The State of Industrial IoT in 2024

How IoT has become a keystone technology for industries that drive the global economy

Viasat

Since Inmarsat's last report, the Internet of Things (IoT) has evolved into a keystone technology that supports the digital transformation of business and the economy. IoT is omnipresent. It has become the 'internet of everything', embedded in the lives of consumers and the operations of enterprises and governments worldwide.

As part of this critical infrastructure, satellite IoT is playing an increasingly vital role for industries, providing reliable coverage for devices in remote and poorly connected regions.

There have been challenges to overcome on the journey to 2024, with integration and unreliable connectivity being the biggest bugbears but, in general, industry has risen to meet them and will continue do so even more effectively.

The future of IoT looks bright. The global enterprise IoT market is now predicted to swell to an impressive $483 billion by 2027. That's 140% up on 2022. [Statista]

And McKinsey projects that, by 2030, IoT products and services will create between $5.5 to $12.6 trillion in value.

Indeed, since we last talked to industrial experts about implementing IoT back in 2021, the market has boomed. Successful trials have given industrial businesses the confidence to formalize IoT implementation.

No surprise then that IoT has positively impacted performance and results, optimized operations and created new avenues for more sustainable practices.

In this report, we explore the transformation of IoT. We recognize the achievements and challenges businesses face and, where relevant, compare this year's findings with those of 2021. We also review the role of satellite in IoT, and deep dive into five key verticals:

- Agriculture
- Energy
- Mining
- Transport
- Utilities

Andy Kessler
Vice President, Viasat Enterprise

> IoT has proven its value for businesses navigating an unpredictable environment, helping them become more agile and efficient.

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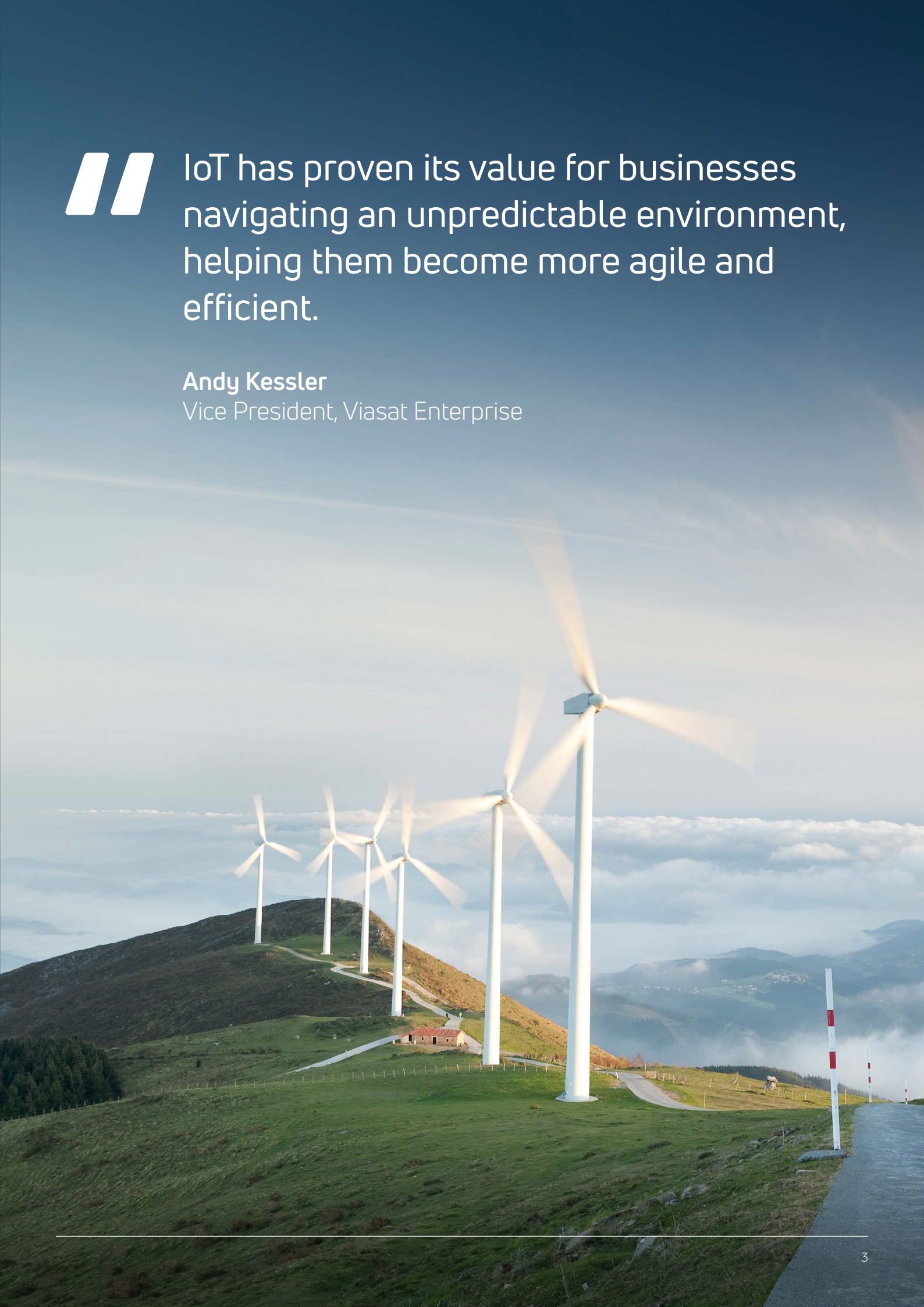


Research objectives

Research objectives

- **To examine the present and future state of IoT** across the five key verticals of agriculture, energy, mining, transport and utilities.
- We explore the momentum behind IoT and, in particular, satellite IoT. We look at solutions, customer priorities, challenges with existing systems, the adoption of new technologies, and the potential growth areas for satellite IoT within those sectors.

Quantitative research

- **Key customer verticals:** agriculture, energy (oil & gas and renewables), mining, transport (logistics & land) and utilities (power, water and wastewater). All organizations approached have experience of IoT and/or satellite IoT.
- **Organization size:** 250+
- **Sample size:** 120 per sector
- **Geographic breakdown:**
  - **North America** (including US): 120
  - **LATAM** (including Brazil): 120
  - **Europe** (including UK): 120
  - **Middle East/Africa:** 120
  - **APAC** (including Australia): 120

Qualitative research

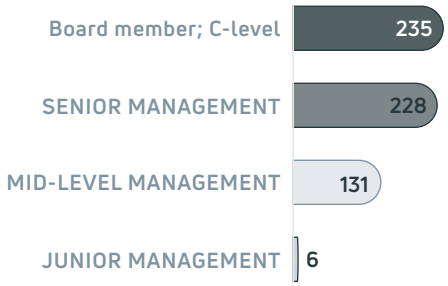
We interviewed 13 qualitative participants from organizations in the US, UK, Australia and Brazil. These organizations are from agriculture, energy, mining, transport and utilities. They have 250+ employees.

All quantitative respondents and qualitative participants are IoT decision-makers or those involved in the implementation of IoT projects in their organization.

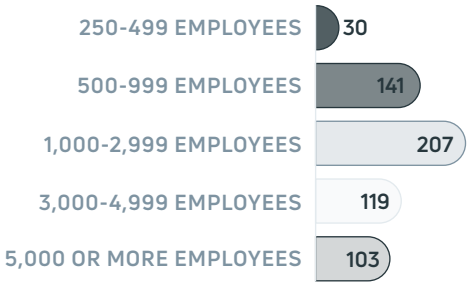
The interviews were conducted online in March and April 2024 and were undertaken using a rigorous multi-level screening process to ensure that only suitable candidates were given the opportunity to participate.

Who we spoke to, split by...

