



China's "National Spatial Infrastructure" and global governance: Chinese way of Military–Civil Fusion (MCF) over the ocean

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ABSTRACT

China is constructing an overwhelming satellite network, called the "National Spatial Infrastructure", that might change the security and economic operations of global governance. Xi Jinping's Military–Civil Fusion (MCF) strategy is founded on this system. Along with the well-known *BeiDou* Navigation Satellite System (BDS), the remote sensing satellite system and the communication and broadcasting satellite system form this new infrastructure. China is using it to establish a strong monitoring capability by: collecting various data on vessels' navigation and oceanography; developing a huge communication network that covers actors and objects on the ocean as well as in the sky and the space; reforming its fishery administration and establishing new laws that enable the authorities to mobilise the numerous Chinese fishermen operating in global waters; and cultivating people-friendly apps to invite more users into the Chinese systems. Based on its strong victimhood mentality that calls for "great rejuvenation of the Chinese nation", the Xi Jinping administration is trying to initiate a new human age by developing advanced technology and integrating it with social implementation that aims to increase China's influence over the globe.

KEYWORDS

National Spatial Infrastructure; *BeiDou* Navigation Satellite System (BDS); Military–Civil Fusion (MCF); satellite network; fishery; space station; vessel monitoring system (VMS); China Coast Guard Law

Introduction

In March 2015, Xi Jinping, General Secretary of the Communist Party of China (CPC), upgraded "Military–Civil Fusion" (MCF) to a national strategy. China's MCF is generally understood as a strategy that adapts civilian technology for military use to boost up its military power, or vice versa. This understanding, however, focuses only on the technical aspects of the MCF and fails to grasp its political implications.

On June 20, 2017, the first meeting of the MCF Development Committee, the Central Commission of the CPC, was held. In this meeting, Xi Jinping stated:

We should exercise the political superiority of our socialist system, that can assemble forces and realize grand affairs. We should adhere to the unity of state leadership and market operation, keep the initiatives by implementing long-term programmes (规划) in an integrated manner, renovate our system, support it with policies, guarantee marketization and other means by the rule of law, improve the cohesion of the combined forces to the highest

level for the MCF development, ... and maximize our comprehensive interests in the economic construction and the national defense construction.¹

Xi has made similar remarks on many other occasions. For him, “the political superiority of our socialist system” is because the CPC’s strong leadership and penetrative power enable it to mobilise the entire Chinese economy and society to achieve the national objectives most efficiently. He sees the MCF as a political means to realise his “Chinese Dream”, that is, the great rejuvenation of the Chinese nation, with the Party’s comprehensive capability.

Recently, it has been pointed out that Xi Jinping’s personal dictatorship over the Party and the nation is growing stronger.² An analysis of the MCF, then, must be based on a comprehensive political understanding of how Xi Jinping and the Central Commission of the CPC are mobilising individuals, organisations and resources of the Chinese state, and what they are trying to achieve as a whole.

Since 2018, when the United States (US)–China trade war intensified, China has rarely mentioned MCF in its official documents. However, circumstantial evidence leaves no doubt that it is still being vigorously implemented. Indeed, it is evident that the MCF has entered a new social application phase with the launch of the “14th Five-Year Programme and the Long-term Objectives for 2035” in April 2021.

This article examines the construction status of the Chinese “National Spatial Infrastructure (国家空间基础设施)”, which is likely to serve as foundation for the implementation of MCF. In particular, it analyses what China intends to achieve with this infrastructure in the maritime domain. Further, it hopes to highlight that the Chinese MCF is not just a way for technological development, but rather a means for integrated practice of the entire society aiming to achieve a grand national strategy under the CPC’s leadership. Finally, the article briefly points out its global implications.

Before proceeding further, the Chinese word *kongjian* (空间) needs to be studied here. It is normally translated as “room” or “space” in English. *Kongjian-zhan* (空间站) refers to “space station” in China. The Chinese government has been preparing “National Territory and Spatial Programme (国土空间规划)” that intends to extend its governance from the continental and maritime territories to the sky and to increase its monitoring capabilities. Here, the word *kongjian* is used to indicate the room that connects land/sea surface and space. In this article, I will use “spatial” as the translation of *kongjian*, but this does not deny it has another meaning, “space”. In fact, in my understanding, the Chinese government probably intends to include the vast space between the earth’s surface and the outer space when it refers to *kongjian*.

