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Analysing China's Digital And Space Belt And Road Initiative

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SECTION I

From 25 to 27 April 2019, Beijing welcomed leaders from around 37 countries and delegates from over 150 countries at the second Belt and Road forum,[1] based on the theme "Shaping a Brighter Shared Future." President Xi Jinping's speech during the event stressed the fact that although the Belt and Road initiative (BRI) has been launched by China, its "opportunities and outcomes" could be reaped by the world. Much has happened since the first inaugural Forum in 2017, including the BRI being consecrated into the constitution of the Chinese Communist Party, and President Xi Jinping removing Presidential term limits. Both moves give more validation to the actualisation of the BRI. The second BRI forum focused mainly on refuting the international criticism of the initiative, especially against China's alleged debt trap diplomacy.[2] In lieu of the previous condemnation, the "Debt Sustainability Framework" was announced at the forum, besides the "Beijing Initiative for the Clean Silk Road", and the "Green Silk Road Envoys Programme" for the participating countries. Furthermore, the forum also emphasized the steps being taken on zero tolerance on corruption and the pursuit of high quality development. In addition to the more traditional areas of economic connection, it was also said that the program would "encourage the development of digital infrastructure."

China is well on the way to being a global leader in key emerging and digital technologies. Beyond its domestic market, international statistics clearly point to China's leading role in exporting digital goods and services.

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1 The Belt and Road Forum for International Cooperation (BRF) is a high-level and comprehensive multilateral platform for the Belt and Road cooperation.

2 China's Debt Trap is a most debated concern that bounds the recipient countries ensnared in a lofty debt that leaves them vulnerable to China's influence.

Digital technology has also given a push to China's economy. Chinese companies are competing successfully worldwide in ICT products and services, and are at the forefront of shaping international standards for emerging technologies. In fact, the Digital Silk Road project was promoted during the "Belt and Road CEO Conference." This conference was the first of its kind, and had the representation from global Fortune 500 companies and other Chinese firms as an indication of their interest. Though not much light was shed on the space medium of the BRI, nonetheless one cannot be ignorant of the developments on that front. This paper complements the existing literature on BRI while highlighting the need to involve the digital and space sector as that allows China to have greater flexibility to expand both business and influence over the regions of its interest. Furthermore, this paper underscores the likely implications in the foreseeable future of China's Digital and Space expansion in economic, geopolitical, technological, security, and geostrategic dimensions. The paper also explores the likely implications and learnings for India. The paper concludes by recommending a balanced approach that allows mutual benefit and growth for all the BRI as well as non-BRI states.

1.1 BACKGROUND

The BRI is the reincarnation of the ancient silk route which was a trade route connecting China to Europe through land and sea routes. The ancient silk route derived its name from silk — the major product that was traded across the route. Trade via the silk route also included a huge network of strategically located trading posts, markets, and thoroughfares designed to streamline the transport, exchange, distribution, and storage of silk other and goods.[3] Besides trade, this route also opened the gate for the exchange of philosophy, religious beliefs, science, language, and culture.

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[3] "About the Silk Road," United Nations Educational, Scientific and Cultural Organization, see https://en.unesco.org/silkroad/about-silk-road, accessed 15 March 2019.

The idea of the new silk route was first floated by President Xi Jinping during a visit to Kazakhstan in 2013.[4] Following the announcement, an action plan was released in 2015 by the Ministry of Foreign Affairs, and the National Development and Reform Commission. Plan laid out by the Ministry of Commerce gave more clarity to the proposed idea.[5] This plan emphasized on the mission as well as the vision of the BRI to develop an efficient and secure network of land, sea, and air passages on the basis of "mutual trust, equality and mutual benefits, openness, inclusiveness and mutual learning, and win-win cooperation."[6]

Additionally, it is important to note that the notion of connectivity has undergone a tremendous change in the twenty first century. It is no longer limited to roads, rails, and sea; rather, it is the virtual connectivity that facilitates the functioning of all three in real time. In the era of the Industrial Revolution of 4.0, China also envisaged the integration of markets and connecting countries along its Belt and Road with a network of next-generation digital infrastructure and satellite coverage. Against this backdrop, an Information and Space Silk Road was also stated as one of the sub goals of the BRI that emphasized the agenda of strengthening digital infrastructure, developing common technology standards, and deepening space cooperation.[7]

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4 Kishan S. Rana, "China's Belt and Road Initiative: Implications, Prospects and Consequences: Impact on India and its China Diplomacy," *Institute of Chinese Studies,* September 2017, see https://www.icsin.org/uploads/2017/10/06/48af1a73bb7c5ce9ae949b0f0ac48112.pdf, accessed 15 March 2019.

5 Manoj Joshi, "The Belt and Road Initiative aka One Belt One Road Scheme," ORF, May 2018, see https://www.orfonline.org/wp-content/uploads/2018/01/The-Belt-Road-Initiative-.pdf, accessed 17 March 2019.

6 "Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road," National Development and Reform Commission, Ministry of Foreign Affairs, and Ministry of Commerce of the People's Republic of China, March 28, 2015, see http://en.ndrc.gov.cn/newsrelease/201503/t20150330_669367.html, accessed 18 March 2019.

7 Chan Jia Hao, "China's Digital Silk Road: A Game Changer for Asian Economies," *The Diplomat,* April 30, 2019, see https://thediplomat.com/2019/04/chinas-digital-silk-road-a-game-changer-for-asian-economies/, accessed 19 March 2019.

The modern equivalent of the ancient silk route called the 'One Belt One Road' (OBOR) encompassed the Silk Road Economic Belt and the Twenty-first Century Maritime Silk Road. This English translation of Chinese Silk road — "OBOR" — was later changed to Belt and Road Initiative (BRI) as the former had attracted several negative interpretations, and many officials also felt that the perception of a single road as a limited offer could drive the regional partners into competition mode, and therefore, the stressing of the numeral "one" had to be avoided.[8] Moreover, the term "Belt and Road" would better reflect the project's numerous cluster networks, and sound more like an inclusive initiative rather than a political strategy.[9] Even the motive of establishing the digital and space Silk Road resonates the same factor of inclusive growth and prosperity for all participating countries.

1.2 PURPOSE OF THE BRI

China's BRI program finds its origin in a number of policy recommendations emanating from the various ministries of China. These policy suggestions were regarding issues like promoting economic cooperation initiatives, the large scale outpouring of China's capital reserves so as to stimulate economic demand overseas, to mitigate China's structural overcapacity problems, and to resolve the issue of plummeting demand.[10]

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8 Una Aleksandra and Berzina Cerenkova, "BRI Instead of OBOR — China Edits the English Name of its Most Ambitious International Project," *Latvijas Arpolitikas Instituts,* July 28, 2016, see http://www.lai.lv/viedokli/bri-instead-of-obor-china-edits-the-english-name-of-its-most-ambitious-international-project-532, accessed 20 March 2019.

9 Angela Stanzel, "China's Belt and Road: new name, same doubts," European Council on Foreign Relations, May 19, 2017, see https://www.ecfr.eu/article/commentary_chinas_belt_and_road_new_name_same_doubts, accessed 20 March 2019.

10 Xu Shanda, "Chinese Marshall Plan to be supported by 500 billion in foreign exchange reserves," *Daily Economic News,* August 2009, see http://finance.sina.com.cn/china/hgjj/20090806/07566578273.shtml, accessed 22 March 2019.

These proposals soon caught the attention of the political leadership and, after the 18th CPC National Congress, were embraced and incorporated into a broader unified initiative called the BRI.[11]

Chinese officials saw the BRI as a means of addressing both the domestic and foreign policy imperatives of China.[12] When President Xi Jinping took over power on 14 March 2013, he had evoked his doctrine of the "Chinese dream", and the BRI is, in all respects, aimed at "organically linking the Chinese dream to the global dream." Many scholars also see the BRI as the Chinese Marshall Plan to "promote growth in its poorer, but vulnerable, western regions, as well as adjacent and strategic Central Asia, or as a pivot towards Eurasia, in response to America's rebalance to Asia strategy."[13] The BRI's ambitions have left much room for multiple speculations. However, the Chinese government has often discouraged these descriptions of the BRI, and have emphasized voluntary participation and inclusive growth.

Nevertheless, there are a few key rationales of the BRI that cannot be overlooked.

1.2.1 Going Out 2.0: Step towards Globalisation, Integration, and Development

The BRI is commensurate with China's out going policy to facilitate its global rise in the international system; it also gives Chinese overseas foreign direct investment a more strategic direction and impetus. Initially, China's relationships with BRI countries were composed of individual bilateral relationships; but with the introduction of the BRI project, these relationships have come to be positioned in multilateral international relations

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[11] Richard Ghiasy and Jiayi Zhou, "The Silk Road Economic Belt: Considering Security Implications and EU- China cooperation prospects," *SIPRI,* February 2017. In Chinese, the initiative is called "N&^Nï " (literally, 'one belt one road'). The English name was changed from One Belt One Road (or OBOR) to the now widely accepted BRI around 2017.

[12] Ibid.

[13] See note 3.

within the BRI framework.[14] The BRI complies with the policy's aim of integrating China more deeply into the world economic system while also positing China as a leader in that system.

President Xi has claimed that 57 countries became active participants in the BRI, with 30 of them formally signing BRI cooperation deals by mid-2016.[15] The country also claims to have established 75 overseas economic cooperation zones in 35 BRI countries.[16] The "connectivity" offered by the BRI is complemented by alternative financial and governance institutions, namely, the New Development Bank, Asian Infrastructure Investment Bank, and the Shanghai Cooperation Organization. These institutions are envisaged to reformulate the world to China's advantage. These new units of the international system respond to the needs of urbanisation and reflect the geopolitical, economic, and ideological preferences of their founder,[17] as well as the concept of a "return to an Asia-centric order wherein China is claiming its rightful place in the current international dynamics."[18] Though there is no denying the fact that the BRI is an ambitious geostrategic initiative, one can, nevertheless, also see the elements of a new approach to

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14 Hideo Ohashi "The Belt and Road Initiative (BRI) in the context of China's opening-up policy," *Journal of Contemporary East Asia Studies,* 2018, see https://www.tandfonline.com/doi/full/10.1080/24761028.2018.1564615, accessed 22 March 2019.

15 "Xi Jinping Highlights Positive Results of 'Belt and Road' Construction in Various Aspects When Delivering a Speech at Legislative Chamber of the Supreme Assembly of Uzbekistan," Ministry of Foreign Affairs of the People's Republic of China, June 22, 2016, see https://www.fmprc.gov.cn/ce/cgmb/eng/zgyw/t1375058.htm, accessed 24 September 2019.

16 Lu Hui, "China's Outbound Direct Investment Surges in Jan-April," *Xinhua*, May 16, 2016, see http://www.xinhuanet.com/english/2016- 05/16/c_135363299.htm, accessed 24 September 2019.

17 Hal Brands, "China's Master Plan: A Worldwide Web of Institutions-Beijing is building an Interlocking Series of Security, Trade, and Educational bodies to Rival the West," *Bloomberg Opinion*, 12 June 2018.

18 Yu-Wen Chen and Obert Hodzi, "The Great Rejuvenation? China's Search for a New 'Global Order,'" Institute for Security and Development Policy, 2017, Sweden.

international cooperation and development. In essence, the BRI may well be a long term strategy of the PRC to create a negotiated and an alternative order in the world economy as well as politics.[19]

1.2.2 BRI as a Tool to Meet Domestic Economic Targets: New Markets and Balancing Growth

In recent years, China has been facing both the wrath of industrial overcapacity and a need to meet domestic economic targets. The BRI became a means to expand China's market beyond its borders. Solving the massive excess capacity in many industries, such as steel and cement, was one of the major economic priorities of the Chinese government. Similarly, there was a massive excess in other active industries. Overcapacity not only makes a country's financial system more vulnerable but also increases debt levels. The BRI was an economically viable option to effectively counter this situation. This was also an avenue for state owned enterprises (SOE's) to spread their economic influence far and wide as these enterprises were also under pressure back home to clean up their debt overhang.[20] Although, the 4 trillion RMB investment plan under the Hu-Wen leadership did help to stabilise the Chinese economy during the economic crisis of 2008.[21] However, the issue of slow domestic growth, accentuated by chronic surplus production capacity and slump in Chinese exports was still not solved following the crisis. By the end of 2012, the rate of the capacity utilization of China's shipbuilding industries, electrolytic aluminium, steel, flat glass, and cement, was all less than 75 per cent, inducing severe implications like increasing non-performing assets, declining profits, and mass unemployment. In 2013, the State Council came out with a "guiding opinion" that advocated an active expansion of the external market as a solution.[22] The objective has always been to strengthen China's own

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19 Frank Holmes, "China's Belt and Road Initiative Opens Up Unprecedented Opportunities," *Forbes*, 4 September 2018.

20 See note 9.

21 Hong Shen, "Building a Digital Silk Road? Situating the Internet," *International Journal of Communication,* 2018, Vol. 12.

22 See note 3.

development and economic "resilience" by galvanizing regional demand for industrial and agricultural products.[23] It was against this backdrop that the BRI was proposed.

1.2.3 BRI: A Blend of Connectivity and Strategy

Connectivity has been the mainstay of the project; however, the growth of the internet and space sector has also become important features of the initiative. As of now, the geographic scope of the initiative remains vague and indeterminate. Most countries have, on occasion, been included within its central perimeter; but the list was never exclusive, and nor was it even confirmed as coming from an official source.[24] Nonetheless, the BRI can be seen as the umbrella that brings all the Chinese overseas projects under one ambit. Many of these initiatives were already in place before the Belt and Road concept was fully articulated, but they have often folded neatly into the overall plan.[25] For instance, the Chinese foray into the South Asian region where it has been conducting multi-dimensional cooperation in all fields, including economic, energy and digital sectors. These bilateral initiatives in the region — often seen as the "string of pearls" phenomena — were started way before the BRI was officially launched.[26] China invested in developing various shipping facilities, constructing deep water ports, naval bases, and pipeline projects. Chinese state owned corporations have projects with countries along the South Asian Region, particularly in Sri Lanka (Hambantota), Myanmar (Kyaukpyu), Bangladesh (Chittagong), and

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[23] M. Zhao, "China's New Silk Road initiative," Instituto Affari Internazionali (IAI), Working Papers 15–37, October 2015.

