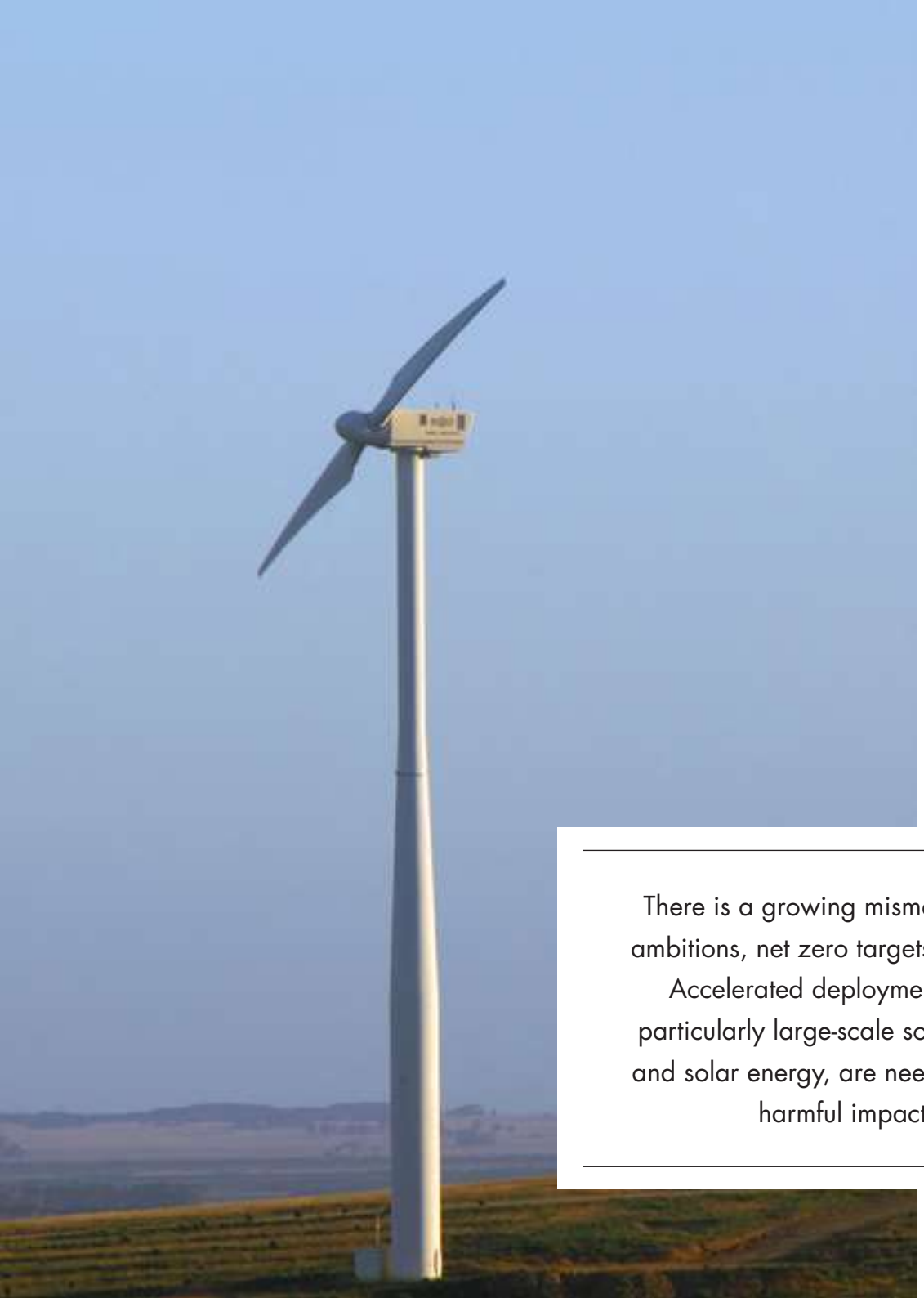
EXECUTIVE SUMMARY



An increasing number of countries are recognising the key role of wind energy in supporting a global clean energy transition, in energy security, and achieving stable energy prices. The urgency to scale up clean power generation and shift away from unabated coal power were key elements of the Glasgow Climate Pact, endorsed at COP26 summit in November 2021 by the nearly 200 countries signed up to the Paris Agreement. This was further cemented at the COP27 summit in Sharm El-Sheikh, held in November 2022. Renewable energy is a component of the Nationally Determined Contributions (NDCs) for most of the Parties to the Paris Agreement, and more than 100 Parties have a quantified clean power target within their NDCs.