Monitoring capabilities of the ocean dynamics and environment satellites

On May 19, 2021, China successfully launched the HY-2D satellite into its scheduled orbit.³ It was manufactured by the Fifth Academy of the China Aerospace Science and Technology Corporation (CASC) and carried by the Long March 4D rocket. The HY-2D is reportedly the third operational satellite in the ocean dynamics satellite series of the National Spatial Infrastructure (国家空间基础设施海洋动力卫星系列), constituting the “Monitoring Network of Ocean Dynamics and Environment (海洋动力环境监测网)” together with the previously launched 2B and 2C satellites. Its main purpose is

to monitor wind speed (with an accuracy of 2 m per second), height of the sea surface, effective wave height, gravity field, ocean circulation, etc. The three-satellite network has made it possible for China to observe more than 80 per cent of the earth's sea surface in six hours.⁴

However, it is not only the ocean dynamics and environment that these satellites can observe from the sky. China's HY-2B and later satellites have been equipped with data acquisition capability of the Automatic Identification System (AIS) signals to grasp large vessels' mobility around the earth. They also receive the data collected by the buoys in China's coastal and other waters. The most recent HY-2D has an upgraded navigation function that can gather dual-mode signals of the Global Positioning System (GPS), invented by the US, and the *BeiDou* Navigation Satellite System (BDS), China's own positioning system, further improving its capability in positioning various actors around the world. Those data are then transferred to land stations and get collected in the analytical centre located in China.

In other words, China is not only collecting the data on oceanography but also the positioning signals of vessels operating in the world in various modes, including AIS, GPS and BDS, through their ocean dynamics satellite series. According to the explanation given in the Chinese media, the establishment of the three-satellite network has given China "heavenly eyes", enabling it to measure the positions, directions and speed of the vessels navigating global waters quite accurately.⁵

Moreover, the Chinese authorities have already entered into the application phase for wider use of data in the society, making full use of the two-way communication function of their satellites. One example is as follows. The HY-2 generation of satellites are equipped with microwave radiometers and radar altimeters that identify fronts and mesoscale eddies in the oceans. The authorities analyse the data to search for good fishing grounds and send the results back to the fishermen on the ocean through the satellites. Since the launch of the HY-2 series, many distant water fishing companies in China have used the information, increasing the catches by 2–3 per cent while saving about 5 per cent in fuel costs.⁶ The Chinese government, thus, supports its own fishermen in such an advanced way.

China launched the HY-1C satellite in September 2018, and another functionally identical HY-1D in June 2020. According to a media report in 2020, the HY-1C has made it possible for China to monitor: (i) the water colour and temperature of tuna fishing grounds near Papua New Guinea; (ii) the coverage, distribution and drifting direction of blue-green algae (浒苔) in the Yellow Sea and the East China Sea; (iii) the freezing conditions of the Hoh Xil salt lakes in Qinghai province deep inside the Chinese territory; and (iv) the conditions of sea ice, red tides, oil spills, forest fires and land reclamation on the earth.⁷ In 2019, the 10th Arctic scientific expedition team of China also made use of its data on sea ice density, distribution and coverage.⁸ With the continuous launch of ocean monitoring satellites, including rapid upgrade of their functions, China has shown strong willingness to strengthen its security and increase its international presence in the coming future.

Who is developing these satellites in China? When the HY-1D satellite was boosted, it was reported that the National Development and Reform Commission (NDRC), the Ministry of Finance (MOF) and the State Administration for Science, Technology and Industry for National Defense (SASTIND) jointly approved the plan to create the satellite

and the Long March 2C carrier rocket, thus meaning that the organisations belonging to the government system and the People's Liberation Army (PLA) system had worked together to achieve it. When it came to the implementation stage, the Ministry of Natural Resources took the lead and assumed ultimate responsibility for the construction of the satellite. The National Satellite Ocean Application Service (NSOAS), established under this ministry as a bureau-level public enterprise, was the agency dealing with satellite operations and data controls (receipt, analysis, preservation, distribution and application).⁹ This type of inter-authority cooperation is becoming more and more common under the Xi Jinping administration.

The Ministry of Natural Resources itself is a new unit, which was created in 2018 when the China Coast Guard was moved from the State Oceanic Administration to the Chinese Armed Police, commanded by the Central Military Commission. At that time, the remainder of the State Oceanic Administration was divided into three organisations, one of which formed the Ministry of Natural Resources with some other resource- and environment-related bureaus. Despite the NSOAS operating under a ministry, it enjoys greater freedom in carrying out commercial activities and interacting with private economies because of its status as a company.

Global satellite network, National Spatial Infrastructure

The next question is: what is the National Spatial Infrastructure that these satellites are reported to comprise as a whole? Let us turn to the document released in October 2015 by the NDRC, the MOF and the SASTIND, titled “National Civil Spatial Infrastructure Medium and Long-term Development Programme (2015–2025) (国家民用空间基础设施中长期发展规划 2015–2025)”, which explains:

The National Civil Spatial Infrastructure (国家民用空间基础设施) is the equipment for the “heaven and earth” integration project (天地一体化工程设施), which uses the space resources for a wide range of users to provide products and services in remote sensing, communication and broadcasting, navigation and positioning, for example. It consists of functionally compatible, continuously and stably operated spatial and ground systems and their associated systems. The Civil Spatial Infrastructure is a strategic infrastructure for an informatized, smart and modernised society. It is an important means to promote scientific development, change the mode of economic development and promote innovation, and also an important pillar for the national security.¹⁰

In other words, first, China is working to develop a huge information infrastructure linking the sky, ground and sea in a comprehensive and integrated manner, and to operate it with a variety of functions. Second, China is trying to establish a new-age society that is based on a new series of technology, with the aim to consolidate its economic power and national security at the same time.