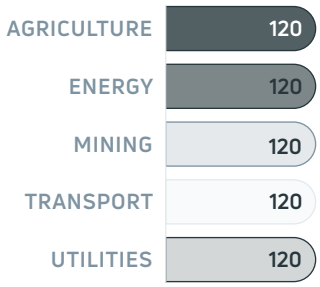
Position



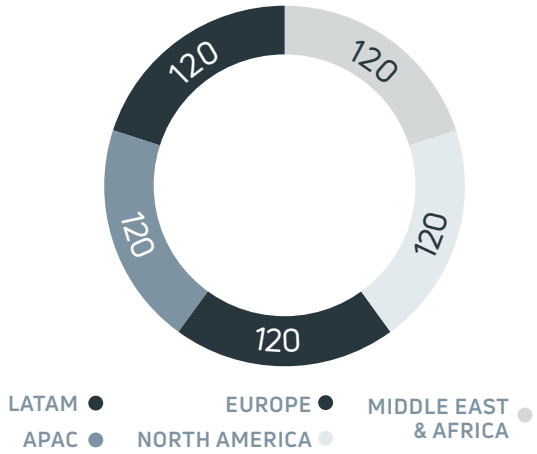
Organizational size



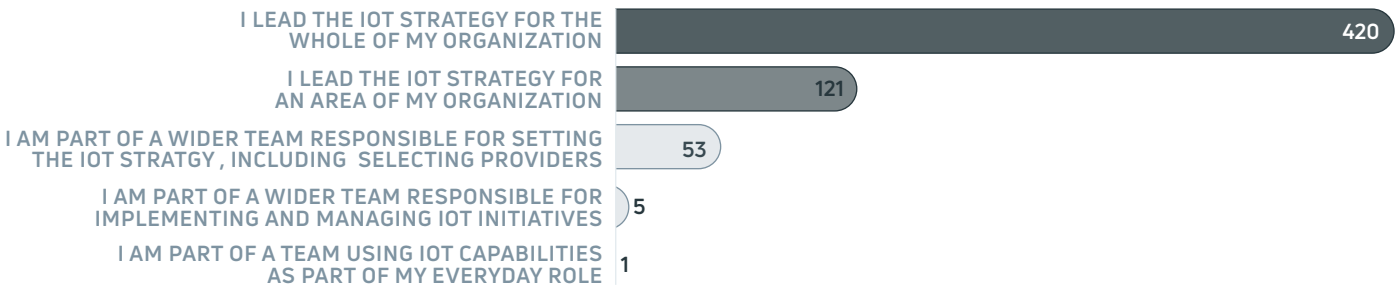
Industry



Region



Involvement in IoT

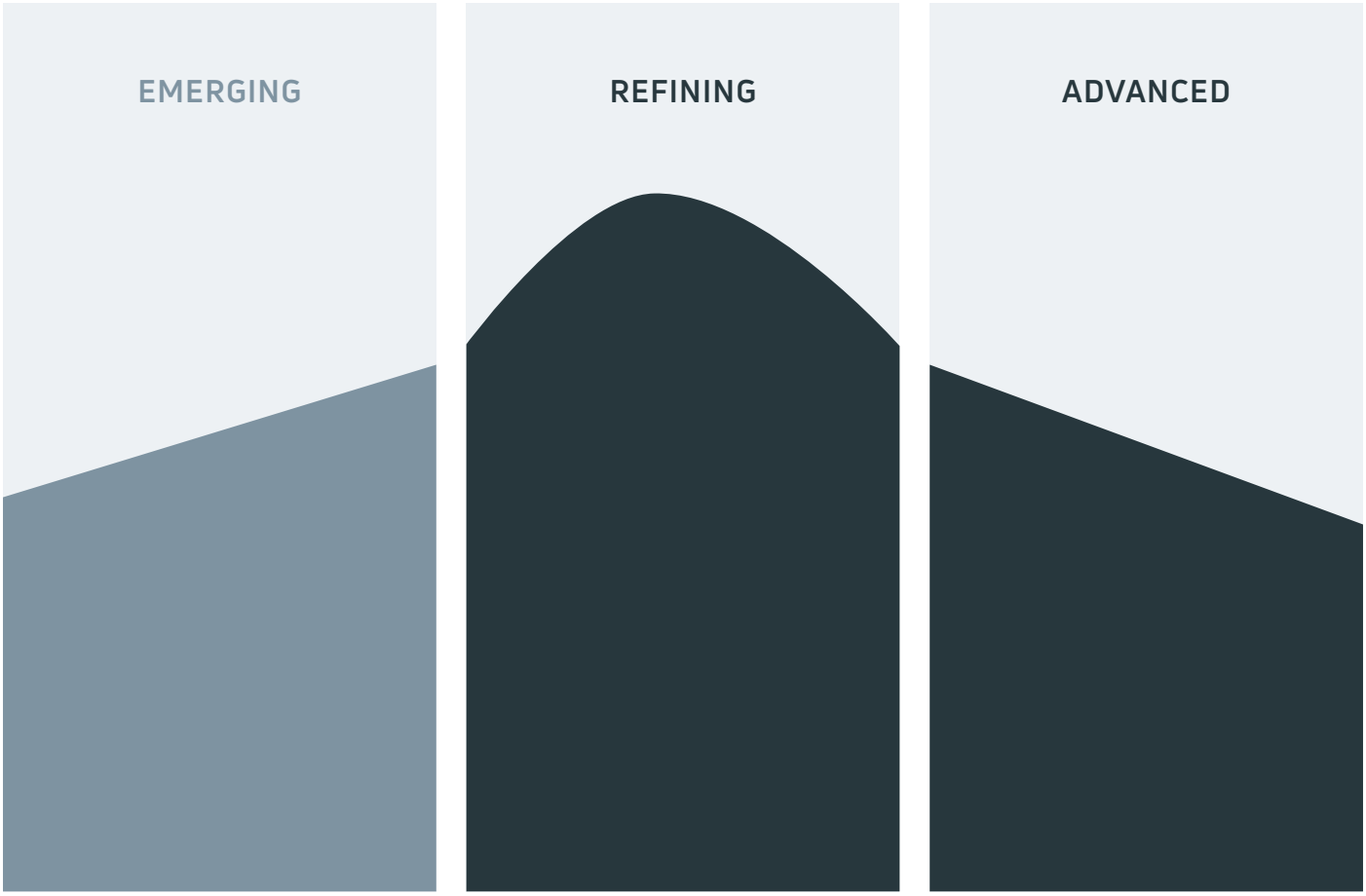


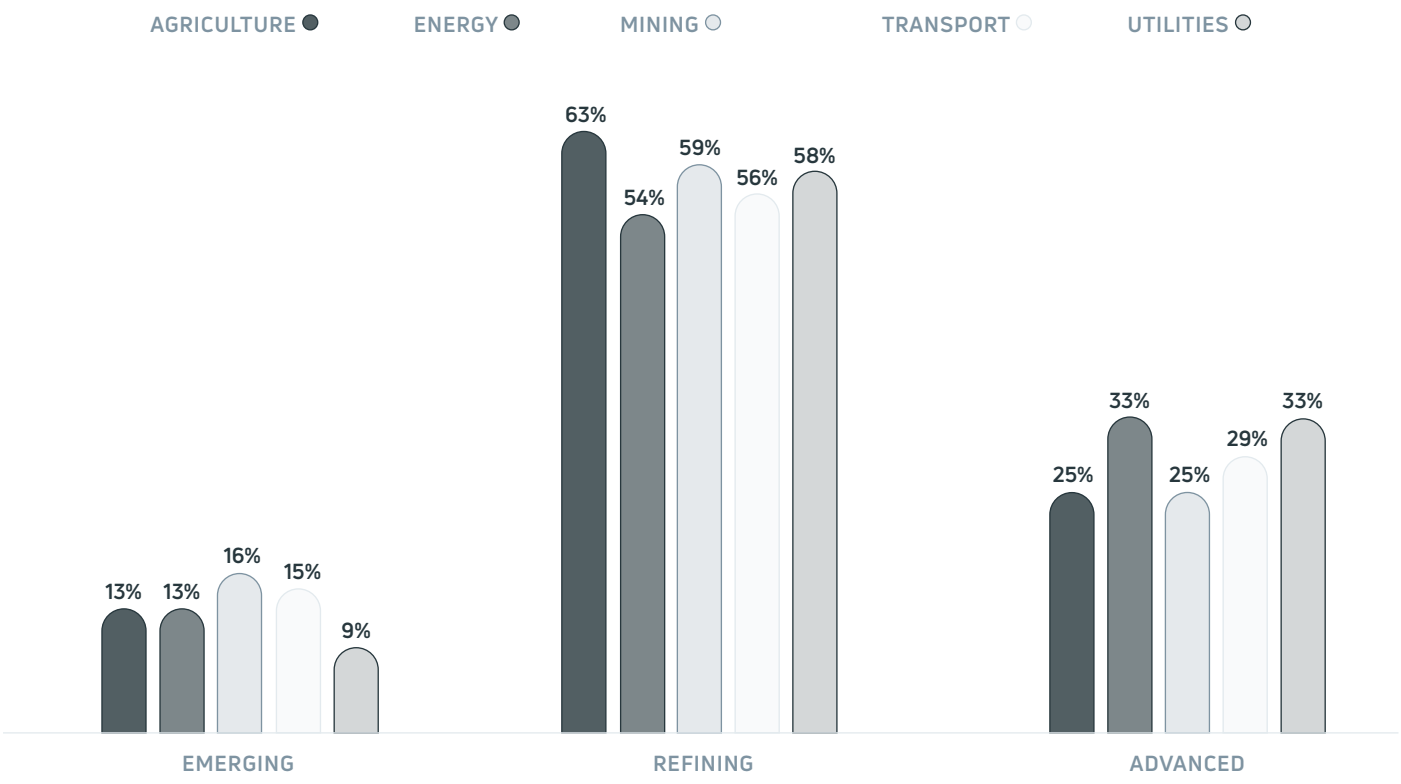
How the maturity index was calculated

The maturity index brings more depth to the data. A blend of criteria was applied to reduce bias and better understand the ins and outs of industrial IoT, the status of current strategy, planned investments, and available skills.

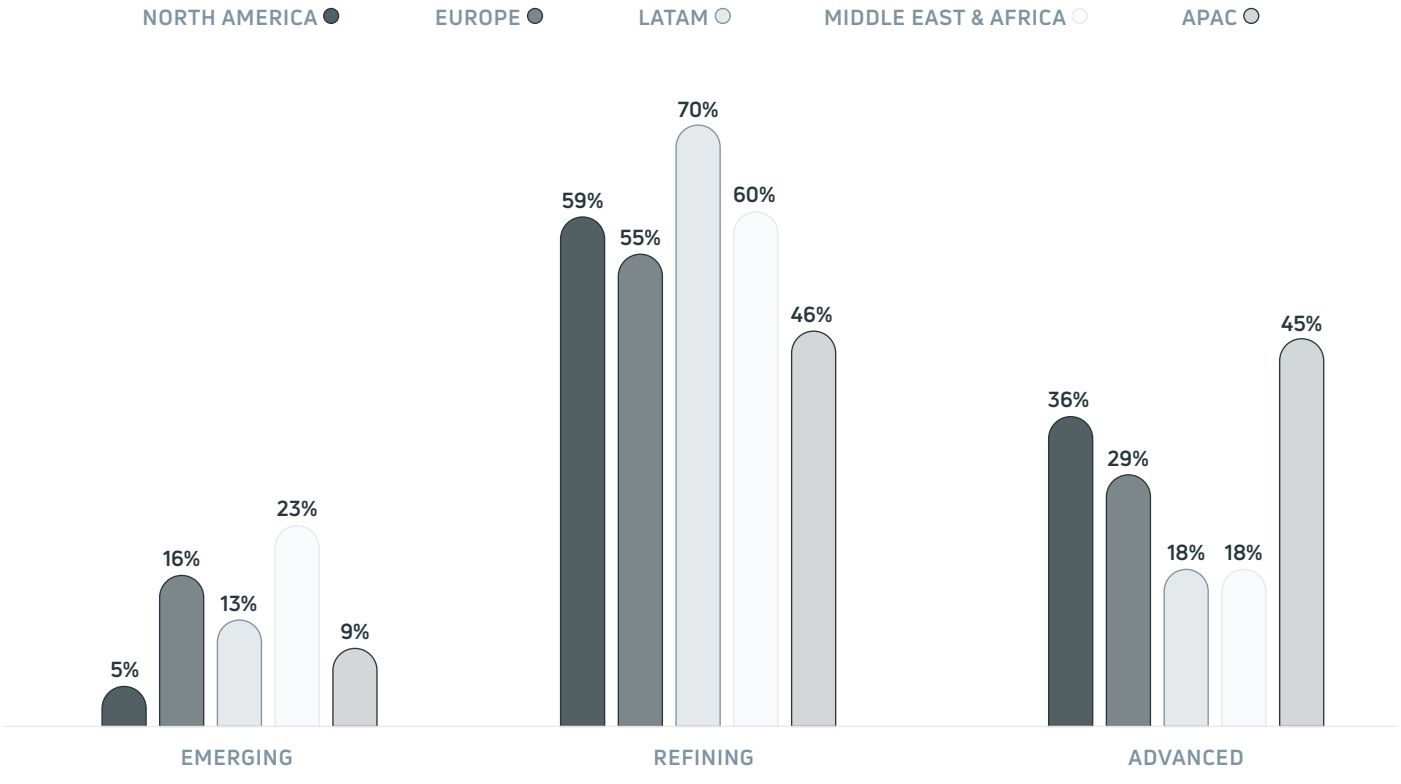
We assigned criteria to organizations based on the maturity level of the business:

- **Emerging** – slower adopters who are developing their IoT strategies and starting to increase budgets but still lack some skills internally.
- **Refining** – most of these businesses are deploying strategies, maintaining budgets and reducing skills gaps.
- **Advanced** – early adopters who are showing strategic progress, have solidified their internal skills, and put budgets on an upward curve.





