

The Legal Framework and Institutional Mechanisms of Space Data Sharing under APSCO

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Abstract

Space data sharing is playing an important role in regional space cooperation. Data sharing contributes to many of the developmental needs and also assists countries in fighting against natural disasters, environmental and climate change, agriculture and food security, and other natural challenges. To access and exchange satellite data in the Asia-Pacific region, the Asia-Pacific Space Cooperation Organization (APSCO) provides a platform for its member states. The article analyzes how APSCO organizes and manages this process. The paper first explains the APSCO legal instruments, including the APSCO Convention, the multilateral agreements of APSCO, and the rules regarding data sharing. This shows how member states benefit from space-based information. The paper further explores the institutional structure of APSCO with a focus on the Data Sharing Service Platform (DSSP). The legal issues and challenges in space data sharing under the APSCO framework are highlighted in the paper. The main issues among them are data ownership, privacy, legal incompatibility, and cybersecurity. If these issues are left unresolved, they may undermine mutual trust, and it can weaken long-term cooperation within the APSCO framework. The paper concludes by proposing ways to improve the APSCO data sharing framework to ensure cooperation in the region can increase fairly and effectively.

Keywords

Regional Space Cooperation, Legal Framework, Data Governance, Capacity Building

1. Introduction

The sharing of space data is important for strengthening regional collaboration,

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helping in carrying out joint missions, monitoring disasters, managing the environment, and conducting research. Different regional space cooperation organizations have developed different models of gathering, sharing, and using satellite information between the members. The Asia-Pacific Space Cooperation Organization (APSCO) has set up an organized and interactive system of space data sharing. APSCO gives its member states access to remote sensing and satellite data via multilateral agreements. The Data Sharing Service Platform (DSSP) is one of the flagship projects of APSCO that is crucial in ensuring regional cooperation in the field of space-based Earth observation. The DSSP offers access to satellite data products, especially those of the Earth observation satellites, which are essential in supporting critical fields like disaster monitoring, agricultural planning, and environmental assessment (Asia-Pacific Space Cooperation Organization, 2023a; Asia-Pacific Space Cooperation Organization, 2023b; Asia-Pacific Space Cooperation Organization, n.d.-a). The platform provides timely and reliable remote sensing information, which enables member states to act promptly in response to natural disasters and ensures that they manage land and resources better while more precisely monitoring the environmental changes (Asia-Pacific Space Cooperation Organization, 2025). APSCO goes beyond data distribution because it encourages collaborative data processing, publication of joint research, and application development through DSSP (Asia-Pacific Space Cooperation Organization, 2025). This model of collaboration assists in reducing the technological distance between the member countries that are more advanced and those that are less advanced by facilitating knowledge sharing and mutual skill development. Consequently, even less developed countries with weak infrastructure or technical capabilities benefit from advanced space technologies, thereby increasing national capabilities and contributing to greater unity and mutual development in the region (Asia-Pacific Space Cooperation Organization, 2023b).

Besides APSCO, there are other regional organizations that have adopted significant space data sharing models, such as the European Space Agency (ESA), which plays a central role in global Earth observation with its Copernicus programme that provides open and free access to a large repository of satellite data through the Copernicus Open Access Hub. This program is not only beneficial to European member states, but it also extends its advantages to other countries in the world through an international data-sharing partnership. Being able to deliver high-resolution environmental and climate monitoring data, Copernicus can be applied in a broad spectrum of uses, such as disaster management or agricultural planning, which makes it a foundation of the overall Earth observation activities in the world (Aschbacher & Milagro-Pérez, 2012). In Africa, the African Union (AU) promotes the exchange of satellite data through its GMES & Africa programme, which aims to promote sustainable development and effective decision-making across the continent. The program is based on a network of regional centers of excellence where African countries receive customized access to Earth observation data for use in activities such as controlling natural resources, maritime

surveillance, and climate-resilience applications. GMES and Africa, through collaboration with European and other international space agencies, enhance the continent's ability to use space technology to achieve socio-economic development.

The Group on Earth Observations (GEO) and its Global Earth Observation System of Systems (GEOSS) are a unified system that combines satellite information from various sources in a free manner and is interoperable to the needs of different members of society. Being a voluntary alliance among governments, research organizations, and space agencies across the globe, GEO encourages data-sharing projects that deal with pressing issues in domains such as biodiversity, water resources management, and disaster management. GEOSS ensures free access to and the use of Earth observation data for users across different regions by promoting an open data policy and standardization (Craglia et al., 2008). Space data sharing in South America is not as institutionalized yet, but still relevant with countries like Brazil and Argentina on the center stage. One such example is the China-Brazil Earth Resources Satellite (CBERS) program, a bilateral program that provides medium-resolution remote sensing to South American countries for use in agricultural, environmental, and urban planning. Although regional coordination is yet to develop, these collaborations demonstrate the increasing importance of collective satellite infrastructure in supporting transboundary problems like deforestation, food security, and monitoring of natural disasters.