[24] Bruno Mações, *Belt and Road: A Chinese World Order*, Penguin Random House, 2019: India, p. 24.

[25] "China's Belt and Road Initiative and Aviation," CAPA, July 26, 2018, see https://centreforaviation.com/analysis/airline-leader/chinas-belt-and-road-initiative-and-aviation-427350, accessed 23 March 2019.

[26] Ashlyn Anderson and Alyssa Ayres, "Economics of Influence: China and India in South Asia," Council on Foreign Relations, August 2015, see https://www.cfr.org/expert-brief/economics-influence-china-and-india-south-asia, accessed 24 March 2019.

Pakistan (Gwadar).[27] Such an arrangement should not only be seen as a way to reduce China's dependence on shipping routes through the Malacca Strait "chokepoint" but also a pre-BRI initiative.

Since its official announcement, the BRI has grown to include activities in the realm of digital and outer space. The following section provides a detailed analysis of the rationale and implication for China's digital and space BRI.

[27] Ashley S. Townshend, "China's String of Pearls," *The Outlook,* September 2011, see https://www.outlookindia.com/website/story/chinas-string-of-pearls/278432, accessed 24 March 2019.

SECTION II

2.1 DIGITAL SILK ROAD

China's science and technology sector has evolved through several phases since the establishment of the People's Republic in 1949. In the first phase, until 1959, technology supported the creation of heavy industry; the second, up through the end of the Cultural Revolution in 1976, saw economic stagnation and the ideological domination of technology projects.[28] A third phase, under reforms launched by Deng Xiaoping and carried forward by Jiang Zemin until 2001, emphasized the setting up of an independent research base and the gradual shift to market oriented, product-driven research. Since 2002, Chinese policy has increasingly backed high technology industrialization, and has promoted an innovation driven economy. China's intelligent investments in the technological field have helped the country grow internally as well as to spread its technological prowess. China accounts for over 40 per cent of global transactions, and the penetration of e-commerce (in per cent of total retail sales) stands now at 15 per cent.[29] China also accounts for 32 per cent of global ICT goods exports, and 6 per cent in ICT services exports.

Digital connectivity is a new geopolitical frontier where smart mobility, grids, and governance is anticipated to combine information and communication technology (ICT) with the social, political, and economic

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[28] Joel R. Campbell, "Becoming a Techno-Industrial Power: Chinese Science and Technology Policy," *Brookings Institute*, April 2013, see https://www.brookings.edu/wp-content/uploads/2016/06/29-science-technology-policy-china-campbell.pdf, accessed 26 June 2018.

[29] Longmei Zhang and Sally Chen, "China's Digital Economy: Opportunities and Risks," IMF Working Paper, January 2019.

design of the New Silk Road. Although the concept of digital connectivity in the BRI has been making good progress during last few years, it is less noticed since the focus remains on high-profile physical infrastructure projects like ports and railways and other associated economic, political, and strategic aspects. Chinese plans to dominate the global digital race rely on both centrally guided economic development and the political aspirations of global power projection. The rise of a few Chinese internet giants in both the domestic and global markets has added impetus to the policy discourses on building the "digital silk road." China's Ministry of Foreign Affairs, the National Development and Reform Commission, and the Ministry of Commerce came out with a white paper in 2015 that notes that

> [China] should jointly advance the construction of cross-border *optical cables* and other *communications trunk line networks …* and create an information Silk Road … build bilateral cross-border optical cable networks at a quicker pace, plan transcontinental submarine optical cable projects, and improve spatial (satellite) information passageways to expand information exchanges and cooperation.[30]

In July 2015, the State Council came out with the "Guideline on Boosting International Cooperation in Production Capacity and Equipment Manufacturing" wherein the telecommunications industry was listed as one of the 13 major sectors that need to increase "international industrial cooperation."[31]

In June 2016, the Chinese President Xi Jinping charted his vision for China to become the leading player in science and technology globally. While

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[30] "Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road," National Development and Reform Commission, (NDRC) People's Republic of China, March 2015, see http://en.ndrc.gov.cn/newsrelease/201503/t20150330_669367.html, accessed 27 March 2019.

[31] "Outline of the Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China," Xinhua News Agency, March 2017, see http://www.gov.cn/xinwen/2016-03/17/content_5054992.htm, accessed 28 March 2019.

speaking at the National Congress of the China Association for Science and Technology, he said that China must be on course to becoming a leading innovator worldwide by 2030. This progress would make China strong and improve the lives of the Chinese people. He argued that the growth to progress is possible because of scientific innovations, realised in a reasonable amount of time. China is found making significant progress in the digital arena in general, and specifically in fields like communication technologies, quantum field, supercomputing, and artificial intelligence. Indeed, the country is working towards becoming a "global innovation and technology hub" for next generation connectivity. Additionally, in 2016, China's State Council published the 13th Five Year Plan that had a specific section on improving internet and telecommunications links across BRI countries. In particular, the five year plan pressed upon[32]

- The construction of land and sea cable infrastructure;
- An Internet Silk Road between China and the Arab States; and
- The creation of a China-ASEAN information harbour.

Significant progress has been made in the construction of China-Pakistan, China-Russia, China-Kyrgyzstan, China-Myanmar cross border fibre optic cables for the smooth transmission of information.[33] China has also signed cooperation agreements with Tajikistan, Afghanistan, and Kyrgyzstan on fibre optic cables, which represent the practical launch of the Silk Road Fibre Optic Cable project.[34]

Equal emphasis has been laid on innovation and use of new technologies. In a work report presented to the National People's Congress in March 2016, Prime Minister Li Keqiang spoke of supply-side structural reforms

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[32] See note 31.

[33] The Belt and Road Initiative: Progress, Contributions and Prospects, 2019, Office of the Leading Group for Promoting the Belt ad Road Initiative, see https://eng.yidaiyilu.gov.cn/wcm.files/upload/CMSydylgw/201904/201904220254037.pdf, accessed 29 March 2019.

[34] Ibid.

which included support for innovative enterprises. He emphasised that innovation is the primary driver for development, and must occupy a central position in China's BRI strategy.[35] Moreover, the country has, time and again, stated its ambition of becoming leaders in 5G, Artificial Intelligence (AI), and other disruptive technologies.[36] Digital BRI could be seen as a stepping stone towards realising their ambition.

Speaking at the inaugural session of the BRI forum in May 2017, President Xi emphasised the critical role of technology and innovation driven development by stating,

> We should pursue innovation-driven development and intensify cooperation in frontier areas such as digital economy, artificial intelligence, nanotechnology and quantum computing, and advance the development of big data, cloud computing and smart cities so as to turn them into a Digital Silk Road of the 21st century.[37]

2.1.1 The Political and Economic Vision behind China's Digital Rise

The rise of the digital Silk Road reiterates the already known political and economic pattern — that is, slower growth rates and industrial overcapacity. China is banking on the future of the digital economy to bolster its growth. China's venture into ambitious national initiatives such as "Made in China 2025" and "Internet Plus," would not only digitalize and technologically upgrade its economic base, but also deploy national players in information

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35 "China adopts new strategy to refuel growth," *Xinhua Insight,* March 2016, see http://news.xinhuanet.com/english/2016-03/06/c_135160728.htm, accessed 28 March 2019.

36 "China is poised to win the 5G race," *EY,* 2018, see https://www.ey.com/Publication/vwLUAssets/ey-china-is-poised-to-win-the-5g-race-en/$FILE/ey-china-is-poised-to-win-the-5g-race-en.pdf, accessed 29 March 2019.

37 Dennis Pamlin, "Belt and Road Initiative's new vision," *China Daily,* October 2017, see http://global.chinadaily.com.cn/a/201711/26/WS5a276b8ca3107865316d3b97.html, accessed 29 March 2019.

technology, e-commerce, and telecommunications, to secure access to untapped markets abroad. There is no better way to achieve this objective than to merge state-led infrastructure development projects with digital connectivity.[38] This not only paves the way for the domestic firms to venture out but also makes the country the largest beneficiary of the scheme. For instance, in 2015, the Industrial and Commercial Bank of China and the China Development Bank gave a credit line of 2.5 billion USD to Bharti Airtel, the largest telecom operator in India, for its domestic infrastructure projects. Bharti Airtel then outsourced part of its network equipment to Huawei and ZTE, thereby giving a boost to the external markets of the two Chinese internet giants.[39] As China digitizes, businesses would witness massive changes in profit pools and revenue across the global value chain. Indeed, research by McKinsey Global Institute found that digital forces can potentially shift and create 10 to 45 per cent of industry revenue in China by 2030. This is creative destruction on a grand scale — one that "can root out inefficiency and vault China's economy to new levels of global competitiveness."[40]

Furthermore, the Chinese government is also banking on pushing digital innovations within and beyond its borders. It has been estimated that development in the Internet of Things (IoT) alone could add upto1.8 trillion USD in cumulative GDP for China by 2030.[41] In 2017, the "size of China's market, state backing, availability of data, and societal openness

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38 Keshav Kelkar, "China is Building a New Silk Road, and This One is Digital," World Economic Forum, August 2018, see https://www.weforum.org/agenda/2018/08/china-is-building-a-new-silk-road-and-this-one-s-digital/ , accessed 29 March 2019.

39 See note 25.

40 Jonathan Woetzel, Jeongmin Seong and Kevin Wei Wang, "How China Became a Digital Leader," McKinsey Global Institute, December 6, 2017, see https://www.mckinsey.com/mgi/overview/in-the-news/how-china-became-a-digital-leader, accessed 23 September 2019.

41 Jennifer L. Schenker, "Why China Wants To Lead the 5G Charge," *Medium,* March 2018, see https://innovator.news/whychina-wants-to-lead-the-5g-charge-249151bee73b, accessed 30 March 2019.

to the adoption of new technologies such as mobile payments" had culminated to massive growth in Chinese e-commerce, constituting to about 42 per cent of the global market.[42]

The focus on digitalisation, as highlighted in President Xi's speech, is also a way to offer something China wants to be known for. China has rapidly transformed itself into a global power in the digital space, leading the world in the number of internet users, the volume of online retail sales, and mobile internet development. The "Digital Silk Road" could potentially bring a transformation in both infrastructure and economic models in emerging markets.

First, critical infrastructure blended with digital as well as state of the art technologies could be seen as a more viable and sustainable investment in the long run as proposed in the second BRI forum. For instance, the China Machinery Engineering Cooperation worked with Siemens to incorporate two high efficiency gas turbines for the Jhang power plant in Pakistan to make more power and become cost efficient. This power plant's generation capacity was equal to the total power consumption of approximately 4 million households in Pakistan.[43] Additionally, advanced monitoring systems and smart sensors can be fused into infrastructure to ascertain the optimization of resources. Smart grids also provide an efficient option of matching supply with demand so that power plants consume fewer fossil fuels.

Secondly, advanced IT infrastructure would facilitate the flow of information and data in cyberspace, which is deemed to minimize cultural differences, reduce asymmetric information, build trust for Belt and Road countries and regions, and stimulate cooperation in multiple fields such as

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[42] Rob Smith, "42% of Global E-Commerce is happening in China. Here's Why," World Economic Forum, April 18, 2018, see https://www.weforum.org/agenda/2018/04/42-of-global-e-commerce-is-happening-in-chinaheres-why/, accessed 30 March 2019.

[43] "First H Class Gas Turbines to be Installed in Jhang," *Dawn,* October 2017, see https://www.dawn.com/news/1361302, accessed 31 March 2019.

information infrastructure, trade, finance, industries, science, education, culture, and health.[44] As many of the Belt and Road countries are yet to experience a thriving e-commerce sector due to the lack of good digital infrastructure. As a result of the initiative, many Chinese online retail giants (such as Alibaba) would be spearheading the development of a truly global e-commerce market. The expected boost in economic growth and further industrial upgrading and restructuring would help in granting more flexibility to employment and start ups. There are villages whose farmers are working on Alibaba's shopping site called "Taobao villages".[45] Alibaba has also officially defined Taobao as "a village in which over 10 % of households run online stores and village e-commerce revenues exceed 10 million RMB (roughly 1.6 million USD) per year." According to Alibaba's data, there are more than 1,000 Taobao villages in China.[46]

China's digital products and services have begun to conquer the global market with 42 per cent of the global e-commerce market.[47] The country is also seeking digital leadership through research collaborations in emerging technologies, building digital infrastructures — for instance, building cable networks and paving the way for e-commerce. In fact, China is among the top three in the world for venture capital investment in key types of digital technology, including virtual reality (VR), autonomous vehicles, 3-D printing, robotics, drones, and AI.[48]

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44 Winston Ma Wenyan, "Could a Digital Silk Road solve the Belt and Road's sustainability problem?" World Economic Forum, September 2018, see https://www.weforum.org/agenda/2018/09/could-a-digital-silk-road-solve-the-belt-and-roads-sustainability-problem/, accessed 01 April 2019.

45 "Alibaba turns hundreds of poor villages into 'Taobao Villages'," *China Daily*, January 2019, see http://www.chinadaily.com.cn/a/201901/13/WS5c3a220ea3106c65c34e4115.html, accessed 01 April 2019.

