ECONOMIST IMPACT

A green edge

Green skills for the future

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About the report

A green edge*: green skills for the future* is an Economist Impact report, sponsored by Kyocera Document Solutions. The report accompanies a barometer that assesses the environment for green-skills development and adoption in six cities—Berlin, London, New York, Singapore, Sydney and Tokyo—via a survey of 300 executives. Expert interviews and an extensive literature review supplemented the survey findings in developing this paper and the barometer.

The purpose of the barometer is to study the green-skills ecosystem in the six cities of focus. It allows us to explore the drivers behind green-skills adoption as well as analyse businesses' readiness and efforts to adopt green skills. The barometer consists of the following pillars:

- **Environmental awareness:** captures the impact of external stakeholders and environmental trends in a city.
- **Leadership:** studies the benefits of adopting green skills for a business as well as the incentives and efforts in an organisation towards adoption.
- **Employee imperative:** analyses the relative importance of green skills compared to other skills as well as the interest shown by survey respondents in different types of green skills.

Both the leadership and employee imperative pillars also look at indicators that measure the current readiness in businesses and employees, respectively, to adopt green skills.

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Executive summary

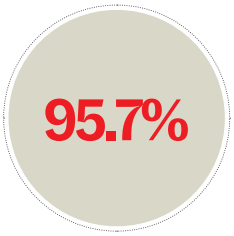
The term "green skills" encompasses an array of competencies meant to drive a shift towards a more sustainable world. They range from technical to intellectual, from scientific to humanistic. Despite the lack of a one-size-fits-all definition, green skills will be a vital tool in the transformation of the global economy, especially amid intensifying threats like climate change.

In the face of rapid urbanisation and escalating environmental challenges, the adoption of green skills has emerged as a pivotal factor in steering cities towards sustainable development. While cities are not the only places where green skills are taking root, they are among the most important venues for their development.

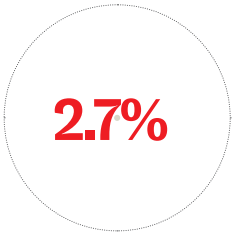
In this study, a survey of 300 executives across some of the most vibrant cities in the world—Berlin, London, New York, Singapore, Sydney and Tokyo—captures the perception of the green-skills environment in an urban context.

The key findings are:

- The increase in importance of green skills for executives is the highest (67 percentage points between today and five years from now), compared with other skills—digital, analytical, management and soft skills. However, currently only a fraction of executives (2.7%) perceive green skills in their organisation as sufficient.



of the surveyed executives expect green skills to become significantly more important in the next five years.



of the surveyed executives perceive the green skills in their organisation as sufficient.

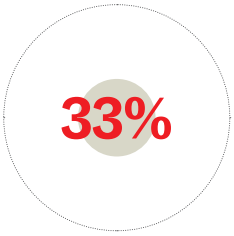
- All types of green skills—leadership, urban design, energy, financial, procurement, waste management and communication—have become more important for the survey respondents over the past five years as companies sharpen their focus on environmental, social and governance (ESG) concerns.

- Highlighting the malleable nature of green skills, brand reputation tops the list of ostensible advantages of green-skills development, followed by resilience against extreme weather events and greater ability to achieve sustainability goals.

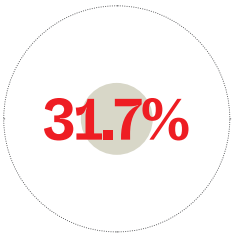
of surveyed executives consider the highest benefit of adopting green skills to their brand reputation.

- Executives cite investment constraints as the top barrier to green-skills development in their companies. Small firms—with their relatively small budgets—are less likely to report vigorous green-skills activity than their larger counterparts.

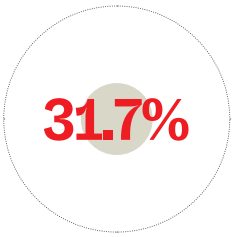
Top three challenges to incorporating green skills in an organisation



investment required

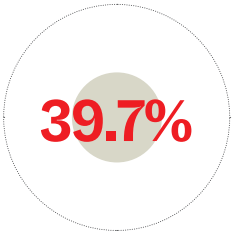


lack of endorsement from top management



lack of clarity over what "green skills" encompasses

- Addressing air pollution and the adoption of renewable energy are the top drivers of green skills across the six cities in the study. Energy skills are of increasing concern for the two Asian cities, Singapore and Tokyo, which are both relative laggards in clean-energy adoption.



of surveyed executives select air pollution as the top trend driving their city towards green-skills adoption.

- All six cities are moving towards green-skills adoption, albeit with different drivers. Over two-thirds of respondents believe that their cities provide opportunities for green-skills development.

Introduction: Skills for a new green era

As cities grapple with the consequences of climate change, resource depletion and pollution, the need for a shift towards environmentally conscious practices is paramount. Cities have a unique opportunity to cultivate green skills to not only enhance the employability of city-dwellers but also contribute to greening a country's economic engine. Sitting at the heart of these cities are businesses that are navigating the challenges of adopting green and sustainable measures.

The role of companies as stewards of the natural environment has never been clearer. The pursuit of profit now exists alongside an awareness that resource exploitation, pollution and other externalities of commercial activity can no longer continue unabated. Jockeying for an edge amid a fast-changing external environment, companies are realising that sustainability can be a way to both hedge against risk and gain competitive advantage.

The proximate cause for this shift is the unmistakable signal that man-made climate change is no longer a far-off concern. Responding to a myriad of stakeholders—as well as the simple imperative of maintaining a liveable planet—companies are declaring net-zero targets in ever-greater numbers.[1,2] Their decarbonisation plans are dovetailing with accelerating action on meeting other environmental goals, like waste reduction, cleaning up air and water, and stemming biodiversity loss.[3,4,5,6] Yet as companies expand these remits, they are bumping up against resource constraints, most notably in the human resources needed to execute their plans. The critical shortage of workers in the green economy may rise to seven million by 2030.[7]

A bygone era may have seen these kinds of responsibilities shunted to a discrete department, often under the label of "corporate social responsibility". No longer. Companies are now embedding sustainability throughout their operations, to varying degrees. But do they have the green skills to be true sustainability leaders? If so, what is driving this adoption? If not, what is holding it back?

This study aims to answer this question in the six cities under its scope. The executive survey analyses companies' understanding of green skills and implementation of initiatives meant to boost green skills in the organisation. Using this survey, Economist Impact developed a green skills barometer alongside this briefing paper. The briefing paper incorporates insights concerning all three pillars of the barometer—environmental awareness, leadership and employee imperative.