Maturity splits by vertical

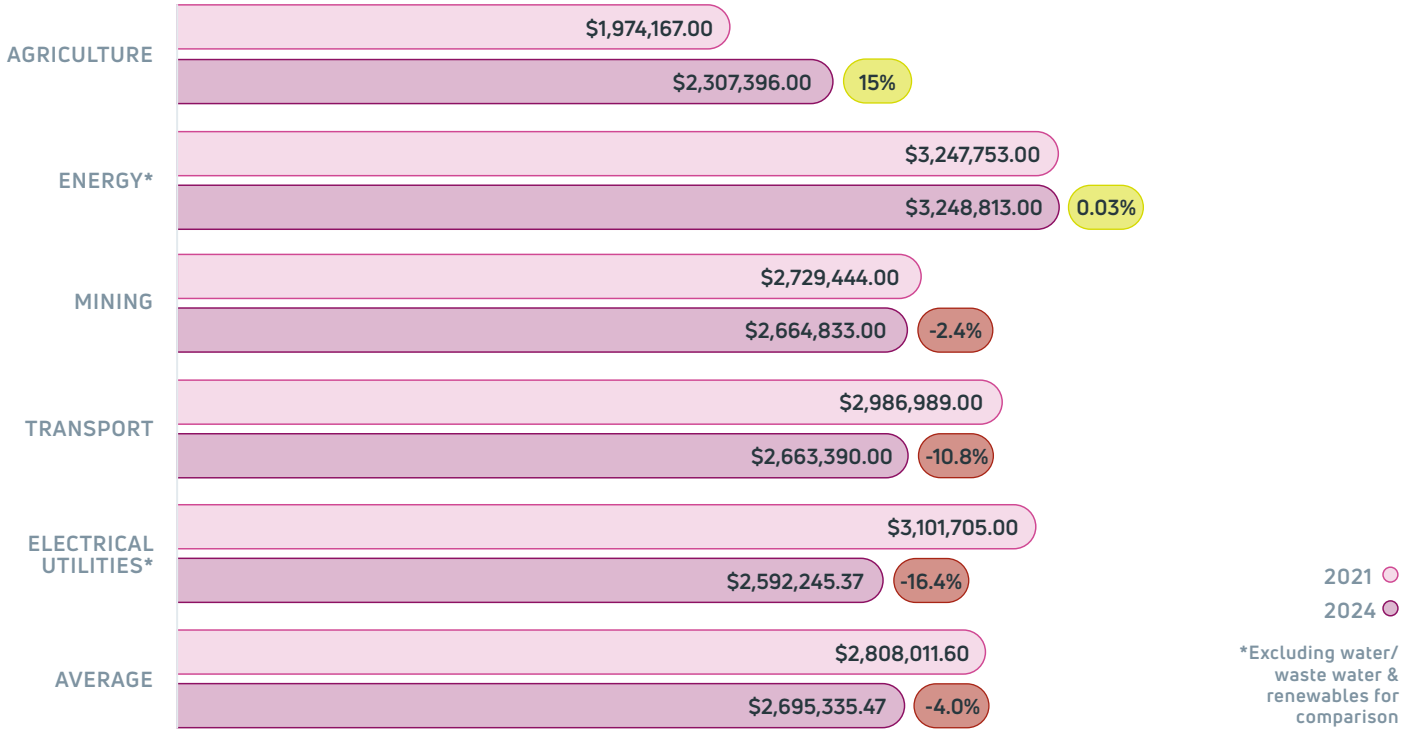


Maturity splits by geography

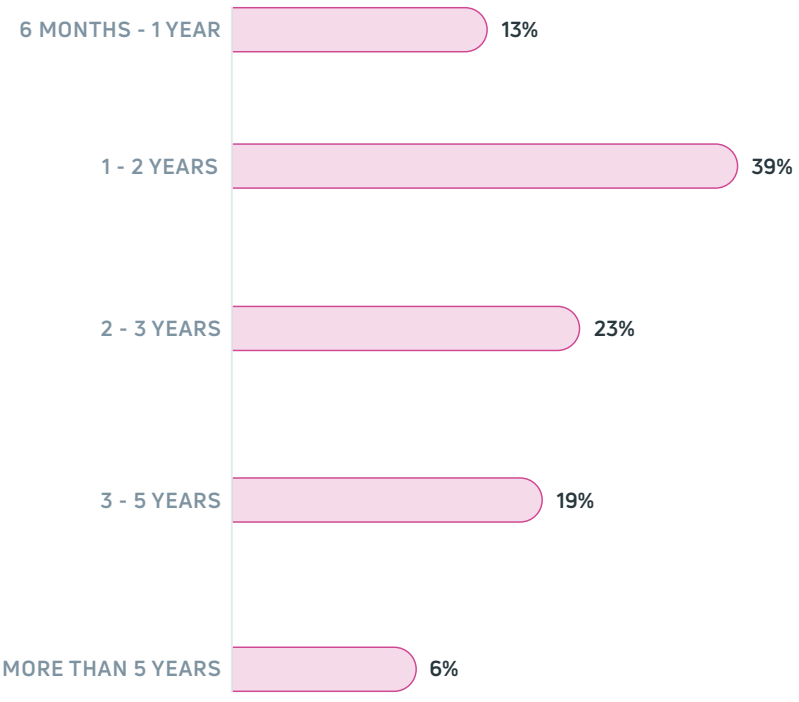

ONE
Hapag-Lloyd
UNIocean
CMA CGM
HMM
UASC
HYUNDAI
K LINE
MOL
YANG MING
NileDutch

The state of IoT in 2024

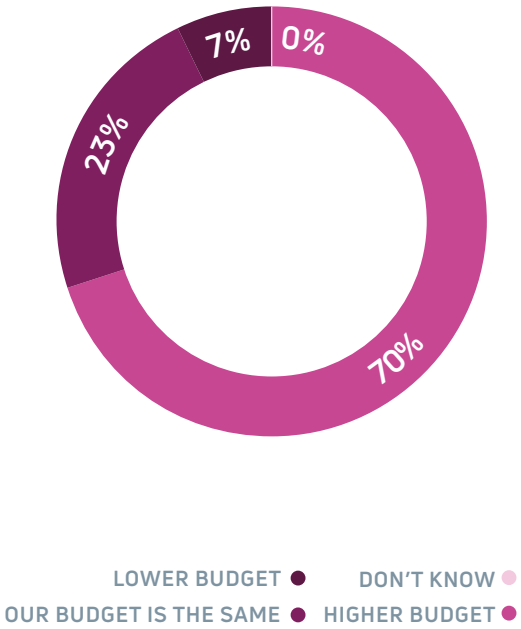
What budget do you plan to spend on IoT (2024 vs 2021)?



When it comes to thinking about an IoT strategy, how far ahead does your organization generally plan?



How will your organization's planned spend in 2025 compare with last year?



What's happened to IoT since 2021?

IoT shows significant progress since our last comparable survey three years ago. From trialing to adoption, the technology has sufficiently matured to become a core part of industrial IT strategies.

Three years ago, IoT was fully deployed in 77% of surveyed companies, with 9% trialing the technology, 13% planning to trial within 12 months, and 1% planning to trial in 18 months to two years.

By 2024, most of the trialing is over, and more use cases are being reported. All respondents have IoT projects and are formalizing their approach by developing strategies. In fact, almost half of the companies surveyed have an IoT strategy in place. Only 13% have no formal strategy, but most plan to develop one within the next 12 months. The 39% that are currently developing a strategy, fall into a range of categories — from slow IoT adopters to businesses with a burgeoning need to scale up their operation and use IoT.

Industrial IoT has shifted to its next phase, and whilst some businesses are still trialing IoT projects, most are moving towards implementation. In 2023, according to Statista, IoT was the third most likely technology to be implemented in North American and European organizations.

Budget increases projected

Overall, reported budgets have reduced slightly since the last survey in 2021, which could be a result of a different respondent group or due to IoT buying cycles. The average current budget is $2.7 million vs $2.8 million in 2021, so this is not significant.

Agriculture saw the biggest positive swing amongst respondents, although it is still by some way the laggard in terms of investment vs the other sectors. On the other hand, electrical utilities saw the biggest drop in investment. Overall energy saw the largest investment, with a figure consistent with 2021.

The good news is our respondents were confident in additional budget allocations for the year ahead, with 70% indicating they felt there would be an increase in budgets. Only 7% felt their budget was set to decrease.

> Industrial IoT has shifted to its next phase, and whilst some businesses are still trialing IoT projects, most are moving towards a formal adoption.

Progress and achievements in IoT

Adopting a structured approach to IoT seems to be the best route to success. And that success is thanks in large part to the better decision-making that the technology enables. There is a waterfall effect that cascades right through to the organizational core, positively impacting on the business as a whole.

To ascertain progress, we asked 'which of the following statements best describes your organization's progress with IoT over the last 12 months?' Respondents had five choices ranging from 'progress has slowed down significantly' to 'progress has increased significantly'.

Overall, 68% of respondent businesses have reported an increase in their IoT progress over the last 12 months and mentioned an increasing variety of use-cases and benefits. These benefits have, in the most part, been recognized by the C-suite. 74% of respondents report that the board is positive about IoT and embracing IoT as key part of business strategy, thereby taking down potential budgeting barriers.

Having a formal approach to IoT pays off. 96% of respondent businesses with a formal IoT strategy report greater achievements, versus 82% for businesses with no formal IoT strategy. Clearly, a structured approach to IoT, with a deliberate focus on what you want to achieve with the technology and how you're going to achieve it, is vital.

However, although reported progress correlates with how formalized an IoT strategy is, it doesn't necessarily reflect investment. Utilities respondents in particular seem to have reached a ceiling, where they report progress despite drastically reducing their IoT budgets. This might indicate that they have reached the potential they think they can reach, or that their focus is on low hanging IoT fruits.

All the sectors surveyed report high achievement. As our graph shows, better decision-making gets the top slot with 93%. Decision-making, beyond directly impacting the way a business operates at its core, also has a positive impact on how it behaves: more confident, more certain and therefore quicker to act. Those are useful qualities in challenging times.

But decision-making isn't a runaway winner. In fact, there's only a 4% difference between the 12 benefits respondents had to pronounce on. Either way, it's clear that the effective implementation of IoT brings a whole array of advantages. Together these underpin how business-critical IoT has become.

Regional differences

By far, the highest achievement and progress scores are reported by North American respondents. 98% of North American businesses claim an impressive array of accomplishments, with "improved customer experience" scoring 100%, closely followed by better decision-making and cost-efficiencies (both scoring 99%).

This is not unexpected from the home of some of the greatest tech giants. Mature and technologically advanced, the North American industrial sector leads the world in its use of technology. The wide adoption and success of IoT is a natural consequence of the region's expertise.

In addition, supportive government initiatives, favorable regulatory frameworks, and significant investments in digital infrastructure, further propel the growth of its industrial IoT market. For example, the United States-

Mexico-Canada Agreement (USMCA) contains one of the most ambitious digital trade chapters of any free trade agreement, providing a vital building block towards a more digitally-integrated North America by enabling the three partners to develop their markets together.

Other regions didn't do quite as well but weren't far behind. In Latin America (LATAM), Middle East and Asia-Pacific (APAC), an average of 90% of businesses surveyed report various IoT achievements and show promising progress on decision-making and improved customer experience:

- **LATAM's** internet penetration correlates with steady IoT growth, supported by the increasing availability of technologies such as 5G, narrow-band and wide area networks.

- **MEA** is progressively adopting the latest technologies, including IoT, as evidenced by the boom in smart cities and digitalized administrations.

- **APAC** is a hub of manufacturing and industrial activities. Led by China and India, it has seen a marked growth in technological progress.

- **Europe** scores lowest, with 86% of European businesses surveyed reporting various IoT achievements. While the score isn't bad per se, it reflects a less proactive approach to technology that possibly holds the region back from achieving as much as it could with IoT.

Size versus achievement

Larger businesses tend to report less achievement than their smaller counterparts. This is to be expected considering the complexity of implementing new technology on a bigger scale, coupled with a more convoluted chain of command and the natural resistance to change that is found in older organizations. Also, achievements might take slightly longer to filter through the system and be recognized. Smaller businesses tend to show greater progress (90%), probably because implementation is easier across smaller infrastructures with shorter chains of command.

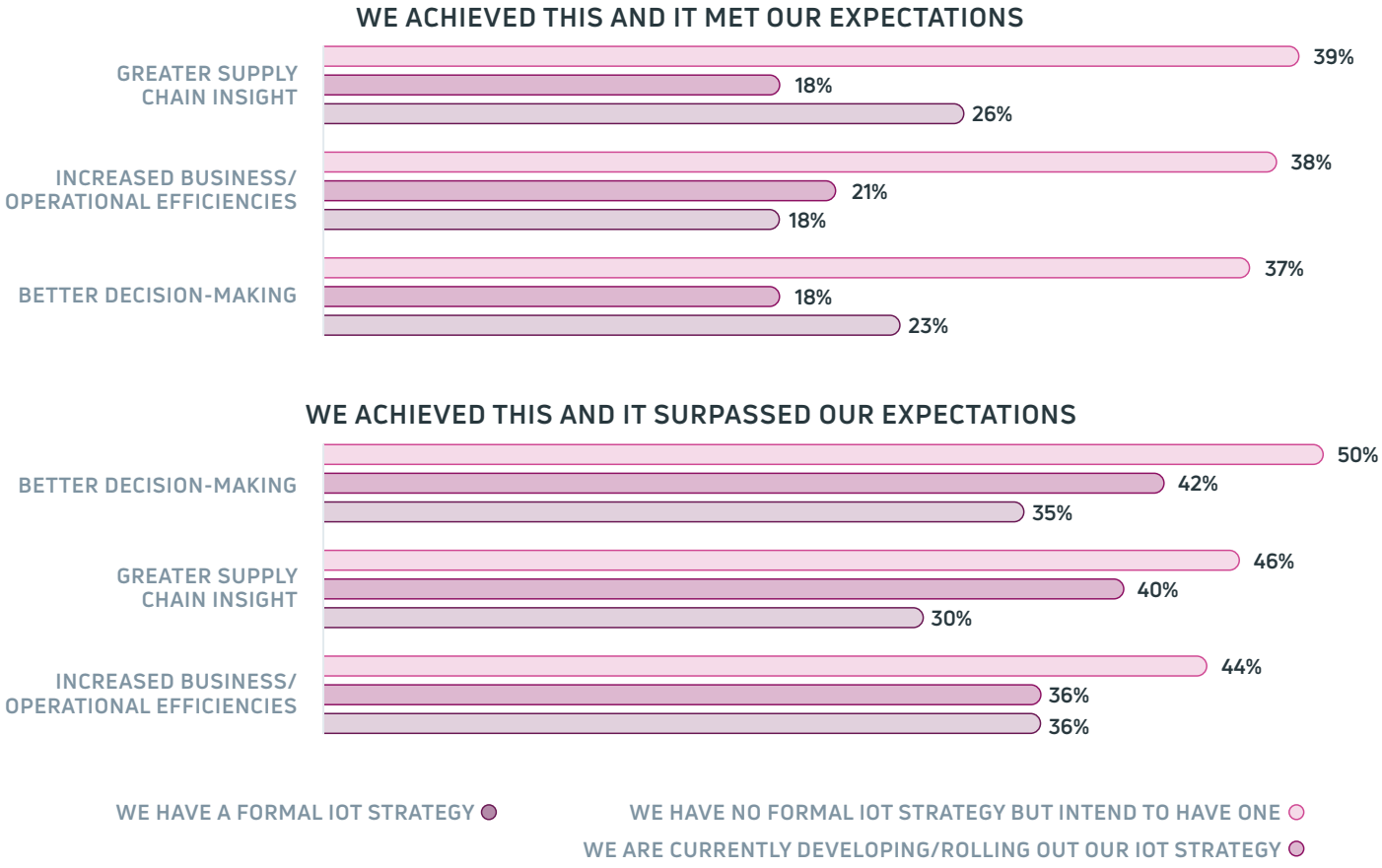
Most successful sectors

Energy reported the highest achievement scores, closely followed by utilities. As you will see from the sector analysis on pages 28 and 40 respectively, these two sectors have reaped the rewards of taking a much more integrated approach to IoT. Interestingly, they also are the most mature sectors.

> The greatest benefits are cost and time saving.


76%
of the energy sector has reported an increase in their IoT progress.

Which of the following benefits has your organization achieved from IoT projects?
Base shown in chart split by IoT strategy.



Which of the following benefits has your organization achieved from IoT projects?

	TOTAL	NA	EUROPE	LATAM	MEA	APAC
INCREASED BUSINESS/OPERATIONAL EFFICIENCIES	91%	97%	90%	88%	92%	90%
BETTER DECISION-MAKING	93%	99%	88%	90%	93%	93%
MEETING ENVIRONMENTAL/SUSTAINABILITY TARGETS	89%	98%	84%	84%	87%	91%
IMPROVED CUSTOMER EXPERIENCE	91%	100%	89%	85%	89%	91%
GREATER SUPPLY CHAIN INSIGHT	92%	98%	86%	88%	96%	93%
NEW REVENUE STREAMS	89%	95%	84%	85%	90%	92%
COST EFFICIENCIES	91%	99%	91%	87%	88%	91%
IMPROVED SECURITY (BOTH CYBER AND PHYSICAL)	90%	98%	87%	88%	90%	88%
IMPROVED HEALTH AND SAFETY	90%	97%	87%	85%	88%	93%
REDUCED DOWNTIME	89%	98%	81%	85%	91%	90%
IMPROVED COMPLIANCE/REGULATORY	91%	98%	86%	86%	94%	93%
COMPETITIVE ADVANTAGE	90%	96%	85%	91%	85%	93%
AVERAGE	**91%**	**98%**	**86%**	**87%**	**90%**	**91%**

What are the biggest barriers to implementation?