46 Ibid.

47 Jonathan Woetzel, Jeongmin Seong et al., "Digital China: Powering The Economy To Global Competitiveness," McKinsey & Company, December 2017, see https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/China/Digital%20China%20Powering%20the%20economy%20to%20global%20competitiveness/MGI-Digital-China-Report-December-20-2017.ashx, accessed 23 September 2019

48 See note 40.

2.1.2 Investment in New Technologies

China is home to dynamic digital innovators, and is a leading global investor in the latest technologies. It has contributed approximately 2 billion USD towards ICT infrastructure development between 2010 and 2014, surpassing traditional donors like UN agencies and EU institutions.[49] With the official announcement of the 2025 "Made in China" strategy, the country has been diligently working towards a large scale digital transformation. In fact, the upgradation of the 2017 roadmap of the strategy to include digital and disruptive technologies — like 5G,blockchain, AI, Quantum Computing — showcases that China taking effective steps towards the implementation of the new digital Silk Road. The "National Talent Development Plan 2010–2020" focuses on increasing the talent pool from114 million to 180 million by 2020 to support the transition to an innovation driven growth model.[50]

5G

The Made in China 2025 document outlines the importance of 5G as a "key emerging technology", and China is taking the lead in developing and implementing 5G, the ultrafast data network technology that is envisaged to turn the digital Silk Road into an information superhighway. The deployment of 5G networks across the BRI states is expected to provide greater bandwidth, speed, reliability and, eventually, ubiquitous connectivity that is needed to support the continual exchange of data between IoT devices and systems. China's leadership in 5G is attributed to intense national coordination in the telecom sector. China Unicom and China Telecom have even started initial negotiations on the state controlled merger with BRI states that would further accelerate 5G expansion. Huawei alone has been investing 600 million for research and development in 5G

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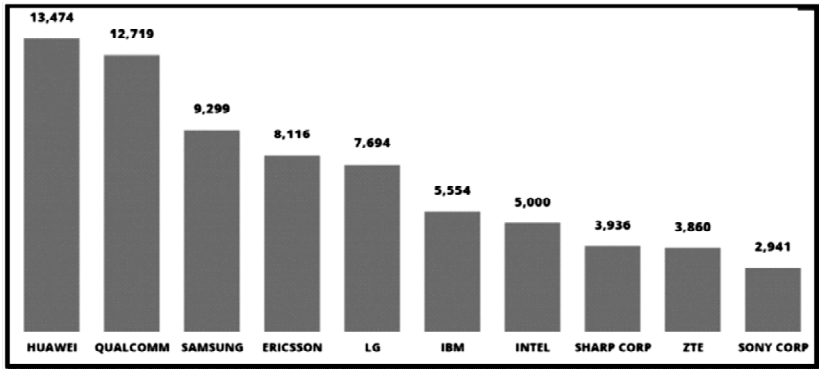
[49] Kristin Shi-Kupfer and Mareike Ohlberg, "China's Digital Rise," Mercator Institute for China Studies, April 2019, see https://www.merics.org/sites/default/files/2019-04/MPOC_No.7_ChinasDigitalRise_web_4.pdf, accessed 20 September 2019.

[50] Ibid.

technologies since 2009.[51] As of February 2019, the company owned 1529 5G patents.[52] Combine these statistics with those of other Chinese telecoms and one finds that China owns most of all the 5G patents worldwide. The chart below depicts that Huawei holds the top position in 5G patents, followed by Qualcomm and Samsung. However, if one combines the statistics of Huawei and ZTE (both are Chinese enterprises), they will surpass some of the top companies worldwide. China has also planned to upgrade its national telecommunications system to 5G, and has announced an investment of 411 billion USD on that front. The China Academy of Information and Communication Technology had predicted that, by 2030, 5G will drive 6.3 trillion Yuan of economic output in the country. State-owned companies have also pushed ahead to develop 5G standards jointly with the government, and to introduce them to international standardization bodies.

5G Patents
Initiatives, Enabling Technologies, and SEPs Comparison



Source: GreyB Services, 2019, see https://www.greyb.com/5g-patents/, accessed 24 September 2019.

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[51] Raymond Zhong, "China's Huawei is at Centre of Fight Over 5G's Future," *The New York Times,* March 7, 2018, see https://www.nytimes.com/2018/03/07/technology/china-huawei-5g-standards.html, accessed 20 September 2019.

[52] Wesley Rahn, "Belt and Road Forum: Will China's 'digital Silk Road' lead to an authoritarian future?" *DW.com*, April 2019, see https://www.dw.com/en/belt-and-road-forum-will-chinas-digital-silk-road-lead-to-an-authoritarian-future/a-48497082, accessed 01 April 2019.

AI

In July 2017, China's government published a comprehensive AI development plan that states China's ambition is to become "the global leader in AI fundamental theory, standardization, technological development, and application by 2030."[53] The Next Generation Artificial Intelligence Development Plan has projected that, by 2030, AI will create entirely new sectors of the economy which are estimated to be worth 150 billion Chinese Yuan (21.6 billion USD). It was also recently reported that China aspires to build a 2.1 billion USD technology park dedicated to developing AI near Beijing. China is also planning to establish at least 50 academic and research institutes by 2020 in the field of AI. Current statistics point out that China has a pool of about 39,000 AI researchers. China's central government funds the core AI-related research projects of big players like Baidu, Alibaba, and Tencent. It has also invested heavily in leading start ups, like Cambricon Technologies, which specializes in AI development and chips. On purely quantitative indicators, China seems well on track to achieve its global AI leadership goals. China tops most quantitative rankings — for example, in the scale of global funding attracted, in the number of patents, and in the scale of investment in research and development.[54] China filed 30,000 patents in 2018, and this would see an increasing trend in the coming years.[55]AI is seen as a core technology in the country which is vital to its economic growth in the coming years, leading to a wave of investments in research and development

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53 Roma Eisenstark, "Why China And The US Are Fighting Over 5G," *Technode*, March 30, 2018, see https://technode.com/2018/03/30/5g/, accessed 02 April 2019.

54 Yawen Chen, "China's City of Tianjin to Set up $16-Billion Artificial Intelligence Fund," Reuters, May 17, 2018, see https://www.reuters.com/article/us-china-ai-tianjin/chinas-city-of-tianjin-to-set-up-16-billion-artificial-intelligence-fund-idUSKCN1II0DD, accessed 02 April 2019.

55 Peter H. Diamandis, "China is Quickly Becoming an AI Superpower," *SingularityHub,* August 29, 2018, see https://singularityhub.com/2018/08/29/china-ai-superpower/#sm.0000vx96wm5h5duvye42h74g8kc46, accessed 03 April 2019.

as well as talent acquisition. China is investing in many AI parks, facial recognition technologies, and data centres to further its ambition of AI leadership. For instance, Malaysia welcomed a project to create an AI hub with the help of Chinese AI unicorn SenseTime. The 1 billion USD park is supposed to help local tech businesses develop robots and speech recognition, and foster tech talent.[56] Even Zimbabwe has signed a contract with a Chinese company named CloudWalk Technology, to implement facial recognition across the country, with cameras expected to be installed at city streets, airports as well as transit facilities by Hikvision.[57]

Blockchain

China is also taking gigantic steps to exploit the potential of blockchain technologies. A survey of international tech executives saw the country as the emerging blockchain leader.[58] China not only ranks third in total blockchain-related spending by region[59] but the Chinese companies have also filed more than half of blockchain patents worldwide in 2017. Many applications are being introduced in China using the technology. For instance, the civil administration in Chancheng district in Guangdong Province has been moved onto a blockchain, with the addition of the "community correction application" which tracks and notes the movement of former prison inmates. The most notable effort has been China moving to become a cashless society by introducing crypto RMB.

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[56] Summer Wang and Tripti Lahiri, "A future AI park in Malaysia shows how criticism is changing China's foreign investment," *Quartz,* April 2019, see https://qz.com/1602194/an-ai-park-in-malaysia-shows-chinas-belt-and-road-is-evolving/, accessed 19 June 2019.

[57] Daniel Kliman, Rush Doshi, Kristine Lee, and Zack Cooper, "Grading China's Belt and Road," *CNAS,* April 2019, see https://s3.amazonaws.com/files.cnas.org/CNAS+Report_China+Belt+and+Road_final.pdf accessed on 19 June 2019.

[58] Miryam Amsili, "Blockchain In China: Local Is Everything," *Supchina,* August 28, 2018, see https://supchina.com/2018/08/28/blockchain-in-china-local-is-everything/, accessed 03 April 2019.

[59] "Blockchain is Here: What's Your Next Move?" *PwC,* see https://www.pwc.com/gx/en/issues/blockchain/blockchain-in-business.html, accessed 04 April 2019.

Quantum computing

China is striving for supremacy in the field of Quantum Computing as well. The country achieved a major breakthrough in Quantum communication in September 2017 when researchers conducted the first quantum video call between Beijing and Vienna. Quantum Computing, communication and sensoring were also a part of the Made in China 2025 strategy, Civil-Military Fusion Plan (2017) and the 13th Five Year Plan (2016-2020).

China's encompassing and ambitious digital policies neatly blankets the weak ICT infrastructure of developing economies as well as their fragmented cyber policies. China's digital connectivity project has already started impacting many countries in terms of fair economic competition; they are creating uncertainties, and may likely be a challenge for data security and privacy protection. At the same time, China's initiative provides a digital alternative to the West dominated digital solutions and business models.

SECTION III

3.1 SPACE SILK ROAD

Space technology is another arena where China has made rapid progress during the last few decades. Today, China gets recognised as one of the leading players globally in the space arena. This chapter debates the various aspects of China's space programme which are BRI specific. The purpose of this paper is not to discuss China's entire space progress. However, just to set a context for locating this programme in the BRI matrix, some general aspects of the space programme have been stated.

As mentioned before, connectivity is the key of the BRI strategy, and hence there is a greater relevance for China's satellite based technology which provides PNT (Positioning, Navigation and Timing) inputs. It was realised that for any connectivity in water, road, rail, or in the air, there is a requirement of such PNT system. It is likely that this need was instrumental in formulating the idea behind the Space Silk Road. This concept was introduced in 2014 by the International Alliance of Satellite Application Services (ASAS). The Space Silk Road aims at creating an entire range of space capabilities, including satellites, launch services, and ground infrastructure, it also aims at supporting related industries and service providers going global.[60]

China's space programme began during the 1950s. Sputnik 1, the first artificial earth satellite, was launched by the erstwhile Soviet Union on 4 October 1957. However, during the Second Plenary Meeting of the Eighth Party Congress on May 17, 1958, Chairman Mao announced the need for China to have its own satellite. Subsequently, China took more than a decade to make its space programme operational, and Dongfanghong I

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[60] "China`s Space Silk Road," *Medium,* May 25, 2018, see https://medium.com/@beltandroad/china-s-space-silk-road-4e09721543a6, accessed 12 March 2019.

was the first space satellite launched successfully by China on April 24, 1970. Initially, the agenda was civilian in nature; but, over a period of time, the involvement of the PLA began. Through the early 1960s, the advocates for China's satellite programme were located within the civilian Chinese Academy of Sciences (CAS). At the same time, China was developing ballistic missiles, primarily with Soviet help. China's successful testing of a medium-range ballistic missile, the DF-2 on 29 June 1964, shaped the circumstances for a change in policy and organization and, since then, the PLA has been the main architect of China's space programme.[61]

China has published four White Papers (in 2000, 2006, 2011, and 2016) on space aspects thus far, and has made public various present and future space projects. These White Papers could be viewed as the attempts made by China towards making public their achievements, commitments, and proposals. However, possibly these could be the only projects which China wants the rest of the world to know about, and not all the projects. China has developed assets for meteorology, remote sensing, earth observation, communication, and navigational purposes. The 2016 White Paper identifies various fundamental policies with regard to international space exchanges and cooperation. The paper also states that China is keen on 'strengthening bilateral and multilateral cooperation which is based on common goals and serves the Belt and Road Initiative.'[62]

Zheng He (1371–1433), a Chinese mariner by profession, is known to have explored much of the world for China. He is known to have undertaken seven major expeditions, and is known to be responsible for establishing Chinese trade in new areas which has facilitated the opening up of the Maritime Silk Road. The ancient Chinese invented astro navigation, and Zheng is known to be the first user of this technique during his various expeditions. The position and course of his fleet were determined by observing the stars and constellations, such as the Big Dipper, the Southern

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61 Gregor Kulacki and Jeffery Lewis, "A Place for One's Mat: China's Space Program, 1956–2003", Cambridge, MA: American Academy of Arts and Science, 2009, n. 9.

62 "Full text of white paper on China's space activities in 2016," The State Council, The People's Republic of China

Cross, and the Lyra constellation. Living on the northern hemisphere, Chinese people on land also used to navigate by spotting the Big Dipper.[63] The Chinese word for the Big Dipper is BeiDou. The modern day satellite based navigational system introduced by China — which is also known to have a major role in the conceptualisation of BRI — is termed BeiDou.

The BeiDou navigational system (BDS) has generated interest globally owing to its quality and to China's systematic management of the entire project. At present, China intends to have a 35-satellite system for providing a global network for positioning, navigation, and timing services. This is an all-weather system, and is in line with the needs of the country's national security and economic and social development.[64] This system is at the heart of the entire BRI project, and is often described as the "digital glue."[65] BeiDou is known to be playing a major role in taking the BRI forward.

3.1.1 THE CHINA SATELLITE NAVIGATION SYSTEM

China started exploring satellite navigation technology in the late 1960s. However, owing to various technical difficulties and the lack of funding — particularly during the Cold War era — China had not made much progress in developing such a system. Based on the 'Twin-Star' regional navigation theory, they tested a satellite positioning system on two DFH-2A communications satellites. This test showed that the precision of the Twin-Star system was comparable to the publicly available signals of the United States Global Positioning System (GPS).[66]

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63 "China's BeiDou navigation system to serve B&R countries," *Xinhua News Agency,* November 16, 2018, see https://eng.yidaiyilu.gov.cn/qwyw/rdxw/71826.htm, accessed 15 May 2019.

64 "China's BeiDou Navigation Satellite System," White Paper, 16 June 2016, see http://www.china.org.cn/government/whitepaper/2016-06/16/content_38681076.htm, accessed 12 February 2019.