The long-term programme exhibits urgency in the construction of the spatial infrastructure because it would be the future foundation for:

a wide range of areas, from national strategy to people's daily lives ... With the rapid development of China's new type of industrialization, informatization, urbanization and agricultural modernization, it has become more and more urgent to accelerate the integrated construction of the Civil Spatial Infrastructure, respond to the critical needs of the national

economy and social development, and enhance the new competitiveness of China's space industry.¹¹

Based on such grand and urgent views, the programme advocates four development principles. First, "contributing to application and promoting integrated designs and development". Second, "carrying innovation-led self-development". Third, it aims at the "coordination and simultaneous development of the heaven and the ground". The fourth is "government-led open development". The government is expected to play a decisive role in the allocation of resources in the market by firmly maintaining the top-down designing and integrated control; taking measures, such as setting standards; sharing satellite data; and enacting policies and regulations, such as the introduction of market entry permits.¹²

While this programme only talks about the civilian spatial infrastructure, it is assumed that the same integration principles would apply to the military part of the programme, which is undoubtedly no less important for the CPC. Naturally, the two systems must be planned and operated as an integrated package, tightly knit together at the top under the Party leadership.

The document provides a long list of detailed "parts" of the National Spatial Infrastructure programme. The entire system is divided into three sections: (i) remote sensing satellite system; (ii) communication and broadcasting satellite system; and (iii) navigation and positioning satellite system. However, it does not describe the specific elements of the third, that is, the BDS, which was put into global operation in July 2020, making the name *BeiDou* so known in the world. The fact that its "parts" have not been listed in the civil spatial infrastructure might imply that the BDS is under the jurisdiction of the PLA in the Chinese division of labour in the authority, weighing more for a "military use" rather than a "civilian use". Nevertheless, because the entire system is intended to operate in an integrated manner under the CPC leadership, the document perhaps needed to present the whole picture, resulting in the limited account just described. Here, I would like to highlight that China has planned a great variety of satellites other than the famous BDS (see [Table 1](#)).

The remote sensing satellite system consists of spatial and ground systems. The spatial system has the land, the ocean and the atmospheric monitoring satellite series respectively. Perhaps because of the difference in measurement features of the monitoring subjects, China has prepared completely different variants for each series. For example, the ocean monitoring satellite series has three different constellations aiming to observe seawater colour, ocean dynamics and ocean environment. In total, there are nine types of satellite constellations in this category alone. The data collected by this spatial system is sent to the ground system where it is analysed and processed for further use in the society. The ground system includes the data receiving station network, the data centre, the common application support platform and the shared internet platform.

Another satellite system is for communication and broadcasting. Its spatial system is divided into two communication and broadcasting systems, one for the fixed and the other for mobile communications. Five types of satellites have been prepared in this category in total. It is expected to use the existing communication stations for the ground systems as they are relatively new in China.¹³

Table 1. The composition of Chinese “Civil Spatial Infrastructure”.

Components in Chinese	English Translation	Components in Chinese	English Translation
I. 卫星遥感系统	Remote Sensing Satellite System	II. 卫星通信广播系统	Communication and Broadcasting Satellite System
1. 空间系统	Spatial System	1. 空间系统	Spatial System
(1) 陆地观测卫星系统	Land Monitoring Satellite System	(1) 固定通信广播卫星系列	Fixed Communication and Broadcasting Satellite System
a. 高分辨率光学观测星座	High-resolution Optical Monitoring Constellation	a. 固定通信卫星	Fixed Communication Satellites
b. 中分辨率光学观测星座	Medium-Resolution Optical Monitoring Constellation	b. 电视直播卫星	Live TV Satellites
c. 合成孔径雷达 (SAR) 观测星座	Synthetic Aperture Radar (SAR) Monitoring Constellation	c. 宽带通信卫星	Broadband Communications Satellites
d. 地球物理场探测卫星	Geophysical Field Exploration Satellites	(2) 移动通信广播卫星系列	Mobile Communication and Broadcasting Satellite System
(2) 海洋观测卫星系列	Ocean Monitoring Satellite System	a. 移动通信卫星	Mobile Communication Satellites
a. 海洋水色卫星星座	Ocean Water Color Satellite Constellation	b. 移动多媒体广播卫星	Mobile Multimedia Broadcasting Satellite
b. 海洋动力卫星星座	Ocean Dynamics Satellite Constellation	2. 地面系统	Ground System
c. 海洋环境监测卫星	Ocean Environment Monitoring Satellites		
(3) 大气观测卫星系列	Atmospheric Monitoring Satellite System		
a. 天气观测卫星星座	Meteorological Monitoring Satellite Constellation		
b. 气候观测卫星星座	Climate Monitoring Satellite Constellation		
2. 地面系统	Ground System		
(1) 接收站网	Data Receiving Station Network		
(2) 数据中心	Data Centre		
(3) 共性应用支撑平台	Common Application Support Platform	III. 卫星导航定位系统	Navigation and Positioning Satellite System
(4) 共享网络平台	Shared Internet Platform		

Source: Created by the author based on 国家发展改革委·财政部·国防科工局 (NDRC, MOF and NDSTN) “国家民用空间基础设施中长期发展规划(2015–2025年) (Medium and Long-term Development Program for National Civil Spatial Infrastructure (2015–2025))”, October 2015 (<http://invest.beijing.gov.cn/xxpt/fzgh/gjgh/201912/P020191206662512892005.pdf>), pp. 6–13.