Integration is reported as one of the biggest barriers to implementation but, once successfully accomplished, our respondents feel it will be less of a challenge in future. However, the adoption of 'humanware' — AKA skills — garners a less confident response. Finding the right talent appears to be an ongoing challenge that industry isn't relishing. The same applies to connectivity, which continues to be seen as unreliable,

The smaller the company, the fewer the barriers. 20% of respondent organizations with 250-499 employees haven't encountered any barriers, as opposed to only 1% of those with over 500 employees. Why? Arguably, smaller scale implementations tend to be easier — especially for younger, more nimble companies.

The trouble with integration

Understandably, integration presents a challenge at the beginning of an IoT journey because it requires businesses to implement new devices and systems into existing infrastructures. Everyone's on a learning curve, including the IoT providers. Which is why solutions sometimes lack standardization and are quite fragmented, due to the number of vendors, stakeholders and suppliers involved. However, as technology continues to mature and ensure better compatibility and interoperability to make integration easier, the organizational challenge — both perceived and real — diminishes.

This was reflected in the research. So, although integration was previously considered to be the biggest barrier to IoT implementation, it drops to fifth place when respondents consider the barriers they expect to encounter in future. Integration is then seen as less of a challenge because that stage in the journey is largely over.

C-suite acceptance

Similarly, senior buy-in is much less of an issue. Overall, 74% of those surveyed report that the board was positive about IoT, although some mentioned that teams or departments can be resistant to change and put up bureaucratic barriers that dampen innovative enthusiasm. Fortunately, most of the C-suite is now buying in, indicating that IoT has proved itself to the board and/or those who hold the purse strings.

> "You can change the lack of knowledge, but changing a corporate culture is much harder.


42%
Have the right partners
and solutions to succeed

Filling the skills gap

The next step on the journey is resourcing the right skills: you start with hardware and follow with 'humanware'. And, as ever with new technology, finding talent presents a significant challenge, particularly on satellite-related projects.

Overall, we found that less mature businesses feel they lack more of the skills necessary to select, deploy and utilize IoT projects than more mature ones. 63% of respondents said they would benefit from additional skills or believe they don't have the right skills to integrate satellite IoT projects. The same percentage said they didn't have the right partners and solutions in place to succeed, while 9% of businesses said they didn't have the right skills at all.

The respondents seem overwhelmed by choice, with too many suppliers to choose from, too little expertise to make the right choice, and too much at stake if they make the wrong decision. Choosing the wrong partner could have disastrous effects on the business itself, not just IoT projects.

Satellite is seen as a particularly complex technology to implement, requiring a combined expertise in industrial IoT and satellite connectivity that's in short supply. This, alongside the other figures, suggests a major skills gap facing the future growth of IoT. This has historically proven problematic for businesses looking to harvest data from remote locations where operational insight can be most vital.

Regional differences

Integrating IoT technology with existing platforms was seen as a key barrier for 30% of businesses across Europe, LATAM, MEA and APAC. However, the North American businesses we surveyed are facing significantly bigger challenges than those regions, with 43% reporting problems.

Similarly, the complexity of simultaneously managing terrestrial and satellite IoT solutions has been an issue for 26% of businesses across the rest of the world, versus 41% in North America.

North America reports more extremes, scoring well on achievements (see page 12) but the region is not coping so well with challenges. Culturally ambitious and naturally entrepreneurial, respondents from the region admit that taking leaps in adopting new technologies can be challenging but overall (and this is the important bit) those leaps pay off.

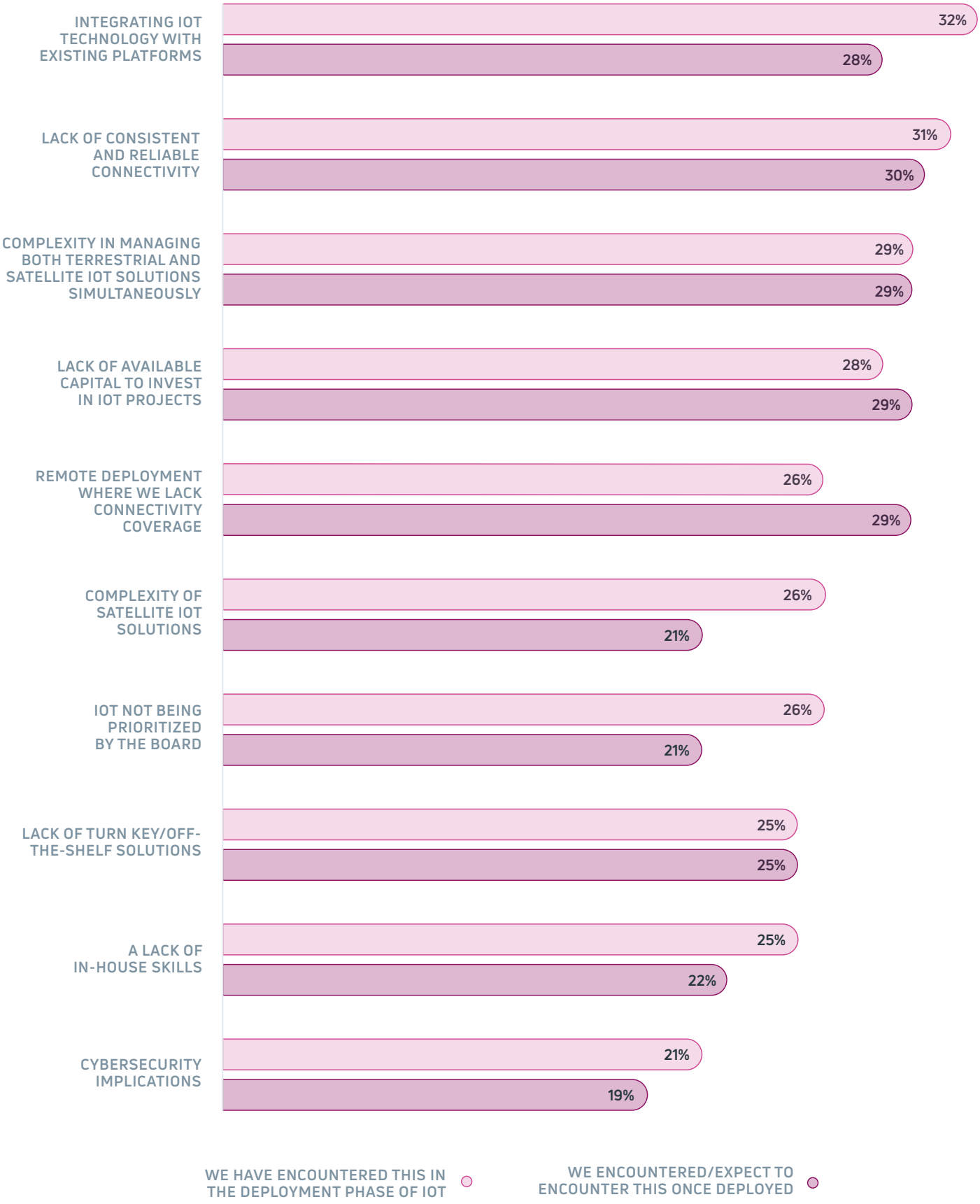
Connectivity issues cause concern

External forces are also at play with connectivity as the major issue. Many businesses (85% of those surveyed) have struggled to develop IoT because of connectivity issues in the areas they want to deploy. Indeed, 30% expect the lack of consistent and reliable connectivity to become the biggest barrier businesses will encounter when implementing IoT, and 43% of them had already experienced this issue during past deployments.

Also, 26% had problems with complex satellite IoT solutions during deployment, with 21% seeing it as a potential barrier to future deployment. The complexity of simultaneously managing terrestrial and satellite IoT solutions was the third biggest barrier and is expected to become the second biggest barrier to implementing IoT in the future.

> The greatest barrier today is the bureaucratic barrier.

What barriers, if any, does your organization face in the deployment of IoT projects?



Satellite and the IoT connectivity mix

When asked 'what connectivity type do you use in your IoT projects?' the response revealed greater variety in the way industry is getting connected. Wi-Fi just topped the rankings in 2021, with satellite coming a close second. In 2024, those positions have flipped and, although satellite is now top, other types are on the up, like NB-IoT, LTE (Private) and fibre.

There's also a clear gap between businesses who considered embracing satellite connectivity and the ones who went ahead with implementing it. Complexity in managing both terrestrial and satellite remains a key barrier to implementation, with emerging businesses more inclined to onboard connectivity than more established operations.

Analysts are predicting big things for satellite IoT. According to berginsight.com, the number of satellite IoT subscribers will increase at a compound annual growth rate (CAGR) of 39.6% to reach 23.9 million units in 2027. Our research found that satellite connectivity now ranks as the most prominently used source of connectivity when it comes to IoT projects (41%), but that none of our respondents are solely using satellite, instead combining it with terrestrial connectivity types across their IoT projects.

Indeed, narrowband IoT (NB-IoT) is now available on satellite as well as terrestrial, which explains why, with the overall adoption of satellite solutions rising, NB IoT jumped from eighth to fourth place between 2021 and 2024. NB-IoT networks require a limited spectrum to function and are particularly easy to scale. It's an increasingly used technology that enables more implementations, such as warning systems, which are particularly relevant in industrial IoT.

Interestingly, since our last survey in 2021, respondents' connectivity priorities have changed. They have shifted from 'reliability, security and network coverage' to 'scalability, costs and mobility' in 2024. It's a matter of nuance, but if you look again, you'll see that they are using overarching business benefits to describe what they aspire to most, not narrow IT benefits as in 2021. These changes are also a reflection of the increasing availability of reliable satellite and terrestrial connectivity technologies and suggest that the advent of D2D advances will be well received.

Satellite highs and lows

Agriculture, challenged by working in remote locations over vast areas requiring IoT coverage, is the biggest user of satellite connectivity, with 50% of their IoT using it to increase productivity and reduce outlay. Likely drivers for this are lower-cost entrants to the satellite solution provider market, as well as a growing understanding of the benefits of satellite IoT.

With that greater understanding also comes an awareness of their own organizational shortcomings. As we saw in the previous section detailing the perceived barriers to implementation, respondents clearly feel that they lack the necessary human resources. Indeed, 63% believe they have neither the right skills nor the right partners to capitalize on satellite IoT.

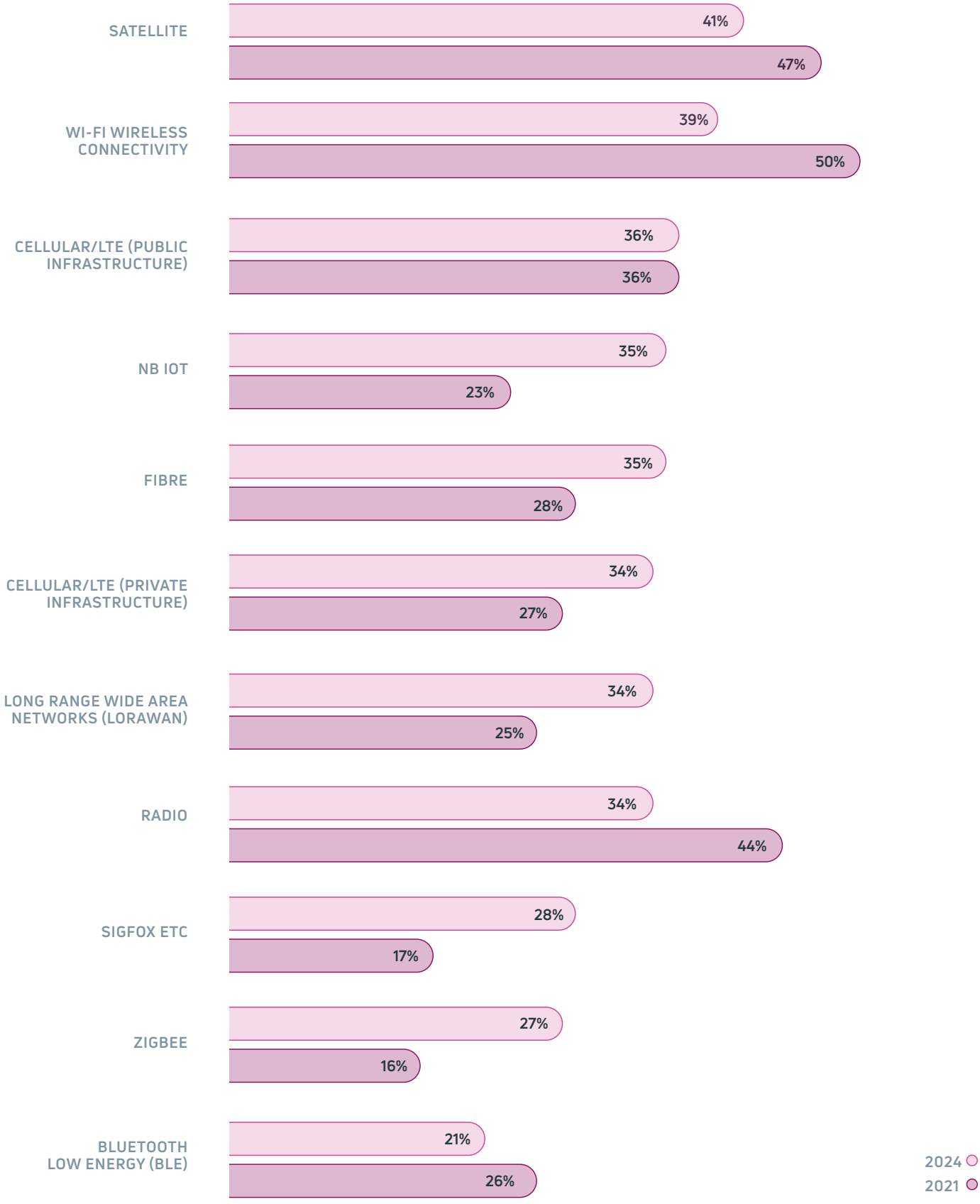
Emerging stars

62% of emerging businesses (as classified by our maturity index) have considered using satellite connectivity during their initial IoT development phases, versus 98% of advanced businesses. However, consideration doesn't always equate to action. Although there has been lots of interest from more advanced businesses to switch to a satellite solution, there's been stronger adoption by emerging businesses. These newcomers are more open to a satellite solution. In fact, 55% of emerging businesses use satellite connectivity, versus 43% of refining and 29% of advanced.