There is a growing mismatch between energy transition ambitions, net zero targets and market realities, however. Accelerated deployment of renewable energy, and particularly large-scale sources of clean power like wind and solar energy, are needed worldwide to limit the most harmful impacts of climate change.

To reach our shared global goal of limiting temperature rise by the end of the century to 1.5°C, the volume of annual wind energy installations must scale up roughly four times over the next decade. This is a huge challenge which will require shared vision and collaboration between governments, industry, and society. Given the urgency of the energy transition, it is vital that the deployment of wind energy does not face unnecessary delays due to resolvable challenges, such as bureaucratic permitting procedures and market barriers to investment.

The resources and coordination required for this scale of action have been stretched over the last few years, due to the COVID-19 pandemic and recent commodity price increases. This challenge is particularly acute in developing economies, where public spending and policy response have focused on short-term protections of society and economy. As countries learn to manage the difficulties of the pandemic and economic activity returns, it is time to undertake the actions which will benefit society and economy in the long term.

Wind energy can play a vital role in improving a country's energy

security and increasing its energy independence. This has been highlighted by Russia's invasion of Ukraine in February 2022, following which many countries have examined their own balance between energy imports and exports. Countries reliant on fossil fuel imports are vulnerable to sudden changes in trade agreements and volatile international pricing markets. Wind energy offers a secure, reliable and affordable long term source of clean power generation. Wind energy also provides a boost to economic activity. Wind energy projects generate significant amounts of capital expenditure and create jobs and other economic benefits for local economies through their construction and operation.

The opportunities in developing economies

There is a growing body of evidence which shows that wind energy can help governments accelerate a green economic growth, and form a bedrock for sustainable economic growth in the future. The benefits of wind energy are wide-ranging and expand beyond clean power generation. They include sustainable job creation, public health cost savings which would be spent redressing the impacts of fossil fuel generation, water consumption savings which would otherwise be used for thermal generation, and a significant capital injection in a local value chain. The sector is particularly attractive for developing economies which need to phase out fossil fuels while maintaining economic growth, meeting fast-growing electricity demand, safeguarding energy security and prices.

To decarbonise power, transport and heating is expected to significantly increase electricity demand. For example, the UK has legally committed to achieve net-zero in 2050 and it is expected to have about the same end user demand then as it has now. To achieve net-zero it will require 3 times as much energy supplied in the form of electricity than it is now. Almost all wind projects installed between 2023 to 2027 will still be generating in 2050 and contributing to achieving net-zero.

Wind energy has achieved significant cost reduction and technological excellence over the past two decades, establishing it as a proven 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, initial investment uncertainty and lack of established supply chain – these costs can quickly reduce with government commitment, policy certainty and market forces. Wind energy has no fuel costs so once installed its costs remain stable and predictable.

This report reflects a study of wind energy potential in developing economies around the world over the next five years, 2023-2027, with the aim to highlight the vast and largely unexploited socioeconomic and environmental opportunities attached to wind energy. Accelerated deployment of wind projects will not only support climate action, but help countries to realise a range of benefits from job creation to cleaner air. The study identifies three common barriers facing wind energy deployment in developing economies and provides recommendations on how these barriers can be overcome.

Five developing economies in particular were selected as country studies: Argentina, Colombia, Egypt, Indonesia, and Morocco. These were selected because they have significant and still largely untapped wind energy resource.

Findings of the study: upsides of accelerated wind deployment in a wind acceleration scenario

The findings of this study, summarised in Table 1 below, show that a wind acceleration scenario of wind deployment from 2023-2027 would realise tremendous socioeconomic benefits for each country. For developing economies facing the difficult balance of ensuring economic growth while maintaining energy security and resilience, investment in the wind sector offers a pathway to a robust and sustainable recovery.