After identifying the components of this satellite network, the programme states that future tasks include the improvement of remote sensing and communication satellite technologies, the development of “heaven–ground integration” technology and the promotion of social application and international dissemination of these technologies.¹⁴

Presently, in line with the development principles of this programme, China seems to be making considerable progress in the integrated operations of the satellite network. An example can be seen in its coordination with the Chinese space station. On April 29, 2021, China launched “Tianhe (天和)”, the core module of its own space station called “Tiangong” (天宫, or generally referred as “kongjian-zhan” [空间站], meaning “space station”), and sent three crew members to it on June 17 on a separate rocket. On June 23, Xi Jinping made a “heaven–ground phone call” with the crew. The fact that the voice from the space was so clear with very little delay surprised many Chinese who have heard previous “heaven–ground” calls starting 2003.¹⁵

Also, recently, as part of advertisement for the 100th anniversary of the CPC (2021), there has been a lot of space-related coverage in China. According to one article, the

crews of Chinese space station use the “heaven-ground communications channel” together with video communication facilities to make two-way video calls and exchange messages with earth. This communication is made possible by relay satellites.¹⁶

According to Yang Yuguang, a researcher at the Second Institute of the CASC, China mainly uses three kinds of facilities for this purpose: (i) ground measurement and control stations (地测控站); (ii) data receiving stations (数传接收站); and (iii) “Tianlian” relay satellites (天链中继卫星). Of these, “Tianlian” satellites play the key role in ensuring seamless communications. They relay various data collected by remote sensing, mapping and meteorology satellites placed in middle and low orbits to the space station; provide measurement and control support services (测控服务) upon the launches of the station; and exchange data and messages among the space station and the ground.¹⁷

China launched the first generation of the “Tianlian” satellite (from 1-01 to 1-03) from 2008 to 2012, becoming the second country in the world to achieve global transmission coverage for medium- and low-orbit satellites. After the launch of the “Tianlian” 1-04 satellites in 2016, it again boosted “Tianlian” 2-01 satellites in March 2019. It was the first second-generation geosynchronous orbit data relay satellite (第二代地球同步轨道数据中继卫星), which has further improved the communication speed, data volume and coverage.¹⁸

Socialist China’s economic programmes are basically carried out in five-year units. The “National Programme for the Medium and Long-term Development of the Satellite Navigation Industry”, that drew the blueprint for the BDS development, had set the end target in fiscal year 2020 (by March 2021) when the 13th Five-Year Programme would end.¹⁹ The overall target of the “National Civil Spatial Infrastructure Medium and Long-term Development Programme” was 2025, but its text mentions that China would firmly promote the tasks of the 12th and 13th Five-Year Plans regarding the satellite network construction.²⁰ In recent years, China’s space industry has been achieving its targets ahead of schedule. The physical foundation of the National Spatial Infrastructure was assumed to get completed during the 13th Five-Year Plan. Therefore, the 14th Five-Year Plan, initiated in April 2021, is naturally expected to promote not only its technical upgrades but also its social application and international diffusion.

Maritime applications of the National Spatial Infrastructure

As mentioned in the previous section, China has been building a global National Spatial Infrastructure using space satellite technology, and its application and diffusion in society is approaching full-scale development stage. This section examines the application possibilities by taking examples from the fishery industry and maritime law enforcement.

For many decades, the Chinese government did not get serious about managing its fishery industry despite international frictions caused by it. According to Hamada Takeshi – who, with Sasaki Takafumi, published a historical review of fisheries issues surrounding Japan – when the Japanese and South Korean governments asked the Chinese to crack down on their fishing vessels violating bilateral fishery agreements, the authorities often replied that the vessels were not registered in China and therefore, they were not under the jurisdiction of the government.²¹ These ships were called “three no

boats (三无船舶, *San-wu chuanbo*)” as they did not have the three types of licences officially required for operation.

In effect, the Chinese government has been allowing such vessels to illegally enter the waters of other countries and operate as if they belong to themselves. The Chinese have also been chasing fish in a destructive manner, often causing harm to the natural environment. In addition, China has been claiming “jurisdiction” over 300 million square kilometre (sq km) of water, including more than 80 per cent of potential exclusive economic zone (EEZ) and continental shelf, in both South and East China Seas. In this, more than 150 million sq km is under dispute, with multiple claimants. Thus, over the years, the Chinese government’s excessive claims on a huge portion of the water in East Asia, along with inaction to control its own fishing vessels, has caused serious challenges to regional fisheries management.²²