[1] https://www.reuters.com/business/sustainable-business/corporate-climate-disclosures-jump-again-2022-cdp-data-2022-10-19/
[2] https://zerotracker.net/insights/net-zero-targets-among-worlds-largest-companies-double-but-credibility-gaps-undermine-progress
[3] https://www.reuters.com/business/environment/un-lays-out-blueprint-reduce-plastic-waste-80-by-2040-2023-05-16/
[4] https://www.unep.org/explore-topics/air/what-we-do/taking-stock-global-efforts/actions-air-quality-report-update
[5] https://www.unep.org/resources/report/wastewater-turning-problem-solution
[6] https://www.unep.org/unep-and-biodiversity
[7] https://www.bcg.com/publications/2023/will-a-green-skills-gap-put-climate-goals-at-risk

Table 1: Green Skills Barometer

Pillars	Indicators
1. **Environmental awareness** captures the role of external stakeholders and environmental trends that influence the adoption of green skills by businesses.	1.1 External stakeholder impact 1.2 Environmental factors
2. **Leadership** studies the benefits of and readiness for adopting green skills for the business, as well as the ways in which leadership incentivises the adoption.	2.1 Benefits of adopting green skills for the business 2.2 Business readiness for green adoption 2.3 Incentives and efforts to adopt green skills
3. **Employee imperative** analyses the importance of green skills compared to other skills as well as the relative importance of different green skills.	3.1 Readiness amidst employees to adopt green skills 3.2 Relative importance of green skills 3.3 Interest shown in different skill types

Source: Economist Impact, 2023

Mapping the perception of business leaders across the six cities, results from the barometer indicate that although cities lie at similar places in their journey, different cities have different drivers behind the adoption of green skills.

Green skills are a vital and growing concern, especially for cities whose role as the economic driver of civilisation has come with a heavy environmental cost.[8] The opportunity for cities' corporate ecosystems to now make a positive contribution to solving challenges like climate change is one they must seize.

[8] https://www.reuters.com/article/global-economy-workers-environment-idUKL8N36T6ZV

Chapter 1: How green is your workforce? Green-skills perceptions in companies

For most people, the colour green evokes nature. Environmental movements of decades past emphasised shrinking humankind's footprint on the planet, usually through the conservation of unspoilt places. Today, green movements often embody different goals, with reducing greenhouse gas (GHG) emissions a top priority.

The varying goals of green movements add to the uncertainty around pinning down a specific definition of green skills. Although in our current era, climate change is undoubtedly inseparable from the term, while conservation has become somewhat more fraught. Both the UN and OECD link the considerable changes in skill requirements with the urgent transition to a greener economy.[9,10] The jobs site LinkedIn urges for a skills-based approach to greening the global workforce to solve the climate crisis, in its Global Green Skills Report.[11] That report places "carbon accounting" first by a wide margin on its list of fastest-growing green skills in the US; "conservation management" ranks fifth-to-last. Neither the UN nor OECD articles on green skills mention conservation at all.

The slippery nature of the term "green skills" is hardly lost on experts. Olga Strietska-Ilina of the International Labour Organisation divides the concept into two broad buckets: skills that are explicitly green in nature (like the aforementioned carbon accounting) and those that may promote green outcomes but do not have a dedicated green purpose. She cites the example of installing an electric solar water heater to help decarbonise a household: "the plumber needs to have some kind of awareness of how to connect household plumbing systems to a renewable energy solution. That is the 'green skill'. But the plumber also needs to know plumbing, per se." Similarly, the plumber also has to have good communications skills to be able to advocate the renewable solutions among households.

[9] https://unfccc.int/news/why-are-green-skills-important-for-youth
[10] https://www.oecd.org/employment/assessing-and-anticipating-skills-for-the-green-transition-28fa0bb5-en.htm
[11] https://economicgraph.linkedin.com/research/global-green-skills-report

Many definitions: what are green skills?

Our assessment of research into the field of green skills revealed that it suffers from a lack of commonly agreed definitions on what the related skills, tasks and jobs are. The OECD echoes this, noting that there is a lack of shared international definitions with current research maintaining a narrow focus on skill requirements without broader consideration of the relevant transversal skills such as environmental awareness and sustainability.[12]

Definitions from research papers:

- Green skills are the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society.[13]
- Green skills are those that enable the environmental sustainability of economic activities.[14]

Definitions from expert interviews:[15]

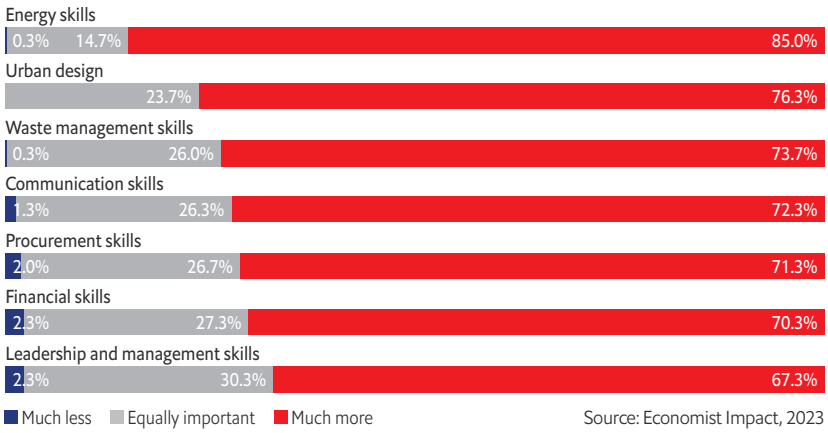
- Soft skills or technical skills that are necessary to implement a climate solution.
- Green competencies is a broader term than green skills, which includes knowledge of green technology, value of sustainability, promoting nature-based solutions, conducting critical thinking and using a systems approach. This would give an employee a well-rounded competence to be qualified to work in a green economy.

For the purpose of this research, we define green skills as follows based on above definitions:

Green skills are the knowledge, abilities, values and attitudes that are needed to support sustainable and resource-efficient business operations as companies focus on reducing their carbon footprint.

Figure 1: Energy hogs

What are the green skills you consider important now, compared with your understanding of green skills in the last five years?



Source: Economist Impact, 2023

Every skill as a green skill

Given how central the energy transition is to alleviate the climate crisis, it is unsurprising that survey respondents see it gaining prominence relative to other green skills. Eighty-five percent of respondents say that energy skills are much more important now compared with five years ago, nearly ten percentage points higher than the next-highest-rated skill, urban design. That said, all types of green skills have become more important over the last half-decade (Figure 1), tracking with anticipated greater importance of green skills overall in the coming five years.

