REFERENCES

[1] D. Tandur, M. Gandhi, H. Kour, and R. Gore, "An IoT infrastructure solution for factories," *IEEE Int. Conf. Emerg. Technol. Fact. Autom. ETFA*, pp. 1–4, 2017.

[2] S. Hadi and H. W. Murti, "KAJIAN INDUSTRI 4.0 UNTUK PENERAPANNYA DI INDONESIA," *J. Manaj. Ind. dan Logistik*, 2019.

[3] B. Wicaksono, "X-CAMP: Managing Sustainable IoT Innovation Program." XL Axiata, Bandung, 2020."

[4] M. I. Nashiruddin, "Understanding the Turbulence of Business Environment in Telecom Industry : Empirical Evidence from Indonesia," *Bul. Pos dan Telekomun.*, 2018.

[5] M. I. Nashiruddin, "Business Strategies in a Turbulent Business Environment: Findings from Indonesian Telecommunication Industry," *J. Pekommas*, 2019.

[6] M. I. Nashiruddin, "Creating Competitive Advantage in the Turbulent Business Environment: Lesson Learned from Indonesia Telecommunication Industry," *Bul. Pos dan Telekomun.*, 2019.

[7] J. Walsh, "Low Power Wide Area Technologies for IoT Use Cases.," pp. 1–14, 2018.

[8] E. S. Santoso and M. Suryanegara, "NB-IoT Network Planning for Smart Metering Services in Jakarta , Depok , Tangerang , and Bekasi," *2019 16th Int. Conf. Qual. Res. Int. Symp. Electr. Comput. Eng.*, pp. 1–6.

[9] M. I. Nashiruddin and A. Hidayati, "Techno-economic analysis of LoRa WAN deployment for typical massive IoT applications in Urban and suburban areas," *Test Eng. Manag.*, 2020.

[10] J. Euchner, "The Internet of Things," *Res. Technol. Manag.*, vol. 61, no. 5, pp. 10–11, 2018.

[11] HUAWEI, "NarrowBand IoT," *huawei.com*, 2020. .

[12] J. Lloret, J. Tomas, A. Canovas, and L. Parra, "An Integrated IoT Architecture for Smart Metering," *IEEE Commun. Mag.*, 2016.

[13] M. Chen, Y. Miao, Y. Hao, and K. Hwang, "Narrow Band Internet of Things," *IEEE Access*, vol. 5, no. c, pp. 20557–20577, 2017.

[14] K. K. Nair, A. M. Abu-Mahfouz, and S. Lefophane, "Analysis of the narrow band internet of things (NB-IoT) technology," *2019 Conf. Inf. Commun. Technol. Soc. ICTAS 2019*, pp. 1–6, 2019.

[15] Northstream, "Connectivity technologies for IoT," no. October, p. 20, 2018.

[16] Ingenu, "RPMA Technology for the Internet of Things," pp. 1–46, 2015.

[17] N. Naik, “LPWAN Technologies for iot systems: choice between ultra narrow band and spread spectrum,” in *4th IEEE International Symposium on Systems Engineering, ISSE 2018 - Proceedings*, 2018.

[18] N. I. Osman and E. B. Abbas, “Simulation and Modelling of LoRa and Sigfox Low Power Wide Area Network Technologies,” *2018 Int. Conf. Comput. Control. Electr. Electron. Eng. ICCCEEE 2018*, pp. 1–5, 2018.

[19] Sigfox, “Sigfox Technical Overview,” vol. 1, no. May, p. 26, 2017.

[20] S. Alliance, “SigFox,” *ONLINE*, 2016. .

[21] R. A. Manager, “Regulatory Framework for LPWA IoT,” no. May, 2018.

[22] Kementerian Komunikasi dan Informatika Repbulik Indonesia, “Perdirjen SDPPI No.3 Tahun 2019 LPWA.pdf.” 2019.

[23] “NB-IoT DeploymeNT GuIDe To BasIc FeaTure seT requIremeNTs,” no. June, 2019.

[24] H. Fattah, *5G LTE Narrowband Internet of Things (NB-IoT)*. 2018.

[25] S. Popli, R. K. Jha, and S. Jain, “A Survey on Energy Efficient Narrowband Internet of Things (NBIoT): Architecture, Application and Challenges,” *IEEE Access*. 2019.

[26] Y. P. E. Wang *et al.*, “A Primer on 3GPP Narrowband Internet of Things,” *IEEE Commun. Mag.*, 2017.

