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85

ASEAN 5G Technology toward European Union Legal Aspect: The State's Practice on Multi-Band Spectrum

เทคโนโลยี 5G ของอาเซียนต่อมุมมองทางกฎหมายของสหภาพยุโรป: ข้อปฏิบัติของรัฐต่อการจัดการคลื่นความถี่แบบ Multi-Band

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Abstract

5th Generation Wireless networks (5G) are the next generation of mobile internet connectivity, offering faster speeds and more reliable connections on smartphones and other devices than ever before. The networks will help power a huge rise in Internet of Things technology, providing the infrastructure needed to carry huge amounts of data, allowing for a smarter and more connected world. With development well underway, 5G networks are expected to launch across the world by 2020.

The European Union for instance in France has earnestly supported the deployment and took up of 5G networks, notably as regards assignment of radio spectrum, investment incentives and favorable framework conditions. In

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comparison to European Union, Southeast Asia is becoming one of the hubs of the Fourth Industrial Revolution. Thus, Southeast Asian nations apparently have varieties of tradition, customary and law which bare the obstacle to completely harmonize regional legal regulations to serve this technology in the midst of this plurality.

The writers intend to submit this work under Technology and Digitalization track. The comparative research method applied aims to analyze the EU regulations toward this technology as legal role model to the Global South Nations wishing to improve their readiness on the legal revolution. We strongly believe on compromising law especially in the region where there existed the regional regulations onto the fair benefit of each state.By the accomplishment of this paper, writers expect to acknowledge the legal development on ASEAN 5G technology as whom the community of nations with powerful legal instrument among this alternately social function.

Keywords: 5G, Internet of Things (IoT), European Union Regulation, Multi-band spectrum auctions, Legal Pluralism

The Journal of Law, Public Administration and Social Secience.
School of Law Chiang Rai Rajabhat University Vol.5 No.1 (January – June 2021)

87

บทคัดย่อ

ในยุคเทคโนโลยีไร้สายเจนเนอร์เรชั่นที่ 5 หรือ 5G เป็นยุคใหม่ของระบบการ เชื่อมต่ออินเตอร์เน็ตที่ให้ความเร็วสูงขึ้นกว่าเดิมและเสถียรกว่าเดิมบนสมาทโฟนและ เครื่องใช้อื่น ๆ อย่างที่ไม่เคยเป็นมาก่อน ด้วยระบบใหม่นี้จะช่วยสร้างโครงสร้างพื้นฐาน ให้แก่เทคโนโลยี Internet of Things ที่จะทำให้สามารถส่งข้อมูลได้ในจำนวนที่มากขึ้น ซึ่ง ทำให้เชื่อมต่อส่วนต่าง ๆ ของโลกได้อย่างดีขึ้นและมีประสิทธิภาพมากขึ้น โดยการพัฒนา ของระบบ 5G ที่ใกล้จะเสร็จ ระบบนี้มีกำหนดจะถูกปล่อยให้คนทั้งโลกใช้ภายในปี 2020

สมาชิกในสหภาพยุโรป เช่น ฝรั่งเศสได้สนับสนุนการพัฒนาระบบ 5G อย่างเอาจริงเอาจัง และใช้ระบบ 5G โดยตัวอย่างที่เห็นได้ชัดคือการจัดการคลื่นความถี่, สร้างแรงจูงใจในการ ลงทุนในระบบ 5G และกำหนดสภาพโครงสร้างระบบ เมื่อเปรียบเทียบกับสหภาพยุโรปแล้ว เอเชียตะวันออกเฉียงใต้กำลังเป็นหนึ่งในจุดศูนย์กลางในการปฏิวัติอุตสาหกรรมครั้งที่สี่ อย่างไรก็ตาม ในภูมิภาคเอเชียตะวันออกเฉียงใต้ยังมีความหลากหลายในเรื่องประเพณี, วัฒนธรรมและกฎหมายที่เป็นอุปสรรคในการพัฒนาให้เข้ากันระหว่างกฎเกณฑ์ในระดับภูมิภาค เพื่อปรับใช้คู่กับเทคโนโลยีในยุคที่มีความหลากหลายนี้