What distinguishes APSCO is its emphasis on capacity building, together with data sharing. APSCO not only disseminates data but also educates member nations in interpreting and applying data. Joint projects such as collaborative satellite missions, harmonized ground segment networks, and training workshops ensure equal access and capacity building. This approach serves to bridge the technological gaps among member countries and ensures efficient application of space-borne information towards socioeconomic growth. Therefore, space data sharing between regional space cooperation organizations has progressed from basic bilateral structures to more comprehensive, multilateral platforms. By 2010, APSCO had initiated ten major cooperative projects, including the development and launch of lightweight and medium-class satellites (approximately 500 - 600 kg) for research, remote sensing, and telecommunications. These projects are crucial because they strengthen the data sharing program for the collective use of data by the organization members, shared from satellite data for the purposes of environmental monitoring, disaster response, and scientific studies.

One notable study is Chukeat Noichim's 2009 work, "The ASEAN Space Organization: Legal Aspects and Feasibility", which concluded that ASEAN countries should combine efforts to promote sustainable space development by establishing an ASEAN Space Organization. Although no regional space agency was formed, from then until now, events that have developed are the integration of ASEAN member states has been accomplished more closely through instruments like the ASEAN Charter and RCEP, the advancement of space development

among member states, and the emergence of new regional space agencies in parts of the world, notably the African Space Agency (AfSA), the Arab Space Cooperation Group (ASCG), and the Latin American and Caribbean Space Agency (ALCE) (Berthet & Corrado, 2024). The Southern African Development Community (SADC) has taken up a strategic initiative aimed at developing a regional satellite sharing framework to enhance the supply and use of data sourced from space across all its member states. This collaboratively aimed framework shall facilitate access to satellite-based services and information to strengthen regional capacities in telecommunications, broadcasting, satellite navigation, weather forecasting, and the monitoring and management of natural and environmental resources. It will go a long way toward promoting greater integration and resource sharing among member countries. In addition, SADC would enrich the decision-making process on matters related to disaster preparedness and sustainable development in the region (Boshoff, 2010; Citaristi, 2022; Siebrits et al., 2019).

2. Definition of Core Concepts

1. Space data

For the purpose of this paper, “space data” refers to raw, processed, and value-added information derived from outer space activities, particularly Earth observation and remote sensing satellites.

2. Data ownership

International space law does NOT clearly define ownership of satellite data. Data ownership in this paper refers to the legal entitlement to control access, use, licensing, distribution, and commercialization of data generated through space activities. This means ownership may differ from physical possession, and ownership may be shared in joint missions.

3. Custodianship

Custodianship refers to the responsibility for storing, managing, securing, preserving, and administering access to shared data, even when ownership remains with contributing states.

4. Non-discriminatory access

Non-discriminatory access refers to equal and fair opportunity for APSCO Member States to access shared space-derived data without arbitrary exclusion, subject to agreed security and operational limitations.

Hierarchy of Legal and Policy Instruments within APSCO

The governance structure of the Asia-Pacific Space Cooperation Organization (APSCO) consists of different categories of legal and institutional instruments that possess different legal statuses and authorities. Distinguishing between treaty obligations, institutional decisions, project-specific arrangements, and academic recommendations is important in order to avoid conflating legally binding commitments with operational practices or scholarly proposals. Such a distinction also assists in clarifying the legal basis of regional cooperation relating to space activi-

ties and data-sharing mechanisms within APSCO.

A. Binding Law

The principal legally binding instrument within APSCO is the Convention on the Establishment of the Asia-Pacific Space Cooperation Organization. As a multilateral treaty ratified by Member States, the Convention establishes the legal foundation of the organization and defines its objectives, institutional structure, and areas of cooperation. The Convention, therefore, constitutes the primary source of legal obligations within the APSCO framework.

Several provisions of the Convention are relevant to regional cooperation in the field of space activities and scientific information exchange. Article 4 identifies the objectives of the organization, including cooperation in the peaceful uses of outer space, development of space technology, and promotion of collaborative activities among Member States. Article 21 further provides for the exchange of scientific and technical information generated through cooperative activities, subject to applicable national laws and relevant restrictions. Collectively, these provisions provide the treaty-level legal basis for cooperative activities involving space-related information and data exchange within APSCO.

B. Institutional Decisions and Administrative Coordination

In addition to the APSCO Convention, the functioning of the organization also depends on decisions and coordination mechanisms adopted by APSCO organs, particularly the Council and the Secretariat. Such measures primarily concern the administration and implementation of APSCO activities and cooperative programs.

Unlike the APSCO Convention, these institutional measures do not possess the status of multilateral treaties ratified by Member States. Their functions are mainly administrative and operational, particularly in relation to program coordination, technical implementation, and institutional management within APSCO activities. Accordingly, they should be distinguished from treaty-based legal obligations under the Convention.

C. Project-Specific Cooperative Arrangements

Certain APSCO cooperative activities are implemented through project-specific arrangements concluded between participating parties. These arrangements may include Memoranda of Understanding (MoUs), technical cooperation arrangements, and implementation agreements relating to particular programs or missions. The legal effect of such arrangements depends on their specific terms and participating entities. In most cases, these instruments govern operational matters relating to technical participation, coordination responsibilities, resource contributions, and project implementation within specific cooperative activities. Their applicability is generally limited to the participating parties rather than APSCO membership as a whole.