[12] https://www.oecd.org/employment/assessing-and-anticipating-skills-for-the-green-transition-28fa0bb5-en.htm
[13] https://www.oecd-ilibrary.org/sites/40882eb1-en/index.html?itemId=/content/component/40882eb1-en
[14] https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/global-green-skills-report/global-green-skills-report-pdf/li-green-economy-report-2022.pdf
[15] Adapted using insights from the expert interviews

Table 2: Specific green skills incorporated in the survey[16]

Green Skill	Definition and example
Energy skills	Skills supporting the clean energy transition from fossil fuels to eco-friendly renewable alternatives as cities race for achieving their net-zero emission targets such as *renewable energy planning, implementing and advising*.
Urban design	Skills that support establishing liveable green cities in the long term in the face of rapid urbanisation, by incorporating sustainability practices into city planning and landscaping including *clean transport systems, green infrastructure, nature-based solutions and effective resource management*.
Waste management skills	Skills that support the development of circular economy and recycling initiatives such as *waste audits and environmental assessments*.
Communication skills	Skills that help with communicating sustainability-related data and activities to other parties including *sustainability reporting and disclosure*.
Procurement skills	Skills that support embedding sustainability practices in the supply chain such as *tracking Scope 3 emissions and sustainability practices of the suppliers*.
Financial skills	Skills that help with incorporating sustainability considerations into the investment process including *impact investment and ESG investing*.
Leadership and management skills	Skills that support driving sustainability practices in an organisation through leadership and management including *creation of new sustainability oriented jobs, fostering a culture of learning, adapting and responding to emerging climate trends and adoption of technology*.

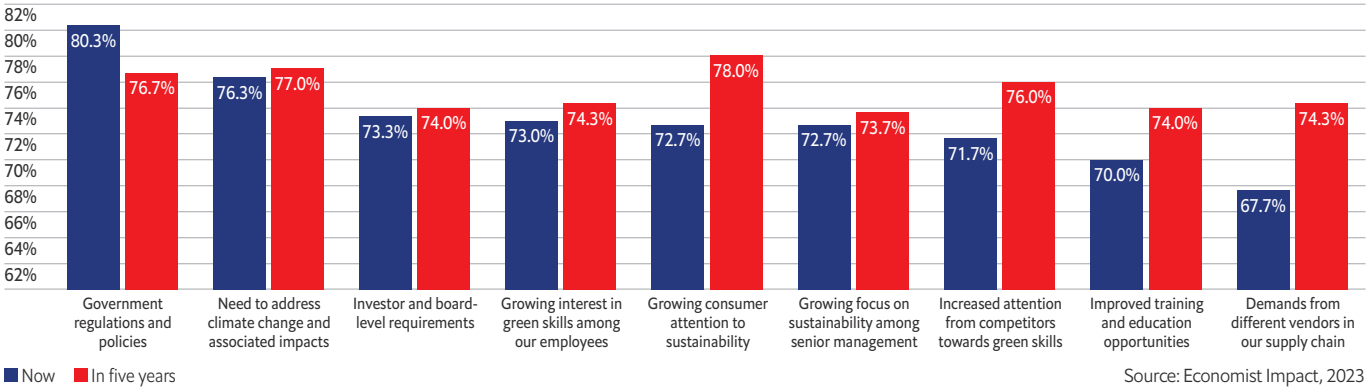
Source: Economist Impact, 2023

Experts stress the expansive nature of green skills, underscoring that companies need to shift their collective mindsets rather than simply engage in box-ticking exercises to onboard a list of skills. "Every skill needs to be a green skill", says Stefan Praschl of WorldSkills, which focuses on cultivating future-focused competencies among the labour pool.

Our survey respondents reflect this holistic idea of green skills, ranking "operations" and "management"—two of the most broadly-defined parts of a company—atop the list of verticals where green skills could provide the most benefit. Sophie Tyldesley of the UK government's Department for Environment, Food and Rural Affairs is witnessing sustainability and environmental awareness going beyond the remit of a single department into something bigger. She attributes this, in part, to "growing consumer awareness of green issues—people are voting with their spending". Indeed, out of a list of nine potential engines of green-skills adoption, most respondents believe "growing consumer attention to sustainability" will be very important in five years (Figure 2).

Figure 2: Consumer (attention) will be king

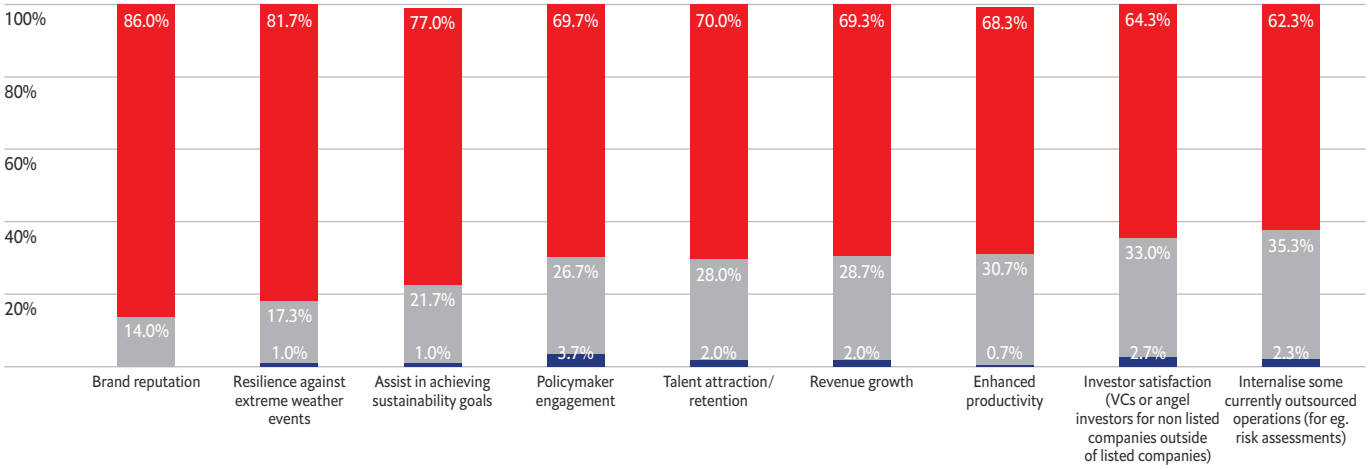
What influences your organisation's demands for green-skills adoption, currently and in the next five years?
Percentage of respondents who select 4 and 5 on a scale of 1-5, where 1 is not important and 5 is very important



Source: Economist Impact, 2023

[16] https://iopscience.iop.org/article/10.1088/1742-6596/1019/1/012030/pdf

Figure 3: An array of benefits
What are the benefits to your organisation of adopting green skills?



Source: Economist Impact, 2023

Only a sheen of green?

Brand reputation sits atop the list of putative advantages, with 86% of respondents pinning "highest benefits" from green skills to this factor (Figure 3). This reflects a growing consensus that companies' image among their consumers or clients is increasingly sensitive to sustainability narratives, both positive and negative. To this point, a recent study found a strong link between product popularity among consumers and ESG claims.[17]

Kristy Drutman of Green Jobs Board warns of greenwashing in the quest for a brand boost from green skills, citing companies that incorporate green-skilled workers only to starve them of resources or dilute their mission. "I worry that companies hire chief sustainability officers only to pat themselves on the back", she says. "It doesn't mean they're actually doing the work." Robin Hicks of Eco-Business, a trade publication, says that instead of truly investing in green-skills development, relevant responsibilities are often foisted on executives that have little interest in, or talent for, the tasks. "There are so many of those people, unfortunately, that have just inherited the sustainability function", he says. "They often just view it as a compliance matter."