ผู้เขียนมีเจตนาที่จะส่งบทความอยู่ในหมวดเทคโนโลยีและระบบดิจิทัล โดย การศึกษาเปรียบเทียบกระบวนการและวิเคราะห์กฎเกณฑ์ของสหภาพยุโรปที่มีต่อ เทคโนโลยีนี้ รวมทั้งกระบวนการทางกฎหมายต่อประเทศทางใต้ของโลก (The Global South Nations) โดยหวังว่าบทความนี้จะเป็นตัวช่วยในการเตรียมความพร้อมของการ ปฏิรูปกฎหมายของหลายฝ่าย โดยผู้เขียนเชื่อว่าการใช้หลักการทางกฎหมายโดยเฉพาะใน ภูมิภาคที่มีกฎเกณฑ์ของภูมิภาคตนเองให้ยุติธรรมต่อรัฐอื่น ๆ และอยู่บนผลประโยชน์ที่เป็น ธรรมของแต่ละรัฐนั้นสามารถเกิดขึ้นได้ โดยบทความฉบับนี้ ผู้เขียนหวังว่าจะมีการจัดการ พัฒนาทางด้านกฎหมายใน ASEAN ว่าด้วยเรื่อง เทคโนโลยี 5G ในฐานะบุคคลในชาติโดย ใช้กฎหมายซึ่งเป็นหนึ่งในเครื่องมือที่ทรงพลังทางสังคมให้เกิดประโยชน์

คำสำคัญ 5G, Internet of Things (IoT), ระเบียบของสหภาพยุโรป, การประมูลคลื่น ความถี่, พหุนิยมทางกฎหมาย

1. Introduction

5G network opens up new prospects and enables an extremely wide diversity of applications and use, unified within a single technology. It will enable efficiency across a variety of industries, for example, better management of agriculture, electricity grids, and supply chains. 5G is not meant to replace existing 4G networks overnight. While 4G and 5G frequencies will probably be initially segregated, future devices will be capable of aggregating 4G and 5G carriers. 4G is still being deployed, and its technological evolution and building blocks will be used by 5G networks as well.

For the IoT industry, a key part of the business strategy for a digital single market in Europe is the telecom laws. The IoT industry relies on establishing a standard for machine-to-machine (M2M) communications over mobile cellular-based networks under the European Telecommunications Standards Institute (ETSI)[1]. 5G technology supports the growth in new types of applications that connect devices and objects. The European Union will support the deployment and take-up of 5G networks through the assignment of radio spectrum, investment incentives and favorable framework conditions. These procedures draw on multiple consultations with stakeholders, targeted surveys, and several research studies. The designation of new frequency bands above 6 GHz is on the agenda of the World Radio Conference 2019 (WRC-19), based on a list of candidate bands identified at WRC-15 with the aim of targeting the widest possible global harmonization.[2]

As technology improves and 5G connectivity becomes widespread, there will be major changes in business processes. The manufacturing industry will evolve towards a distributed organization of production, with connected goods, low energy processes, collaborative robots, working across integrated manufacturing and logistics systems.[3] The automotive and transportation sector

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[1] Suwimon Vongsingthong and Sucha Smanchat, "Internet of Things: A review of applications & technologies," *Suranaree Journal of Science and Technology* 21, 4 (January 1, 2014): 359-374.

[2] Aleksandr Ometov et al, "Facilitating the Delegation of Use for Private Devices in the Era of the Internet of Wearable Things," *IEEE Internet of Things Journal* 4, 4 (July 21, 2016): 843-854.

[3] Mario Hermann, Tobias Pentek and Boris Otto, *"Working Paper 01/2015 Design Principles for Industry 4.0 Scenarios: A Literature Review, Audi Stiftungslehrstuhl Supply Net Order Management,",* 2015, www.snom.mb.tu-dortmund.de accessed May 24, 2019.

The Journal of Law, Public Administration and Social Secience.
School of Law Chiang Rai Rajabhat University Vol.5 No.1 (January – June 2021)

89

will introduce autonomous and cooperative vehicles within the next decade, with enhanced safety and security standards. Entertainment and digital media sectors will unlock new opportunities for integrating broadcast TV and digital media. E-health will also see new changes.[4] 5G technology will unlock new value propositions and business models to improve cost structures to ultimately benefit consumers.

This work focuses on the comparative research method applied aims to analyze the EU regulations toward this technology as legal role model to the Global South Nations, wishing to improve their readiness on the legal revolution among this pluralism. We believe on compromising the plurality of law especially in the region where there existed the regional regulations onto the fair benefit of each state.

