

# Artificial Intelligence and Broadband Divide

A stylized globe with colorful lines representing data connections and wireless signals. The lines are in shades of red, orange, yellow, and green, with arrows pointing upwards. There are four wireless signal icons: one red at the top left, one green at the top right, one blue at the bottom left, and one orange at the bottom right. A blue horizontal band is overlaid on the globe.

## STATE OF ICT CONNECTIVITY IN ASIA AND THE PACIFIC

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The Economic and Social Commission for Asia and the Pacific (ESCAP) serves as the United Nations' regional hub promoting cooperation among countries to achieve inclusive and sustainable development. The largest regional intergovernmental platform with 53 Member States and 9 associate members, ESCAP has emerged as a strong regional think-tank offering countries sound analytical products that shed insight into the evolving economic, social and environmental dynamics of the region. The Commission's strategic focus is to deliver on the 2030 Agenda for Sustainable Development, which it does by reinforcing and deepening regional cooperation and integration to advance connectivity, financial cooperation and market integration. ESCAP's research and analysis coupled with its policy advisory services, capacity building and technical assistance to governments aims to support countries' sustainable and inclusive development ambitions.



The shaded areas of the map indicate ESCAP members and associate members. Information and statistics presented in this publication include only those member and associate member States located in the Asia-Pacific region.

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## Foreword



Our region has moved stridently into, and is a key part of a technological revolution that will profoundly transform the way we live, work, and relate to one another. The Asia-Pacific region has become a source of the innovation behind the Internet of Things, artificial intelligence (AI), robotics and automation, also known as the “fourth industrial revolution” or “industry 4.0”. As traditional infrastructures, the manufacturing and services sectors reconfigure, new whole-of-economy efficiencies and value-added are emerging, that can be harnessed to address long intractable problems such as our altered climate and degraded environment.

There are now 5 leading research institutions on AI and robotics in Asia-Pacific with numerous private sector companies, many in global joint venture or public-private-partnership setups, that are advancing machine learning, taking advantage of the Internet of Things and embracing cloud and cognitive computing. In its scale, scope, and complexity, this technological transformation will be unlike anything our vast and diverse region has experienced before. If the technological race in the 1960s was about space exploration, today it would appear to be all about AI.

Key sources of concern also emerge. One is that it is a revolution that could widen inequalities. While the advanced countries use their scale and network effects to reinvent technology and ensure continued expansion of their mature markets, that otherwise would be prone to stagnation, some developing countries risk continued stagnation with ever widening lag gaps, as the advanced economies in the region pull away. The report underlines that AI seems to grow rapidly once all the key technology pieces are put in place. This means that without robust broadband connectivity, leveraging on the AI dividend will be much more difficult. Only half of the region’s 4.4 billion people have access to mobile broadband services, while access to fixed-broadband service is only 0.5 billion. Eighteen countries have fixed-broadband penetration of less than 2 per cent at prices that are unaffordable. Investing in supply-side infrastructure is thus the critical, albeit insufficient condition, for the uptake of AI in lagging countries. ESCAP has thus prioritized implementation of its Asia-Pacific Information Superhighway Initiative which seeks to augment broadband infrastructure connectivity seamlessly across Asia-Pacific.

A second prominent source of concern is cybersecurity. AI can identify security threats and risks, and provide solutions, but the introduction of various digital components of AI without security measures also increases exposure. As society becomes more dependent on AI, digital frictions, mistrust and vulnerabilities are on the rise.

A third top concern especially for lower-income countries with large populations is the potential displacement of labor which without a corresponding increase in total factor productivity can ignite “new poverty” and marginalization, creating fertile ground for conflict. This needs to be addressed through a prevention agenda that anticipates the most vulnerable sectors and job categories and finds ways to mitigate the impacts in a holistic way, by interalia, retooling education systems, promoting existing talent and nurturing latent talent which is in abundance in these countries, especially among the youth.

The emergence of AI and its double-edged impacts underlines the centrality of public policy and the need to shape priorities in more specific and strategically deliberate ways. This is certainly the pattern that is emerging in those countries in the region that are experiencing high digital and AI dividends. At the same time, for inclusiveness and sustainable development, governments need to work in partnership with the people, putting in place strong mechanisms for multi-stakeholder cooperation and improved transparency and accountability. In this context, regional platforms could be a particularly important mechanism to address common policy challenges, share experience, promote knowledge and technology exchanges, and come up with common solutions and approaches.

Against this dynamic and game-changing trajectory, it is our hope that the findings in this report will help policy makers anticipate where the region is going and that through the baseline set out, it will facilitate a continuous assessment of regional innovation capacities and their sustainable development impacts, over the SDG implementation period for shared prosperity and human solidarity.



Shamshad Akhtar  
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## Executive Summary

**A**rtificial Intelligence (AI), consisting of digital technologies and machine intelligence, is increasingly transforming the way we live and work in the region and beyond. Faster and more versatile connectivity, together with exponential increases in the availability and type of data collected and analysed in real time, provide us with unprecedented opportunities—but also new challenges—as we strive to achieve the Sustainable Development Goals by 2030.