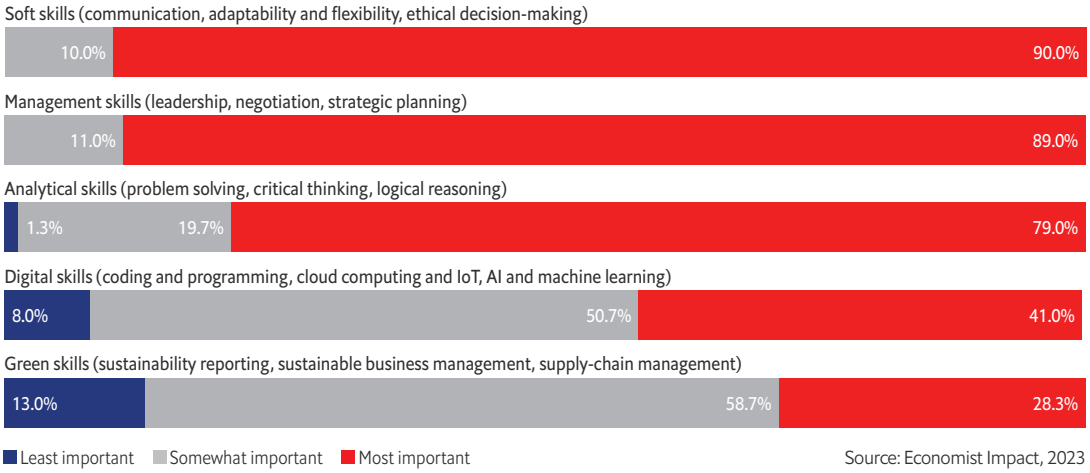
Echoes of this concern bubble up in the survey; for instance, while supermajorities of respondents agree with statements like "improving our green skills will be a competitive advantage for our organisation", only 46% agree that their companies have a decarbonisation or net-zero strategy. This suggests that the highly technical, labour-intensive, deeply transformative work of addressing one's climate impact is something that most companies cannot, or are not willing to, do yet. Ben Hellström, head of search and partnerships at Apricot, remarks that "a lot of people have nonchalantly transitioned into sustainability jobs in the past years but it should be as jarring to move to sustainability as it is to accounting or marketing." According to him, "sustainability jobs are technical and you can do them badly like any other job."

Similarly, only about a quarter of executives state that "green skills are a top priority area with a lot of activity" and compared with other skills, such as analytical skills, digital skills, soft skills and management skills, fewer respondents

[17] https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/consumers-care-about-sustainability-and-back-it-up-with-their-wallets

Figure 4: A surfeit of somewhats

How would you rate the current importance of the following skills for employees in your organisation?



Source: Economist Impact, 2023

think that green skills are currently important for employees in their organisation (Figure 4).

Impediments to a greener workforce

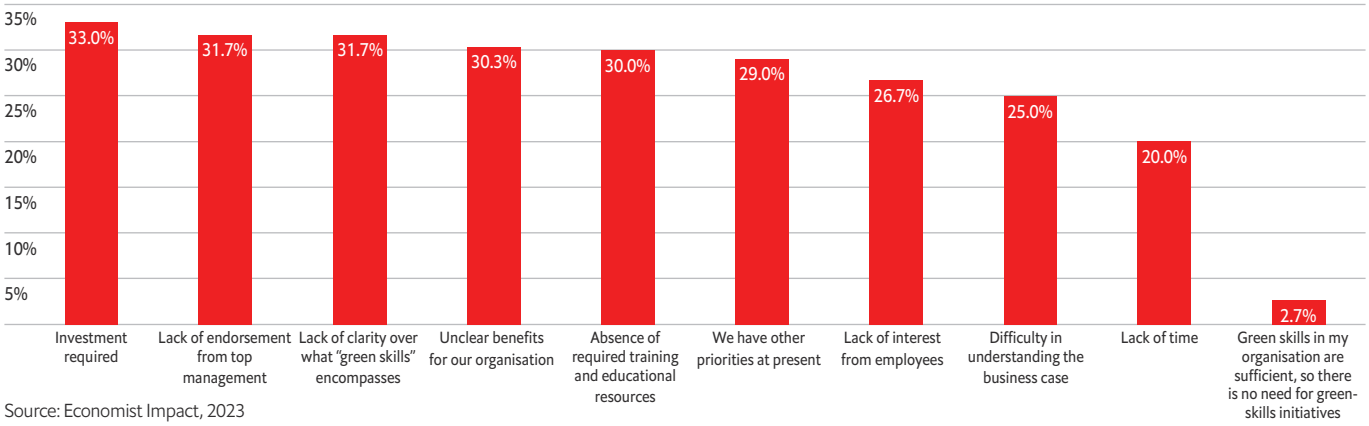
Disappointingly, less than 3% of respondents mentioned that green skills in their organisation are sufficient (Figure 5). Hence, it is crucial for businesses to focus their attention and efforts in driving the adoption of green skills. However, the road to adopting green skills is not smooth—many challenges lie ahead. Survey respondents ranked "investment required" atop the list of factors impeding green skills in their organisation.

Moreover, the culture prevalent in an organisation is paramount in creating an environment where green skills are not just valued, but receive the requisite time, attention and funding to truly take root in the organisation.[18] A lack of endorsement from top management is ranked as the second most significant challenge to the adoption of green skills in the survey, alluding to the important role that leadership plays in driving green-skills adoption.

The lack of clarity over what green skills encompasses also hinders progress. Romain Boitard of the European Training Foundation

Figure 5: Finding the green to go green

What are the top three challenges to incorporating green skills in your organisation?



Source: Economist Impact, 2023

[18] https://www.forbes.com/sites/forbescoachescouncil/2018/11/20/why-does-culture-eat-strategy-for-breakfast

gives an example of an initiative to develop a common understanding of skills by standardising definitions, "The European Standards of Qualifications and Occupations is like a phone book of all the different skills you can have in any job. It has started labelling some of the skills as green".

Size matters

Larger companies place greater emphasis on green skills than their smaller counterparts. This might be due to smaller companies lacking resources to do much more than execute on its core functions. Our survey calls attention to this disparity in numerous spots.

Mr Hicks notes that regulators are increasingly mandating sustainability disclosures from large, listed companies, a requirement rarely imposed on small and medium-sized enterprises. This can result in what he calls an inequality between the two types of firm when it comes to green skills. As sustainability considerations increasingly permeate large companies, their smaller suppliers will need to adapt accordingly, especially if they want to sell to customers in places like Europe, where climate ambitions are driving increasingly stringent environmental regulations.

Table 3: The bigger, the better?