However, in November 2020, the Chinese Ministry of Agriculture and Rural Affairs (MARA – the new name of Ministry of Agriculture following a holistic organisational reform in March 2018) came out with its first “White Paper on China’s Distant Water Fishing Compliance”. The paper states that the country has completed the installation of vessel monitoring system (VMS) equipment on all of its distant fishing vessels and is already able to locate every one of them once an hour, exceeding the international standard of once in every four hours. It also reveals that the VMS equipment has a warning function that prohibits the boats from entering illegal waters, which makes it possible for the authorities to monitor their activities 24 hours a day.²³ In January 2021, Ministry of Foreign Affairs spokesperson, Hua Chunbao, stressed at a regular press conference that China has “zero tolerance” for violations caused by its distant fishing vessels and has, therefore, implemented strict supervision and management over them.²⁴

With so much contradictory information on Chinese fishing operations, we need to trace the history and confirm its development status as of today. In fact, a fundamental fishery reform, underway in China since January 2017, was initiated by the nationwide announcement of the “13th Five-Year Programme for National Fisheries Development (2016–2020)”, issued by the Ministry of Agriculture. Though the general 13th Five-Year Programme was published in March 2016, its fishery version came out some 10 months later.

The fishery five-year programme included a target to reduce domestic maritime catches (within China’s claimed “jurisdictional waters”) from 13.15 million tonnes to 10 million tonnes; instead, distant water catches and aquaculture productions were to be increased. It was also decided to reduce the number and power of the motored fishing vessels for domestic operation at sea by 20,000 boats and 1.5 million kilowatts (kw) respectively. Further, in order to reduce the fishing pressure over “jurisdictional waters”, the government decided to dismantle old vessels and encourage the fishermen to transfer to aquaculture or marine-related tourism industry, hoping to raise their net per capita income to 21,000 yuan, four times of the 2010 level.

The new programme was comprehensive and envisaged a wide range of other reforms, including establishment of nature reserves for aquatic life and healthy model aquaculture farms, constructing new infrastructure for fisheries administration and ports, upgrading the fishing technology and related innovation, etc. Furthermore, with a strong focus on application of information technology to the fishing industry, the programme proposed a holistic package for promotion of smart fishery that included: monitoring of fishery

resource conditions; market forecasting; basic data management using satellite and remote sensing technology; and informatisation of fishery control from licence application to life-saving calls.²⁵ It can be said that China had set out a policy to promote sustainable fisheries by utilising advanced digital and satellite technology.

In addition, the programme was accompanied by an important reorganisation of the fisheries administration. Fishing vessels were divided into three categories according to their lengths: small (up to 12 m); medium (up to 24 m); and large (over 24 m). All relevant licences were previously administered by provincial-level local governments, but from this point onwards, all medium- and large-sized boat licences were to be applied to and issued by the Ministry of Agriculture in Beijing, while small ones remained under the control of the local governments. Also, their operational area was divided by the “Ban Lines for Motored Trawlers (机轮拖网禁渔区线)”, set approximately 50–70 km away from the coast, allowing small boats to fish only inside and larger vessels only outside.²⁶ This was expected to make it easier for the central government to manage fishery disputes with neighbours because it now had direct control over the number of bigger vessels that could operate in the disputed waters, all of which fell beyond the ban lines. In addition, the central authorities assigned the local governments various strict targets that were aimed at reducing the fisheries production, and declared that they would examine the locals’ performance in cracking down on the “three no boats” for their members’ promotions in the Party.²⁷

This decision had a huge impact on the entire fisheries management in China that had made rather slow progress till then. After the review by the NDRC and the MARA, the “National Coastal Fishing Port Construction Programme (2018–2025)” was announced in April 2018. The aim was to convert Chinese fishing ports into “smart” ports, as they were important infrastructure for fishery development. To ensure scientific management of the industry, the programme set out goals to transform the ports as hubs of human, financial and logistical flows, as well as platforms for integrated management of safety control, disaster forecasting, information services, visa entry and exit control, vessel inspections, crew training and maritime law enforcement by the fishery administration.²⁸

The technical highlight of the project was the introduction of visa system for fishing vessels entering and exiting the ports. Automatic identification devices were to be installed at the port entrances to examine the entry and exit of the fishing boats. The vessel’s licence would act as the visa, to be checked together with the fisherman’s personal identity card registered at the time of application. If they matched with the information the authorities had, the boat could enter and leave the port safely. This meant that a fishing vessel could only use one registered port for landing, where the authorities would be waiting to capture detailed data on its catch and crew members. In this way, the Chinese government could bring the vessels and the fishermen under its full control.

All these measures are being developed with a slight lag as compared to the progress in the National Spatial Infrastructure, strongly suggesting an integrated design and operation. Maritime fishing is an obsolete industry in China. While aquaculture production has been increasing steadily, the sea catches have been hitting their limits for decades, accompanied by declining average income for the fishermen. It is, therefore, hard to find the economic rationality behind the huge investment into this industry.²⁹ However, from the perspective of building the National Spatial Infrastructure, fishing

vessels are seen as important end users to support the scheme from the sea, who can also contribute to improve its overall accuracy as they move in the many oceans on the earth in numbers.