2. IMT for 2020 Vision and framework

This section focused on enabling a connected society in the 2020 timeframe. In this context, The International Telecommunications Unions (ITU) and its partners, sharing a common community of interest, have recognized the relationship between IMT (International Mobile Telecommunication system) and 5G and are working towards realizing the future vision of mobile broadband communications.

ITU has highlighted 5G networks and artificial intelligence (AI) as fields of innovation necessary for enabling smarter societies. In early 2012, ITU-R embarked on a programme to develop and setting the stage for 5G research activities that are emerging around the world. The ITU is developing "IMT for 2020 and beyond" and established the Focus Group on Machine Learning for Future Networks, setting the stage for 5G research activities emerging around the world[5]

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[4] European Commission, *"Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions – e-Health Action Plan 2012-2020 – Innovative healthcare for the 21st Century,"* https://ec.europa.eu/health//sites/health/ files/ehealth/docs/com_2012_ 736_en.pdf, accessed May 24, 2019

[5] International Telecommunications Union, *"IMT Vision Framework and overall objective of the future development of IMT for 2020 and beyond,"* https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.2083-0-201509-I!!PDF-E.pdf, accessed May 24, 2019.

5G is the next generation of mobile standards being defined by the ITU. IMT-2020 (5G) is a name for the systems, components, and related elements that support enhanced capabilities beyond those offered by IMT-2000 (3G) and IMT-Advanced (4G) systems. International Mobile Telecommunication 2020 standards (IMT-2020). The role of the ITU is to[6]:

• Set the stage for 5G research activities that are emerging around the world

• Define the framework and overall objectives of the 5G standardization process

• Set out the roadmap to guide this process to its conclusion by 2020 (see Figure 1).
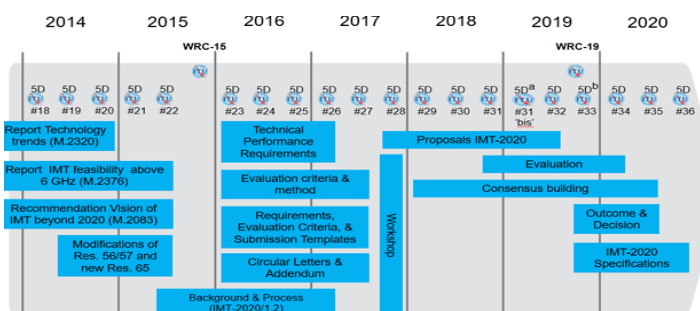

Figure 1: Detailed timeline & process for IMT-2020 in ITU-R

Source: ITU-R

After we introduces the role of the ITU in developing 5G standards as well as the potential benefits that 5G can generate. It important to remember that 5G technology need a spectrum requirement. More spectrum bandwidth will be required to deploy 5G networks to the high capacity requirements, increasing the need for spectrum. In consequence, the industry is making concerted efforts to harmonize 5G spectrum. The ITU is expected to decide on the additional spectrum for IMT in the frequency range between 24 GHz and 86

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[6] International Telecommunications Union, *"Setting the scene for 5G: Opportunities & Chal-lenges,"* https://www.itu.int/en/ITU-D/Documents/ITU_5G_REPORT-2018.pdf , accessed May 24, 2019.

GHz at the World Radio Communication Conference in 2019 (WRC-19). (see Figure 2)

Existing mobile allocation	No global mobile allocation
24.25 – 27.5 GHz	31.8 – 33.4 GHz
37 – 40.5 GHz	40.5 – 42.5 GHz
42.5 – 43.5 GHz	
45.5 – 47 GHz	47 – 47.2 GHz
47.2 – 50.2 GHz	
50.4 GHz – 52.6 GHz	
66 – 76 GHz	
81 – 86 GHz	

Figure 2: New spectrum bands study for WRC-19

Source: ITU-R

5G use cases could potentially be met by a variety of spectrum fre-quencies.[7] The 700 MHz spectrum is essential to achieve wide-area and indoor coverage for 5G services.[8] (see Figure 3)

Frequency Band	Frequency Range	Countries/Regions	Comments
Low Band	<1 GHz (UHF) usually 600/700 MHz	EU, USA, India	Current favourite as longer range, so less costly infrastructure and more familiar technology
Mid Band	3-5 GHz (above UHF)	EU, Korea, Rep., China, India with USA at 2 GHz; China and Japan in 2020	More spectrum available, with compromise on range and performance
High Band	20-100 GHz	EU, USA, Korea, Rep.; in 2020 - China, Japan, India	Short range (10-150m), high speed, low latency

Figure 3: The main frequency bands for 5G standards

Source: Bertenyi, 2017; authors.