D. Academic Recommendations and Reform Proposals

In addition to analyzing the existing APSCO legal and institutional framework, this paper also discusses several possible reforms concerning data governance, le-

gal harmonization, cybersecurity standards, dispute resolution mechanisms, and equitable access to shared space data. These discussions are intended to contribute to the broader academic and policy debate regarding the future development of regional space cooperation. Several recommendations discussed in this paper are normative reform proposals advanced by the author and should not be interpreted as existing APSCO legal obligations. Rather, they are presented as possible approaches that may strengthen transparency, accountability, legal certainty, and fairness within the APSCO data-sharing framework in the future.

3. Purpose and Scope of Space Data Sharing in the Regional Space Cooperation Organization

The space data sharing has an important role to play in the overall development of the regional space cooperation organizations. The main role of this cooperative interaction is to enable the member states, which may have different degrees of space capabilities, to gain equitably from space-derived information. These data comprise Earth observation, meteorological, telecommunication, and geospatial data. The exchange of such data will allow member countries to tackle the problems affecting the region collectively by facilitating the advancement of scientific progress and improving the pace of socioeconomic growth. On a more fundamental level, the aim of space data sharing is also political and strategic; it promotes regional integration, diplomatic confidence, and a sense of ownership of common scientific infrastructure. Space collaboration can be used in many regions to decrease dependency on external forces and instead establish self-sufficient and knowledge-based economies (Zhang, 2025).

Space data sharing is very broad (Kaku et al., 2006) and encompasses many applications, such as

- Disaster monitoring and response;
- Environmental and climate surveillance;
- Agriculture and food security;
- Urban planning and infrastructure;
- Water resource management;
- Biodiversity and forest cover assessment;
- National security and border monitoring;
- Capacity building and education.

This wide application is especially evident in intergovernmental organizations like the Asia Pacific Space Cooperation Organization (APSCO) (Zhang, 2025), ASEAN, and the African Union (AU), through its African Space Policy (Offiong, 2022), and emerging networks in Latin America (CELAC) (Vadell, 2022). These organisations understand that sharing space data will multiply its value; it will allow analysis at regional scales, reduce expensive satellite launches, and develop a joint research community. Joint research and technological innovation are among the fundamental roles of space data sharing. Member states do not need to duplicate their efforts at an international level, but they can instead share their

resources, be it data or expertise, to work together on common scientific goals. For instance, within the Data Sharing Service Platform (DSSP) organized by APSCO, member countries have shared data in Earth observation, which is collected by their respective national satellites. This common repository facilitates project collaboration, such as estimating agricultural yields, mapping land degradation, and conducting urban growth studies. Through collective platforms such as ARTSA, as well as involvement in Sentinel Asia, ASEAN enables its members to research environmental dynamics collectively, such as the haze in the region, deforestation, and urban heat islands. Timely space data in disaster-prone areas is indispensable to early warning systems and environmental monitoring. The regional organizations work as a bridge for cross-border data transfer and for coordinated response. Sentinel Asia involves the involvement of ASEAN in the Philippines during a typhoon to access JAXA satellite images for damage assessment. Similarly, the disaster monitoring platform provided by APSCO also provides real-time access to data to its members, including Pakistan, China, and Iran, to monitor floods and earthquakes. This significantly improves the response time and the extent of the disaster. Other equally significant elements of technical capacity development are the training of personnel, particularly where the member states do not have domestic satellite programs. The spread of space information enables the involvement of countries that have primitive infrastructure and enjoy the best space technologies. Scientists and engineers in developing countries are provided with the opportunity to train, as well as common data repositories and joint missions, which help them improve. APSCO participates in joint Master's and Ph.D. programs in space science and conducts practical training workshops on satellite image processing and data analysis. The African Union space policy proposes to have shared ground stations and open access to Earth observation data as a way of bridging technical disparities between the African Union member states. In addition, the data obtained in the common share space is directly used in the areas of sustainable economic development. It involves optimization of satellite images of agricultural activities through crop health surveillance, irrigation requirements, and the forecast of harvests. In other regions, remote sensing assists in enhancing the planning of transportation and infrastructure design as part of environmental impact assessment procedures. These regional projects typically involve the incorporation of space data in economic programs like mining, forestry, and water management, as the SADC Satellite Framework testifies. Such applications drive productivity advancement, while resource mismanagement and improved governance take place through evidence-based policymaking. In addition to these technical and economic factors, space data sharing promotes political integration and institutional alignment. Space cooperation in the region not only enhances scientific cooperation but also promotes alignment of the national policies and standards. The regional space programme of the East African Community (EAC) facilitates common space laws, joint investments in satellite infrastructure, and integrated development objectives. Frequent meetings, dialogue over

policies, and joint missions develop a deeper understanding and help improve the process of long-term integration at a regional level.