Within the National Spatial Infrastructure, it is the BDS that has the closest link with the fishing vessels traditionally. Unlike American GPS, *BeiDou* satellites allow direct two-way communication with the end users even when there are no ground stations in between. This means that the BDS has clear advantage for use at sea, at high altitudes and in polar regions, where it is difficult to set up ground stations. Again, unlike the GPS, the *BeiDou* satellites can also exchange short messages with the end users as well as with other satellites or ground stations. China is currently in the process of extending this function from regional to global coverage.³⁰

As shown in the white paper, by using the BDS as the technological foundation, China has improved its own VMS to manage the location of its fishing vessels. Also, the Chinese VMS helps the authorities to make payments to the fishing vessel owners; in fact, it was originally invented in 2005 to support the Chinese fishing vessels operating in the South China Sea. From an early stage of the system, it was envisaged that the government would provide fuel subsidies to the vessels that sail far into the “nine-dash-line” claimed by China. Today, the payment speed must be instant given electronic money diffusion in China.

The attraction of this innovative Chinese system is not only due to its advanced technology but also because of low-cost and user-friendly functions, which makes a good foundation for future international diffusion. The inclusion into the VMS scheme brings about significant benefits for the fishermen too. In addition to information on good fishing grounds, they can obtain information on weather, sea conditions, market trends, authorities’ policies, as well as request assistance from the authorities in case of emergency at sea.³¹ Furthermore, they can connect their smartphones to the VMS terminals onboard, via Bluetooth, and chat with family and friends on land through an app called *BeiDou* Hailiao (北斗海聊, meaning “sea chat”). The Chinese authorities have improved this service to an extent that it has become more convenient and attractive for the people. By combining the interests of both sides, the aim is to perfect the system and spread it further.

Let us now consider the relationship between the fishing vessel management and China’s maritime law enforcement activities, which is called “right protection and law enforcement (海上维权执法)”, hinting that China aims to expand its defence and national interests on the sea in the name of law enforcement. The China Coast Guard Law of February 2021, a product of many years of comprehensive review on how to consolidate Chinese governance and power over the “jurisdiction waters”, demonstrates significant correlations with the National Spatial Infrastructure as well as the fisheries reforms. Its Article 12-(7) stipulates that the operations carried by Chinese fishing vessels in waters outside the Ban Lines for Motored Trawlers (including distant fishing) will be supervised and inspected by the China Coast Guard.³² In other words, Chinese fishing vessels over 12 m in length will be monitored and directed by the China Coast Guard at sea, no matter if they are in China’s claimed “jurisdictional waters”, another country’s EEZ or the high seas.

The information technology too can be used in various ways. For instance, Article 57 claims:

The Coast Guard shall strengthen the informatization, operate contemporary information technology, make law enforcement more open, increase services aiming to upgrade the convenience of the people, and improve the efficiency of right protection and law enforcement work. The Coast Guard shall open the maritime reporting service platform so as to be able to receive the reports and emergency calls by the people at all times.³³

Further, Article 58 makes it clear that these efforts will be cross-departmental by asserting:

The Coast Guard shall establish a collaborative mechanism for sharing information and working together with the responsible departments in diplomacy (foreign affairs), public security, natural resources, ecological environment, transportation, fishery and its administration, emergency management and maritime customs, as well as the relevant departments of the People's Courts, People's Procuratorate and the military.³⁴

It also appears that China Coast Guard hopes to exclude foreign parties from data collecting activities in its "jurisdiction waters". Article 20 states that the China Coast Guard may forcibly remove "buildings, structures and various fixed or floating devices installed" by foreign organisations or individuals in China's "jurisdiction waters" and features in them without China's permission.³⁵ In fact, recently, China has been actively collecting data using buoy-type floating devices (浮标) through satellite communications. Such a provision is probably a reflection of its own effort at developing them.

In other words, China has set out new missions for its coast guard on the premise of utilising the National Spatial Infrastructure to strengthen governance over the sea. It aims to build a collaborative system to work with other domestic departments through the information network. The fact that Chinese fishing and other vessels operating beyond the ban lines are supervised by the coast guard, directed by the Central Military Commission, may indicate that the Chinese maritime administration is now (quasi-)militarised.

As claimed at the beginning of this article, China's MCF is not only about technologies, but is planned as holistic social practice led by the Party. Thus, in the name of National Spatial Infrastructure, China is building a seamless ocean monitoring system that covers the entire globe.

In light of this, the recent behaviour of Chinese fishing vessels has caused serious concern among related countries. Since March 2021, more than 200 Chinese fishing boats have been staying off western Philippines in the South China Sea.³⁶ If, as claimed by the Chinese government, the authorities are in complete control of the behaviour of their fishing vessels, then these must be commanded by them. It is also worth taking note of the fact that more than 3,100 Chinese fishing boats were found for illegal operation by the Fisheries Agency of Japan in 2020–2021 in the Yamatotai fishing grounds in the Sea of Japan, where the EEZ has been disputed by Japan and North Korea.³⁷ There is speculation that China may have purchased fishing rights here from Pyongyang, though all member countries have been prohibited from doing so due to the United Nations sanctions against North Korea for its nuclear programme. It might be a new tactic of China Coast Guard that competes with Japan Coast Guard in southern waters around the Senkaku Islands, because when illegal foreign fishing fleets enter into the Sea of Japan, Japan has to divide its team and respond to each in different waters. As explained earlier, the Chinese VMS enables the authorities to contact and mobilise its vessels by paying bonuses if these act according to their directions.