It should be noted, while the ecosystem is not fully developed, 5G may not yet be an appropriate consideration across all regions. In addition, there is some concern that the initial deployment of 5G in dense urban areas may

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[7] *Ibid.*

[8] European Commission, *"700 MHz is a must for the Digital Single Market,"* https://ec.eu-ropa.eu/commission/commissioners /2014-2019/ansip/blog/700-mhz-must-digital-single-market_en, *accessed May 24, 2019.*

increase the digital divide. Policy-makers should consider using globally harmonized spectrum to maximize the efficient use of available spectrum.

3. Towards 5G in Europe

This section reviews the key challenges faced by the European Commission strives to make 5G a reality for all citizens and businesses in Member States by the end of this decade. To realize 5G application in EU states everywhere, the European Commission created a 5G for Europe Action Plan.

The Action Plan is a roadmap for public and private investment on 5G infrastructure in the EU. The roadmap sets out several measures to guarantee a coordinated approach among all EU Member States to make 5G accessible to all by the end of 2020.

In Europe, the 5G Public Private Partnership (5G-PPP) is dedicated to 5G research and development, created as one of the European Commission's initiatives in 2013. The main objectives set by 5G-PPP are[9] :

- Create stronger ties between the economic players and academic bodies devoted to the telecommunications sector over R&D projects, along the entire value chain;

- Reduce technological dependence on the United States and Asia while sustaining a strong global market;

- Regain technological leadership, notably in disruptive technologies, by promoting standards in international bodies;

- Allow innovative business models to emerge;

- Facilitate large-scale experimentation.

The results of this work will help clarify the 5G action plan (see below), and fuel the standardization work that is currently underway.

To achieve its ambitions, 5G-PPP has set stages of work: systems optimizations from the end of 2017 to mid-2019; and a full-size trial stage from 2019 to 2020.[10]

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[9] Republic of Estonia, Ministry of Economic Affairs and Communications, *"5G roadmap,"* https://www.mkm.ee/sites/ default/files/8.a_b_aob_5g_roadmap_final.pdf, accessed May 24, 2019.

[10] Chaim Gartenberg, *"The first real 5G specification has officially been completed,"* Mobile tech, entry posted December 20, 2017, https://www.theverge.com/2017/12/20/ 16803326/5g-network-specification-standard-3gpp-nr-official, accessed May 24, 2019.

The Journal of Law, Public Administration and Social Secience.
School of Law Chiang Rai Rajabhat University Vol.5 No.1 (January – June 2021)

93

3.1 5G action plan in Europe[11]

The European Commission has given every EU country a number of ambitious targets. One core objective for 5G is to have at least one major city in every European country outfitted with this new generation mobile system by 2020, and coverage of every city, motorway and high-speed railway line by 2025. As a complementary measure, in September 2016, the European Commission launched its 5G for Europe Action Plan to bolster investments in 5G infrastructure and service rollout efforts in the Digital Single Market. This action plan sets out a clear roadmap for public and private 5G investments inside the EU, including the legal regime for those preparing auctions. [12]

In 2020, one core objective for 5G networks in the EU is to have at least one major city in every European country outfitted with this new technology by 2020, and coverage of every city, motorway and high-speed railway line by 2025. Some countries have progressed further than others. Currently, nine member states have published their 5G actions plans– Austria, France, Finland, Netherlands, Spain, Sweden, Germany, Luxembourg and the UK (European 5G Observatory, 2019). Europe has been prominent in the number of 5G trials that have taken place, with some 138 trials across all 28 member states recorded by early 2019. However, according to the European 5G Observatory, only 7% of 5G pioneer spectrum has been assigned. The Observatory's scoreboard notes that 82% of the 700 MHz band, 87% of the 3.5 GHz band and over 96% of the 26 GHz band remains unassigned.[13]

We would like to present France, the country in Europe that have progressed further than others.