Table 1 **Summary of wind growth impacts in business-as-usual scenario versus wind acceleration scenario for 2023-2027.**

Country	2023-2027	New wind installations (MW)	FTE jobs created over wind farm lifetimes (jobs)	Gross value added to economy over wind farm lifetimes ($)	Homes powered by clean energy annually from 2027 (homes)	Tons of carbon emissions saved over wind farm lifetimes (tons)	Litres of water saved annually from 2027 (litres)
Argentina	BAU	1,500	112,000	3.3 billion	1.7 million	71 million	12 million
	Wind Acceleration	1,965	176,000	4.7 billion	2.2 million	93 million	16 million
	Potential Upside	465	64,000	1 billion	0.5 million	21 million	4 million
	% increase	31%	57%	45%	30%	30%	31%
Colombia	BAU	2,700	191,000	4.9 billion	5.5 million	233 million	15.5 million
	Wind Acceleration	3,900	339,000	8.1 billion	7.8 million	336 million	22.5 million
	Potential Upside	1,200	148,000	3 billion	2.3 million	103 million	7 million
	% increase	44%	77%	65%	43%	44%	44%
Egypt	BAU	2,602	242,000	3.5 billion	6.5 million	225 million	21 million
	Wind Acceleration	3,758	406,000	5.6 billion	9.2 million	326 million	31 million
	Potential Upside	1,158	164,000	2.1 billion	2.8 million	101 million	10 million
	% increase	45%	68%	60%	43%	45%	45%
Indonesia	BAU	450	34,000	1.2 billion	1 million	23 million	2.6 million
	Wind Acceleration	565	51,000	1.6 billion	1.2 million	29 million	3.2 million
	Potential Upside	115	17,000	400 million	0.2 million	6 million	0.7 million
	% increase	26%	50%	36%	24%	26%	26%
Morocco	BAU	1,500	99,000	2.1 billion	4.7 million	77 million	8.6 million
	Wind Acceleration	2,138	174,000	3.4 billion	6.6 million	110 million	12.3 million
	Potential Upside	638	75,000	1.3 billion	1.9 million	12.3 million	3.7 million
	% increase	*43%*	*76%*	*63%*	*40%*	*42%*	*43%*

While this report includes only five country studies, similar socioeconomic benefits can be achieved by other countries. A previous report in early 2022 studied this for Brazil, India, Mexico, South Africa and The Philippines, published by GWEC in February 2022.
The study analysed international experience of the onshore wind industry and found that typically a 1 GW/year installation rate over 5 years could unlock nearly 157,000 new jobs and $13.8 billion gross value added (GVA) to national economies over wind farms' lifetime, among other benefits.

Recommendations to support wind growth in developing economies

In the course of the study and conversations with industry and investment experts around the world (see the Methodology in Appendix A), several barriers to wind energy deployment were identified that are common to developing economies. The most significant common barriers are a lack of clear policy commitment, insufficient transmission system infrastructure, limited investment in grid upgrade and expansion, and complex regulatory frameworks.

Addressing these barriers proactively, in coordination with the wind energy industry and other relevant stakeholders, can support accelerated deployment of wind energy and a wind acceleration in developing economies.

Policy commitment: provide clarity and ambition for wind energy

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.

Invest to expand transmission system infrastructure

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 like Indonesia, 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.

Simplify permitting frameworks for renewable energy

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.

Based on industry experience to date, a country which installs 1 GW of onshore wind energy capacity per year from 2023 to 2027 could unlock a range of socioeconomic and environmental benefits*:

A total of 130,000 jobs during the development, construction, and installation phase of the wind farms

US$12.5 billion gross value added (GVA) to national economies over the lifetime of the wind farms

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

28.8 million litres of water saved annually from 2026

Power 4.9 million homes with clean energy per year from 2026

240 million metric tons of carbon emissions equivalent saved of carbon emissions over the lifetime of the wind farms

The resulting 5 GW of wind energy:

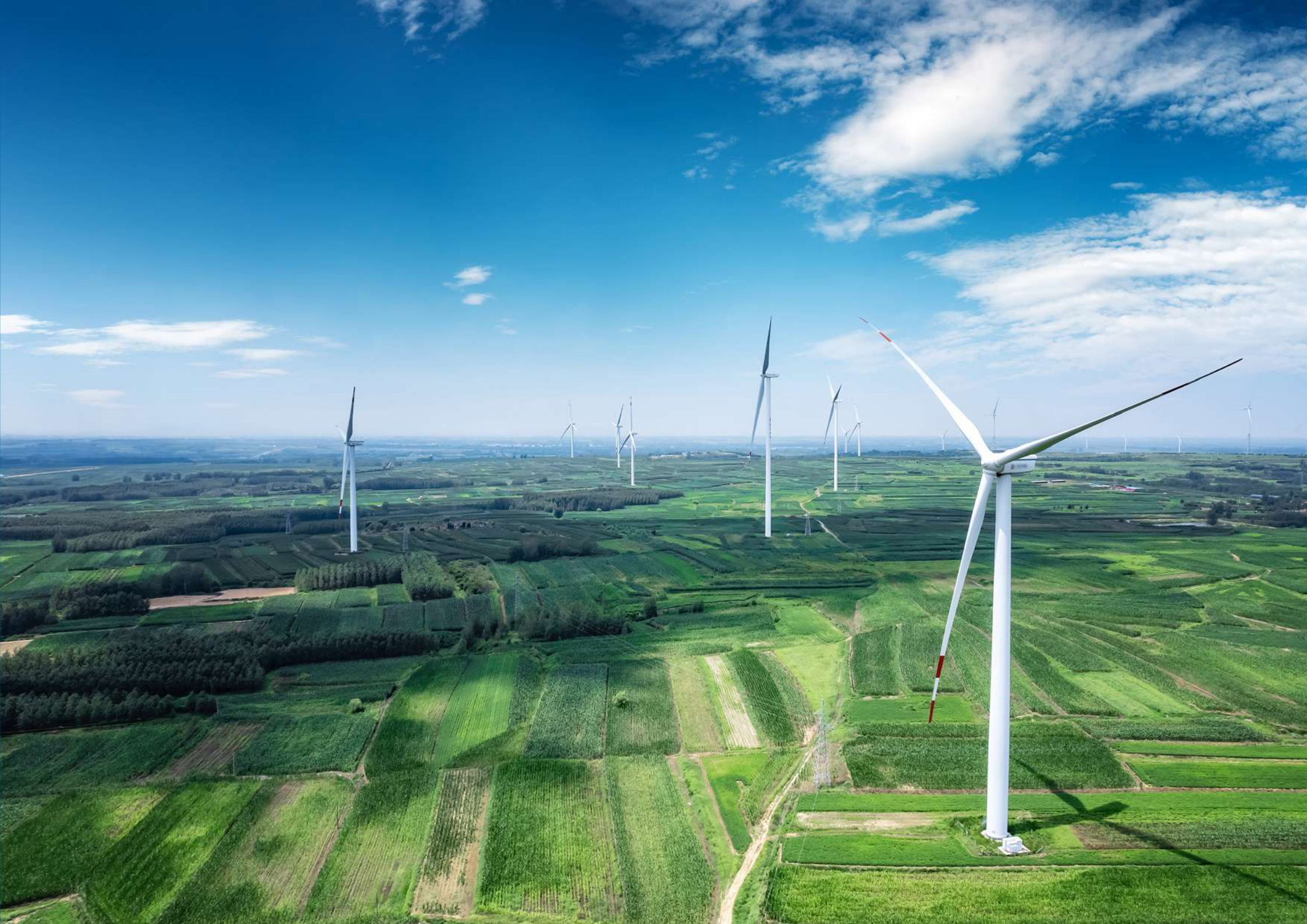
Mitigates 240 million metric tons of CO_2 emissions over the lifetime of the wind farms, which is the equivalent of:

83.5 million return flights from New York to Sharm el-Sheikh

Taking **53 million** internal combustion engine cars off the road for one year

Planting and maintaining **6.4 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.*



1. Introduction

An increasing number of countries have set wind energy targets in the coming decades, recognising wind energy's key role in supporting a clean energy transition and achieving Nationally Determined Contributions (NDCs) and net zero targets under the Paris Agreement.