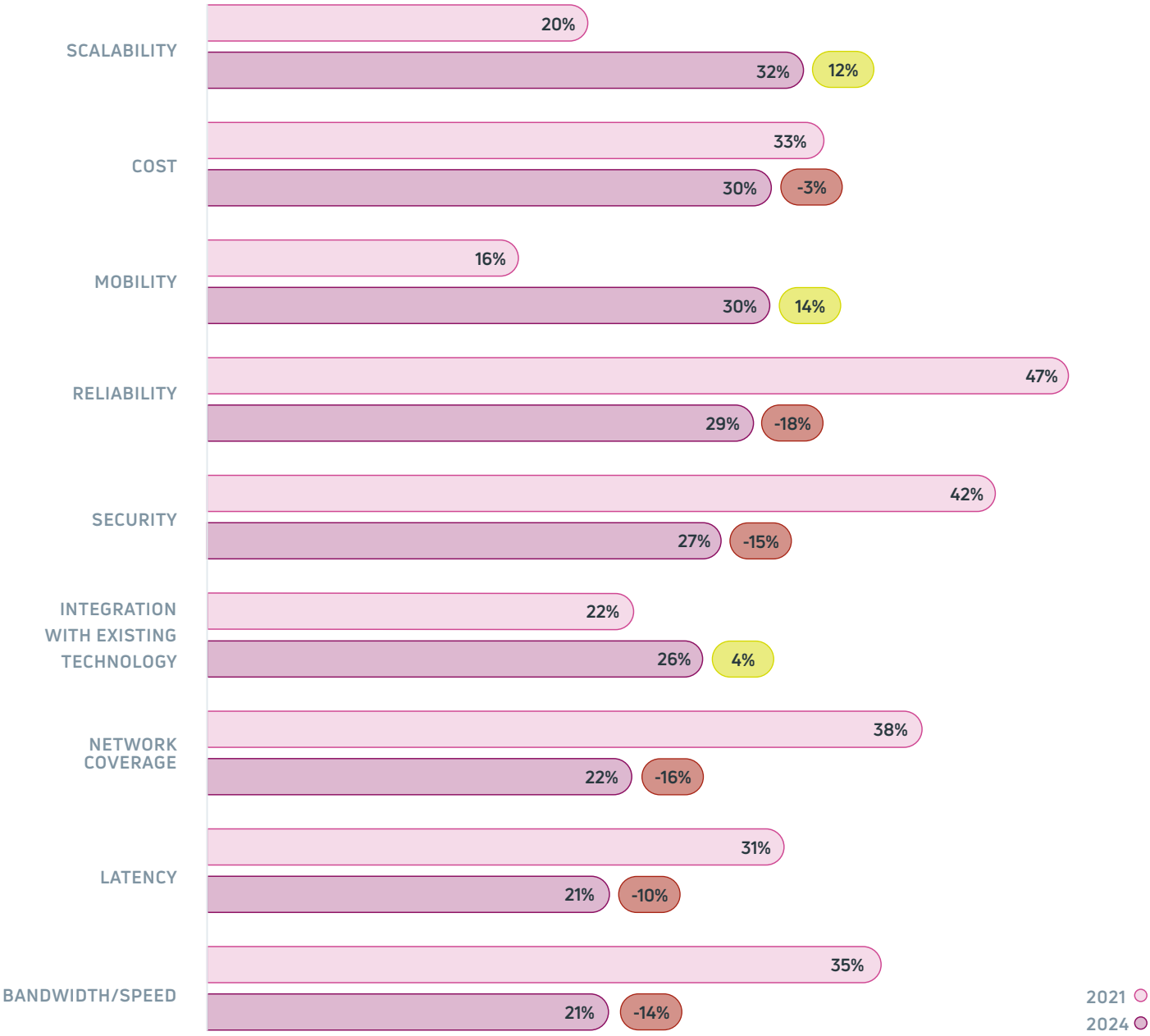
That final percentage is notably low. Is it that advanced businesses currently have fewer remote deployments, and therefore are in less need of satcoms? Or do they prefer not to expose themselves to challenges? The jury is still out on that one.


41%
of businesses use
satellite connectivity
for their IoT projects

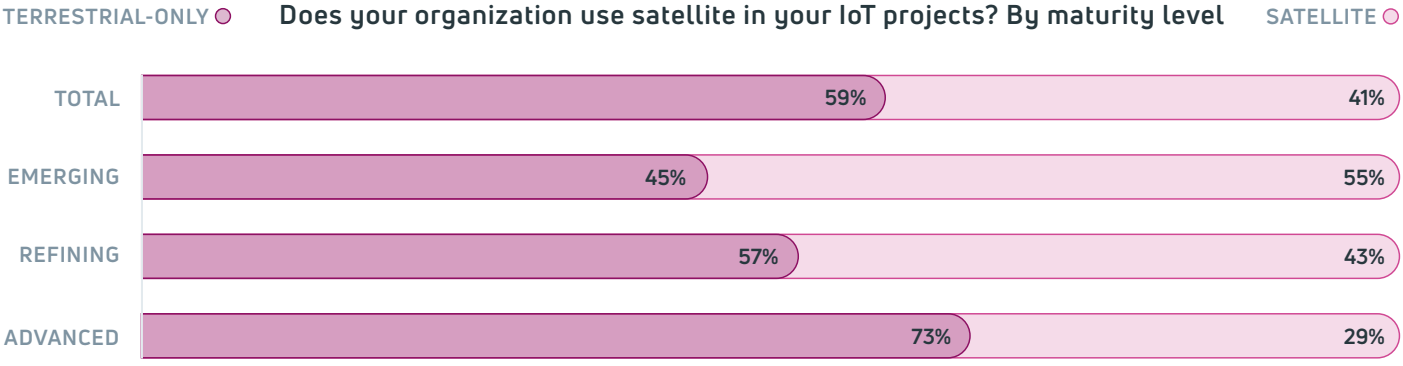
What connectivity types does your organization typically use in its IoT projects?



What do you look for in your IoT connectivity medium?



Does your organization use satellite in your IoT projects? By maturity level



What's the state of IoT in agriculture?

The research shows that agriculture is taking a more integrated approach to IoT and is now well up to speed with other verticals. In fact, agriculture is at the forefront of IoT implementation and leads on sustainability target achievements.

Greatest achievements:

- Improved supply chain (74%)
- Better decision-making (73%)
- Meeting sustainability targets (72%)
- Increased competitive advantage (72%)

Biggest barriers:

- Integrating IoT with existing platforms (33%)
- Lack of available capital to invest (31%)
- Remote deployment where connectivity coverage is lacking (31%)

Agriculture prioritizes IoT

After lagging behind in our 2021 survey, IoT is now taking a key role in agriculture's development. Adoption of IoT amongst respondents working in agriculture is 94%, compared to an average of 88% across all sectors.

Driven to some extent by environmental, geopolitical and economic uncertainty worldwide, respondents in the agriculture sector have been keen to leverage IoT to help manage these pressures, increasing their budgets by 16% since 2021 to fund that ambition That growth seems set to continue. However, other agricultural businesses still flag a lack of capital to invest as a key barrier.

A vast area to cover

Agriculture encompasses a wide range of activities, resulting in equally diverse use cases. Some deployments have been easier than others. Crop storage (42%) and remote water reservoir monitoring and control (43%) are the most deployed projects for agriculture respondents surveyed. These are fundamental to agriculture as they cover essential elements of arable and livestock operations and, being static and centralized, are the easiest to deploy.

Weather and soil monitoring has yet to prove itself. The remote deployment and coverage of sensors over vast, sparsely inhabited areas has proved particularly challenging, but given the urgency that climate change demands, this is a problem that will have to be resolved — hopefully by D2D.

Cold chain monitoring (48%) is currently the most trialed IoT deployment for respondents in the agriculture sector, showing that the sector recognizes its necessity across the whole supply chain. This is driven by increasing pressure for temperature-controlled storage (again in part due to climate change) and stringent quality/safety standards expected by customers and demanded by regulators, especially for meat and seafood.

Under pressure

With the undeniable impact of climate change and market volatility, agriculture is under pressure. The sector should be applauded for the way it has embraced IoT since 2021 and made the most out of technology at the broadest level – from boosting operational efficiency across the supply chain and improving decision-making, to deploying the latest technology to tackle demanding sustainability targets. But as agriculture does its best to keep up with that demand, the lack of connectivity coverage for remote deployment has become one of its biggest problems. One that the latest D2D technology can undoubtedly help to overcome.

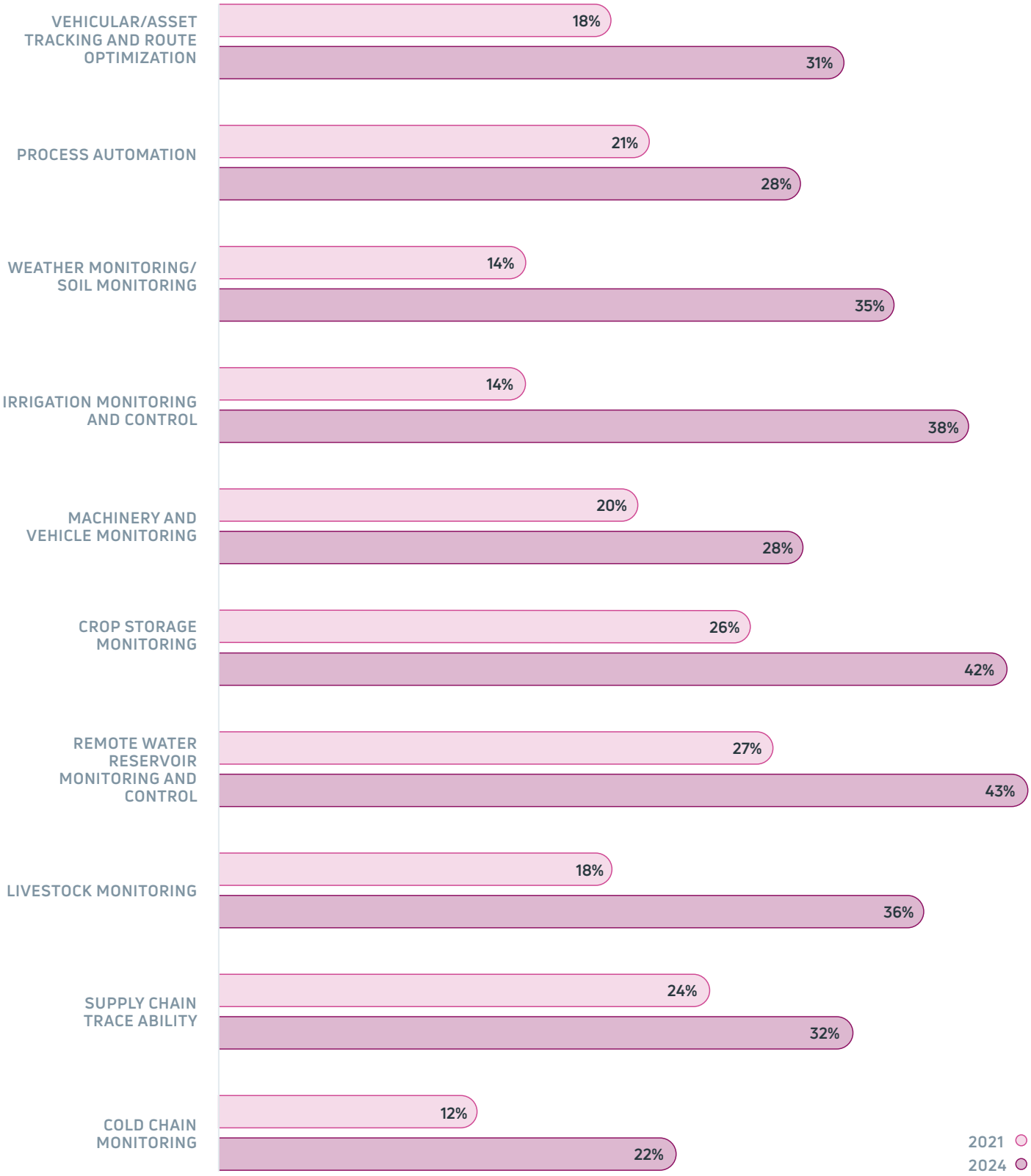
"

They developed a technology that reads cows' facial biometrics, so now I can see if my cows feel well treated.