65 "China's 'One Belt, One Road' Takes to Space," *The Wall Street Journal,* December 28, 2016, see https://blogs.wsj.com/chinarealtime/2016/12/28/chinas-one-belt-one-road-takes-to-space/, accessed 12 February 2019.

66 "Beidou1 Experimental Satellite Navigation System", see http://www.astronautix.com/craft/beidou.htm accessed on 30 Jun 2019.

Following this, government approval for the development of the satellite navigational system was granted during 1993–94. BeiDou/BeiDou-1 was China's first regional navigational system, and was developed by the China Academy of Space Technology (CAST).[67]

As per the China National Space Administration (CNSA) and CSNO (China Satellite Navigation Office), the development of the Chinese global navigation system is to be carried out in three phases.[68]

1) Phase-I is the BeiDou Navigation Satellite Demonstration System, which was established in the period 2000–2003. The experimental BeiDou navigation system consisted of 3 satellites.

2) Phase-II is the regional BeiDou navigation satellite system covering China and the neighboring regions by 2012. By 2014, the system will be ready to initially offer high-precision positioning and navigation services to the Asia-Pacific region.

3) Phase-III is the BeiDou navigation satellite system to be established completely, and provide global service by 2020.

China is planning to have a 35-satellite global navigational network by the year 2020. The BeiDou supports both global worldwide services as well as regional services. The global services are further sub-divided in two other services: the Open Service and the Authorized Service. The Open Service is similar to GPS and Galileo, and it is free of charge and open to all users worldwide. The system is designed to provide a position accuracy of 10 meters, a timing accuracy of 50 ns, and a velocity accuracy of 0.2 meters per second. The Authorized Service aims at ensuring highly reliable use even in complex situations, and is expected to provide military grade signal. For regional use, there are wide area differential services, and short

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67 Ajey Lele, "Autonomy in Satellite Navigation Systems: The Indian Programme", *Indian Foreign Affairs Journal* Vol. 9, No. 3, July–September 2014, pp. 240–254.

68 "CNSS," *eoPortal Directory*, see https://directory.eoportal.org/web/eoportal/satellite-missions/content/-/article/cnss, accessed 11 May 2019.

message services.[69] The entire system is expected to be dynamic in nature. As the number of satellites increase, then obviously the nature of services provided would improve. Some structural changes are also expected owing to the emergence of new technologies as also based on the performance of the system.

The Beidou Phase III system comprises the migration of its civil Beidou 1 or B1 signal from 1561.098 MHz (Megahertz) to a frequency centred at 1575.42 MHz — the same as the GPS L1 and Galileo E1 civil signals — and its transformation from a quadrature phase shift keying (QPSK) modulation to a multiplexed binary offset carrier (MBOC) modulation similar to the future GPS L1C and Galileo's E1. The Phase II B1 open service signal uses QPSK modulation, with 4.092 megahertz bandwidth centred at 1561.098 MHz. The existing (as during May 2019) Beidou constellation spacecraft are transmitting open and authorized signals at B2 (1207.14 MHz) and an authorized service at B3 (1268.52 MHz). Real-time, stand-alone Beidou horizontal positioning accuracy was classed as better than 6 meters (95 per cent) and with a vertical accuracy better than 10 meters (95 per cent).

The CNSS (Compass Navigation Satellite System) which at places also gets referred to as BDS (BeiDou Navigation System) supports two different kinds of general services: the RDSS and the RNSS. In the Radio Determination Satellite Service (RDSS), the user position is computed by a ground station using the round trip time of signals exchanged via the GEO satellite. The RDSS long term feature further includes short message communication (guaranteeing backward compatibility with Beidou-1), large volume message communication, information connection, and extended coverage. The Radio Navigation Satellite Service (RNSS) is very similar to that provided by the GPS and Galileo, and is designed to achieve similar performances.[70]

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[69] "BeiDou Services," *esanavipedia*, see https://gssc.esa.int/navipedia/index.php/BeiDou_Services accessed on 08 May 2019.

[70] Information in this and previous para is as mentioned in see https://www.nasaspaceflight.com/2019/04/beidou-3g2q-navigation-long-march-3b/ accessed on 10 May 2019.

Overall, there has been a reasonable amount of transparency about this system, and China has made available various technical details about the system. For example, there are documents giving details about the specifications relating to open service signal B1I and B2I between the space segment and the user segment.[71]

The BeiDou-1 system was capable of providing all-weather, two-dimensional positioning data for both military and civilian purposes. It could also undertake communication functions. The first two satellites for this system were launched during 2000, and the system began providing navigational support in late 2001. The third satellite (backup) was launched in 2003, and the network was made available to civilian users in April 2004 (BeiDou-1A, BeiDou-1B, and BeiDou-1C belong to the original BeiDou-1 system). With this, China became the only third country in the world to possess an operational space-based navigational network. The last satellite in this constellation was launched in 2007, and the system was working with 20m accuracy. All these satellites were in geostationary orbit.

BeiDou-1 provided a lot of learning value for China. Based on this experience China undertook the next two phases of development. There is some obvious overlap between all the phases. With the development of Beidou-2, China envisioned establishing a global navigational footprint. As of December 2011, the BeiDou system was officially announced to provide Initial Operational Service — that is, providing initial passive positioning navigation and timing services for the whole Asia-Pacific region, with a constellation of 10 satellites (5 GEO satellites and 5 IGSO satellites). Subsequently, various additional satellites have been added.[72] The Wuhan Optics Valley BeiDou Holding Group Co. Ltd. (Optics Valley, BeiDou) is dedicated to promoting and popularising BDS technology and applications

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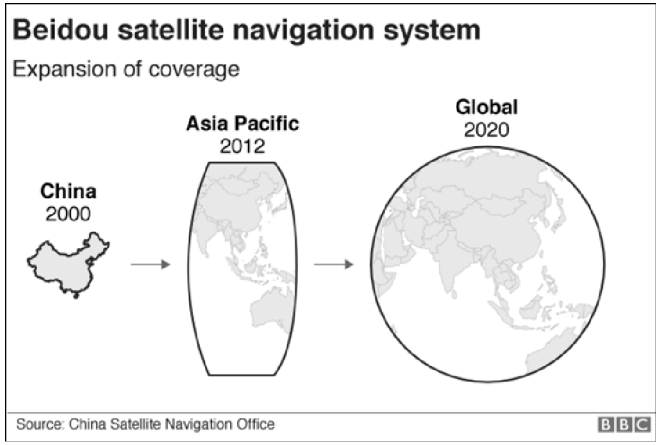
71 "BeiDou Navigation Satellite System Signal In Space Interface Control Document: Open Service Signal (Version 2.0)," China Satellite Navigation Office, December 2013, see http://www2.unb.ca/gge/Resources/beidou_icd_english_ver2.0.pdf, accessed 02 May 2019

72 "BeiDou General Introduction," *esanavipedia*, see https://gssc.esa.int/navipedia/index.php/BeiDou_General_Introduction, accessed 04 May 2018.

in the ASEAN area, and also within China.[73] There are eight subsidiary companies in this group and this group is responsible to manage all BDS related business interests. On 27 December 2018, the BeiDou Navigation Satellite System has started providing global services. Owing to the overlap between the various phases, it is tricky to identify exactly how many satellites are launched per phase. Also, it may be noted that few satellites launched during the beginning of the 21st century have already completed their lifecycle. The following table is based on various sources available on the internet, and gives a broad idea about various navigational system related launches.

Summary of Satellites

Block	Launch Period	Satellite launches			Currently in orbit and healthy
		Success	Failure	Planned	
1	2000-2006	4	0	0	0
2	2007-2018	19	0	1	15
3	2015-present	25	0	15	25
	Total	48	0	16	40
Last updated: April 21, 2019					



[73] "Optics Valley Beidou," see http://www.whggbd.com/En/DataContent/39, accessed 08 May 2019.

BeiDou has a significant user base in China. More than 6.17 million commercial vehicles are known to be using this system. This is particularly true of the public transportation systems —like buses and taxis — which are very dependent on these systems. There are also 35,000 postal and express delivery vehicles, 80,000 buses in 36 cities, as well as some 370 public service ships across the country all of which are dependent on China's GPS system. At present, the reach of BDS is possibly more than 50 countries, with an approximate population of around 3 billion people. The system is also used in indigenous civilian aircraft.[74]

The relevance of the BeiDou system for BRI needs to be inferred from the various specific and general purpose characteristics of the system. According to statistics, in contemporary information society, 85 per cent of the information society has the property of location, velocity and time. Thus, the Navigation Satellite System that offers this sort of property has become the essential infrastructure of the progress of the information society, and has also become the core and base of the development of the information industry.[75] The BeiDou Navigation Satellite System provides basic services to all users, and high-level services to specific users. The performance is expected to be of high-quality over the region of the Asia-Pacific. Subsequently, when the system would become fully operational with all satellites in space, it is expected that it would be available globally. Also, the system will be compatible with other major global navigation systems.

The BeiDou also has applications beyond standard navigational inputs. It has been widely used for communication, marine fishery, hydrological

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[74] "10 BeiDou satellites to be launched by China this year," *Geospatial World*, February 2019, see https://www.geospatialworld.net/news/10-beidou-satellites-to-be-launched-by-china-this-year/, accessed 16 May 2019.

[75] "Overview of Overview of Compass/ Compass/BeiDou Navigation Navigation Satellite System (CNSS) Satellite System (CNSS)," China Satellite Navigation Project Center China Satellite Navigation Project Center, February 2008, see http://www.unoosa.org/documents/pdf/icg/providersforum/2008/3.pdf, accessed 13 May 2019.

monitoring, weather forecasting, surveying, mapping and geographic information, forest fire prevention, time synchronization for communication systems, power dispatching, disaster mitigation and relief, emergency search and rescue, and other fields.[76] The BRI member states would have all these services available for themselves.

China is trying to plug in the BDS with other global satellite systems to provide free research and use in rescue services around the world. It has been recognized by the International Civil Aviation Organization, the International Maritime Organization, and the 3rd Generation Partnership Project (a standards organization which develops protocols for mobile telephony). The BDS has already been used in the Safe City Project in Phongsaly in northern Laos. It is used to maintain public security, and position police forces and emergency vehicles. BDS is expected to make the applications of the BeiDou system tailored to suit customers' needs. BDS can provide diverse and innovative services. For example, accurate positioning can be used in driving tests and the overhauling of tracks of high-speed railways. This system is also expected to have significant utility in arenas like disaster management. It would help to monitor landslides and dam deformations using accurate positioning. It is broadly argued that the capabilities of the BDS can be only limited by imagination.[77] Thus, there appears to be much attraction towards the acquisition of this system amongst the BRI states.

As of May 2019, BDS covers 30 countries involved with the BRI, including Pakistan, Laos, and Indonesia. China plans to extend BeiDou services to all the BRI countries.[78] Also, providing high-quality navigational service to

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[76] Rui C. Barbosa, "Beidou-3 navigation satellite launched on Long March 3B," *NASA Spaceflight.com,* April 20, 2019, see https://www.nasaspaceflight.com/2019/04/beidou-3g2q-navigation-long-march-3b/, accessed 10 May 2019.

[77] "China's BeiDou navigation system to serve B&R countries," *Xinhua News Agency*, November 16, 2018, see https://eng.yidaiyilu.gov.cn/qwyw/rdxw/71826.htm, accessed 15 May 2019.

[78] Sabena Siddiqu, "BRI, BeiDou and the Digital Silk Road", see https://www.asiatimes.com/2019/04/opinion/bri-beidou-and-the-digital-silk-road/, accessed 14 May 2019.

the Arab world is high on the Chinese agenda. The Arab ICT Organization had organized the second edition of the "China-Arab States BeiDou Cooperation Forum" in Tunis(Tunisia) in April 2019 in partnership with CSNO. This forum is a multilateral platform for cooperation and exchange between China and the Arab countries in the field of Satellite Navigation. The aim of this forum is to further promote BeiDou services and applications benefiting the socio-economic development of the Arab states as well as the other countries along the BRI region, and in African countries as well.[79]

3.1.2 Space Silk Road[80]

A comprehensive evaluation of the Digital Silk Road is closely linked to China's activities in space. As a part of the initiative, the country not only provides internet connectivity but also satellite launches. Thus, "Space-based Silk Road" is likely to encompass many powerful communications satellites and high resolution remote-sensing satellites.

The Institute of Space & Earth Information Science (ISEIS) of the Chinese University of Hong Kong (CU) has signed an agreement with Dong Fang TengFei (DFTF, a subsidiary of the Beijing Xiangzhi company) in 2014 to join the "Space Silk Road" for developing global satellite services. To further international services for Chinese satellites, important aerospace enterprises and research institutes — like the China Great Wall Industry Corporation, China Satellite Communication Co Ltd, etc. — have come together to form an International Alliance of Satellite Application Service (ASAS) in August 2014, and have initiated the "Space Silk Road" programme to coordinate international cooperative research in space-based satellite technology for the 'Silk Road Economic Belt' strategy.

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[79] "The Second "China-Arab States BeiDou Cooperation Forum," Arab Information and Communication Technologies Organization, April 2, 2019, see http://www.aicto.org/the-second-china-arab-states-beidou-cooperation-forum/?lang=en accessed on 30 April 2019.

[80] This section is based on author's earlier work, available at https://idsa.in/idsacomments/silk-road-initiative-via-aerospace_alele_211015, accessed 16 May 2019.

Apart from governmental and private agencies, a few interdisciplinary non-profit NGO's are also involving themselves in this project. The China Satellite Global Services Alliance (CSGSA) is one such agency. Launching satellites is only one aspect of data collection. It is important to have the ground infrastructure for the purposes of collection, analysis and dissipation of data. Hence, they are investing in developing good ground facilities. Currently, the CSGSA has established trial satellite receiving bases in Xinjiang, Ningxia, Hainan, and Fujian, all important locations for the B & R projects. Subsequently, for establishing receiving stations they propose to move westwards over land, through Central Asia and its neighbourhood, to Europe, the Indian Ocean, Africa, and Latin America. China would require assistance from the Central Asian states, Malta, Malaysia, India, the USA, Brazil, and Norway for establishing satellite receiving facilities within their borders.