It would appear that China Coast Guard is using the newly developed National Spatial Infrastructure to maximise its national interests and has begun to mobilise private vessels and individuals for achieving its national goals over the ocean. Considering the MCF nature of the infrastructure, what the China Coast Guard can do with it in the near waters can also be carried out by the PLA in global oceans, in air and on continents. In the process of implementing the 14th Five-Year Programme, it is expected that the MCF will accumulate more cases of social practices by combining various Chinese policies with the National Spatial Infrastructure.

Conclusion

In March 2021, the National People's Congress adopted the "Outlines of the 14th Five-Year Programme and the Long-term Objectives for 2035". In relation to the National Spatial Infrastructure, the outlines stipulated that China would promote the construction of traditional and new infrastructure in parallel, "build information infrastructure working in a high-speed, integrating the heaven and the ground, comprehensively interconnected, secure and efficient, and strengthen the ability to sense, transmit, store and compute data." It further aimed to "establish a Spatial Infrastructure system for communication, navigation and remote sensing that covers the whole world and can be operated efficiently", and also build a commercial rocket launch base.³⁸

At the same time, it became clear that China was planning to use the satellite technology to launch a space-based internet. In June 2020, China Unicom and Huawei signed the "Strategic Cooperation Agreement for Air-Ground Integration (空地一体化战略合作协议)" for technological integration of low-orbit satellites and 5G communication.³⁹ In September 2020, China submitted an application for radio frequency allocation to the International Telecommunication Union, which included plans to build two constellations of low-orbit satellites named "GW", totalling 12,992 satellites. In March 2021, the plan was publicly acknowledged for the first time by Bao Weimin, a senior researcher working for state-owned CASC, responsible for satellite development in China. Bao, who was the head of the company's Science and Technology Committee and also a member of the National Committee of the Chinese People's Political Consultative Conference, stated that China was planning to launch a space-based internet called "Guo Wang (国网)", and that test satellites had already been boosted.⁴⁰

It is expected that the foundation and application capability of China's National Spatial Infrastructure will be enriched during the 14th Five-Year Programme period. Considering the trajectory of the past few years, it is likely to be much faster than the developed countries in the West can imagine. There is no doubt that the totalitarianism driven by the CPC, that can decide at its own discretion how to allocate funds and resources throughout the country with a population of 1.4 billion, is making the impossible possible for the Chinese.

The China Data Security Law, adopted on June 10, 2021, stipulates in Article 5:

[the CPC's] Central National Security Leading Body is responsible for the decision-making and coordination of national data security work, researching, formulating, guiding and implementing the national data security strategy and related major guidelines and policies, coordinating major affairs and important work of national data security in an integrated manner, and establishing a national data security work coordination mechanism.⁴¹

In China, data is controlled and utilised by the CPC with the aim to strengthen its own governance. As China's one-party dictatorship operates on the premise that the Party can do no wrong, there are no checks and balances on it. Indeed, Hong Kong's version of the National Security Law has demonstrated that it is almost impossible to fight off the CPC's governing power inside China.

However, there is a need to think what this development means for the world. As stated earlier, China is strengthening its National Spatial Infrastructure, monitoring every corner of the globe with many types of eyes, developing a space-based internet, planning to formulate new types of economic and other activities on the system, and preparing to spread the new Chinese way of life all over the world. If this progresses as per plan, the CPC will eventually take possession of an overwhelming amount of data on human activity and global operations, and possibly use its seamless monitoring capabilities to take control of global governance. The major data on global climate change, personal information on the smartphones used in developing countries and the movements of fishing boats and cargo ships on the world's oceans are all likely to fall under the strong influence of China. Past instances indicate that China tends to be rather self-centred in its decisions, especially in relation to security and sovereignty. The CPC is likely to use its political power and collected information to loosely mobilise Chinese and non-Chinese private actors to strengthen the Party system and China's supremacy in the world.

The problem is that the other countries, who are likely to be influenced by China, have yet to decipher China's intentions and future plans. China's National Spatial Infrastructure is not only about the technology itself, but also about how it will be used to change the way how our society is run. In order to measure the magnitude of China's impact, it is necessary to analyse what kind of national programmes it is planning, with how much strength the bureaucrats have in trying to implement them, and what kind of domestic/international legal backing they are preparing for in the aim of mobilising the people in accordance with the Party's idea. This kind of effort is especially imperative for countries that have border and maritime boundary disputes with China, and where its "heavenly-eyes" are closely monitoring. Since the Xi Jinping administration is pushing this through the MCF strategy using the power of the Party, it is also necessary to read China's intentions through the joint efforts between the science experts, who understand related technology, and the area study researchers, who are familiar with China's idea and domestic systems. Eventually, international cooperation will be crucial to come up with countermeasures.