49%

have a formal IoT strategy

What IoT projects has your organization already deployed and what will your organization deploy in the future?



What's the state of IoT in energy?

In this diverse sector — spanning oil & gas and renewables — the focus of IoT deployments is on business outcomes. Which is why words like 'optimizing' and 'performance monitoring' are common in respondents' answers and clearly core to their IoT strategies. Renewables are even more focused on business benefits than oil & gas. Being a younger industry, renewables seem more capable of embracing IoT as part of a business enhancement strategy.

Greatest achievements:

- Better decision-making (73%)
- Improved health & safety (73%)
- Reduced downtime (71%)

Biggest barriers:

- Integrating IoT with existing platforms (36%)
- Complexity of simultaneous terrestrial and satellite IoT management (33%)
- Lack of consistent and reliable connectivity (31%)

A strong investment performance

Energy is leading investments across all sectors, with both oil & gas and renewables deploying IoT at a similar pace. While oil & gas investment amongst respondents ($3.2m) has remained constant since 2021, renewables is booming. It's a much-in-demand younger industry that's quickly catching up on integration, which explains the larger investment figures ($3.5m).

89% of our energy respondents have developed or are developing a formal IoT strategy. Overall, we're seeing steady progress in the last few years. 49% of oil & gas businesses had a formal IoT strategy in 2021, compared to 54% in 2024, just 1% behind electrical utilities. (Renewables didn't feature in the 2021 report, hence direct comparisons cannot be drawn).

48% of renewables organizations surveyed now use IoT for energy generation performance monitoring, and 45% for climate and/or weather monitoring. Energy generation performance is key at an operational and business level, while climate monitoring is important for renewables located in regions where the weather can be difficult, such as seashore wind farms.

In the sector as a whole, 39% of respondents use IoT for vehicular and asset tracking as well as route optimization. Vehicular asset tracking and route optimization is one of the key elements of downstream operations, which are common to both sub-sectors.

Safer and more efficient

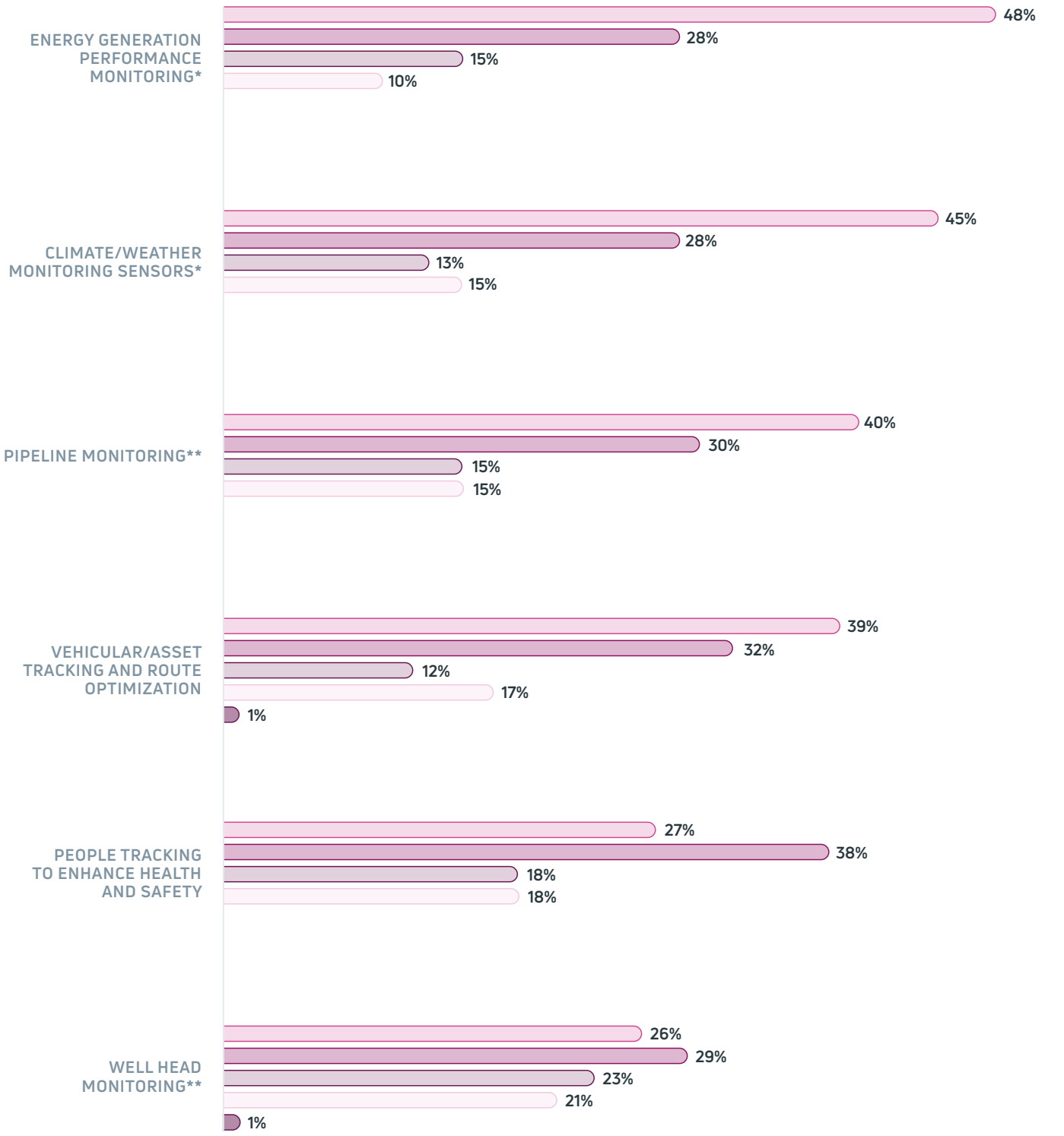
Of all the sectors, energy reports the most reduced downtime as a result of its IoT deployments. Another positive is that health & safety is also scoring well — especially as the sector has a reputation for being one of the most dangerous to work in.

Integrating with existing platforms was particularly challenging for established oil & gas businesses, where infrastructure, both operational and IT-related (including legacy machine-to-machine technology) is often older and less interoperable. Organizations that concentrate on renewables are more likely to have already deployed IoT projects compared to those that focus on oil & gas. This could be due to the relative infancy of the renewables sub-sector, which isn't as encumbered by legacy infrastructure and systems, enabling a more agile approach.

Renewables also show the most confidence about their increased business/operational efficiencies and improved compliance. However, they report a greater degree of challenges, partially explained by their perceived inferiority with in-house skills.


$3.3m
average investment
over the next 3 years

What IoT projects has your organization already deployed and what will your organization deploy in the future?



* Only answered by those working in renewables
** Only answered by those working in oil & gas

WE HAVE NO PLANS FOR THIS
WE WILL DEPLOY THIS
WE ARE TRIALING THIS
WE HAVE ALREADY DEPLOYED THIS
WE TRIALED THIS BUT THE PROOF-OF-CONCEPT FAILED AND WE DID NOT DEPLOY IT FULLY

What IoT projects has your organization already deployed and whatwill your organization deploy in the future?

* Only answered by those working in renewables
** Only answered by those working in oil & gas

RENEWABLES ○ OIL & GAS ●

What's the state of IoT in mining?

Mining is not only at an IoT standstill, but also remains far behind other sectors. Compared to 2021, fewer mining respondents report having a formal IoT strategy. However, the hiatus might soon be over, due to ESG pressures. The sector is facing new regulations around tailings management and more sustainable mining practices. There's also a spotlight on critical minerals that will force a change of approach for the whole industry. And given that funds are available for further investment (our research shows that budgets aren't decreasing massively) IoT could become a key factor in response to this shift.

Greatest achievements:

- Better decision-making (73%)
- Improved customer experience (70%)
- Superior supply chain impact (70%)

Biggest barriers:

- Complexity of simultaneous management of terrestrial and satellite IoT (34%)
- Integrating IoT with existing platforms (33%)
- Lack of consistent and reliable connectivity (33%)

In 2024, 83% of respondents from the sector say that they have or are developing an IoT strategy. However, there's a slight decrease in investment levels with 2.4% less being spent in 2024 versus the last time we surveyed the sector.

In fact, mining has the lowest progress score of all the sectors surveyed. There seems to be a siloed approach to IoT with a stronger focus on equipment and machinery than on the workforce. IoT for equipment monitoring and control (pumps, lights, conveyor belts) stands at 36% deployed and 30% trialing. Meanwhile, IoT for people tracking that enhances health and safety (18%) lags behind other industries. Perhaps the mining industry is prioritizing those IoT implementations which will provide the most return on investment, as the cost of monitoring and controlling equipment is more likely to affect the bottom line.

Environmental pressures

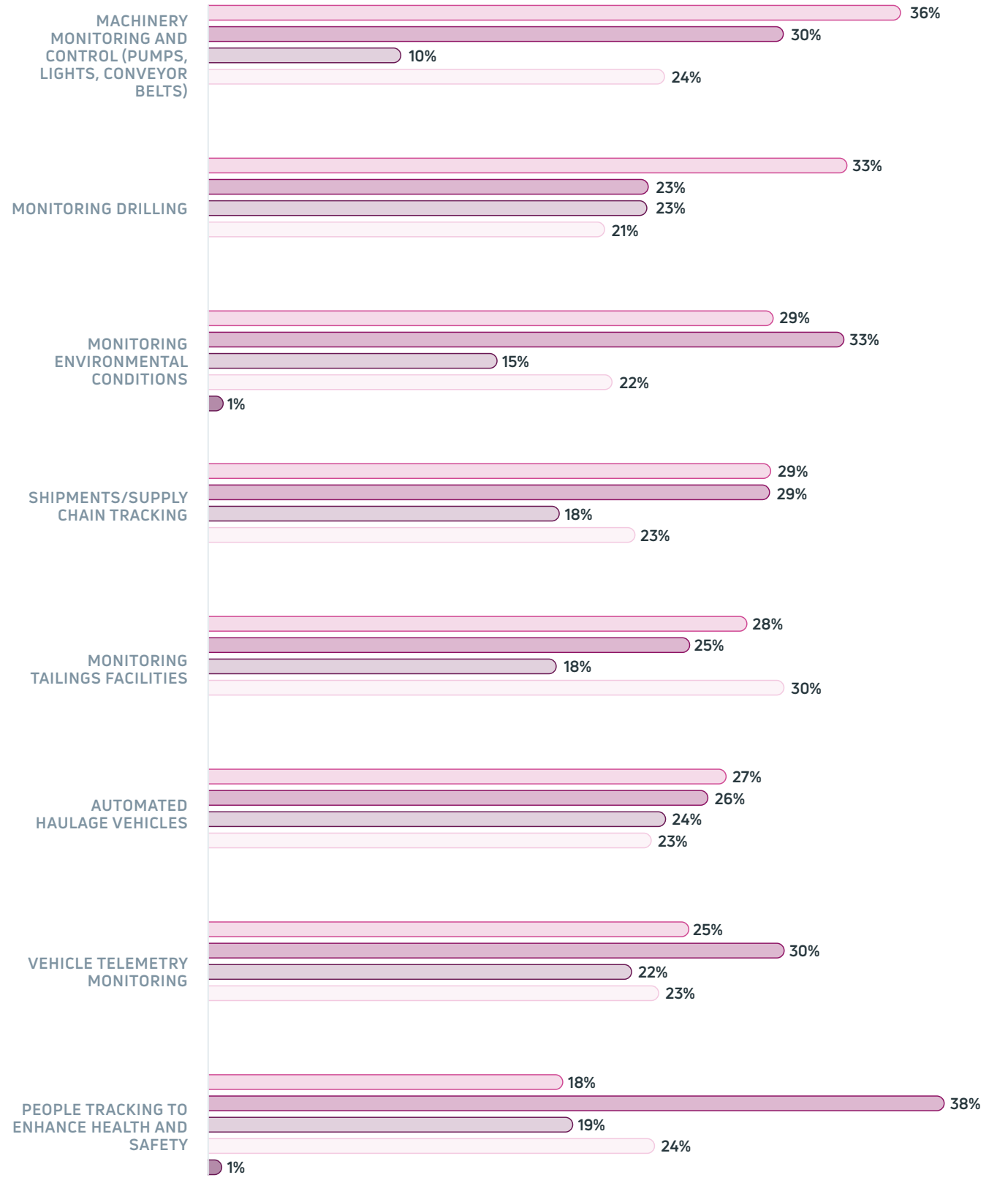
One area is getting more attention due to regulatory pressure. Mine waste (known as 'tailings' in the industry) is under considerable scrutiny due to environmental concerns and regulations are getting tighter. No surprise then that 53% of respondents say that they have deployed or are trialing IoT for the purposes of monitoring their tailings facilities.