Survey question	Share of respondents in companies with 25,000 or more employees agreeing	Share of respondents in companies with less than 250 employees agreeing
Green skills are a top priority area with a lot of activity	65.8%	7.3%
My organisation is completely ready to support green-skills development and training	42.1%	6.3%
We do not incentivise employees to adopt and/or build their green skills	0%	22.9%

Source: Economist Impact, 2023

Leading from the top to empower the bottom: the role of leadership in driving the adoption of green skills

Businesses increasingly understand the importance of sustainability and its impact on the company's bottom line. Studies find that a focus on ESG can generate greater value creation in fundamental business areas: growth, cost reductions, regulatory and legal interventions, productivity, and investment and asset optimisation.[19]

Mr Hellström highlights that the biggest change across organisations is the shift in mindset towards sustainability, which starts with leadership. Given their role in driving these decisions, greening the skills of the leadership would be essential, Mr Hellström adds. When asked in the survey which two functions in their organisation would benefit the most from green-skills development, eight-of-ten respondents (86%) highlighted senior executives and over half (56.7%) selected C-suite executives. "C-suite commitment is critical to implement sustainability strategies in every organisation I worked with", agrees Samantha Sharpe of the Institute for Sustainable Futures at University of Technology Sydney.

In addition to driving corporate sustainability strategies, attracting talent will be key for leaders. A Gallup poll finds that seven out of ten employees take into account a firm's environmental and sustainability efforts when determining employment.[20] With this in mind, leadership in an organisation is well placed to drive company decisions around green-skills adoption.

[19] https://www.forbes.com/sites/forbeshumanresourcescouncil/2022/09/07/the-importance-of-sustainable-leadership/?sh=50cc1bd31b6a
[20] https://www.forbes.com/sites/forbeshumanresourcescouncil/2022/09/07/the-importance-of-sustainable-leadership/?sh=50cc1bd31b6a

Chapter 2: The bigger picture
Green skills as a planetary imperative

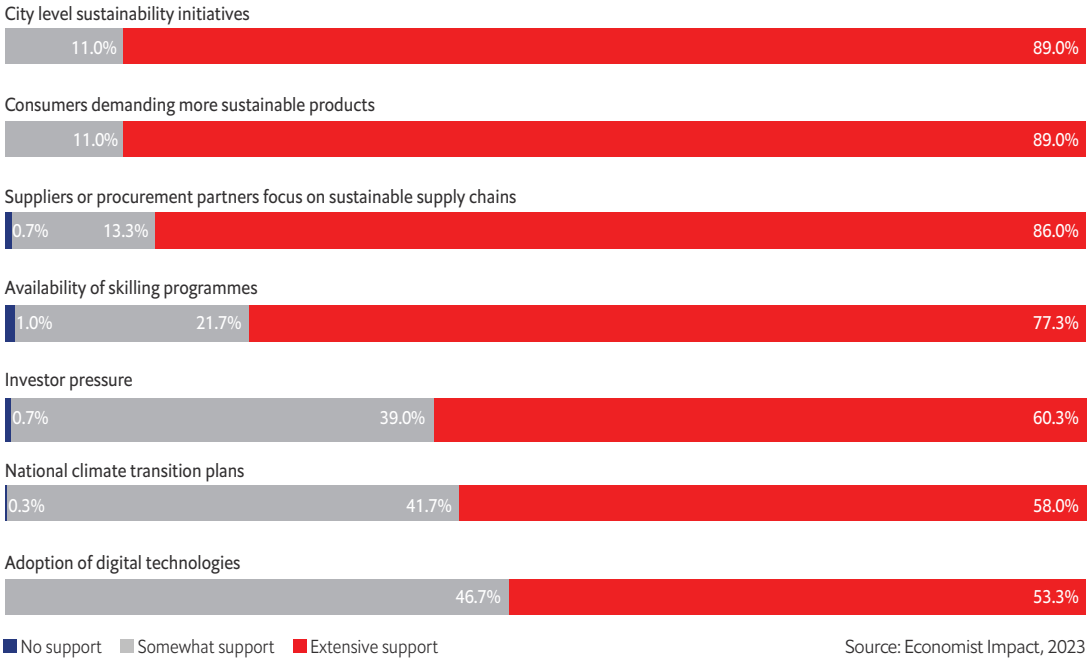
Perhaps more so than other types of skills, green skills are rooted in a broader environment that is fast recognising the urgency of sustainability, especially when it comes to climate change. The Paris Agreement of 2015, in which 196 nations pledged to limit global temperature rise to no more than 2°C, and ideally no more than 1.5°C, was a starting gun for many countries' efforts to curb emissions.[21]

At the same time, the relatively incipient nature of climate as a matter for national policy is creating a landscape riddled with trial and error, as countries attempt to craft decarbonisation plans that can appeal to extreme ends of the political spectrum. The UK, for one, recently backtracked on several climate goals.[22] For our entire sample, "national climate transition plans" ranked second-to-last out of seven external factors in offering "extensive support" for the adoption of green skills in the wider workforce (Figure 6).

Even as national climate policies suffer from a perception of weakness when it comes to fostering green skills more broadly, climate concerns loom large for individual companies, according to survey findings. When asked what drives their organisation's—rather than the wider

Figure 6: Tepid transition plans?

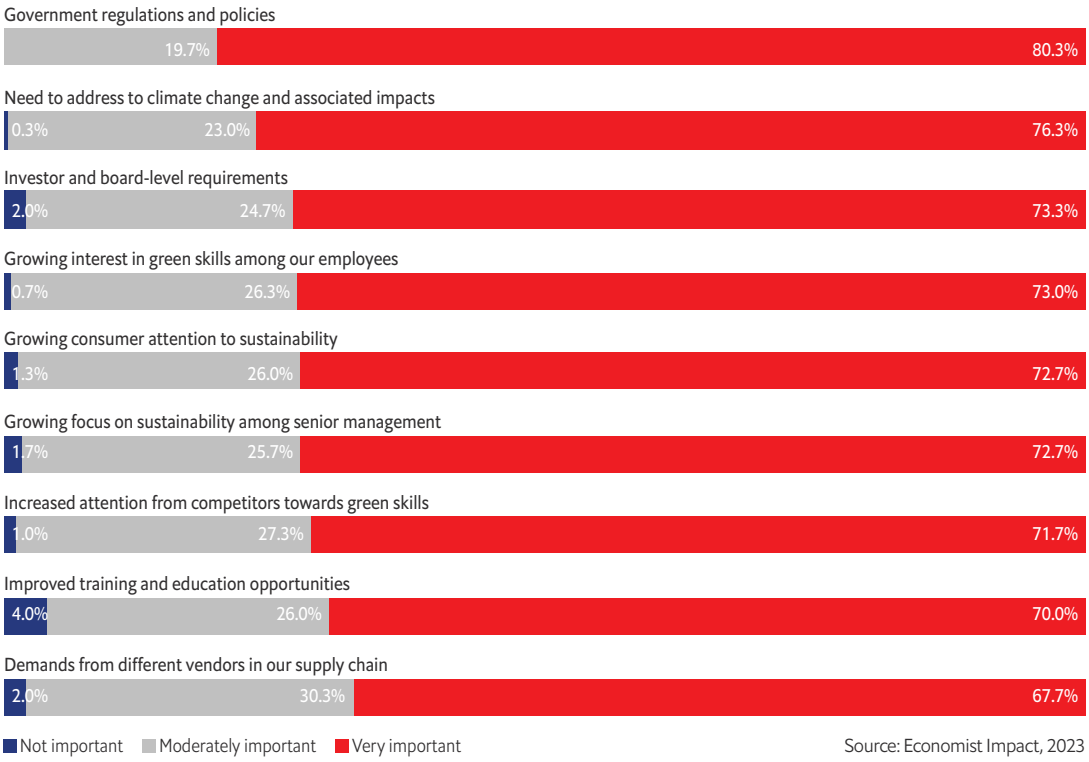
To what extent do the following factors support the adoption of green skills in the wider workforce?