The Importance of Space Data Sharing in APSCO

Space data exchange is a strategic tool that is advancing scientific development, capacity building, and the geopolitical integration of regional space cooperation, meaning it is not merely a technological path. The Asia-Pacific Space Cooperation Organization (APSCO) has considered space data sharing to be a primary means of achieving its objectives related to the peaceful utilization of space, the reduction of technological disparity among member states, and improved development in the region. As there are also different degrees of space capabilities among APSCO members, with the world-class space-faring states such as China to developing countries such as Bangladesh or Mongolia, equity in sharing and using space data becomes a necessity of the cooperative approach of APSCO. It is perhaps most central to the strategic importance of space data sharing that it is one means by which APSCO ensures that information derived through satellites is provided to all equitably. Many states in the APSCO region have neither the resources nor the means to independently develop or sustain their space-based Earth observation systems. In this context, such countries gain access to an extended range of satellite imagery, remote sensing products, and geospatial datasets through the APSCO Data Sharing Service Platform (DSSP) and other similar shared platforms. This not only democratizes the use of space technology but also enables smaller or emerging space nations to meaningfully partake in research and decision-making discussions. Space data sharing is therefore consistent with the principle of “shared benefits and shared responsibilities” espoused by APSCO, which promotes equal cooperation (Nasution et al., 2018). Besides, the two significant application domains that were identified during joint programs with APSCO, i.e., disaster management and environmental monitoring, clearly suggest the strategic significance of data sharing. Timing is everything with regard to satellite imagery when the Earth is shaking due to earthquakes, clogged by a natural disaster, or hit by drought. The available data allows one to make significant advances in post-disaster assessment and early warning. APSCO cooperative mechanisms have been designed to support regional disaster-response activities through the exchange of Earth observation information. This reiterates the practical utility in terms of shared data being a resource for regional security and resilience, thus adding support to national risk mitigation strategies and humanitarian actions. The other significant factor is the development of capability. In addition to space data sharing programs of APSCO, member countries also carry out technical training and education programs that empower them with the ability to process, analyze, and interpret satellite data. This strategy cultivates self-sustenance in space applications and the building of long-term scientific potential. For example, image processing, data calibration, and application development are taught and trained at APSCO through topical workshops. Such workshops tend to use either live or ar-

chived shared datasets. In this way, these projects promote not only scientific co-operation but also institutional growth throughout the region and contribute to the transformation of space data exchange into a power source. Also, APSCO promotes cost-effective strategies and research collaboration through space data sharing. This prevents mission and infrastructure overlap during the creation of mutually shared capabilities, including ground stations, processing tools, and analytical expertise. Multinational programmes like the Small Multi-Mission Satellite (SMMS) constellation and joint remote sensing programmes show pooling of data usage for climate impact research, urban land use evaluation, and regional agriculture observation. Hence, these collaborative ventures can be discussed as examples of how joint data can trigger scientific creativity and integration (Kitamura et al., 2019). And, last but not least, the space data exchange, which is brought by APSCO, is extending the arms of diplomacy in unity. Even countries that have different political regimes and developmental priorities can build an atmosphere of trust, transparency, and understanding in which frequent exchange on the level of interagency discussions, sharing of data, and collaborative missions are addressed. This is one of the assumptions that are relevant against the background of the geopolitical climate in the Asia-Pacific region. The space collaboration provided by APSCO enables productive interaction within a neutral environment. The inclusion of data exchange in its governance structure allows APSCO to create regional stability, soft diplomacy, and technical growth.

4. The Legal Instruments and Agreements of APSCO for Space Data Sharing

The exchange of space information between sovereign states must have a structured legal and regulatory framework to promote clarity, fairness, transparency, and compliance with international space law. In this regard, there are several legal instruments, internal policies, and multilateral agreements established by the Asia-Pacific Space Cooperation Organization (APSCO) to govern the manner in which satellite data and other associated information are gathered, processed, exchanged, and utilized among its Member States. Such legal arrangements are needed to safeguard national interests as well as to promote regional collaboration in the peaceful application of outer space. The foundational legal instrument of APSCO is the Convention on the Establishment of the Asia-Pacific Space Cooperation Organization, which was signed in 2005 in Beijing. This is a legally binding document, which identifies the principles of equality, mutual benefit, peaceful co-operation, and sharing the results of joint projects. Although the Convention does not literally determine the operation of data sharing, it establishes the legal foundation of the cooperation and confirms the interest of all the members to participate in common programs. Article 2 of the APSCO Convention is related to the definitions that are the interpretative basis of the legal instrument. The article does not deal with substantive provisions in terms of space cooperation or data sharing; instead, it sets a clear meaning of some important organizational and institutional

terms applied in the Convention. In particular, it establishes the terms of APSCO like the “Organization” (which implies referring to APSCO itself), the Host Government (which is the People’s Republic of China where the headquarters are based), the Member State (which implies referring to any country where the Convention is a party), the Council (the highest decision-making body of APSCO), the Chairman (the head of the Council), the Secretariat (the executive body), and the Secretary-General (the chief executive officer of the Organization) (*Asia-Pacific Space Cooperation Organization, 2005a*). These definitions have been used to present a stable legal system which has promoted coherence and consistency in the interpretation and application of the further provisions of the Convention. It is necessary to understand Article 2, which plays the fundamental role of defining the legal identity and functions of the institutions of APSCO, which play a pivotal role in carrying out the objectives of the institution. The Convention obliges all Member States under the law to assist in common efforts and maintain decisions made by governing bodies at APSCO, even in relation to data policies (*Zhao, 2009*). In order to implement the provisions of the Convention, APSCO appears to employ operational arrangements and project-based practices relating to data governance, although comprehensive publicly available data-sharing regulations remain limited. Moreover, some documents may specify the modalities of:

- Accessing shared satellite data.
- Data custodianship responsibilities.
- Data confidentiality, licensing, and rights of use.
- Security and intellectual property rights (IPR).