The idea of the "Space Silk Road" is almost nearing reality. On 29 May 2015, the CSGSA and the International Trade Centre (ITC) jointly held the 2nd China Satellite Global Services International Cooperative Talks wherein international experts discussed the construction of the Space Silk Road. With an increase in global aviation traffic in general, and an increase in traffic in the region owing to Belt and Road network, a rise in the safety demands of civilian airlines is expected. The disappearance of Malaysia Airlines flight MH370 and the shooting down of flight MH17 over Ukraine highlights the need for a more comprehensive satellite network to provide additional and real time information about the position of aircraft.

The existing black box in aircraft provides information only after a mishap (provided it is found and is not damaged). China wants to use the Space Silk Road system to create a live-feed "black box" which would provide constant global coverage of all air, shipping, and overland routes. The system is also expected to enable planes and satellites to communicate with each other. China proposes to use the Beidou navigational network as one of the important components in this system. Obviously, all this would require an addition to the civilian aircraft equipment inventory by adding relevant transmitters, receivers, data storage equipment, etc. This could generate additional business too.

Seamless internet connectivity would be essential for the success of space BRI as there could be issues with aircraft and ships passing through areas covered by different satellite signals. The main satellite company in China — the China Satellite Communications — has plans to launch new satellites using the Ka-band frequency (which offers higher speeds and requires a smaller satellite dish for operations) that will envelop the BRI region in the near future. Possibly, in this connection, in December 2018, China carried out the launch of a secretive communications satellite to geostationary orbit. The payload is known as the communication technology test satellite 3 (Tongxin Jishu Shiyan Weixing-3), or TJS-3. In fact, in September 2015, China launched the communications satellite TJS-1, and Ka-Band frequency broadband communications were tested.[81] China may also have to look for other options — like high-altitude drones or near-space systems — to ensure that no internet blackout takes place.

Statistics from the International Disaster Database show that the relative disaster losses along the Belt and Road are double the global average of meteorological disaster. The Fengyun satellite — developed by China's Aerospace Science and Technology Group — is an important member of the Global Earth Observation and Meteorological satellite. With the help of these satellites, all Arab countries have access to tailor made all-weather, three-dimensional observation, clearly capturing changes in wind and cloud, and effectively compensating for the shortcomings of ground observation. The Fengyun 2 H star — which was launched in June 2018 —would provide better monitoring services for Arab countries after completing the on-orbit test.[82]

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[81] See https://gbtimes.com/china-sends-secretive-satellite-towards-geostationary-orbit-with-38th-launch-of-2018, accessed 16 May 2019.

[82] "Xi Jinping: To build a "Belt and Road" space information corridor," Netcom military and civilian integration, China Aerospace Science and Technology Group Co., Ltd., July 2018, see https://mp.weixin.qq.com/s?__biz=MzI0NjU2NDMwNQ==&mid=2247485987&idx=1&sn=4e0e96f65efe032f29b0daffd71bb997&chksm=e9bc1e9ddecb978b3e79cfcee210cbb963d55be7b5c0bd2009bb430d31aff0354f2789f57fc9&scene=0#rd, accessed 19 June 2019.

There are some projects (mostly at the bilateral level) which are not clearly identified as projects under the BRI umbrella; however, it appears that such projects would be a part of the (official or unofficial) BRI mandate. Some projects could be said to have begun before the initiation of the BRI and now could be supported by BRI policies.

The most startling example today is in Argentina. Here, one project has sparked broad international media interest. This is a 50 million USD Chinese-funded satellite and space mission control centre in the country's Patagonia region that had a role in landing a Chinese rover on the far side of the Moon in January, 2019. The bilateral agreement between China and Argentina was signed in 2012 (only the non-military clause was added in 2016,) and gives Argentina access to antenna time at the control centre. However, there is no evidence that there are any scientific benefits for Argentina from this project. The project is run in a very secretive fashion, and common people, visitors, and the media have no access to the site. Also, no information about the nature of the ongoing work there is shared with the outside world.

In comparison, there is some clarity about the project with Brazil which got established in August 2014. The Chinese Academy of Sciences (CAS) and Brazil's National Institute for Space Research (INPE) in São Paulo have a China–Brazil Joint Laboratory for Space Weather. The project provides real-time data about the processes and disturbances in the Earth's upper atmosphere to researchers in both countries.[83]

In South Asia, Pakistan is an important partner for China in its Space Silk Road project. The science and technology relationship between Islamabad and Beijing dates back to the 1970s, and has typically involved China's assistance in technology transfers, undertaking joint projects and training. In recent times, the cooperation between the two countries has deepened and widened owing to the China-Pakistan Economic Corridor (CPEC),

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[83] Lucien O. Chauvin and Barbara Fraser, "South America is embracing Beijing's science silk road," *Nature,* May 8, 2019, see https://www.nature.com/immersive/d41586-019-01127-4/index.html, accessed 16 May 2019.

a flagship BRI project. They are planning to expand and deepen their collaboration in the areas of new and emerging technologies, such as nanotechnology, biotechnology, and information and communications technology. Space is also one area which is getting a lot of attention. China has already launched satellites for Pakistan. Recently, in 2018, a remote sensing satellite was launched. Now, there is a proposal to cooperate in human space flight with the aim of sending a Pakistani astronaut into orbit by 2022. Their cooperation also extends to space security efforts in multilateral forums.[84]

By connecting industries and infrastructure projects along the BRI, China's satellite navigation and communication system hopes to dominate the new digital infrastructure in the BRI space. As new ideas for space-based internet services emerge, China is well ahead of the curve. Google, Amazon, and SpaceX are all developing projects to provide broadband services around the world through networks of satellites numbering hundreds.[85]

On 16 July 2018, China announced its plans to launch 320 low-orbit satellites (the Hongyan constellation; Hongyan stands for 'wild goose'; in ancient China, geese were used to deliver messages) to provide worldwide communication services. This is a global two-way, real-time data transmission system along with other multimedia data services. It is expected to provide energy and engineering companies with services, including the management of global assets, personnel positioning, and emergency rescue and communication services. Eventually, this satellite communication network will take the place of the ground-based network, and will allow a mobile phone to be connected everywhere on the planet, either in a remote desert or at sea.

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[84] "Space Silk Road: Pakistan And China Enhance Space, Science And Technology Cooperation," *Spacewatch Asia Pacific*, see https://spacewatch.global/2018/11/pakistan-and-china-enhance-space-science-and-technology-cooperation/, accessed 28 April 2019.

[85] C. Rajamohan, "Raja Mandala: A silk road for the heavens," *The Indian Express,* April 23, 2019, see https://indianexpress.com/article/opinion/columns/india-china-silk-route-beijing-belt-and-road-initiative-big-earth-data-5689184/, accessed 08 May 2019.

The first satellite, called Hongyan-1 (launched in December 2018) is to be one of nine satellites placed in orbit by 2020 as part of a pilot demonstration for the Hongyan system. The initial 60 satellites making up the first phase of deployment of the Hongyan mega-constellation are supposed to be in orbit and in operation by around 2023.[86] The entire 320 satellite system is expected to be completed by 2025. A factory capable of assembling 130 Hongyan satellites every year has been constructed in Tianjin, a port city close to Beijing. The Hongyan mega-constellation will reportedly be capable of providing mobile connectivity to 2 million users, satellite broadband to 200,000 users, and IoT coverage to 10 million users within China as well as in countries participating in the BRI.[87]

China's space ambition neatly folds into the technological requirements of the developing BRI countries. Control of the high ground of space would allow the domination of the earth because if information is the basis of 21st century power, space is the domain through which that information will flow. While China presents these dramatic advances as part of its effort to promote space and digital connectivity through international cooperation, there is no mistaking its implications on all fronts — geopolitical, technological, in foreign policy, and at the geostrategic level.

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[86] Rupali Pruthi, "China to launch 300 satellites to provide worldwide low-orbit communications," *Jagran Josh,* July 17, 2018, see https://www.jagranjosh.com/current-affairs/china-to-launch-300-satellites-to-provide-worldwide-loworbit-communications-1531819736-1, accessed 08 May 2019.

[87] "China's New Space Race: First Satellite of CASC's Hongyan LEO SATCOM Constellation to Launch By End Of 2018," *Spacewatch Asia Pacific,* see https://spacewatch.global/2018/11/chinas-new-space-race-first-satellite-of-cascs-hongyan-leo-satcom-constellation-to-launch-by-end-of-2018/, accessed 08 May 2019.

SECTION IV

4.1 ASSESSING THE DIGITAL AND SPACE BRI

The BRI is an ever evolving concept that has changed considerably since its inception in 2013. It has generated a blend of optimism and consternation around the world. This is due to the disruptive nature of the technology itself, and the geo-economic and geopolitical environment in which the BRI formulates can either reinforce or undermine the conscious choices made by China or other states. The impact of China's investment on both the digital and space front will primarily depend on two critical factors (See note 49): first, whether China pursues its ambition within a politically more "assertive", or more "cooperative" framework; secondly, the way the world will respond to the challenges accruing from China's rise— that is, either in a "united and strong" manner, or in a "bifurcated and weak" manner. Many of the Belt and Road Projects have explicit geopolitical, technological, security, and geostrategic implications as dwelt upon below. This initiative can be seen as an exercise primarily to position China as a fulcrum of the induced change in the international strategic, digital, and space dynamics which, in turn, aims to alter the dynamics of the larger world order.

4.1.1 The Economic Dimension

China's BRI projects aim to integrate financial markets and connect nation states with a string of next generation digital infrastructure and satellite coverage. This initiative could be seen as China's move to dominate a large part of the global communications market and, in turn, multiply its own economic growth in the international arena. Interestingly, a New World Bank Group Study has also promoted the BRI, stating that it could "speed up economic development and reduce poverty for dozens of developing countries; but it must be accompanied by deep policy reforms that increase transparency, improve debt sustainability, and mitigate environmental, social,

and corruption risks."[88] It further states that, if implemented in the envisaged manner, BRI could help lift 32 million people out of moderate poverty and boost global trade by up to 6.2 per cent, and up to 9.7 percent for corridor economies.[89] Global income could also increase by 2.9 per cent.[90]

The global activities of Chinese tech companies are a natural extension of China's going out policy, which also provides a chance to developing economies to catch up with the high speed developed digital world. ZTE and Huawei have managed to become key partners for major telecom operators in advanced countries, and is also making inroads into developing economies by setting up data centres, laying down optical fibre cables, and proposing ICT infrastructure. For instance, Zambia's communications infrastructure is going to be built by Huawei entirely, and Chinese e-commerce giants Alibaba and Tencent are expanding their services for small businesses in Southeast Asia and Africa.

China has a knack for spotting trends, making cost-effective products, and understanding the needs of the customer, all of which have allowed it to easily capture markets. This has been given a boost by home grown companies like Tencent, Alibaba, and Huawei that also aid in promoting the same in the development of the Digital Silk Road. Yet, these opportunities mean more challenges for developed countries as developing economies gain more level playing fields through China's technological transfers in the days to come. In Myanmar, in 2017, less than 1 per cent of the population had access to broadband. Now, the country's Minister of Transport and Communication is operating with Huawei to bring in 5G broadband services by 2025, catapulting many generations of mobile networks, in contrast to countries like Malaysia or Singapore.[91]

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88 "Success of China's Belt & Road Initiative Depends on Deep Policy Reforms, Study Finds," The World Bank, June 18, 2019, see https://www.worldbank.org/en/news/press-release/2019/06/18/success-of-chinas-belt-road-initiative-depends-on-deep-policy-reforms-study-finds, accessed 24 September 2019.

89 See note 86.

90 See note 85

91 Chan JiaHao, "China's Digital Silk Road: A Game Changer for Asian Economies," *The Diplomat,* April 30, 2019, see https://thediplomat.com/2019/04/chinas-digital-silk-road-a-game-changer-for-asian-economies/, accessed 20 May 2019.

As mentioned earlier, China's space program is also an integral part of its national economic rejuvenation and development goals. The country's space program is aimed at long-term wealth creation for the Chinese nation by utilizing a space-based economy. For instance, China's plans to establish a lunar base would be a means of accomplishing its economic goals through deep space exploration, asteroid mining, and exploitation.[92] A base on the moon, with the industrial capacity to build space craft by using lunar resources, will also lower the costs of inter-planetary travel.

The rapid development in the digital and space Silk Road would not only give a push to the Chinese economy but could also side line other emerging digital and telecom companies, and ensure Beijing as the sole provider of digital and space services at least within the BRI countries.

4.1.2 The Geopolitical Dimension

With the growing tentacles of China encompassing both the digital domain and the space medium, there is no denying the fact that it will eventually have to lock horns with the major player in the field — the USA. Moreover, sensing competition, many thriving national companies of other states may bring out their shields to protect their own interests. This would, no doubt, give rise to a fragmented international community.

It is important to note that by signing up to the BRI 'Space and Information Corridor', the BRI states would become reliant on Chinese-provided digital and space services. This would give China enough vantage to steer the policy options of those states as it would control the vital capabilities that support their economic growth. Additionally, Chinese tech giants are making inroads in many BRI as well as non-BRI states. Backed by strong state support, Chinese tech companies aim to become global leaders in Information Technology and network equipment manufacturing as well as in their plans to fortify their position in global deployment and standards-setting of 5G. The scale of Chinese state support for emerging technologies

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[92] Namrata Goswami, "China's Get-Rich Space Program," *The Diplomat,* February 28, 2019, see https://thediplomat.com/2019/02/chinas-get-rich-space-program/, accessed 22 May 2019.

undermines the ability of US or any other firms to compete fairly either within China or in third markets. It is known by many players that first mover advantage in deployment will create new revenue streams from the expanded use of the IoT and other 5G-enabled technologies, and so enable faster advancements in a country's development.