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[11] European Commission, *"Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions: 5G for Europe an action plan,"* https://eur-lex.europa.eu/legal-content/EN/TXT/ PDF/?uri=CELEX:52016DC0588&from=EN, accessed May 29, 2019.

[12] Dave Burstein, *"Factcheck: Large increase of capacity going from LTE to 5G low and mid-band,"* Wireless One, entry posted November 4, 2018, http://wirelessone.news/spectrum/1204-factcheck-large-increase-of-capacity-going-from-lte-to-5g-low-and-mid-band, accessed May 29, 2019.

[13] Colin Blackman and Simon Forge, *"Policy Department for Economic, Scientific and Quality of Life Policies,"* 2019, https://www.europarl.europa.eu/Reg-Data/etudes/IDAN/2019/631060/IPOL_IDA(2019)631060_EN.pdf, accessed May 24, 2019.

3.2 5G in France

In a context of strong industrial, commercial law and political dynamics around the 5G in France, the regulator ARCEP[14] has prepared for the arrival of this new generation of technologies since 2016. 5G requires the use of new frequencies, particularly in high frequency bands, to increase the capacity of mobile networks.

3.2.1 The availability of law to support frequency bands for 5G

To enable all players – operators, industrialists, start-ups and lawyers to prepare for the arrival of 5G, ARCEP opened a 5G pilot in early 2018. It allowed ARCEP to issue authorizations for the use of new 5G frequency bands. This section presents the availability of a new law for 5G frequencies in the 3.5 GHz band (3.4 - 3.8 GHz) and 26 GHz band (24.25 - 27.5 GHz). ARCEP is working to free these bands by migrating current users to other bands.[15]

After 2026, a guard band requirement will be identified to avoid interference from the Ministry of Armed Forces radars below 3.4 GHz. It will also ensure a power limitation as recommended by the European Conference of Postal and Telecommunications Administrations (CEPT) in this part of the spectrum. This guard band is currently estimated at between 10 to 20 MHz, but could potentially be reduced with improved performance of radio equipment. 5G will use new frequencies much higher than used today in civil telecommunications, within the "millimeter" bands above 24 GHz.[16] These new frequency bands will enable us to reach very high networking speeds to meet the localized needs of mobile networks in very dense areas, and to develop new 5G services dedicated to an industry. Today, only the band 26.5 - 27.5 GHz is free and can be used by 2020. Subsequently, the entire 5G spectrum should be made progressively available, subject to coexistence conditions and the improvement of legal regulation to control

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[14] Autorité de Régulation des Communications Électroniques et des Postes

[15] Arcep, *"Tableau de bord des expérimentations 5G en France,"* 2020, https://www.arcep.fr/cartes-et-donnees/nos-publications-chiffrees/experimentations-5g-en-france/tableau-deploiements-5g.html, accessed May 24, 2019.

[16] Foo Yun Chee, "EU countries, lawmakers strike deal to open up spectrum for 5G," *Reuters,* March 3, 2018, https://www.reuters.com/ article/us-eu-telecoms-spectrum/eu-countries-lawmakers-strike-deal-to-open-up-spectrum-for-5g-idUSKCN1GE2IB, accessed May 24, 2019.

The Journal of Law, Public Administration and Social Secience.
School of Law Chiang Rai Rajabhat University Vol.5 No.1 (January – June 2021)

95

the spectrum. With radio astronomy and earth exploration services, there is currently work in progress to evaluate the shared use of the 26 GHz spectrum between 5G systems and satellite earth station.

3.2.2 Prepare and simplify the deployment of legal conditions

In preparing for operations within 5G frequencies, ARCEP must define the technical legal conditions of use of the bands to avoid interference be-tween neighboring countries' 5G networks, and with existing users in the 5G bands or in adjacent bands (GSA: Spectrum for Terrestrial 5G Networks: Licensing Developments Worldwide). The conditions will be:

A. specify the allocation schedule to allow the opening up of 5G services by 2020.

B. examine the conditions under which operators deploying a network should offer other stakeholders.

In particular, ARCEP has already established the regulations for an operator who has contributed to the investment in network to use supernumerary fiber for the collection of its mobile base stations (Decision No. 2018-0569-RDPI of May 17, 2018). However, the situation of the multiband infringement is unavoidable.