These policies are normally implemented using the APSCO Council, and they are applied by its Executive Body. They make sure that the sharing of data takes into consideration national security issues, ensures the prevention of misuse, and complies with international obligations (e.g., Outer Space Treaty, Remote Sensing Principles) and domestic laws of the member states (*Zuiderwijk & Janssen, 2014*). Moreover, APSCO implements project-based contracts on certain programs, such as the Data Sharing Service Platform (DSSP), Asia-Pacific Ground-Based Optical Space Object Observation System (APOSOS), Joint Small Multi-Mission Satellite (SMMS) Constellation Program, and Earthquake Monitoring and Early Warning Systems. These projects are governed by Project Implementation Plans (PIPs) and Memoranda of Understanding (MOUs) that define project roles in data collection and processing, as well as clarify roles in the ownership and custodianship of mission data while stipulating distribution rights and non-commercial usage conditions of mission data. These contracts ensure that everybody complies with the legal and operational standards of APSCO. APSCO practice may be understood as involving varying levels of accessibility, including openly shared, restricted, and collaboratively managed datasets, although no comprehensive public classification framework could be identified. APSCO aligns its legal framework with international space law instruments, such as the Outer Space Treaty (1967), the UN Principles on Remote Sensing (1986), and the Registration Convention (1976). All

these alignments contribute to the practices of the organization being globally accepted, which makes it more credible as a model of regional cooperation. Lastly, the institutional regulation of APSCO provides good governance and legal enforcement. The APSCO Council forms the strategic direction and approves data-sharing frameworks, while the Executive Body handles implementation and coordination. The Legal and Policy Affairs Department ensures that legal standards are adhered to, as well as resolving conflicts and enforcing consistency in regulatory enforcement. All these bodies contribute to transparency, trust, and enforceability, cementing APSCO as a leading institution in cooperative space data governance.

4.1. The APSCO Convention and Its Provisions Related to Space Data Sharing

The APSCO Convention is the basic legal framework to be followed in order to regulate the purpose, structure, and mechanism of the organisation. The APSCO Convention provides the legal framework through which the Member States in the region cooperate peacefully in outer space. The Convention provides an inclusive legal framework that allows and promotes data-related collaboration in the domains of cooperative space projects, scientific research, and capacity building.

Article 3 of the APSCO Convention formally establishes APSCO as an inter-governmental, non-profit, and independent organization, and it has full international legal status. (*Asia-Pacific Space Cooperation Organization, 2005b*) This gives APSCO the status of an entity in international law, and as such, it can exercise its rights to form a contract, take on liabilities and obligations, enjoy the benefits and privileges, and hold international responsibility. Although the legal personality of APSCO is confirmed by the Article, it lacks specifications on the limits and boundaries of the status. However, this legal identity enables APSCO to operate successfully in the international community and collaborate in space-related programs and policies (*Islam, 2020; Zhu, 2012*).

Article 4 of the APSCO convention states the main aims of the organization as it focuses on the peaceful collaboration of space science and technology among member states. It aims to build cooperation by establishing a framework for the common development and use of space technologies. The paper identifies the need to assist member countries in terms of an integrated research, development, training, and capacity-building program. It also promotes collaboration among the concerned enterprises and institutions to promote the industrialization of space applications. Moreover, the APSCO commitment to the peaceful use of space by cooperating with other nations is strengthened in Article 4, which makes the benefits of space activities distributed fairly among the members¹.

Article 18 on financial arrangement indirectly influences data sharing. (*Asia-Pacific Space Cooperation Organization, 2005c*) Article 18 indirectly supports the

¹ Asia-Pacific Space Cooperation Organization. Convention of the Asia-Pacific Space Cooperation Organization. 28 Oct. 2005. Entered into force 12 Oct. 2006. Article 4.

principle that Member States contributing to APSCO cooperative activities may reasonably expect to participate in the benefits and outputs of such programs. Shared funding can help justify the shared technical output (Yan, 2021).

Article 21 of the APSCO Convention plays an important role in promoting the exchange of technical and scientific information among its members. Article 21 consists of two parts, and the title of Article 21 is “Exchange of Information”. The specific quote of the article is below.

Part 1 “The Organization and the Member States shall facilitate the exchange of scientific and technical information pertaining to the areas of space science, space technology, and their applications. A Member State may not communicate such information to the Organization and vice versa if it considers that such information will infringe its own agreements with a third party or is inconsistent with the interests of its own security.”

Part 2 “In carrying out its activities, it will be ensured by the Organization that the scientific results in view of a scientific and/or technological research/study shall be made public/published only after these have been used by the scientists/engineers within the Member States responsible for the experiments under the aegis of the Organization. The Organization shall have all exclusive rights to the results and reduced data, which shall be the property of the Organization.”

Legally, this establishes a qualified obligation rather than an absolute duty of disclosure. The provision supports cooperative data exchange while preserving sovereign discretion in matters involving national security or external contractual obligations.

All the member states bear in mind their national security and sovereignty while sharing scientific, technological, and operational data generated from collaborative projects and activities carried out under the APSCO framework. All in all, Article 21 allows knowledge and resources to be shared for the advancement of space science and sustainable development, while not forgetting their own national security. A member state may refuse to provide information if it would jeopardize its security or disclose its agreement with a third party (Asia-Pacific Space Cooperation Organization, 2005d).