There is a possibility that the race to develop science and technology would significantly impact the world by dividing it into two groups of states. Many people in China believe that the West, led by the US, has unfairly enjoyed a dominant position in the world for too long, particularly in the field of advanced technology. Based on its strong victimhood mentality that calls for "great rejuvenation of the Chinese nation", China hopes to initiate a new age for human beings under Xi Jinping's leadership by developing advanced technology and integrating it with social implementation. It is widely believed in China that establishing a supreme position in the world with the power of science will lay a foundation for lasting "peace" for the country against the Western powers. Here, China is not isolated in the world as it is supported by many countries which share the same perceptions about the West, or which have similar authoritarian political systems. Therefore, it is also important to analyse to what extent this Chinese-style system might be able to spread among developing countries.

In the long term, development of science and technology, whatever be the field, will eventually be undertaken by one nation or the other. It is extremely difficult to make a neutral judgement on this issue about which side is right and which side is wrong. In the current times, with the international order undergoing a period of restructuring, international politics seems to be returning to the fundamental mode of power competition.

Notes

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2. For example, see Joseph Fewsmith, “The 19th Party Congress: Ringing in Xi Jinping’s New Age”, *China Leadership Monitor*, No. 55, 2018, <https://www.hoover.org/sites/default/files/research/docs/clm55-jf-final.pdf>, and George Solos, “Xi’s Dictatorship Threatens the Chinese State”, *Wall Street Journal*, August 13, 2021, <https://www.wsj.com/articles/xi-jinping-deng-xiaoping-dictatorship-ant-didi-economy-communist-party-beijing-authoritarian-11628885076> (both accessed December 13, 2021).
3. HY indicates 海洋/*Haiyang*, meaning “ocean”.
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5. *Ibid.*
6. *Ibid.*
7. 柴雅欣 (Chai Yaxin), “国海洋一号D卫星成功发射：九天瞰海再添慧眼 (China’s HY-1D Satellite Successfully Launched: Another Wise Eye that Overlooks the Sea in Nine Days),” 中央纪委国家监委网站 (CPC Central Commission for Discipline Inspection and State Supervision Commission website), June 22, 2020, https://www.ccdi.gov.cn/yaowen/202006/t20200622_220544.html (accessed June 27, 2021).
8. *Ibid.*
9. “我国海洋一号D卫星成功发射 (China’s HY-1D Satellite Successfully Launched),” *澎湃新闻* (*Pengpai News*), June 11, 2020, https://www.sohu.com/a/401089885_260616 (accessed June 27, 2021). The NSOAS website explains the detailed functions of these ocean monitoring satellites. See http://www.nsoas.org.cn/news/node_44.html (accessed June 28, 2021).
10. For the date, refer to: 国家发展改革委·财政部·国防科工局 (NDRC, MoF and NDSTN), “国家民用空间基础设施中长期发展规划(2015–2025年) (National Civil Spatial Infrastructure Medium and Long-term Development Programme [2015–2025])” October 26, 2015, 北京市促进民间与社会投资信息平台 (Beijing Information Platform for the Promotion of Private and Social Investment), January 3, 2017, http://invest.beijing.gov.cn/xxpt/fzgh/gjgh/201912/t20191206_904940.html (accessed December 14, 2021). For the text of the programme, refer to: “国家民用空间基础设施中长期发展规划(2015–2025年) (National Civil Spatial Infrastructure Medium and Long-term Development Programme [2015–2025])”, p. 1, <http://invest.beijing.gov.cn/xxpt/fzgh/gjgh/201912/P020191206662512892005.pdf> (accessed June 26, 2021).
11. “国家民用空间基础设施发展规划 (National Civil Spatial Infrastructure Development Programme)” (the text), p. 3.

12. Ibid., pp. 4–5.
13. Ibid., pp. 6–13.
14. Ibid., pp. 13–18.
15. 柴雅欣·薛鹏 (Chai Yaxin and Xue Peng), “信号不间断、时延仅为秒级：天地通话何以如此清晰(Uninterrupted Signal and Second-Level Time Delay: What Makes Heaven-Ground Calls So Clear),” 中国新闻网 (Chinanews.com), June 24, 2021, originally cited from 中央纪委国家监委网站 (CPC Central Commission for Discipline Inspection and State Supervision Commission website), <https://www.chinanews.com.cn/gn/2021/06-24/9505994.shtml> (accessed December 13, 2021).
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18. Ibid.
19. This explains why China completed the construction of the third generation of BDS network by the mid-2020s.
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33. *Ibid.*
34. *Ibid.*
35. *Ibid.*
36. Brad Lendon, "Philippines Demands Chinese Fishing Flotilla Leave Disputed South China Sea Reef," *CNN*, March 22, 2021, <https://edition.cnn.com/2021/03/22/asia/china-fishing-boats-philippines-reef-intl-hnk/index.html> (accessed on December 14, 2021). Also see "There Back Again: Chinese Militia at Iroquois Reef and Union Banks", Asia Maritime Transparency Initiative, March 22, 2021, <https://amti.csis.org/there-and-back-again-chinese-militia-at-iroquois-reef-and-union-banks/> (accessed on December 14, 2021).
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