Source: Economist Impact, 2023

[21] https://unfccc.int/process-and-meetings/the-paris-agreement
[22] https://www.theguardian.com/commentisfree/2023/sep/23/observer-view-rishi-sunaks-cynical-backtracking-on-climate-will-be-to-no-electoral-avail

Figure 7: A changing climate for green skills
Currently, what influences your organisation's demand for green-skills adoption?



Source: Economist Impact, 2023

workforce's—demand for green skills, climate change ranks second out of nine factors (Figure 7) in terms of which are "very important".

Companies in many countries are no strangers to green regulations in various other areas, from clean air and water to preservation of sensitive ecosystems. This is likely the reason why "government regulations and policies" ranked first on the same tally of "very important" factors influencing demand for green skills. Policy coherence is as important, according to Ms Strietska-Ilina. "Policies concerning education and training and policies on greening investments and climate change should talk to each other", she explains.

Ms Sharpe says that these big-picture pressures, especially on the regulatory side, are essential for green-skills development. "You need action at the enterprise level but also at the economy-wide level, whether that's emissions-reductions policies or other sustainability policies and targets that allow people to say, 'okay, this is a risk-free path'", she explains.

Green for life

While policy can help create a greener zeitgeist for society, the spread of green skills throughout the corporate world requires education, training and upskilling or reskilling, in which mid-career individuals pick up new competences or refine existing ones. This can happen through several avenues, including formal educational institutions or within companies themselves. Three-quarters of respondents agree that their companies prefer to upskill and reskill their current employees over hiring new talent for green skills.

Yet many experts interviewed for this report lament the lack of coordinated plans and support for such lifelong learning between governments, companies and educational institutions. Mr Boitard points to the increasing interest to find a purpose-driven job among young adults. At the same time, Jochem de Boer of workforce solutions company The Adecco Group, says that reskilling current workers will help fill talent gaps more effectively than simply "hoping that the youth will save us all". Similarly, Borhene Chakroun of UNESCO, says that few jurisdictions under his purview pay sufficient attention to continuing education. "Some countries have done better than others; they have created councils for vocational training or lifelong learning, but I don't see this as a top priority."

According to Mr Boitard, new players emerge to match rapidly transforming industry needs with training opportunities to fill the skills gap in organisations. "The education system is usually slower to adapt than the private sector so companies take the matter into their own hands and partner with centres of excellence. The best centres recognise the particular skilling needs of a city and set up their own programmes accordingly", he explains. To facilitate more coordination between public and private sectors, "social dialogue is really instrumental", explains Ms Strietska-Ilina. "Otherwise it's very hard to overcome skills gaps and plan for future skills needs", she adds.

Ms Sharpe says that a problem in the green arena in particular is the lack of a clear career pathway or credentialing process, along the lines of accountancy, law or medicine. This makes it hard to gauge the value of investing in upskilling for green competencies. She calls for greater quality assurance for institutions responsible for technical and vocational education around sustainability, and more effort to set uniform standards. "[That could be] industry coming together and saying, 'yes, this is what the skill set should be'", she says.

Regardless of how it takes shape, a greater push to fill companies' need for skills of all stripes will be essential for future corporate competitiveness. Our survey emphasises the issue: when asked whether different types of skills—including green skills—will be more important in five years than they are today, the importance of all skills is higher in the future than now (Figure 8). The difference for green skills is especially significant with an almost 68 percentage points increase in the percentage of respondents considering green skills as most important in the next five years (95.7%), compared with now (28.3%).

Figure 8: Wanted: Skills—all of them

Currently and in five years, how important are/will the following skills be for employees in your organisation?
Percentage of respondents who select 4 and 5 on a scale of 1-5, where 1 is least important and 5 is most important

Source: Economist Impact, 2023

Same goal, different paths: How different industries are leveraging green skills

Green skills are hardly uniform across the corporate world. However, given that climate change and its associated impacts are relevant for each sector, the adoption of green skills will be crucial for all. A study highlights that reducing Europe's net carbon emissions to zero by 2050 will require a continent-wide reskilling effort. It is estimated that 18m people will need to be reskilled. The number varies for industries, for example, more than one million solar workers will be needed in the EU by 2030 to meet higher renewable energy targets. Globally, it is estimated that a total of 568,800 wind technicians will be needed by 2026 to install, operate and maintain the growing fleet of global onshore and offshore wind turbines.[23]

Our study includes 11 sectors, a diverse group representing a range of skills needs.[24] In some industries, the connection to green skills is glaringly obvious. Energy, for one, is the prime mover of the climate transition. The International Energy Agency calls out the need for training and reskilling programmes in vital technologies like wind and solar power to keep the sector's transformation on pace to meet climate targets.[25] In the survey conducted for our research programme, a higher proportion of respondents who select "Green skills are a top priority area with a lot of activity" came from the energy, utilities and natural resources sector compared with other sectors.

Manufacturing, machinery and industrial companies constitute the world's heaviest users of fossil fuels and rank among its biggest GHG emitters. They also face complex considerations—and heavy skills deficits—as the net-zero race gains steam. Green skills will be needed to do everything from making technical improvements to efficiency, to implementing radical new innovations like thermal batteries or carbon capture, utilisation and storage.[26,27] Change might be imminent—when asked if the organisation's level of readiness to support green-skills development and training is "completely ready", a higher share of respondents were from the manufacturing, machinery and industrials, and energy, utilities and natural resources sectors. Further, all respondents belonging to the manufacturing, machinery and industrial sector consider green skills to be most important in the next five years.

Other sectors less directly connected to emissions are also poised for green shifts that will spark demand for new capabilities. The financial sector, for instance, is racing to fill gaps in ESG expertise as governments increasingly demand sustainability-related disclosures and roll out an alphabet soup of green tax incentives and penalties.[28,29,30] According to the survey, respondents from the financial services sector believe to a greater extent than other industries that brand reputation is a key benefit of adopting green skills. Additionally, making sure that companies not only comply with these new regulations, but can leverage the various green incentives on offer, will also foster significant skills needs in the legal profession.[31] However, a lower share of respondents from the legal services sector (compared to other industries in the survey) agree with the statement that their companies are regularly publishing sustainability reports, an indication of a company's focus on sustainability in general.