AI is expected to create an increasing range of new services, products and value-added in various socioeconomic sectors. However, the changes induced by AI are still ongoing, and new AI technologies and solutions are being brought to the market on a weekly, if not daily, basis. With this dynamic and game-changing trajectory, assessing the nature and magnitude of AI's impact on the economy and society at this early stage is tentative, but nevertheless vital. It is more important to understand where the region is going than where it stands today and as such, analysis can help establish a baseline against which regional developments in the future will be assessed.

Given this background, the report aims first to deepen our understanding of the digital components of AI and how they relate to AI. The main digital components supporting AI include: (1) the Internet of Things; (2) cloud computing; (3) broadband connectivity; and (4) big data. This report gives a summary of their characteristics, applications and benefits to various socioeconomic sectors of the region. An important observation is that AI expands rapidly and brings about transformative impacts, once all the components are put in place.<sup>1</sup>

Second, the report provides selected examples of AI-induced transformations that have contributed to accelerating implementation of Sustainable Development Goals (SDGs). It looks at how AI is contributing to increased agricultural productivity, improved health and well-being, better water quality and sanitation, and enhanced energy efficiency, through inter alia, driverless transport systems and smart logistics. In fact, AI-related technologies have already proven to be instrumental in optimizing supply chain performance and in automating some manufacturing process resulting in resource use efficiencies and increases in total factor productivity. This technological approach helps identify gaps and shape public policy priorities in more specific and strategically deliberate ways.

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<sup>1</sup> MIT Technology Review, "Asia's AI agenda. How Asia is speeding up global artificial intelligence adoption", November 2016. Available from <https://.amazonaws.com/trasia/AsiaAI.pdf>.



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## Conditions, prerequisites and drivers of AI development and growth

The report goes on to analyse some of the conditions, prerequisites and drivers of AI development and uptake. First, the findings show that the quantity of AI research, is positively related to market size. Second, countries that produce a large amount of AI research are also those that have better technology absorption capacity. Third, there is a positive correlation between the quantity of AI research and investment in ICT services. Thus, the returns on investment in AI among those countries with high technology absorption capacity and investment in ICT services are likely to be significantly higher than in other countries without them. Fourth, the telecommunication sector appears to be one of the key drivers of AI research, compared with other sectors. The telecommunication industry remains the most strongly correlated to productivity in AI research when the share of sectors/subsectors in GDP is examined. Fifth, with the exceptions of US island territories, the most economically-advanced economies of the region such as Australia, Japan and the Republic of Korea unsurprisingly exhibit large numbers of patents, as well as a high number of patents relative to their population size. Finally, broadband connectivity is one of the foundations and essential requirements for AI development and uptake. In this context, it is not surprising to find that broadband connectivity has a positive linear correlation with the quality of AI research, which demonstrates the importance of the underlying ICT infrastructure for the development and uptake of AI.

### Broadband divide as a critical constraint

At the heart of this emerging ICT landscape is the expectation that affordable and resilient broadband connectivity would provide ubiquitous access to connect people and devices. While least developed countries, landlocked developing countries and small island developing states in Asia and the Pacific stand to benefit from these emerging technologies, the digital divide among countries continues to widen. The fixed-broadband subscriptions per 100 inhabitants in the Asia-Pacific region is still far lower than Europe and North America, and remains below the world's average of 12.4 in 2016. Advanced economies in the region have increased their subscriptions and the quality of their broadband networks, with the Republic of Korea having more than 40 fixed-broadband subscriptions per 100 inhabitants. However, 18 ESCAP member countries still have less than 2 fixed-broadband subscriptions per 100 inhabitants, and this situation has not changed much over the past decade.

Furthermore, notwithstanding the dynamic development and rapid uptake in mobile broadband, the Asia-Pacific region as a whole still remains behind Latin America, Europe and North America, based on subscriptions per 100 inhabitants. While some of the low-income countries are quickly catching up and surpassing other higher income group countries, overall rates remain relatively low, and the high-income countries are showing slower growth due to market saturation. When progress is assessed by subregion, it is clear that a number of subregions continue to grow at slower rates than others.

In terms of empirical evidence for the widening divide in broadband subscriptions both the standard deviation and the interquartile range have increased considerably since 2010, even as the regional mean rose significantly during the same period. While East and North-East Asia is leading the Asia-Pacific region as a whole in broadband growth (largely driven by the Republic of Korea, Japan and China), South and South-West Asia and the Pacific need to catch up on both fixed- and mobile-broadband connectivity. This widening gap among subregions in Asia and the Pacific is an alarming trend, considering that the widespread introduction of AI and related digital technologies can only happen when prerequisite broadband infrastructure is in place. In sum, the advanced countries in the region, and across the globe are using their scale and network effects as a means of reinventing themselves and ensuring continued expansion of their mature markets, while some developing countries risk continued stagnation with widening lag gaps as the advanced countries pull away..

## Challenges and way forward

Despite the benefits that AI can bring to the region, there are formidable challenges ahead for the majority of ESCAP member countries. While some of the challenges identified in this report are not entirely new, the context has changed with the emergence of AI, and it has become more urgent to take actions before opportunities for developing countries to catch up dissipate.

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