4.2. Bilateral and Multilateral Agreements within the Framework of APSCO

Bilateral and multilateral agreements are essential tools for operationalizing the cooperative principles within the legal and practical framework of the Asia-Pacific Space Cooperation Organisation (APSCO), especially when it comes to space data exchange. Although the APSCO Convention offers a general framework for Member State cooperation, specific agreements, either bilaterally between APSCO and individual members or multilaterally among multiple members, are required to carry out specific missions, projects, and data exchange protocols.

In fields including Earth observation, satellite navigation, remote sensing, and catastrophe monitoring, these agreements are crucial instruments for establishing

formal cooperation, guaranteeing fair access to data, and defining roles for cooperative projects (Žaludová, 2018).

Within APSCO, bilateral agreements often take place between two member states or between the organisation and one member state. These contracts are frequently utilized to:

- Offer specialized technical assistance or access to infrastructure (e.g., ground receiving station installation).
- Permit access to data for certain missions or datasets (e.g., satellite images used for Earth observation).
- Encourage capacity-building initiatives, including national-level training focused on data utilization, internships, and scholarships.

As an illustration, APSCO entered into separate contracts with member nations like Thailand and Pakistan to facilitate the establishment of data processing and receiving facilities. Through these agreements, the participating nations were able to exploit satellite data produced by cooperative APSCO missions, such as the Small Multi-Mission Satellite (SMMS), for national development and environmental monitoring. These bilateral agreements support tailoring cooperation to a nation's unique strategic goals or technology requirements while staying true to the APSCO purpose.

Multilateral agreements are more comprehensive and involve multiple member states coming together under APSCO's coordination to implement joint projects. These agreements are often:

- Related to satellite missions, such as design, launch, operation, and shared data access.
- Structured around shared platforms, such as the Data Sharing Service Platform (DSSP), enabling multiple countries to exchange and analyze satellite-derived data.
- Linked to joint research and development programs, such as the GNSS Applications Projects or Space Law and Policy Frameworks.

The Data Sharing Service Platform (DSSP) project is a leading example of multilateral data sharing mechanisms developed by APSCO with participation from multiple countries. APSCO cooperative projects involving multiple member states have sought to facilitate shared access to Earth observation information. The DSSP platform enables real-time exchange of remote sensing data for better regional disaster response systems and monitoring of agriculture and water resources. Another example of a significant multilateral endeavor is the APSCO Earthquake Monitoring and Early Warning Pilot Project, in which the member states jointly contribute and share seismic and geospatial data to establish a regional risk management system.

4.3. Data Policy Framework and Guidelines of APSCO

The Asia Pacific Space Cooperation Organization (APSCO) data policy framework and rules safeguard transparent, fair, and safe sharing of space data among

its member states. APSCO cooperative activities involving space-derived information appear to operate through project-specific arrangements and institutional coordination mechanisms developed under the broader objectives of the APSCO Convention.

This structure, built from the guiding principles of the APSCO Convention, will be elaborated in specific project agreements, operational procedures, and capacity-building programs. It is developed to achieve a balance between open sharing and data security in fields such as geospatial intelligence, Earth observation, and disaster observation, all of which deal with sensitive data. In accordance with the APSCO Convention, which advocates the sharing of scientific and technological information, it aims to assure that all member states have equitable access to space-based data, irrespective of their technological abilities. Article 4 contributes to the realization of education and collaborative development through capacity building². APSCO's official program for the Asia-Pacific Ground-based Optical Space Objects Observation System (APOSOS) seeks to leverage shared data for use in disaster management, agriculture, urban planning, and environmental monitoring. The said policies are in line with the international legal framework with a view to data privacy and compliance with domestic and international laws (Jagirani & Pei, 2024). Although APSCO lacks a comprehensive publicly available data governance framework, OECD data governance principles provide a useful comparative benchmark for evaluating transparency, accountability, and fairness in regional data-sharing systems. The OECD Recommendation on Enhancing Access to and Sharing of Data (EASD), whose final version was proposed to the Council by the Secretary-General on 22 October 2021, outlines key principles necessary for effective and ethical sharing of data. The principles emphasize fairness, legitimacy, specification of purpose, proportionality, data quality, transparency, and accountability. Fairness means no discrimination in the processing of data, which is transparent. Legitimacy requires that data be obtained and processed for valid purposes. Purpose specification requires that data be collected for clear and defined objectives. Proportionality and data minimization dictate that only data necessary for the stated purpose is collected and processed. Ensuring data quality involves maintaining accurate, relevant, and up-to-date information. Transparency calls for open communication about data collection, usage, and sharing practices. Accountability obligates all involved parties to comply with data protection standards and ethical considerations. Collectively, these principles, as outlined by the OECD, aim to foster trust, protect individual rights, and promote responsible data governance, particularly in cross-border data-sharing frameworks. The Data Sharing Service Platform (DSSP) is a cooperative initiative supporting regional data-sharing activities, designed to facilitate efficient and seamless exchange of space-based information among Member States (Asia-Pacific Space Cooperation Organization, 2024). The Data Sharing Service Platform (DSSP) is an APSCO cooperative initiative intended

²Asia-Pacific Space Cooperation Organization. Convention of the Asia-Pacific Space Cooperation Organization. 28 Oct. 2005. Entered into force 12 Oct. 2006. Article 4.

to facilitate regional exchange and access to space-derived information among participating Member States. The platform supports collaborative data-sharing activities related to Earth observation and associated applications. Through such initiatives, APSCO seeks to strengthen regional cooperation, technical coordination, and capacity building in the use of space-based information.