The definition of "green" in these and other sectors may differ, but the interconnected nature of commerce across industries means that as sustainability becomes the baseline for business-as-usual, green skills will gain prominence in every corner of the global economy.

[23] https://www.weforum.org/agenda/2023/05/europe-green-skills-solar-wind/
[24] This includes educational services, energy, utilities and natural resources, financial services, government, healthcare, legal services, manufacturing, machinery and industrials, real estate and urban planning, retail and wholesale trade, IT, transport, logistics, warehouse and distribution
[25] https://iea.blob.core.windows.net/assets/953c5393-2c5b-4746-bf8e-016332380221/Skillsdevelopmentandinclusivityforcleanenergytransitions.pdf
[26] https://energyinnovation.org/wp-content/uploads/2023/07/2023-07-13-Industrial-Thermal-Batteries-Report-v133.pdf
[27] https://www.iea.org/reports/transforming-industry-through-ccus
[28] https://www.ey.com/en_us/climate-change-sustainability-services/finance-professionals-step-up-to-the-challenge-of-esg-reporting
[29] https://www.reuters.com/sustainability/sec-chief-says-new-california-law-could-change-baseline-coming-sec-climate-rule-2023-09-27/
[30] https://www.pwc.com/gx/en/services/tax/green-tax-and-incentives-tracker.html
[31] https://nysba.org/why-law-firms-need-to-make-esg-a-priority/

Chapter 3: Urban jungles
Cities as drivers of corporate sustainability

What makes a city green? This can feel like a paradoxical question, given the stereotypical view of a city as a cacophony of neon and chrome, of people crammed together in tall buildings and busy streets. In reality, however, many cities present a model for sustainable living, with various studies showing that GHG emissions per person are lower in some cities than in suburbs or rural areas.[32,33,34]

Cities can also take steps to foster sustainability, via urban design factors that affect how people move around, how much energy they consume, how clean their air and water is, how much access they have to parks and natural areas, and other outcomes. Examples include the goal for a zero-emission London transport system by 2050, a residential sector in Singapore that will have centralised cooling, automated trash collection and a car-free town centre, and green building laws in New York.[35,36,37]

Cities' sustainability cultures are inseparable from the corporate sectors that call the city home; cities serve as the locus of business activity and their choices on sustainability have a major impact on companies, including when it comes to green skills. This is all the more apparent for the six cities in our survey, where 89% of executives say that city-level sustainability initiatives provide "extensive support" for green-skills adoption in the wider workforce. The supply of green-skilled workers is also high in each city, although with some variation; executives in London, for instance, are 12 percentage points less likely to perceive a "good" or "extensive" level of green skills than those in New York or Sydney (Figure 9). In 2019, increased demand for green roles meant that a third of the vacancies in London were hard to fill due to skills-related reasons.[38] Studies highlight that occupations related to homes, building and landscape sectors—including electricians, plumbers—had skills shortages and required significant retraining for the current workforce to meet decarbonisation needs.[39] Ms Tyldesley remarks that the UK is currently going through a policy landscape shift. "Even for the most directly impacted industries, such as forestry, energy and waste, engagement with green skills is a continuous journey because the delivery of climate and

Figure 9: London falling?

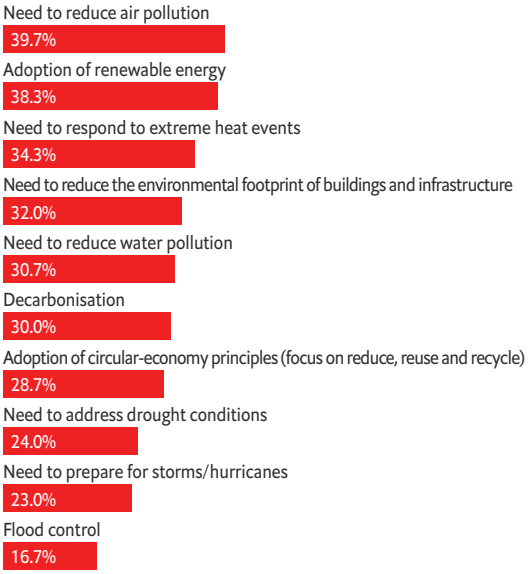
To what extent does the workforce in your city possess green skills?
Percentage of respondents saying "good" or "extensive"

Source: Economist Impact, 2023

[32] https://theconversation.com/suburban-living-the-worst-for-carbon-emissions-new-research-149332
[33] https://news.berkeley.edu/2014/01/06/suburban-sprawl-cancels-carbon-footprint-savings-of-dense-urban-cores
[34] https://www.bbc.com/news/science-environment-49639003
[35] https://www.cnn.com/style/article/singapore-tengah-eco-town/index.html
[36] https://www.nyc.gov/site/oec/green-building/green-building-laws-regulations.page
[37] https://www.london.gov.uk/programmes-strategies/transport/green-transport
[38] https://www.london.gov.uk/sites/default/files/identifying_green_occupations_-_working_paper_99.pdf
[39] https://wpieconomics.com/site/wp-content/uploads/2021/10/Green-Jobs-and-Skills-in-London-Final-Report-1.pdf

Figure 10: Greening the air

Which of the following trends are driving your city towards green-skills adoption?



Source: Economist Impact, 2023

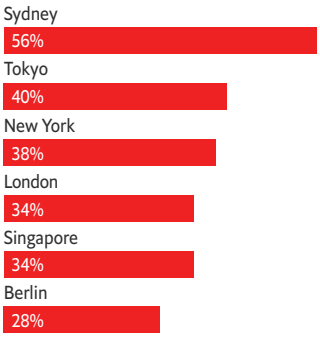
environmental objectives is ongoing", she explains, highlighting that green skills adoption is a work in progress.

The drivers of green-skills adoption vary significantly by city, with executives in London, New York and Tokyo ranking "need to reduce air pollution" atop the list. Air pollution is a key challenge for cities around the world with serious health and environmental consequences as per an Economist Impact study.[40] In June 2023, the air pollution in New York reached some of its worst levels following wildfires in Canada, highlighting the importance of a long-term plan to minimise the risks.[41] Cities are exploring various strategies such as leveraging technology to provide real-time air quality data in South Korea, which requires technical skills.[42]

On the other hand, Singaporeans choose reducing water pollution and Sydneysiders crown "adoption of renewable energy" by a wide margin. This is likely

Figure 11: Energy down under

Which of the following trends are driving your city towards green-skills adoption?
Percentage choosing "adoption of renewable energy"



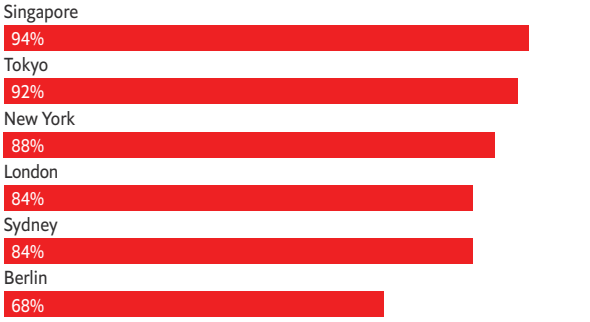
Source: Economist Impact, 2023

driven by Central Sydney's recent embrace of 100% renewable energy—the only city among our six to reach this milestone. Renewable energy ranked a close second to air pollution in the overall tally (Figures 10 and 11).