Indeed, ESG is putting on the pressure. There's a growing demand for key materials and metals (also known as 'critical minerals') that are essential to the production of clean energy. At the same time, sustainability targets are adding pressure to improve the efficiency of mining's existing assets and operations, integrate net-zero at the core of operations and build social purpose in what the industry does. Understandably, this has shifted internal focus away from progressing IoT, which is ironic considering IoT should be a key part of the solution.

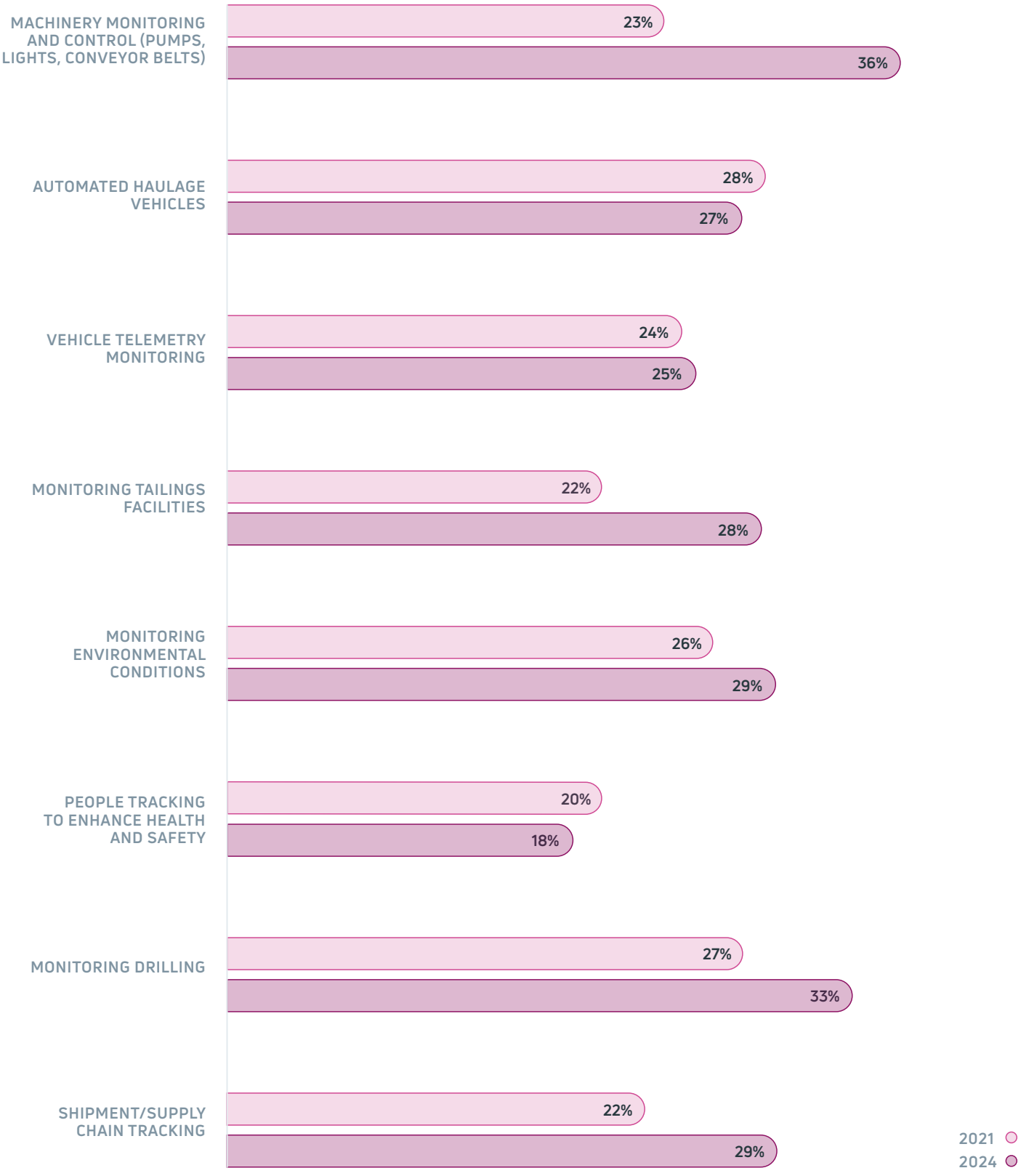
> Mining has the lowest progress score of all the sectors.


$2.7m
average investment
over the next 3 years

What IoT projects has your organization already deployed and what will your organization deploy in the future?



What IoT projects has your organization already deployed and what will your organization deploy in the future?



What's the state of IoT in transport?

IoT implementation in the sector is stabilizing with respondents claiming that IoT remains key to their operations. However, despite strong adoption of IoT and significant formalization of IoT strategies, planned investments in the technology are decreasing slightly and the whole supply chain – from manufacturer to distributor – still needs to be brought up to speed.

Greatest achievements:

- Increased business/operational efficiency (70%)
- Better decision-making (69%)
- Improved cyber and physical security (69%)

Biggest barriers:

- Lack of available capital to invest in IoT projects (34%)
- Inconsistent and unreliable connectivity (33%)
- Integrating IoT with existing platforms (30%)

Respondents admit to a reduction in investment (down 10.8% since 2021). They cite board-level reluctance as a major stumbling block. Like several other sectors, ESG is a major source of additional pressure. As one of the most significant contributors to greenhouse gas emissions, transport is under scrutiny and must comply with continuously evolving laws and regulations.

What's more, 2023 was challenging for the global transport market. Interest rates went sky-high to combat inflation, leaving many economies teetering on the brink of a recession and the sector desperate to protect its margins. It has also been under great pressure since the disruptions of the pandemic, and external factors continue to make a negative impact: geopolitical uncertainties; trade wars; climate change; supply chain disruption... any or all of those could explain the barriers we've seen in our research.

Positive moves

But the figures aren't all negative. 88% of those surveyed have developed or are developing their IoT strategy. 46% had a completed formal IoT strategy in 2021, versus 52% in 2024.

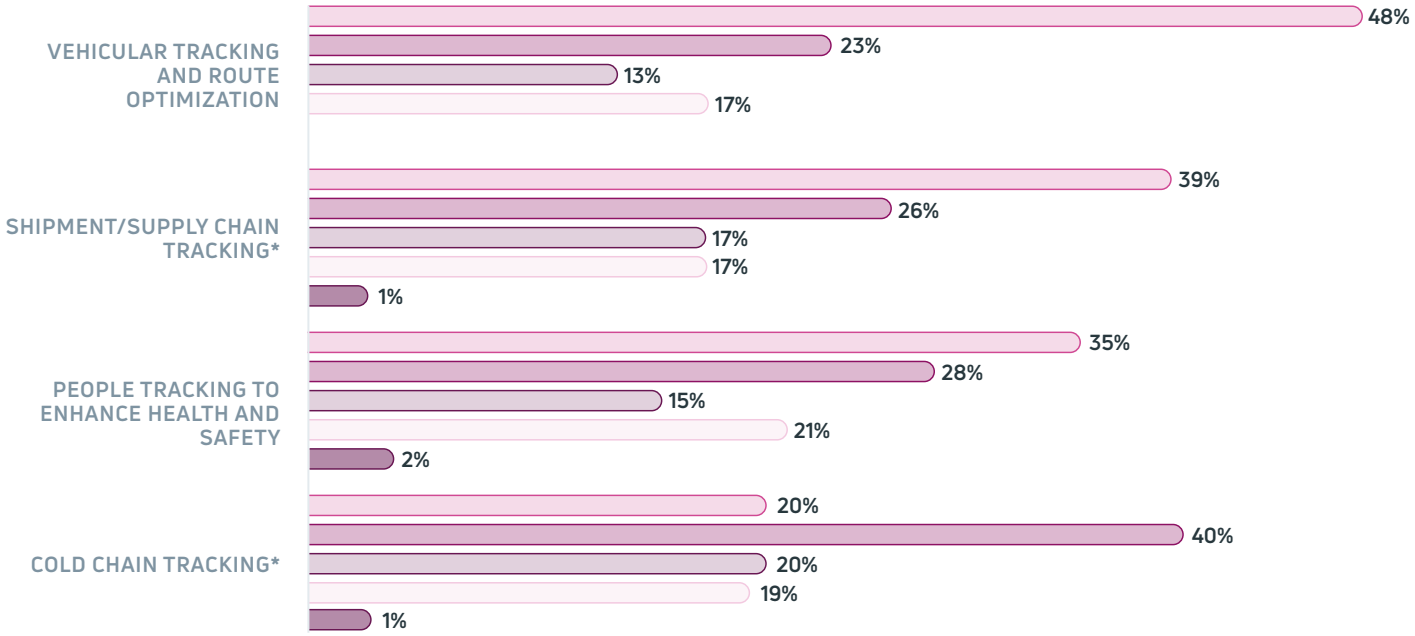
Unsurprisingly, there's a strong adoption of vehicular tracking and route optimization (48%) across the transport sector. Logistically, the focus is more on shipment/supply chain tracking. 39% of respondents have already deployed it, versus 20% who have deployed cold chain tracking. Compared to agriculture, transport's focus on cold chain tracking isn't as strong, which is understandable given that refrigerated goods are a minority of logistics' overall activities.


88%
have developed
or are developing
their IoT strategy

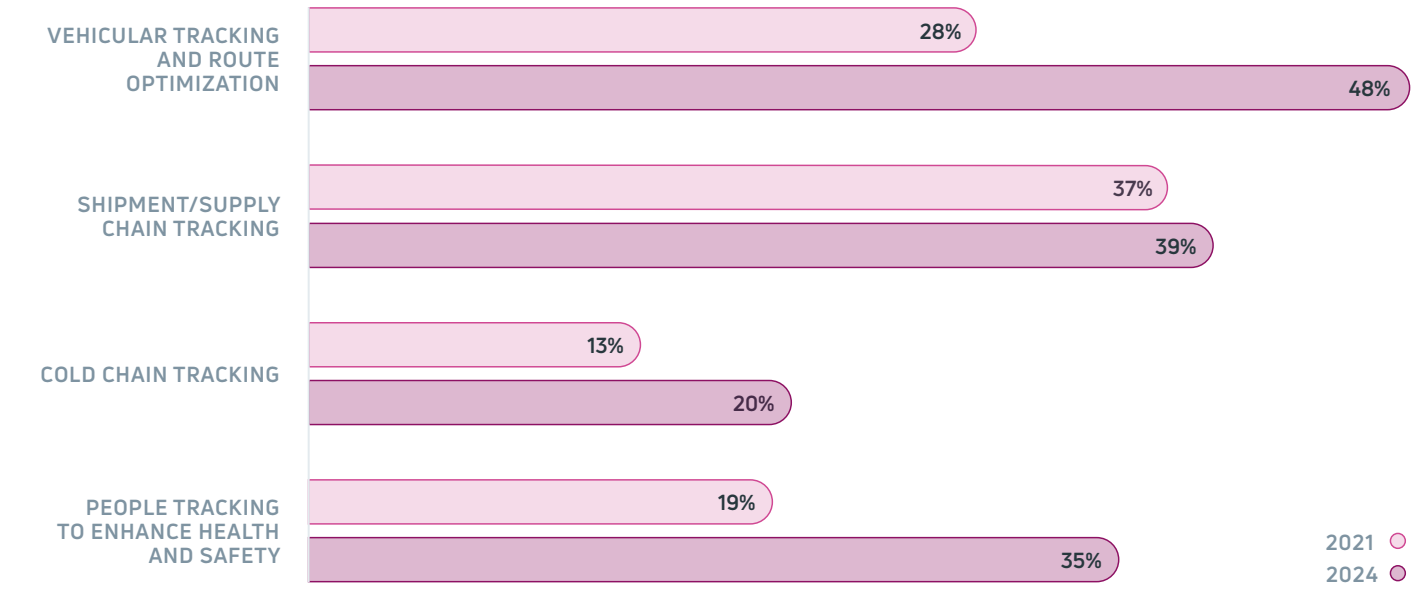
> We're seen as a tech-savvy operator now, whereas before we were thought of as middle of the road. Our IoT adoption has changed perceptions.

Transport decision-maker interviewed as part of the research.

What IoT projects has your organization deployed and what will your organization deploy in the future?



What IoT projects has your organization already deployed and what will your organization deploy in the future?