5. The Legal and Institutional Mechanism of APSCO for Data Sharing

APSCO's data sharing system is founded on legal and institutional frameworks to ensure meaningful cooperation in the region. Such mechanisms establish all the ways of sharing the data derived through collaborative missions in a fair and responsible way among the Member States. This framework is composed of treaties, institutional frameworks, technical platforms, and policy instruments that, when combined, bring about transparency, shared interest, and the peaceful use of outer space. APSCO promotes trust, encourages scientific cooperation, and facilitates the efficient exchange of data to serve many applications that include satellite operations, environmental surveillance, and disaster monitoring in the Asia-Pacific region by setting specific legal standards and operational frameworks (Islam, 2020). Space data sharing in APSCO is largely supported by the APSCO Convention, which is a binding agreement signed by all member states. This convention encourages collaboration in the development of satellites and the common use of space data and technologies, making sure that all the members of this convention have equal access to the space data and technologies, irrespective of their capabilities in space. It also protects intellectual property rights and data confidentiality in collaborative projects. In addition to the Convention, data sharing is also controlled by certain bilateral and multilateral agreements, which explicitly specify the procedures, responsibilities, and protocols for accessing, using, and securing data within a particular project. APSCO has developed a multi-level institutional system to handle, oversee, and assist space data sharing (Cragin et al., 2010; Nie, 2019).

The APSCO Council is the top governing body in the organization, which consists of one representative from every member state. It also has some important roles, including the approval of policies regarding data sharing, and ensuring that the frameworks are aligned in accordance with the objectives of the organization and with international standards. Another aspect the Council observes is compliance and legal adherence, in which the implementation of policies is observed to ensure that all members adhere to the agreed-upon rules and regulations. It also leads strategic planning of the joint space activities, which determines the course of the joint projects and encourages cooperation among the member states within the space industry. The Secretariat is the executive branch of APSCO based in Beijing and is charged with the day-to-day operation of the organization and the proper coordination of the project. It plays an important role in the management of communication among the member states, especially in terms of data access, which ensures easy cooperation and sharing of data. Also, the Secretariat plays the

role of making sure that the legal and institutional decisions are being put in place, taking the policies and strategies that the APSCO Council has passed, and turning them into practical plans and seeing them through to the end objectives of the organization. Technical Committee and Expert Groups are professional bodies that consist of engineers, scientists, and legal advisors of the Member States of APSCO, which are important to the functioning of the body. They have the responsibility of coming up with technical standards in data sharing so that the data shared among member states is consistent, reliable, and usable. The teams also strive to address operational and legal issues that might emerge in the process of collaborative projects to offer some knowledge to overcome intricate problems. Moreover, they play an essential role in the deployment of the APSCO data infrastructure, which is a part of the system development and maintenance aimed at providing the opportunity to efficiently share data and interact within the region. The Legal and Policy Affairs Division manages the legal affairs of the operations in APSCO. Its main responsibilities involve lawful and legal adherence to international space law, as well as the internal regulations of APSCO, which is why it ensures that all the projects and joint ventures used are compliant with the accepted legislation. The division is also important in terms of examining and preparing contracts, as well as making sure all partnerships, data-sharing agreements, and joint ventures are legally valid and transparent. It is also used to settle disputes among the member states, and thus solve conflicts and ensure a cordial working relationship. Additionally, the division strives to facilitate uniformity in national policies where there is coordination between the legal standards of APSCO and the national laws of the member states.

APSCO embraces the use of technological tools and platforms to reinforce its legal framework, and the Data Sharing Service Platform (DSSP) is one of its important examples. This is a secure digital platform that enables the availability of satellite and Earth observation data and allows member states to exchange useful geospatial information. It also allows the transfer of national information into it, which can be distributed to other member states, helping to promote collaboration. The DSSP is also used to aid in the collaborative processing and visualization of geospatial data, which facilitates collaborative research and analysis. The use of the platform is regulated by certain policies which specify the access rates, rights of users, and protection of data, while all activities are organized in accordance with the legal and institutional standards of APSCO. In order to ensure that there is fair usage and consistency of the data, APSCO has put in place strong enforcement and compliance measures. These also include systems that monitor the flow and use of data on the platform, and they ensure that the protocols are followed as agreed upon. Conflicts that arise as a result of sharing data are normally resolved using dispute resolution mechanisms that are managed by the Council or Secretariat. APSCO may potentially restrict participation or operational access in cases of non-compliance, although publicly available enforcement procedures remain limited. Transparency and accountability are maintained through regular

evaluation and auditing to ensure that the system operates within the main values and objectives of APSCO.