One of the major debates has been over the deployment of 5G networks. As the trade and technology competition driven by US economic and national security concerns and by China's ambitious economic, technological, and industrial development goals, has steadily escalated over the past years, every major issue linked with the network has become politicized.[93] On 15 May 2019, the US administration issued an Executive Order (EO) stating the need to "secure the Information and Communications Technology and Services Supply Chain," as a part of which both sides have imposed tariffs on the import of goods from the other country.[94] This EO comes in the wake of allegations against Chinese companies — and specifically against Huawei — on account of malicious activities, like economic and industrial espionage and close ties with the Chinese government. This EO would have global ramifications as Chinese-made ICT products are much cheaper than their Western counterparts. Consumers of ICT products are generally individuals and businesses. If companies of Chinese origin are forbidden or restricted from carrying out their business in the USA or with their American counterparts, the costs of ICT products will certainly rise.

While the USA has the upper hand vis-à-vis innovation capacity, China has the first mover advantage as it has already built its domestic 5G ecosystem, and Chinese companies are competing for market share abroad. This geopolitical tiff may give rise to a fragmented 5G ecosystem, paving the

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[93] "Eurasia Group White Paper: The Geopolitics of 5G," *Eurasia Group,* November 2018, see https://www.eurasiagroup.net/siteFiles/Media/files/1811-14%205G%20special%20report%20public(1).pdf, accessed 19 June 2019.

[94] "Statement from the Press Secretary", The White House, May 15, 2019, see https://www.whitehouse.gov/briefings-statements/statement-press-secretary-56/, accessed 26 June 2019.

way for two politically divided and potentially non-interoperable technology spheres of influence — one steered by the USA and backed by the technology development of the Silicon Valley; and another chaperoned by China and braced by its highly capable home grown digital companies. Efforts by the USA and like-minded allies to exclude Chinese networking equipment suppliers from Western and allied 5G networks will continue, with the US-China trade and technology confrontation showing little sign of easing, and the potential national security risks posed by Chinese hardware increasingly dominating policy debates. However, the brunt of this power politics has to be borne by the middle powers and growing economies.

4.1.3 The Technology Dimension

China is also making headway in shaping international standards for emerging technologies, again using its first mover advantage to aid in the introduction of most of the dual-use technologies. In 2015, the Chinese leadership set up a "Special Leading Small Group on the Major Project of Standardization along with the BRI project" to coordinate the idea of "first develop then regulate." The major focus of the group was on promoting China's home grown standards. Currently, China is the only country ahead of the UN's International Telecommunication Union's "2020 5G development schedule." Chinese experts are leading the way in the 5G group of the International Organisation for Standardisation (ISO) (also called 3rd Generation Partnership Project or 3GPP), by submitting 40 per cent of the standards and 32 per cent of the documents. It has been estimated that China is the leader in the standardization of 5G, the Internet of Things, and blockchain technology. In June 2018, ISO members approved China's IoT Reference Architecture (ISO/ IEC 30141).[95] China and the International Telecommunication Union (ITU) have also signed a "letter of intent to strengthen Cooperation on Telecommunication and Information Networks" within the framework of the Belt and Road

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[95] Kristin Shi-Kupfer and Mareike Ohlberg, "China's Digital Rise," Mercator Institute for China Studies, April 2019, see https://www.merics.org/sites/default/files/2019-04/MPOC_No.7_ChinasDigitalRise_web_4.pdf, accessed 10 June 2019.

Initiative.[96] Besides, China also holds important positions in the three main standard setting bodies namely: ITU, ISO, and IEC (International Electrotechnical Commission).[97] This can also be seen as the country's long term strategy wherein any kind of restrictions are not put on the Chinese products and services in the name of regulations.

The standard setting process is crucial as it will determine not just how networks would be built but also how money flows between participants in the technology ecosystem. For instance, companies whose technology becomes the industry standard for 5G will receive royalty payments from other ecosystem participants.[98] Politics will play a significant role in 5G standards setting. For instance, in the selection of a control channel modulation standard championed by China's 5G leader Huawei: while the standard had technical merit, its approval triggered deliberation, with some tech experts indicating that China's burgeoning global economic clout and overall presence at 3GPP were compelling determinants of the confirmation. There is no doubt that Chinese firms, backed by Beijing, are exerting much more influence in the standards-setting process. However, the USA is not that far behind.

4.1.4 Security Dimension

There is a lurking fear that China has a backdoor access to many of the digital infrastructures it constructs. In an investigation report brought forth by French newspaper *Le Monde*, China was accused of allegedly inserting a backdoor in the African Union (Chinese built Headquarters) servers that allowed the copying of confidential data onto servers in Shanghai.[99] The

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96 See note 25.

97 See note 51.

98 See note 75.

99 Abdi Latif Dahir, "China 'gifted' the African Union a headquarters building, and then allegedly bugged it for state secrets," *Quartz Africa,* January 30, 2018, at https://qz.com/africa/1192493/china-spied-on-african-union-headquarters-for-five-years/, accessed 22 May 2019. The original report by *Le Monde* can be accessed here: https://www.lemonde.fr/afrique/article/2018/01/26/a-addis-abeba-le-siege-de-l-union-africaine-espionne-par-les-chinois_5247521_3212.html.

risk of backdoor access can arise during both software and hardware design and development. On the basis of potential threats to national security on the grounds of espionage and data theft, the USA and Australia banned the Chinese state-affiliated firms Huawei and ZTE Corporation from its 5G mobile network; other countries are also reconsidering their relationship with these firms.[100] These threats have also motivated other countries to rethink their investment plans with Huawei. However, because of the benefit of low cost data networks, many countries tend to undermine the security risks. Far from being limited to ICT projects, this increased threat of backdoor access is likely to impact more infrastructure types in the future.

China's mission of becoming a global digital connector and leading provider of 5G technology (which would be a catalyst in developing refined AI technologies, like the facial recognition system and autonomous vehicles) to a number of developing states also raises the plausibility of exporting its Great Firewall model that has demonstrated ruthless efficiency in cutting off its internet from the outside world, thus blocking unwanted international headlines and social media platforms. Human Rights Watch reports that China has developed an app to exercise control over the population across many regions in the country. China has been profusely investing in setting up facial recognition technology for many developing countries. The limited technical capabilities of many of these states often favour China as it will have to directly operate the system, and provide training in the interim period. One report has highlighted that all the facial data collected in Zimbabwe has to be sent to China so that its algorithm could be refined. This means that Zimbabwe may not have exclusive control over its data.[101]

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[100] Mike Cherney and Dan Strumpf, "Taking Cue From the US, Australia Bans Huawei From 5G Network," *Wall Street Journal*, August 23, 2018, https://www.wsj.com/articles/australia-bans-chinas-huawei-from-5g-networkrollout-1534992631, accessed 23 May 2019.

[101] Daniel Kliman, Rush Doshi, Kristine Lee, and Zack Cooper, "Grading China's Belt and Road," *CNAS*, April 2019, see https://s3.amazonaws.com/files.cnas.org/CNAS+Report_China+Belt+and+Road_final.pdf, accessed 23 May 2019.

Additionally, its continuous efforts to harness the potential of AI and big data technologies indicate that it would soon have the ability to handle a huge amount of data flow from countries connected via the digital highway. This would give Beijing greater political influence and advantage in shaping up a new cyber governance model. China is also heavily financing a vast network of undersea cables. According to research, 98 per cent of global telecommunication would be relayed through international waters.[102] Currently, Chinese companies are handling nearly 90 undersea cable projects, either as suppliers or owners. In fact, Huawei Marine has completed over a dozen undersea cables project in South Asia, and close to 20 are under construction.[103] Moreover, internet users have no say over which cable system transmits their data across the globe, and just 380 active submarine cables handles global internet traffic via a landing station.[104] These cables are vulnerable to cyber intrusion, particularly in underdeveloped countries where such tampering cannot be monitored. In addition, China is the largest manufacturer of IoT devices — that is, physical equipment embedded with sensors that collect data and connect to each other as well as the broader internet. The rapid increase in these allegedly unsecure devices may create several vulnerability points for cyber-attacks, intelligence collection, industrial control, or censorship.[105] China also recognizes the likelihood of increasing demand in the space arena, and has made quick moves to grab the market. It has been found making focused efforts to engage states in the 'space net', and by doing so, is increasing the number of 'made in China eyes' in space and its reach of attaining maximum amount of data and intelligence gathering.

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[102] Sabeena Sidiqui, "BRI, BeiDou and the Digital Silk Road," *Asia Times,* April 2019, see https://www.asiatimes.com/2019/04/opinion/bri-beidou-and-the-digital-silk-road/, accessed 28 May 2019.

[103] Huawei Marine, see http://www.huaweimarine.com/en/Marine/Home/Experience, accessed 28 May 2019.

[104] Ibid.

[105] US-China Economic and Security Review Commission, 2018 Annual Report, see https://www.uscc.gov/sites/default/files/Annual_Report/Chapters/Chapter%204%20Section%201-%20Next%20Generation%20Connectivity_0.pdf, accessed 28 May 2019.

Data is indeed the new age oil which is manoeuvring humans, governments, and organisations. All require access to humongous information about real-life human behaviour, which makes data perhaps the most important resource in the world. Thus, China's control over a vast amount of data is the most obvious strategic risk. By controlling data flow, China can understand markets better, identify and eliminate local competitors, and carry out commercial research and development, thus limiting the capacity of home grown players to reap the economic benefits of data produced in the region. This could also pave the way for a new form of colonialism called the "data colonialism" wherein raw information is mined, processed, and used to exercise control throughout the world.[106] For instance, data giants in Beijing can collect and collate medical and personal records of officials in distant countries, and use it to manipulate public opinion.

Also, those who control data would eventually reshape the world's economic and political future, as well as eventually the future of world order. China's dominance of global communication would also be an opportunity for it to promote its own cyber governance model which runs counter to the model of free and accountable cyberspace. In 2018, a report titled "The rise of Digital Authoritarianism" has China being accused of being the front runner of abusers of internet freedom, and also blamed of exporting its "techno-dystopian" model to other nations. [107]Egypt, for instance, has been drawing heavily from China's model of cyber governance.[108] In 2018, Egypt passed a cyber crime law that infringes on the individuals' right in the name of national security.[109] China has hosted a two week long seminar

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[106] Yuval Noah Harari, "Who Will Win the Race for AI?" *FP Global Thinkers,* 2019, see https://foreignpolicy.com/gt-essay/who-will-win-the-race-for-ai-united-states-china-data/, accessed 31 May 2019.

[107] Emily Dreyfuss, "The Internet Became Less Free In 2018. Can We Fight Back?" *Wired,* December 26, 2018, see https://www.wired.com/story/internet-freedom-china-2018/, accessed 31 May 2019.

[108] Tin Hinane El Kadi, "The Promise and Peril of the Digital Silk Road," *Chatham House,* June 2019, see https://www.chathamhouse.org/expert/comment/promise-and-peril-digital-silk-road, accessed 02 June 2019.

[109] Ibid.

on "Cyberspace Management" for officials of countries along the Belt and Road Initiative," besides conducting sessions on its systems of surveillance and censorship for media officials from Morocco, Libya, and Egypt.[110] Promoting its own model of cyber governance (that is, sovereign cyberspace), enables China to protect its own critical information infrastructure from unwanted cyber intrusion and foreign data access. At the same time, controlling data would allow the country to monitor enterprises and citizens to enforce compliant and conformist behaviour.

4.1.5 The Geostrategic Dimension

Another important aspect of China's digital and space strategy is civil-military integration which has been a national strategy since 2014. It has been debated that the new age Silk Road would play a pertinent role in the formation of strategic alliances and security ties for China. This would aid not only in transforming the Asian security dynamic but also in creating a strategic space for China. Becoming a technology superpower is also closely knitted into China's ambition of becoming a leader in dual-use disruptive technologies, thereby advancing cyber and space capabilities, weaponizing AI, gaining quantum computing supremacy, and data colonialism. At the same time, Some BRI investments could advance potential military advantages for China.

An important point of contention has been China's efforts to merge its commercial space industry with its defense industrial base, which would aid in accelerating innovation in outer space systems. Under the ambit of BRI, Pakistan is the leading example of how Chinese projects are being used to give Beijing both favour and leverage among its clients.[111] Pakistan

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[110] Abdi Latif Dahir, "China is exporting its digital surveillance methods to African governments," *Quartz Africa,* November 2018, see https://qz.com/africa/1447015/china-is-helping-african-countries-control-the-internet/, accessed on 08 June 2019.

[111] Maria Abi-Habib, "China's 'Belt and Road' Plan in Pakistan Takes a Military Turn," *The New York Times,* December 19, 2018, see https://www.nytimes.com/2018/12/19/world/asia/pakistan-china-belt-road-military.html, accessed 19 June 2019.

has allowed China's BeiDou satellite navigational System for military services to ensure precise guidance for missiles, ships, and aircraft.[112]

In the coming years, the IoT and related developments that incorporate more sophisticated sensing technology would be integrated into smart cities, electric grids, and other connectivity infrastructure that could boost productivity. However, the derelict security measures and universal connectivity of IoT devices create numerous points of vulnerability that China can exploit to hold any nation's critical infrastructure, businesses, and individuals at risk. These types of risks will grow as IoT devices become more complex, more numerous, and embedded within existing physical structures. The size, speed, and impact of malicious attacks against IoT devices will intensify with the deployment of 5G. Smart infrastructure or cities can either be an asset or threat, depending on what is being collected and who is watching. Moreover, "smart" infrastructure could be converted into a surveillance infrastructure during a wartime situation.

A common understanding has been that future wars would be fought using data and high-end technologies. Undisputedly, future military victories would be determined by those states that conceive, design, build, and operate a mix and match of different information based technologies to deliver new combat power. China's control of both the digital and space domain also give weight to the fact that China may be able to control future warfare dynamics.

