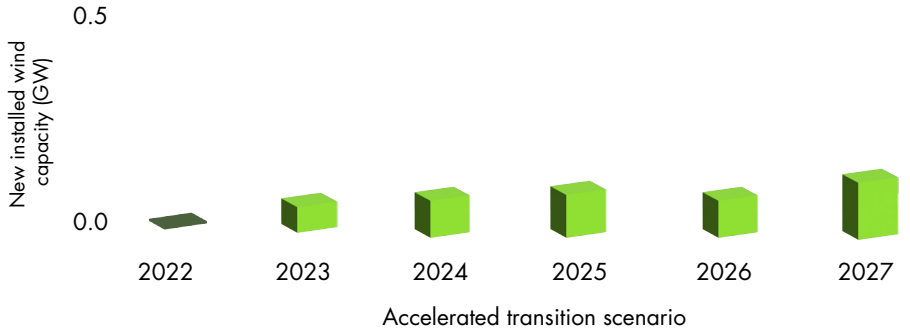


Figure 11 Forecast of installed capacity in Indonesia in the accelerated transition scenario



New installed wind capacity (GW)	2022	2023	2024	2025	2026	2027
Business as usual scenario	0	75	100	100	75	100
Accelerated transition scenario	0	75	105	120	105	160

Appendix A: Methodology

The work on the forthcoming report in 2023 will be carried out in six stages:

- Data collection and engagement
- Country studies of five countries with developing economies
- Identify project pipeline scenarios
- Conduct economic impact analysis
- Closed-door discussion with financial institutions, and
- Deliver recommendations based on the studies and research conducted above.

Identifying and finding required data through engagement

For this summary report, we worked with national wind energy associations and developers in each country to collect data and to understand the current barriers and challenges to wind energy in these countries.

Five country studies

Based on the engagement and the data collected, we provided a brief overview of the energy transition situation in the country and any challenges to wind energy and general renewable energy deployment. The energy transition summary included a brief overview of the current energy mix and a brief overview of public targets and commitments, and what is needed still to get there.

Project pipeline scenarios

We developed a 2022-2027 project pipeline forecast under a business-as-usual scenario and an accelerated transition scenario. The business-as-usual scenario is the current 2022-2027 GWEC Market Intelligence forecast. In the accelerated transition scenario, we applied an annual % increase to the business-as-usual forecast, arrived at by looking at the potential impact of following the recommendations in this study.

The specific barriers and recommendations that we assume can be overcome in the latter scenario for each of the five countries will be detailed in the forthcoming report in early 2023.

Economic impacts analysis

For the analysis of economic impacts, which will be included in the forthcoming report in early 2023, we will use a supply chain breakdown as a framework to help identify where local jobs in the supply chain will arise in the five countries. This is based on input from the local wind energy associations and developers to arrive at a local content percentage in each of the categories, and the typical costs for wind farms in each country.

Environmental impacts analysis

We will then use a country-specific capacity factor to calculate the annual power production from the two scenarios for each country. This will be factored into environmental impact analysis in the forthcoming report.

Recommendations

Based on the findings in our analysis and engagement, the forthcoming report will provide broad recommendations for developing economies, as well as country-specific recommendations for each of the five countries, to clean implementation and investment barriers to ensure long-term growth and sustainability of the wind energy sector.

Appendix B Example Jobs at an Onshore Wind Farm

Table 1 **Example Jobs at an Onshore Wind Farm**

Segment of the Wind Value Chain	Example Activities	Example Jobs
Development and Project Management	• Site selection • Feasibility studies • Environmental impact assessments • Community engagement • Engineering design • Project development	• Legal, property and tax experts • Financial analysts • Engineers • Environmental and geotechnical scientists
Manufacturing / Balance of plant	• Manufacturing and assembly of nacelles, blades and towers • Manufacturing of monitor and control systems • Design specifications • Sourcing	• Factory workers • Quality control • Marketing and sales • Engineers • Management • Sourcing specialists • Engineers
Installation	• Project site preparation • Civil works • On-site assembly of components • Transport of components	• Construction workers • Technical personnel • Engineers • Health and safety experts • Logistics and quality control experts • Drivers • Logistics experts • Technical personnel
Grid connection and commissioning	• Cabling and grid connection • Project commissioning	• Construction workers • Technical personnel • Engineers • Health and safety experts
Operation and maintenance (O&M)	• Ongoing O&M over project lifetime (typically 25 years)	• Operators • Engineers • Construction workers • Technical personnel • Lawyers • Management • Asset management • Accountants
Development and Project Management (Decommissioning)	• Planning decommissioning or repowering • Dismantling the project on-site • Disposal and recycling of components • Site clearing	• Construction workers • Technical personnel • Drivers • Engineers • Environmental scientists • Health and safety experts

Credit: "Renewable Energy Benefits: Leveraging Local Capacity for Onshore Wind." IRENA, Abu Dhabi.

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