Possibly due to the relatively low share of renewable energy in Tokyo and Singapore,[43,44] executives in those cities place greater prominence on energy skills over the past five years, compared with respondents from other cities (Figure 12).

Figure 12: An Asian energy shift

What are the green skills you consider important now, compared with your understanding of green skills in the last five years?
Percentage of respondents saying energy skills are "much more" important



Source: Economist Impact, 2023

[40] https://www.undp.org/asia-pacific/publications/asia-focus-clean-air-and-business-and-human-rights-agenda
[41] https://www.cnbc.com/2023/06/07/canadian-wildfire-smoke-nyc-residents-urged-to-stay-inside.html#:~:text=Smoke%20from%20the%20Canadian%20wildfires,quality%20on%20June%207th%2C%202023.&text=New%20York%20Gov.,can%20stay%20indoors%2C%20stay%20indoors.
[42] https://www.unep.org/news-and-stories/story/these-five-cities-are-taking-aim-air-pollution
[43] https://www.isep.or.jp/en/1436/
[44] https://energytracker.asia/renewable-energy-singapore/

Figure 13: Green light to go green

How do you incentivise employees to adopt and/or build their green skills? Select all that apply

Source: Economist Impact, 2023

Given that both Tokyo and Singapore have pledged to achieve net-zero emissions by 2050—with 2030 interim targets just around the corner—both will need to see an explosion of energy activity in the coming decades, and will need the required skills to support this movement.[45,46]

Both green and skilful

All six cities in our study are green-skills leaders in certain aspects. A recent Economist Impact index ranked London 5th out of 25 cities considering environmental resilience[47] whereas Tokyo ranks 10th and Singapore 15th.[48] Singapore, however, is regularly touted as an education vanguard and boasts intensive official support for reskilling, including of the green variety.[49,50,51,52] It recently set up a green-skills committee to bring together industry players and training providers to develop green skills.[53] Ms Strietska-Ilina credits the close coordination between government and the private sector for keeping Singaporeans at the forefront of skills development and employability. "They have an excellent system where every citizen has some access to a training fund that they can use at different points in their career", she says.

Berlin also gains plaudits for its skills initiatives. "The educational system in Germany is one of the most advanced in the world", notes Mr Boitard. He cites Germany's dual system of education and training as a way for students to gain hands-on experience in the technical applications of theoretical skills in fields like science and engineering.[54]

Even cities in our study that may draw a starker line between public provision of skills and utilisation of those skills by industry are still largely seen as green-skills powerhouses. In our survey, 68% of respondents overall believe that their cities provide opportunities for green-skills development, likely due to the various green initiatives that cities around the world are rolling out on a regular basis.[55]

Cities incentivise employees to adopt green skills in various ways. Communicating a clear sense of how green skills can contribute to the organisation is the most popular incentive across the six cities. This goes back to the challenge around lack of understanding of what green skills mean and how they can contribute to organisations. Recognition of achievements is among the important incentives in Berlin and New York. Sydney opts for offering free or subsidised tuition to training/education courses as one of the top incentives whereas offering paid time off to attend training/education courses is crucial for Tokyo.

[45] https://www.c40.org/case-studies/zero-emission-tokyo-strategy/
[46] https://www.nccs.gov.sg/singapores-climate-action/singapores-climate-targets/overview/
[47] Defined as embracing climate change adaptation, mitigation actions, and disaster risk reduction while recognising the complexity of rapidly growing urban areas and the uncertainty associated with climate change. Urban resilience requires the responsible and sustainable management of natural resources for the benefit of people and the planet.
[48] https://impact.economist.com/projects/resilient-cities/en/whitepaper/the-resilient-cities-index/
[49] https://hbr.org/2020/07/what-would-it-take-to-reskill-entire-industries
[50] https://www.weforum.org/press/2020/01/the-reskilling-revolution-better-skills-better-jobs-better-education-for-a-billion-people-by-2030/
[51] https://www.skillsfuture.gov.sg/
[52] https://www.skillsfuture.gov.sg/docs/default-source/initiatives/04-green-economy.pdf
[53] https://www.mti.gov.sg/Newsroom/Press-Releases/2023/11/New-Green-Skills-Committee-to-support-Skills-Development-for-Green-Jobs
[54] https://www.bmbf.de/bmbf/en/education/the-german-vocational-training-system/the-german-vocational-training-system_node.html
[55] https://climatechampions.unfccc.int/from-innovation-to-implementation-cities-driving-the-race-to-zero/

Conclusion: Tailwinds for the green-skills revolution

Green skills adoption is rising as cities around the world confront intensifying challenges in sustainability, especially a transformation of the energy system that must occur in the next few decades. The corporate world is playing a leading role in this shift, as workforces need to embody sustainability at every level and in every vertical. This synergy between the public and private spheres is important for the planet to stave off a climate disaster as global temperatures rise. Positively, three quarters of the surveyed executives (75.7%) highlight that green skills are a top priority area and that initiatives are being rolled out for its adoption.

Yet, we are still in the early laps of this race, only 2.7% of the respondents perceive the green skills in their organisation as sufficient and believe there is no need for green-skills initiatives. Although the pace is likely to pick up, concerns remain that it may not happen quickly enough to forestall the worst consequences. "We often hear from some of our institutional partners that, 'sustainability is great, but we have other issues to deal with'", says Mr Boitard. Almost 30% of respondents in the survey highlight having other priorities currently as a challenge in adopting green skills. "Important beyond the actual skill set is how someone with green skills will actually get things done, rather than just be exploited as a public-relations exercise", says Mr Hicks.

But with expectations for sustainability and climate stewardship rising among the public, lawmakers, investors and other stakeholders, companies will need to fill their green-skills gaps sooner or later. A lack of endorsement from management is one of the top challenges to green-skills adoption—also highlighted by the fact that only 16.3% believe their organisation is "completely ready" to support green-skills development and training. Other challenges include investment requirements, a lack of clarity on what green skills encompass and their benefits, and the absence of training and educational resources.

Thankfully, businesses have their urban partners—the cities they call home—to support them in the green-skills adoption journey. While cities differ in 'how' they are adopting green skills, ranging from communicating the benefits of green skills to offering free or subsidised training—overall they lie at the same place in the state of adoption. The majority of respondents (68%) agree that their city provides opportunities for employees to develop their green skills.

Cities are both laboratories of innovation and essential forces in the green transition. In partnership with companies, they can make sure the green-skills revolution has the wind at its back.

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