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[112] See note 92.

SECTION V

5.1 LEARNING AND IMPLICATIONS FOR INDIA

India was one of the early critics of China's BRI venture as it infringes India's territorial integrity and sovereignty.[113] There was also scepticism regarding China's hidden strategic motivations that kept the country distant. Chinese development of the digital and space Silk Road has left the country in a strategic dilemma since the country, unwantedly, finds itself tied with Chinese telecom giants like Huawei.[114] Even the south Asian neighbours of the country, including Nepal, Pakistan, and Sri Lanka, have deep reliance on China's telecom companies. This brings into question the implications of not being the part of the BRI and the options available for the country. India's intent of staying away from the BRI needs to be backed by its own strategy.

India does realize that advances in digital infrastructure and outer space would pave the way for social, commercial, and strategic benefits. For future growth, both the digital and the space medium are critical factors, especially due to the dual use of many of the technologies. India is not a key player in technology development or the manufacture of digital

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[113] "Official Spokesperson's Response to a Query on Participation of India in OBOR/BRI Forum," MEA, May 13, 2017, see https://mea.gov.in/media-briefings.htm?dtl/28463/Official+Spokespersons+response+to+a+query+on+participation+of+India+in+OBORBRI+Forum, accessed 24 September 2019.

[114] P. K. Mallick, "5G, Huawei and India," *VIF*, 2019, see https://www.vifindia.org/sites/default/files/5g-huawei-and-india_0.pdf, accessed 24 September 2019.

equipment;[115] but the country has joined the race for 5G, Quantum Computing, AI, and other emerging technologies.

The country is also taking strides in the outer space dimension — including building different types of satellites (ranging from Earth observation to strategic surveillance), rockets (capable of placing satellites in different types of orbits), space telescopes, undertaking deep space and planetary missions, and probably also sending humans into space in a couple of years from now.[116] Every mission in the space domain has been a technological challenge, and has been accomplished with a high degree of self-reliance and capability, despite many international technology embargoes.[117] The success of the Mangalyaan mission speaks volume of this fact. Not only has the country been able to explore outer space in a more economical way but it has also become self-reliant, and assists many nations in their space projects.[118] In 2017, India launched the South Asian Satellite to boost regional communication, and improve disaster links amongst its six neighbours that has helped the country to carve a unique place in space diplomacy.[119]

In order to set a roadmap for the rollout of 5G, the government of India had set up a high-level forum which, in its report, suggested the early

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115 Cellular Operators Association of India, *Annual Report 2017-18*, p. 11, see https://www.coai.com/sites/default/files/Annual%20Report%20COAI%202017-18.pdf, accessed 22 September 2019.

116 Dinesh C Sharma, "Space Race 2.0: ISRO now Stands at the Cusp of Next Change," *DownToEarth*, May 06, 2019, see https://www.downtoearth.org.in/news/science-technology/space-race-2-0-isro-now-stands-at-the-cusp-of-next-change-64257, accessed 25 September 2019.

117 Ibid.

118 Ajey Lele, "Mangalyaan's Mars Orbit: One Giant Leap for India, One Small Step for Mankind," *The Wall Street Journal*, September 24, 2014, see https://blogs.wsj.com/indiarealtime/2014/09/24/mangalyaans-mars-orbit-one-giant-leap-for-india-one-small-step-for-mankind/, accessed 25 September 2019.

119 South Asian Satellite to boost regional communication, Press Information Bureau, Government of India, May 07, 2017, see https://pib.gov.in/newsite/printrelease.aspx?relid=161611, accessed 25 September 2019.

allocation of the 5G spectrum, increasing the quantum of spectrum available, and lowering spectrum pricing. The panel had also suggested three initiatives — attracting global 5G conference events to India, setting up national 5G events, and the creation of a comprehensive programme to develop India-specific 5G applications. Moreover, the country has repeatedly stated its ambition of "not missing the 5G" bus.[120]

Additionally, the Department of Science and Technology (DST) has been working on a national plan to fund quantum computing research.[121] The Physics departments at the Indian Institute of Science, Bengaluru, and the Harish Chandra Research Institute, Allahabad, have also forayed into the theoretical aspects of quantum computing. A DST official has said, "The time has come to build one [quantum computer]."[122] AI is another sector where India is making remarkable progress. India ranks third in the world in terms of high-quality research publications in the field.[123]

India is also taking steps towards laying the foundations in many emerging technologies sector, although it still has a long way to go. A model similar

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120 Navadha Pandey, "India's Game Plan to Switch on 5G Connections," *LiveMint,* October 4, 2018, see https://www.livemint.com/Industry/Kf4PMD5CxQMB5AKR6gBcEP/Indias-game-plan-to-switch-on-5G-connection.html, accessed 24 September 2019.

121 Hari Pulakkat, "How India is contributing in Development of New-Age Computers?" *The Economic Times,* November, 13, 2018, see https://economictimes.indiatimes.com/tech/hardware/how-india-is-contributing-in-development-of-new-age-computers/articleshow/66598881.cms, accessed 22 September 2019.

122 Richa Bhatia, "Quantum Computing Researchers: Next Breed of Tech Experts India Is Going To Fall Short Of," [Author may please re-check. This does not seem accurate] *Analytics India,* October 23, 2018, see https://www.analyticsindiamag.com/quantum-computing-researchers-next-breed-of-tech-experts-india-is-going-to-fall-short-of/, accessed 24 September 2019.

123 Jacob Koshy, "India Ranks Third in Research on Artificial Intelligence," *The Hindu,* January 18, 2019, see https://www.thehindu.com/sci-tech/science/india-ranks-third-in-research-on-artificial-intelligence/article26030596.ece, accessed 24 September 2019.

to that of space could be used for promoting digital diplomacy. However, the major challenge has been the lack of the manufacturing sector. Most of the infrastructure for these technologies would most likely rest upon either technology imports, or on equipment made by foreign vendors in India. Nevertheless, the country has a huge market that could be used as economic leverage to achieve strategic objectives. Control over investments provides the Indian state an economic tool to attain political and strategic objectives. The Indian Government must keep this in mind while framing rules attracting foreign investment and regulating the participation of foreign firms in any sector.

Even technology collaboration should be given serious consideration wherein technology giants of different nations could be invited to build capacity in India. This will give a positive push to "Make in India", and the "Digital India" movement. However, India would need to lay down its own laws on data integrity, encryption, and access for law enforcement to electronic data, the Internet of Things and digital payments to ensure security as well as development together.

India should focus on a few niche areas and ensure better implementation. The country can help facilitate alternative paths of growth for its immediate neighbours by leveraging its links with its extended neighbourhood. This should be done in ways that are transparent and mutually beneficial — in contrast to Chinese projects that are seen as debt-traps and one-way roads to Beijing's domination. This will help re-imagine a joint destiny of growth for India and its immediate neighbours, which will build more sustainable relationships and make the neighbours partners in India's rise. There is a need to promote inclusive and affordable connectivity that is secure, reliable and mutually beneficial. It could become difficult for India to resist Chinese technological flows; but there needs to be a careful assessment of domestic needs, the ability to adopt new technologies, and the cost of innovation if India wants to attain competitive advantage in the long run.

5.2 CONCLUSION

From the Chinese perspective, the Belt and Road Initiative is in harmony with the philosophical notion of a "community of shared destiny." However, its overall expanse in general, and its growing control over the digital and space domain in particular, allows Beijing to bend this common

destiny towards satisfying its own geopolitical, geoeconomic and geostrategic ambitions.

China is incessantly tapping new markets and technology in ways that allows Beijing to overpower competitors in terms of sheer scale; it can prey on smaller economies, and possesses tools to control and manoeuvre their national policies. Such an arrangement creates long-term dependencies on China. The contentious presence of Chinese agencies in various global markets not only allows them to access such (continuously flowing) data, but also allows them to use it for various other purposes like creating a huge database of information.

China's increasing commercial presence across the globe is causing critical dependence at the same time as this presence begets substantial uncertainties and potential security risks. With rapid advances of China in the outer space arena, the country would soon become champions in providing indigenously owned and operated telecommunications and remote-sensing satellites to a number of countries. This is a part of Beijing's overall diplomatic outreach to these countries. Satellites are a channel through which countries can gain easy access to information; but they are also vulnerable to cyber hacks. Just as the digital infrastructure funded and built by China facilitates government-led surveillance, censorship, and even espionage in some cases, a space-based Silk Road may well increase China's influence over many BRI countries. Additionally, the BeiDou navigation system that may be granted under the ambit of BRI may further aid China to gather data at a global scale. Naturally, the dual-use nature of space and digital technologies means that China can provide potential military assistance under the aegis of assistance to developing nations in critical regions. While the global standards and norms governing both digital and space technologies are yet to fully mature, there have been numerous cases of technology being misused in order to influence and control public opinion. The effort of China at promoting the concept of "Internet sovereignty" — which allows the State to control what citizens can access online — are worrisome. Equally problematic are the efforts of various national governments to direct foreign firms that are acquiring the data of their nationals to store such sensitive and private information on servers located within their national borders. The governments are also seeking unlimited access to such data on the pretext of 'national security.'

Despite the hue and cry on security concerns, China continues to dominate in many markets, and its services are seen as cost-effective and attractive. This is because of the simple concept of need and accessibility — China is able to understand the requirements of developing economies and provides products/services accordingly.

It is also important to note that all the security concerns varying from data theft, manipulation, to setting the standard for emerging technologies is not exclusive to China. There have been times when, even the US, often seen as the pall bearer of the free flow of internet and data has been blamed for snooping and the violations of privacy. Indeed, the information era is encapsulated in the constant dilemma of national security and privacy rights. Thus, the current debate calls nation states to take an approach where everyone gets the pie even though the size of the pie may differ. This is largely about commercial competition. Countries with few resources, deficient ICT and space infrastructure, or limited political will, find China as a financial force-multiplier without whom it might have taken weaker economies another couple of decades to come at par with the developed economies at all levels. This dependency does not prohibit states from having enough oversight on these developments to ensure that the tools are not misused. The innovation of any kind needs to be based on reciprocal and transparent cooperation. When someone builds you a security system, you should change the password. It is important for countries to build and ascertain secure supply chains. It is also pertinent to minimize the risks by testing and verifying the security aspects of the imported equipment, and safeguard balanced reciprocal conditions with regards to China. At the same time, it is necessary to devise effective and autonomous policies to ensure the system of effective checks and balances. Another important move has to be towards data localisation rather than allowing the data to be stored in other countries where it is susceptible to attacks and misuse.

Middle powers can become regulators, as they control which firm would establish the technology in their country, and on what grounds. Countries could leverage the opportunity to bargain a better price from global players for the roll out of technologies like 5G services, or the development satellite launch vehicles. There also needs to be a push towards becoming self-sufficient, and allowing national enterprises to thrive in a fair competitive environment while learning the trades of the play from China.

It is important to understand that the impact of China's growing clout would not only envelop the BRI states but also put indirect pressure on the non-BRI nations to join the initiative. Shakespeare rightly said "What's in a name?" Many of the projects with non-BRI countries are on a bilateral basis; however, once finished they can easily be drawn under the blanket of China's BRI to garner additional benefits — like using China's navigational services via BeiDou. This also shows the bifurcation of the world into two parts wherein China is trying to create a new cost effective alternative, and challenging the established rule of order. With so many countries geo-economically involved with China, it would be really difficult to not allow China to have its way. China fully understands that the vehicle for BRI connectivity and monitoring is going to the assets in space. Hence, they are making significant investments into communication and earth observation satellites. Appreciating that the future of internet dependents not only on the sea based hub of cables for connectivity but also on satellite based connectivity, China is developing constellations of low earth orbit satellites for internet connectivity.

China is often seen as an emerging "revisionist" power that is fundamentally challenging the way global security is underwritten.[124] There are many options for the BRI states that could allow them to be in a mutually beneficial position with China — like using Chinese assistance for growth and development but at the same time ensuring their own safety. Another is placing eggs in different baskets — that is, allowing various states to invest in the digital and space sector for growth and development, but again, writing one's own rules of the game. In international relations, national interest always remains paramount, and countries tend to bend towards the side that gives those benefits at cost-effective rates. But again, countries should be vigilant enough to convert the cheap and easy into secure and profitable gains. Thus, it is pertinent for countries to ensure that BRI fits into their own national and regional development plans while ensuring BRI's compliance with a rules-based inclusivity.