C. Address the challenges of laws governing 5G deployments (within a technical expert group), including:

- evaluate the feasibility of a legal framework on network sharing (e.g., microcells, active antennas, macro-cell / microcellular articulation)

- assess the feasibility and constraints associated with the provision of specialized mobile services on public networks

D. Promote 5G deployments and small cells, and identify and generalize legal best practices (within a working group with communities):

- bringing together best practices for public infrastructure access rules for 5G deployments. Establish legal guidance on best practices for the deployment of small cells.

3.2.3 Mobilize actors and identify new uses of law[17]

The uses targeted by 5G require the mobilization of actors coming from different perspectives, to test and to create new Partnerships Economic and Law models. A 5G pilot has started in January 2018. The 22 authorized

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[17] *Ibid*

parties have conducted experiments in the 3.4 - 3.8 GHz band.[18] This work will feed improvements on the format and conditions of future laws related to frequency allocations.

As stated earlier, 5G is not meant to replace 4G immediately. In France, devices will undoubtedly be multi-modal: connecting to the 4G network, then transitioning to 5G network when it becomes available. The latest trials conducted in France are allowing 4G networks to perform better thanks to the use of pre-5G technologies. In addition to the strong integration between 4G and 5G, the new laws will no doubt also continue convergence efforts between frequency bands governed by exclusive licenses. For example, combining bands that are allocated exclusively to a mobile operator and unlicensed frequency bands, governed by a system of general authorization.[19]

5G is progressing well in Europe. The process has significantly accelerated since the end of 2017. Ambitious goals were set at European level since 2016. The European Commission's 5G Action Plan of 14 September 2016 confirmed by the Member States in December 2017, targets ensuring commercial rollout of 5G in at least one major city in every Member State by the end of 2020 and uninterrupted coverage of all urban areas and major terrestrial transport paths by 2025. The European Union regulatory framework for electronic communications has recently been reviewed and the new European Electronic Communications Code (EECC) entered into force on 21 December 2018. Member States will have two years to transpose it into national law, which will give a strong push to 5G and high-speed broadband networks as a whole.[20] After the telecommunications operators rolling out 5G networks. Particular focus is given to how appropriate regulation and government policy might help operators to use of spectrum.

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[18] Total Telecom, *"GSA launches first global database of commercial 5G devices,"* 2019, https://www.totaltele.com/502531/GSA-launches-first-global-database-of-commercial-5G-devices, accessed May 24, 2019

[19] Arcep, *"la 5G,"* 2020, https://www.arcep.fr/la-regulation/grands-dossiers-reseaux-mobiles/la-5g.html, accessed May 24, 2019.

[20] Frédéric Pujole, Carole Manero and Tarek Jaffal, *"5G observatory quarterly report 3 up to March 2019,"* http://5gobservatory.eu/wp-content/uploads/2019/04/80082-5G-Observatory-Quarterly-report-3.pdf, accessed May 24, 2019.

4. 5G deployment in ASEAN

Countries in Southeast Asia are not sitting on the sidelines with their 5G initiatives. The ASEAN telecommunications industry is a significant contributor to the growth of the region's economy. The World Bank has found that a 1. 0 percent increase in mobile penetration is associated with a 1.35 percent increase in GDP for developing countries.[21] ASEAN invested heavily in mobile infrastructure during this phase. Therefore, growth was driven by mobile internet and online computing, instead of fixed internet connectivity. ASEAN's mobile connectivity now ranks third globally, with a young population very focused on mobile content. The growth of the telecom sector has been extraordinary across ASEAN. According to the 'We Are Social' Global Digital Report 2018, the average mobile connectivity in Southeast Asia was 141 percent as of January 2018, facilitating 81 percent mobile broadband penetration. These figures are higher than global averages (connectivity 112 percent, mobile broadband 63 percent).[22]

Since the adoption of the Master Plan on ASEAN Connectivity 2010 (MPAC 2010), notable progress has been made. As of May 2016, 39 initiatives in MPAC 2010 have been completed. However, much remains to be done to realize the vision of a seamlessly connected ASEAN. Given the dynamic environment in which ASEAN Connectivity takes place, it is crucial to consider the emerging trends that will influence the ASEAN Connectivity 2025 agenda. the movement of 90 million more people to cities within ASEAN by 2030; the need for infrastructure spending to more than double from the historical levels; the challenge of equipping the world's third-largest labor force with the skills needed to support growth and inclusiveness; the emergence of disruptive technologies; the opportunity to transform natural resource efficiency in the region; and the imperative to understanding the implications for ASEAN as the world shifts to-wards a multipolar global power structure.