The importance of energy security has also been brought into sharp focus in light of February 2022 Russian invasion of Ukraine. It is 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 independent of future fossil fuel prices and their associated uncertainty. Also in many countries, onshore wind power is the cheapest form of electrical energy.

The development of wind energy also can be a major boost to economic activity forming a bedrock for sustainable economic growth. 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[1] 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.

This report provides a:

- Study of wind energy potential in five developing economies around the world over the next five years, with the aim to highlight the vast and largely unexploited socioeconomic, energy security-related, and environmental opportunities attached to wind energy.
- Discussion of the common barriers facing wind energy deployment in developing economies, and
- Recommendations on how these barriers can be overcome.

This report examines five developing economies, as shown in Figure 1. These countries were selected because they face particular socio-political and economic challenges which threaten to slow down the clean energy transition, as well as for having significant and still largely untapped wind energy resource.

A previous report in early 2022 provided likewise for Brazil, India, Mexico, South Africa and The Philippines.[2] Since then the relative economics of wind power has increased further, making the transition to wind more cost effective.

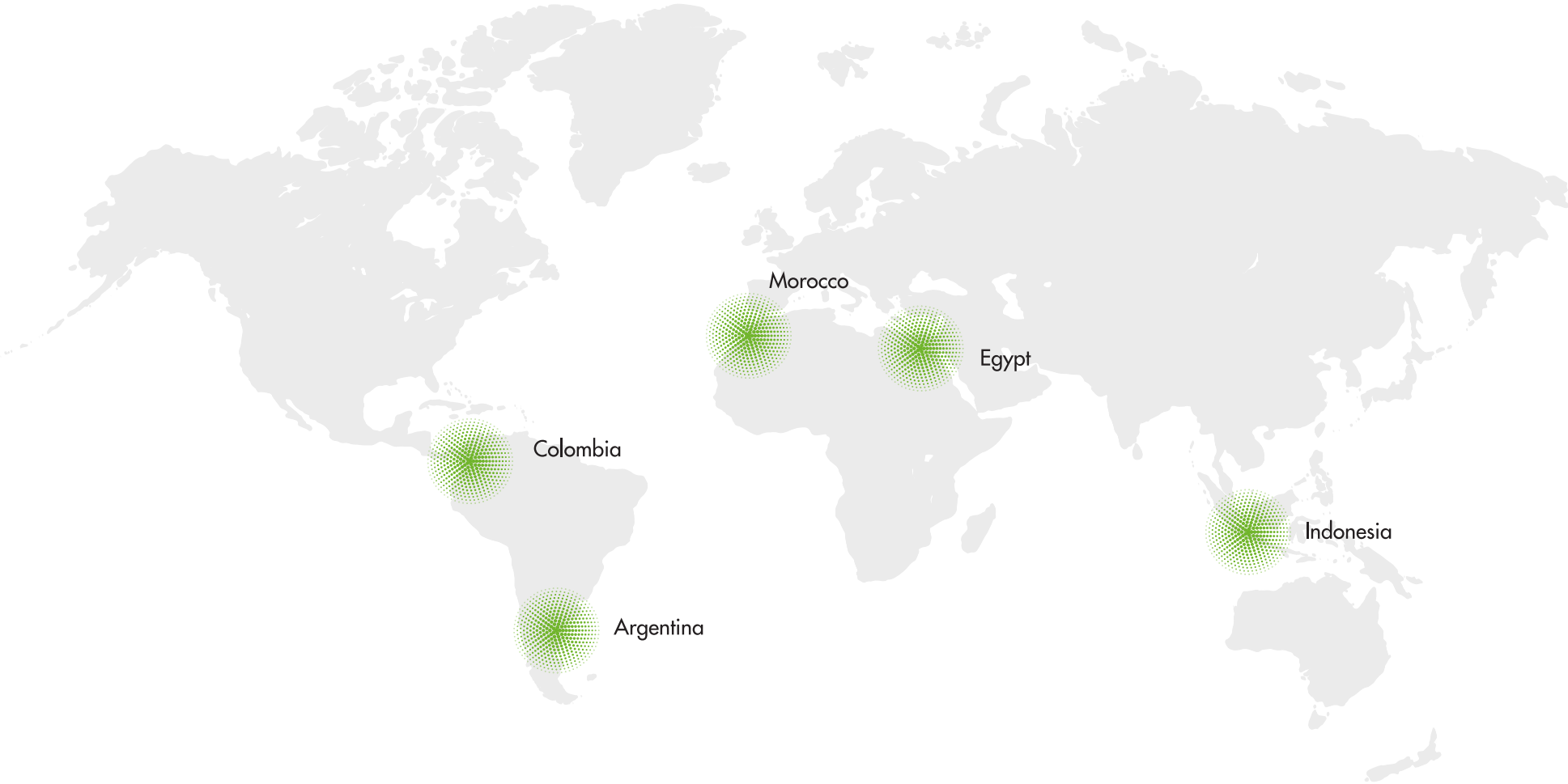
Note on offshore wind

Given the five-year horizon and the countries selected for study, only onshore wind capacity and no offshore wind capacity has been included into the analysis of the countries discussed. While offshore wind makes up zero or a small proportion of the wind capacity in each of the countries discussed, all of the countries have significant offshore wind potential which could be realised in the coming decades. This is particularly the case for Argentina. Many of the broader recommendations made in this document are relevant for offshore wind.

1 International Energy Agency, World Energy Outlook 2022, October 2022, available online at: https://iea.blob.core.windows.net/assets/fe7c251b-8651-4d3a-8362-0ffe3e50d37b/Executivesummary_WorldEnergyOutlook2022.pdf

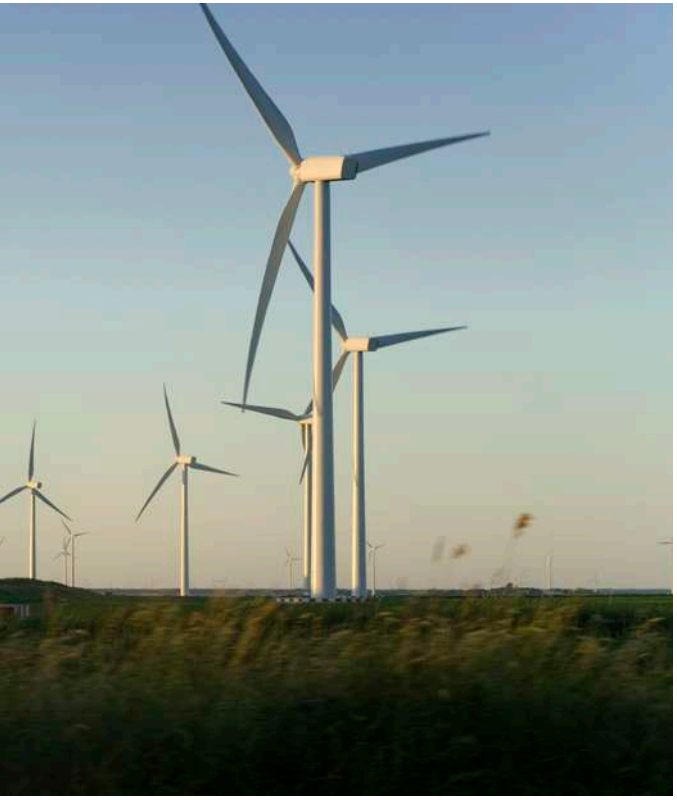
2 GWEC, Capturing Green Recovery Opportunities from Wind Power in Developing Economies, Feb 2022, available online at: https://gwec.net/report-capturing-green-recovery-opportunities-from-wind-power-in-emerging-economies/

Figure 1 **Countries examined in this study.**



2. General barriers to wind energy deployment

While the benefits of wind energy are great and numerous, 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. 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.

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 that each can cater for the volumes of projects progressing.