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WE TRIALED THIS BUT THE PROOF-OF-CONCEPT FAILED AND WE DID NOT DEPLOY IT FULLY ●

What's the state of IoT in utilities?

Utilities have taken an integrated and steady approach to IoT over the years, which is paying off. There has been significant progress in formalizing strategies between 2021 and 2024 but not all plans have solidified into actual implementation and investment.

Greatest achievements:

- Cost efficiencies (78%)
- Better decision-making (77%)
- Improved health and safety (77%)

Biggest barriers:

- Inconsistent and unreliable connectivity (33%)
- Integrating IoT with existing platforms (30%)
- Lack of available capital to invest (30%)

Across the sector, the projects the most deployed by respondents are energy generation (34%) and vehicle tracking (33%). Metering backhaul comes last, with only 21% deployment, which is surprising given the potential for IoT as a way of monitoring both consumer and business consumption. The even application of IoT across activities shows a coherence that is likely to be driven by ESG considerations, where new regulations are forcing the industry to rethink their operations across the whole supply chain. Our qualitative research backs that up, with respondents clearly associating IoT with sustainability.

Overall, 55% of utilities respondents said they had a formal IoT strategy in 2024 compared with 48% in 2021, making utilities the leading sector in this regard. It also has the highest achievement scores. It seems the sector has found a comfortable plateau, as evidenced by the smaller rise in IoT investment than other sectors, but there's a risk it might be resting on its laurels. We believe there's an opportunity to enhance IoT achievements.

An uncertain future

Utilities is at a turning point, showing great success to date but putting the brakes on further effort and investment. For example, electrical utilities respondents have seen the most drastic reduction in planned long-term investment compared to 2021 (-16.4%).

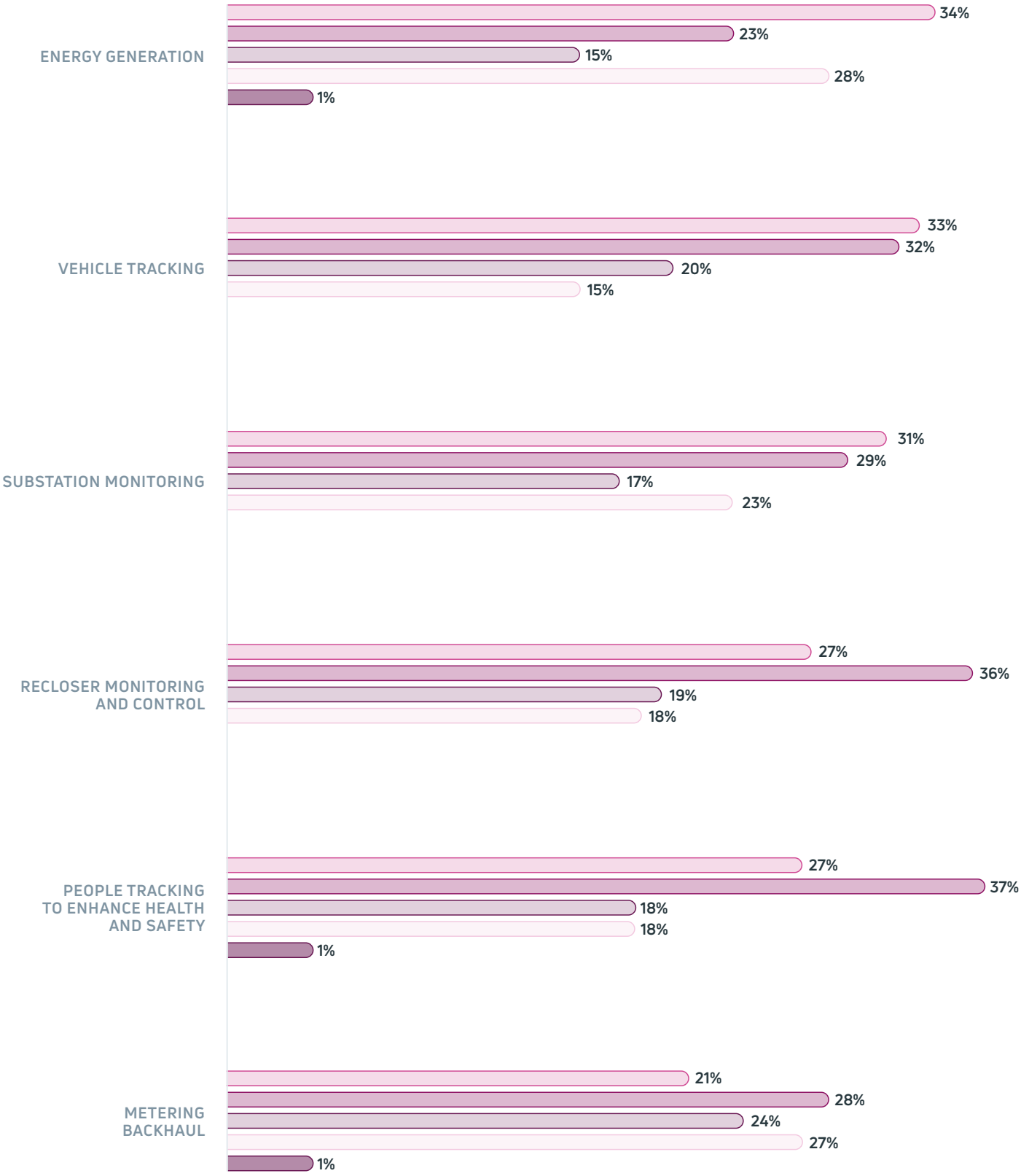
Although the sector has benefited from the rise of sustainability targets and geopolitical events which have been pushing the industry forward and driving demand up, there is less confidence than expected. Climate change is forcing the sector to rethink water management as extreme heat and droughts are becoming the norm. Also, the supply chain has been hit by the recession, while shortages of steel, aluminium, and other materials still disrupt operations.

We understand that geopolitical uncertainties and global recession might have caused a cautious attitude towards investment, but we know the funds for IoT are available, as the industry declared the highest year-on-year budget increase. The money is there, it's just not being spent.

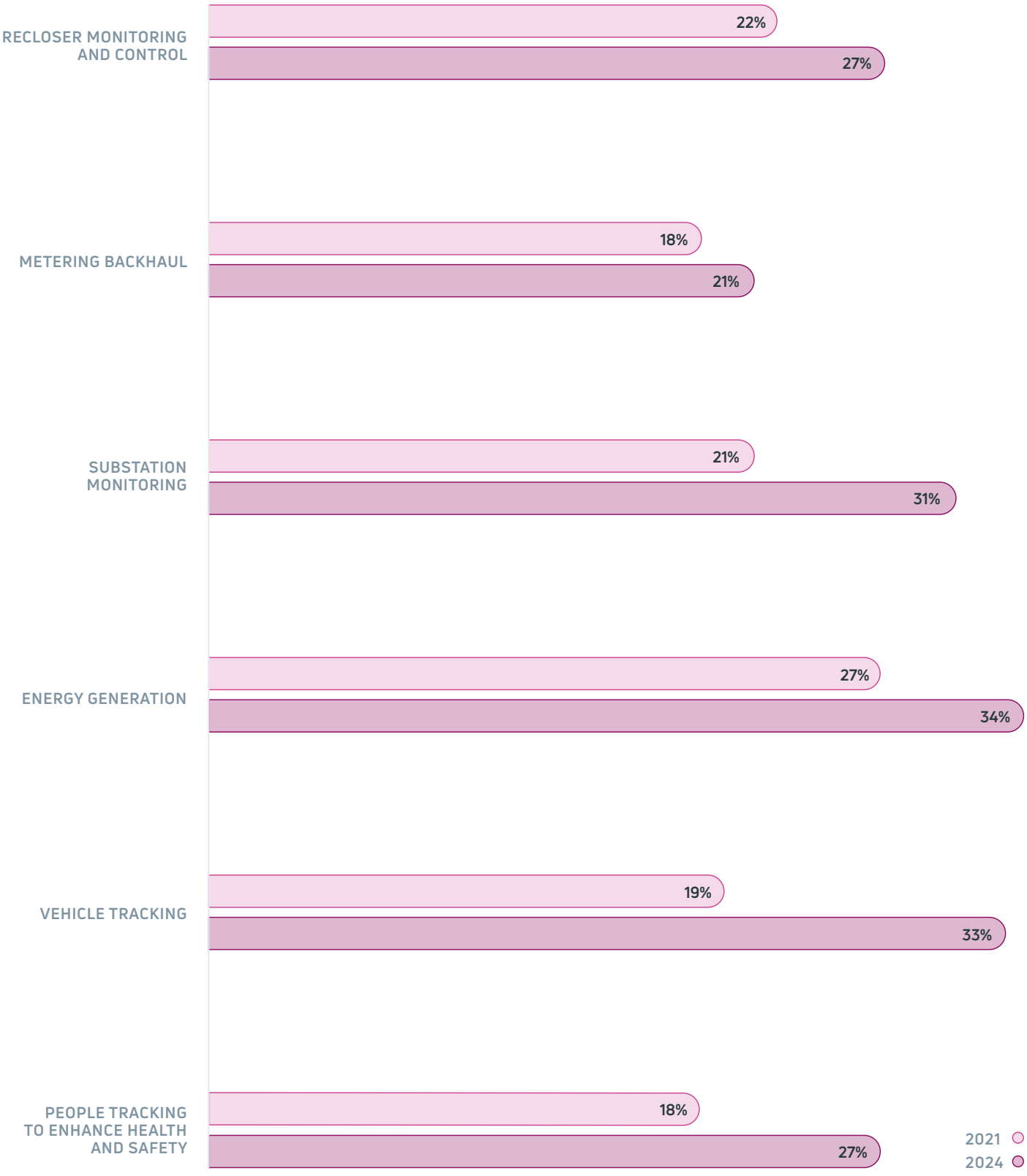
> "ESG has made it really important for us to be able to track fuel consumption and CO2 emissions of our trucks.
>
> Utilities decision-maker interviewed as part of the research.


53%
have a formal
strategy

What IoT projects has your organization already deployed and what will your organization deploy in the future?



What IoT projects has your organization already deployed and what will your organization deploy in the future? Not showing all answers.



An aerial view of IoT in 2024

Overall, the research shows strong adoption, with IoT investments largely being maintained and projects implemented industrywide.

In return, they are seeing positive payback. The more their approach to IoT is integrated across all operations, the greater the impact is on business.

Integration and connectivity have been the biggest barriers to success. But industry has learnt from the experience and foresees fewer problems in future implementations.

Organizations are steadily fulfilling the promise of industrial IoT. With a smart and strategic approach to the technology, they can take on these barriers and leverage the technology to transform how they operate. This will help them better navigate an unpredictable and dynamic macroeconomic environment.

A quick close up on verticals

- **Agriculture** has caught up with other verticals and is taking a much more integrated approach to IoT.
- **Energy** now regards the realization of business benefits as core to its IoT strategies.
- **Mining** might be at an IoT standstill, with a siloed focus on machinery rather than on the workforce, but new regulatory pressures could kickstart a change.
- **Transport's** IoT implementation is stabilizing but there are obstacles yet to overcome.
- **Utilities** has taken an integrated and steady approach to IoT, which has paid off. But is the sector resting on its laurels and in danger of losing momentum?

How Viasat Enterprise helps drive effective IoT deployments

The connectivity challenge

As highlighted throughout this report, organizations across industries are driving operational transformation with IoT. They are deploying the technology in a broad array of situations, from oil rigs to railways to fisheries, and are already reaping the rewards in the form of better decision-making and cost and time savings.

Yet many have encountered connectivity problem along the way - 85% of respondents said they struggled to develop IoT because of connectivity issues in the areas they want to deploy.

Operating in remote, hostile and challenging locations, agriculture, energy, mining, transport and utilities organizations don't always have access to robust and reliable cellular connectivity. That often hampers their capacity to collect, transmit and receive data across devices, and undermines the effectiveness of deployments.

Meeting a variety of IoT connectivity needs

With Viasat's highly reliable L-band network — providing near global coverage and up to 99.9% network availability — organizations can drive connectivity and communications across global operations, whether in urban areas or in far-flung remote locations. And with Viasat Enterprise's broad portfolio of IoT connectivity services, they can help ensure that this connectivity delivers the right business outcomes, at the right cost. IoT deployments can vary dramatically.

Some deployments need just a couple of devices to provide a ping on a monthly basis, in a predictable fashion. Others require always-on data transfer, so that they can continuously monitor and control operations. And many deployments are event-based, with an unpredictable external occurrence — such as equipment breakdown or a flash flood — triggering an instantaneous, high-priority message.

And it is not just data requirements that can vary — hardware is also a key variable. In some locations, it is vital that hardware can withstand bad weather and extreme temperatures. In others, there might be no access to power sources, so low-power consumption is vital to ensure everything keeps functioning correctly.

Viasat's broad portfolio of IoT connectivity services has been designed to meet these diverse needs, with a range of data and hardware plans. Please visit our website to find out more, and email enterprisemarketing@inmarsat.com with any queries.