[27] J. Schlienz and D. Raddino, “Narrowband Internet of Things Whitepaper,” p. 42, 2016.

[28] R. Ratasuk, N. Mangalvedhe, Y. Zhang, M. Robert, and J. P. Koskinen, “Overview of narrowband IoT in LTE Rel-13,” in *2016 IEEE Conference on Standards for Communications and Networking, CSCN 2016*, 2016.

[29] BPS, “Batam Municipality in Figures 2018,” .

[30] U. Raza, P. Kulkarni, and M. Sooriyabandara, “Low Power Wide Area Networks: An Overview,” *IEEE Commun. Surv. Tutorials*, vol. 19, no. 2, pp. 855–873, 2017.

[31] S. M. B. Smart and G. Strategic, “IEC Smart Grid Standardization Roadmap Prepared by SMB Smart Grid Strategic Group (SG3),” *Group*, 2010.

[32] R. K. Pillai, R. Bhatnagar, and H. Thukral, “AMI rollout strategy and cost-benefit analysis for India,” in *2016 1st International Conference on Sustainable Green Buildings and Communities, SGBC 2016*, 2017.

[33] “Batam-Tourist-Map.” .

[34] Kementerian Komunikasi dan Informatika Repbulik Indonesia, “Peraturan Menteri Komunikasi dan Informatika Republik Indonesia Nomor 19 Tahun 2005,” *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 1981.

[35] “PP Nomor 80 Tahun 2015.pdf.” .

[36] Kementerian Komunikasi dan Informatika Repbulik Indonesia, “Peraturan Menteri Komunikasi dan Informatika Republik Indonesia Nomor 17 Tahun 2016,” *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 1392.

[37] Kementerian Komunikasi dan Informatika Repbulik Indonesia, “Peraturan Menteri Komunikasi dan Informatika Republik Indonesia Nomor 1 Tahun 2019,” □□□□□ □□□□□, vol. 4, no. 3, pp. 57–71, 1392.

[38] R. Indonesia, “Peraturan Menteri Komunikasi dan Informatika Republik Indonesia Nomor 13 Tahun 2019 tentang Penyelenggaraan Jasa Telekomunikasi,” 2019.

[39] M. Communications, “3gpp tr 45.820,” vol. 0, 2015.

[40] G. Wibisono, G. P. Saktiaji, and I. Ibrahim, “Techno economic analysis of smart meter reading implementation in PLN Bali using LoRa technology,” in *2017 International Conference on Broadband Communication, Wireless Sensors and Powering, BCWSP 2017*, 2018.

[41] M. I. Nashiruddin and A. Yusri, “SigFox Network Planning for Smart Metering Based on Intemet of Things for Dense Urban Scenario,” in *2020 8th International Conference on Information and Communication Technology, ICoICT 2020*, 2020.

[42] B. Ray, “NB-IoT vs. LoRa vs. Sigfox,” *Link Labs*, 2018. .

[43] “Techno-economic study on capillary networks and cellular technologies for Machine-to-Machine communications,” 2014.

[44] M. R. Nugroho and G. Wibisono, “Techno Economic Analysis of Spectrum License Price in Indonesia for NB-IoT Deployment,” *Proc. - 2018 4th Int. Conf. Sci. Technol. ICST 2018*, vol. 1, pp. 1–5, 2018.

[45] G. de Rus, “Introduction to cost-benefit analysis: Looking for reasonable shortcuts,” *Introd. to Cost-Benefit Anal. Look. Reason. Shortcuts*, no. March, pp. 1–249, 2010.

[46] Actility, “LoRaWAN and Cellular IoT (NB-IoT , LTE-M): How do They Complement Each Other ?,” *Actility*, 2018.

[47] F. Vannieuwenborg, S. Verbrugge, and D. Colle, “Choosing IoT-connectivity? A guiding methodology based on functional characteristics and economic considerations,” *Trans. Emerg. Telecommun. Technol.*, vol. 29, no. 5, pp. 1–16, 2018.

[48] K. Mekki, E. Bajic, F. Chaxel, and F. Meyer, “A comparative study of LPWAN technologies for large-scale IoT deployment,” *ICT Express*, 2019.

[49] D. Kusumawati, B. Winarko, R. A. Wahab, and W. Pradono, “Analisis Kebutuhan Regulasi Terkait dengan Internet of Things,” *Bul. Pos dan Telekomun.*, vol. 15, no. 2, p. 121, 2017.