Now ASEAN has the Master Plan on ASEAN Connectivity 2025 (MPAC 2025). MPAC 2025 will focus on five strategic areas to achieve. One of them is digital

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[21] GSMA, *"The Mobile Economy Asia Pacific,"* 2018, https://www.gsma.com/r/mobileeconomy/asiapacific/, accessed May 24, 2019.

[22] Simon Kemp, *"Global Digital Report,"* We are social, entry posted January 30, 2018, https://wearesocial.com/blog/2018/01/global-digital-report-2018, accessed May 24, 2019.

innovation. Digital technologies in ASEAN could potentially be worth up to US$625 billion by 2030 (8 percent of ASEAN's GDP in that year), which may be derived from increased efficiency, new products and services, etc. Capturing this opportunity requires the establishment of regulatory frame-works for the delivery of new digital services (including data management and digital financial services); support for the sharing of best practices on open data; and equipping micro, small and medium enterprises (MSMEs) with the capabilities to access these new technologies.[23]

To ensure efficient and robust implementation of MPAC 2025, it will be (Instruction to Deliver: Fighting to Transform Britain's Public Services, Michael Barber, 2007; Delivery 2.0: The New Challenge for Governments, McKinsey & Company, 2012);

- Strong focus and targets: MPAC 2025 have focused on just five new strategies but not only them. There are also clear output and input level metrics to measure progress for each of the initiatives within these strategic areas.

- Clear and aligned plans: The starting point for successful implementation is to ensure that there is a vision which is both realistic and clear. The creation National Focal Points at the initiative level to complement the work of the existing ASEAN Connectivity National Coordinators can help ensure better coordination with the relevant implementing bodies in each ASEAN Member State.

- Presence of core skills, incentives, and finance: The National Focal Points and relevant implementing bodies will be critical to the successful delivery of MPAC 2025. There is a need to strengthen the ASEAN Connectivity Division to support the implementation of MPAC 2025.

The goal of the telecommunications in ASEAN are accelerate;

- the development of ICT infrastructure and services in each of the ASEAN Member States and

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[23] ASEAN, *"Master Plan on ASEAN Connectivity 2025,"* https://asean.org/wp-content/uploads /2016/09/Master-Plan-on-ASEAN-Connectivity-20251.pdf, accessed May 24, 2019.

- the development of an efficient and competitive logistics sector, in particular transport, telecommunications and other connectivity related services in the region.

In Southeast Asia, the launch timeline is much fuzzier. Many countries have announced some form of 5G trials, which demonstrate various experimental applications and services, but none have explicitly committed to a commercial launch date.

5. Conclusion

With regard to the 5G development situation around the world, the application of the technology is progressing rapidly. Countries are looking for efficient ways to improve mobile connectivity and provide the best quality for customers. The Southeast Asia region with its fast-growing economies will benefit a lot from 5G technology in some areas such as robots, the manufacturing industry and self-driving cars. The digital economy, with its new business models and methods, is creating opportunities for organizations and enterprises. New technologies will enable better connectivity across supply chains, reducing logistics and business costs.

The spectrum needs for 5G in different markets are being driven by different market demands between countries, as well as being influenced by the frequencies that have been identified by the global equipment industry as being most favorable for initial 5G technological development and network deployment. The 5G spectrum roadmap published in each of our benchmark countries (EU). The assessment identifies that in several countries under study – specifically in France – regulators have published detailed 5G spectrum roadmaps, and notices of intention/call for industry input to prepare for 5G licensing. These roadmaps give a strong signal to the national industry in each of these countries to make further spectrum available for 5G. In comparison with ASEAN, various countries are also planning or considering the release of another spectrum for 5G. The launch timeline is much fuzzier. Many countries have announced some form of 5G trials, which demonstrate various experimental applications and services, but none have explicitly committed to a commercial launch date.

An overhaul of the regulatory, government and local authority approach to digital policy, is needed to boost the roll-out of 5G networks. Importantly, this includes ensuring affordable access to public assets thereby strengthening the commercial case to invest in small cell infrastructure and 5G spectrum.

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103

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