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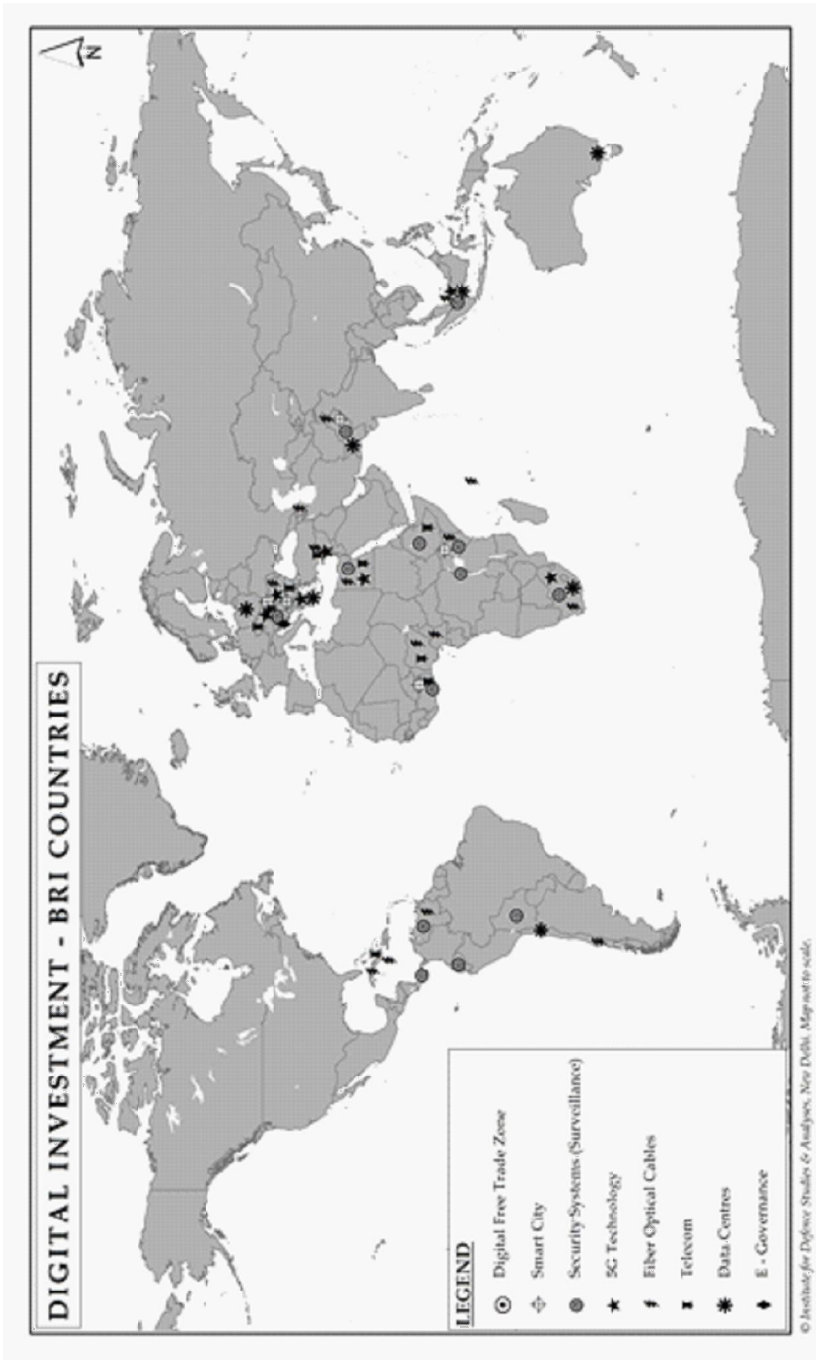
[124] Scott L. Kastner and Phillip C. Saunders, "Is China a status Quo or Revisionist State? Leadership Travel as an Empirical Indicator of Foreign Policy Priorities," *International Studies Quarterly,* March 2012, Vol. 56, No. 1, pp. 163-177.


DIGITAL INVESTMENT - BRI COUNTRIES
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LEGEND
Digital Free Trade Zone
Smart City
Security Systems (Surveillance)
5G Technology
Fiber Optical Cables
Telecom
Data Centres
E - Governance
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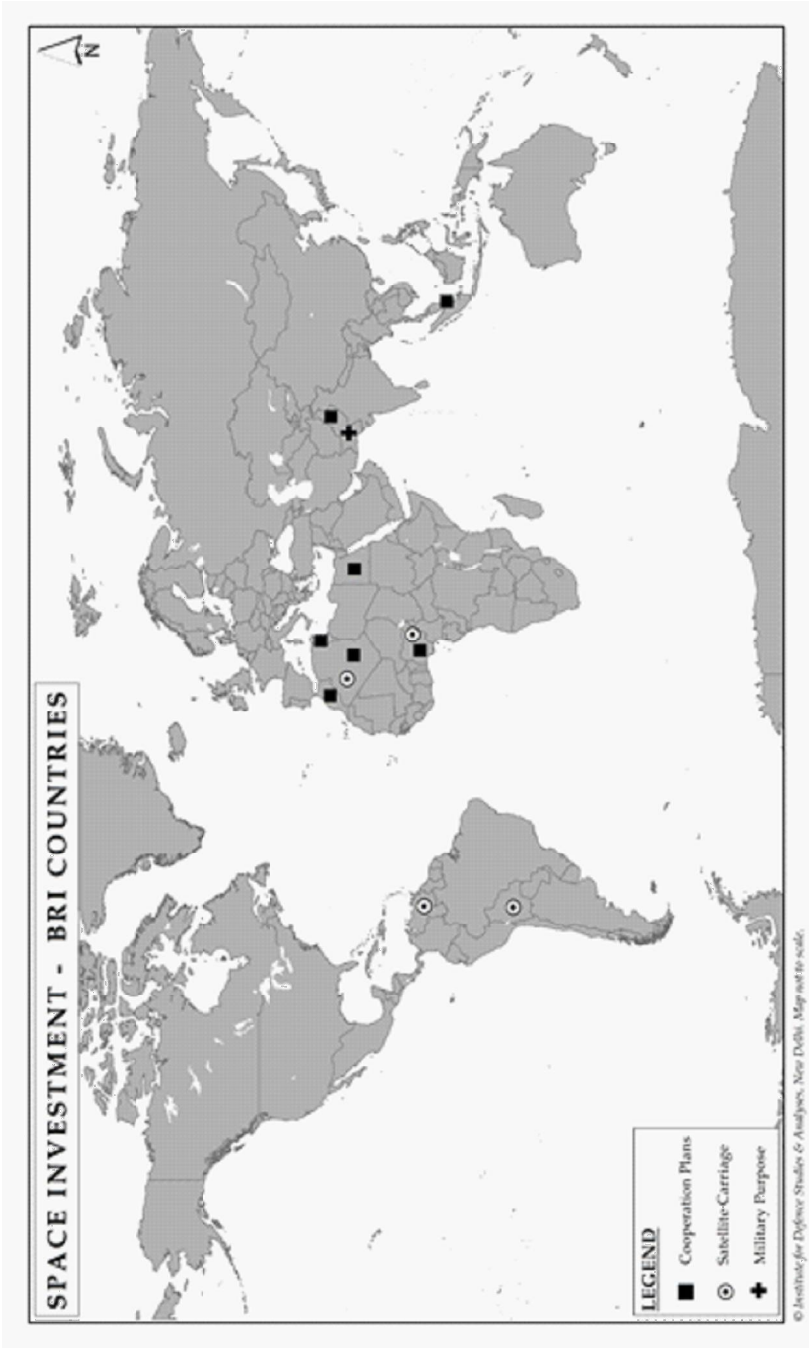
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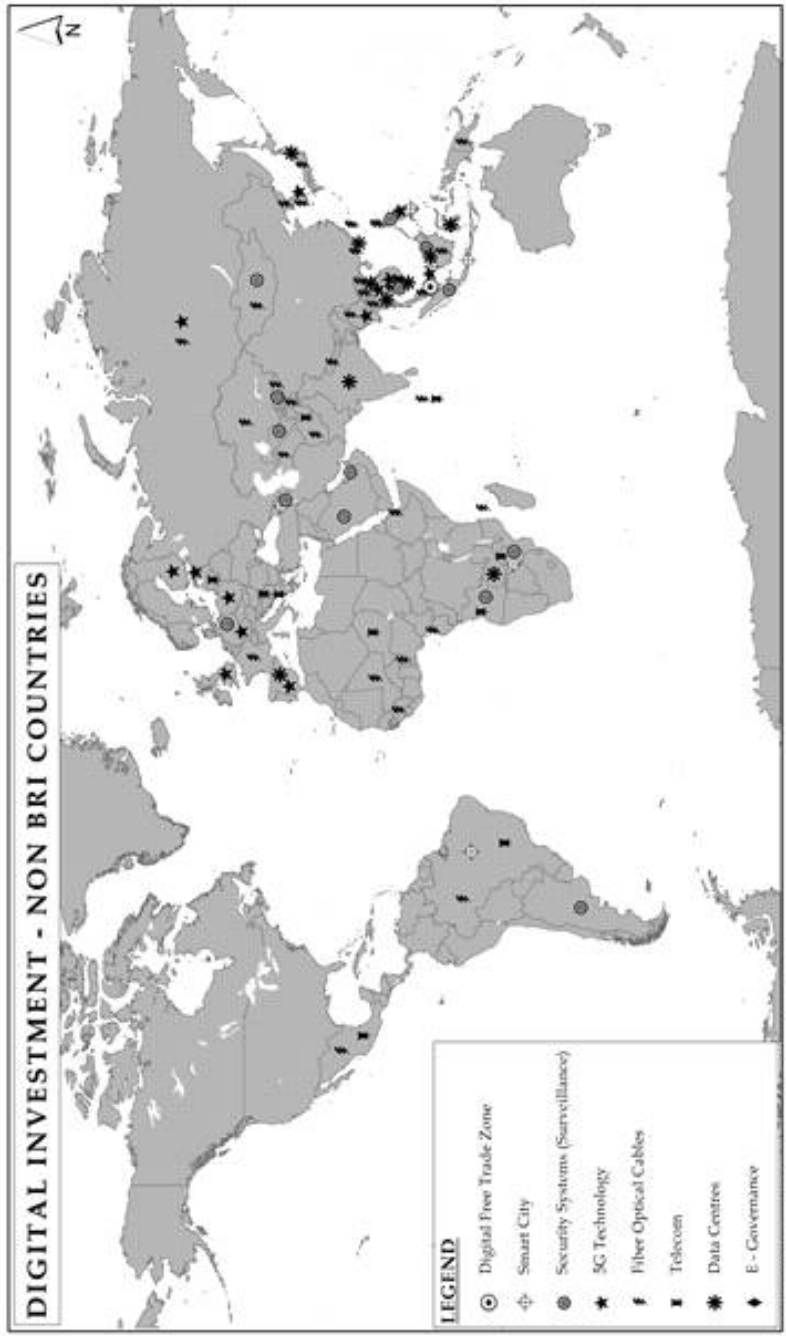
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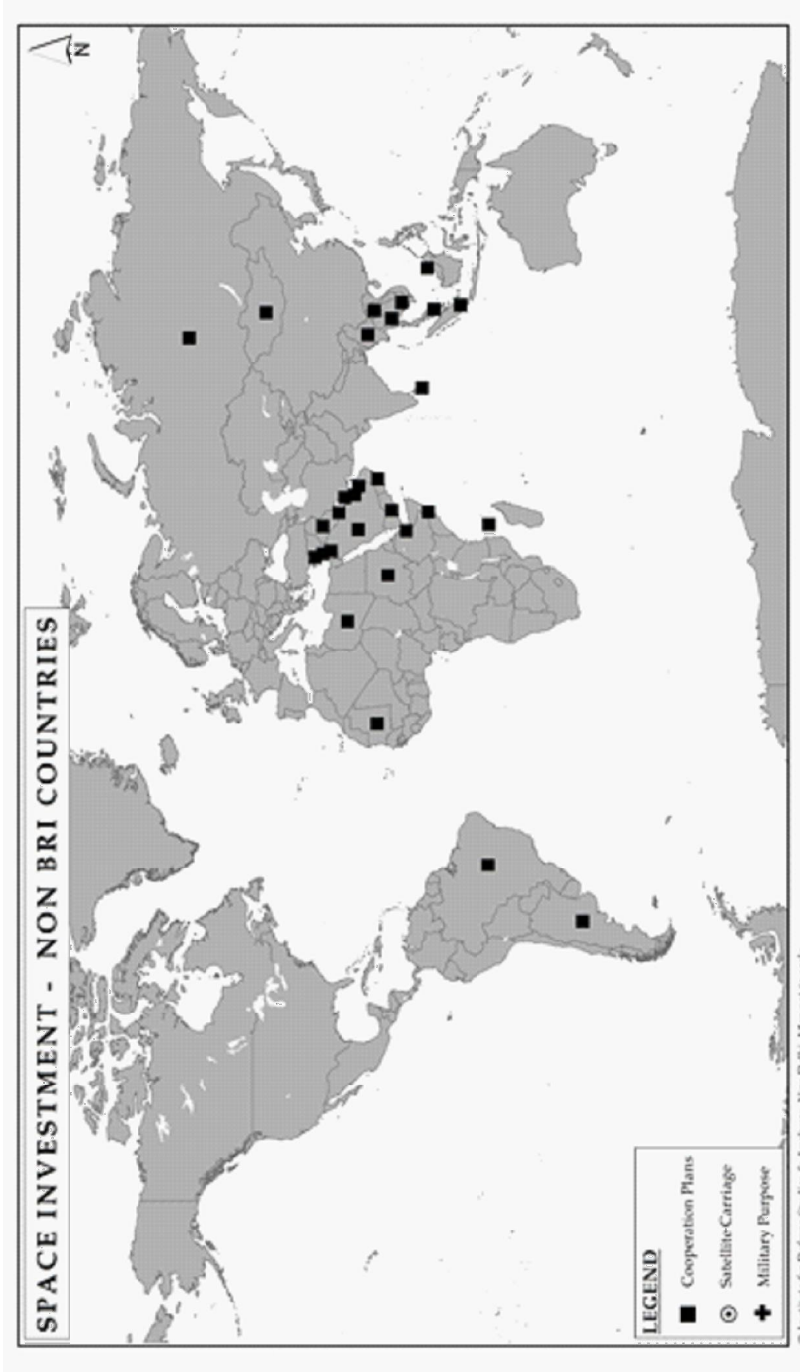
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The recently held second Belt and Road forum in April 2019 based on the theme “Shaping a Brighter Shared Future" gained considerable momentum in the world community. BRI has been an ever evolving concept that has changed considerably since its inception in 2013. It has generated a blend of optimism and consternation around the world. This paper complements the existing literature on BRI while highlighting the need to involve the digital and space sector as that allows China to have greater flexibility to expand both business and influence over the regions of its interest. Furthermore, this paper underscores the likely implications for China’s Digital and Space expansion in economic, geopolitical, technological, security, and geostrategic dimensions. The paper also reflects on the impact of the expansion of China's digital and Space BRI on India in the foreseeable future and lessons for India. The paper concludes by recommending a balanced approach that allows mutual benefit and growth for all the BRI as well as non-BRI states.

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