5.1. Institutional Framework for Space Data Management under the APSCO Organization

APSCO has established a detailed institutional framework to control the collection, processing, storage, and sharing of space data between its Member States. This structure consists of several important entities and specialized departments that are charged with policymaking, legal control, technical standardization, and coordination of operations (*Asia-Pacific Space Cooperation Organization (APSCO), 2005*). The ultimate decision-making body is the APSCO Council, which has the mandate of ratifying space data policies and endorsing cooperative efforts between the member states (*Asia-Pacific Space Cooperation Organization, n.d.-b*). It provides the strategic pathway for space data sharing and aligns with the objective of APSCO. The operational center is the Secretariat, which is based in Beijing and oversees the daily operations of APSCO while providing the process of data sharing and implementing the decisions of the Council effectively (*Asia-Pacific Space Cooperation Organization, 2025*). Data formatting, transmission, and security protocols are the technical standards of data sharing and are defined by Technical Committees and Expert Groups, which are made up of professionals working in the member states of APSCO, ensuring that the data shared is efficient and secure (*Asia-Pacific Space Cooperation Organization, n.d.-a*). The Legal and Policy Affairs Division also ensures that the activities of the organization are performed within the framework of the established legal norms and that the processes of data sharing are carried out in accordance with the internal governance policy of APSCO. It is a well-organized system that ensures APSCO has a legally compliant, transparent, and cooperative system that has facilitated the peaceful utilization of space-based information throughout the Asia-Pacific region, enhancing cooperation and mutual gain.

5.2. Mechanism for Data Access and Exchange among Member States

Asia-Pacific Space Cooperation Organization (APSCO) has developed a detailed framework that can enable fair access to data and effective cooperation among its Member States. This framework is regulated by standardized procedures aimed at providing fairness, mutual benefit, and technical reliability. Member States have unrestricted access to the information obtained in joint space missions and the satellite projects led by APSCO. This policy encourages openness and joint use of common resources, which fosters the research and development activities of collaborative work efforts (*Nie, 2016*). In situations where the mission data of the nations is utilized within the context of APSCO cooperation, the sharing is performed under preestablished terms and procedures. This guarantees that the exchange of data is in line with national interests and is also used to achieve common goals. APSCO has deployed the DSSP, which is a digital platform that enables safe, real-time access and exchange of data between Member States. DSSP increases

interoperability and simplifies the process of data exchange, which raises the efficiency of collaborative projects. Data is sorted in terms of type and sensitivity, such as raw, processed, open, or restricted, with special rules that have been laid down concerning use and application. This classification ensures that information management is in line with security standards and considers the different degrees of data sensitivity. Such an organized method of accessing and sharing information not only increases the availability of data but also supports collective research and disaster monitoring projects. The structure of APSCO is what enhances the integration of space activities in the region, which is taken into consideration to further the development of space technology and its uses among the Member States (Pavesi, 2021).

5.3. Ensuring Accountability and Transparency in Data Sharing

The Asia-Pacific Space Cooperation Organization (APSCO) upholds the importance of accountability and transparency in data sharing between its Member States. These concepts are part of its system of governance, which creates mutual trust and long-term collaboration. APSCO is in line with international best practices and the legal framework in order to operationalize these principles (Yan, 2021). APSCO also creates comprehensive legal frameworks and working arrangements that outline data access rights, obligations, and terms of use for every Member State. APSCO cooperative projects appear to rely on project-specific operational arrangements concerning data access, coordination, and technical cooperation, although many such instruments are not publicly available. The method resembles the OECD recommendation of consistent and scalable data governance structures that incorporate legal, technical, and ethical aspects. In order to ensure adherence to accepted standards, APSCO deploys robust monitoring systems and audit trails that can trace the usage and flow of shared data. The OECD recommends the use of impact assessments and audits by adopting these practices to ensure responsible data stewardship. Member States are under an obligation to report on a periodic basis regarding the implementation and results of shared data. This practice also complies with the Data Policy Framework presented by the African Union, which supports transparency and accountability by regularly reporting and engaging in dialogue with stakeholders (Nyirenda-Jere et al., n.d.). APSCO has instituted measures that are handled by its Council or Legal Division to deal with disputes or acts of noncompliance. This is in line with the OECD guidance on embracing technology-neutral and agile legal environments that offer the required legal assurance and protection. By integrating these mechanisms, APSCO not only maintains compliance with its internal governance standards but also aligns with international standards and practices, thereby making its data-sharing initiatives more effective and legitimate.

6. Legal Issues and Challenges in Data Sharing under APSCO

The Asia-Pacific Space Cooperation Organization (APSCO) has a fundamental

objective of ensuring the fair and safe exchange of space-based data between Member States. Although the organization has made significant progress in building technical platforms and policy frameworks, formidable challenges remain in successfully establishing an operational and legally sound data-sharing mechanism. **Figure 1** shows the challenges that can arise because of data sharing under the existing legal framework. All these challenges are multifaceted, as they are created by legal ambiguities, as well as by operational differences between Member States (Berthet & Corrado, 2024). Among them, data ownership, data privacy, legal incompatibility issues, and cybersecurity are the key ones.



Figure 1. Legal issues and challenges in data sharing under APSCO.

When they are not addressed in time, these barriers have the potential to disrupt mutual trust and can reduce long-term cooperation in the organization.

Ambiguity regarding the ownership of the data is one of the most pressing legal issues in the sphere of law, particularly in the case of joint missions or shared satellite platforms. Concerns arise about the question of who possesses legal rights over the data, and who holds the rights to use, restrict, or redistribute it. This issue is worsened by the fact that there is no internationally agreed structure of space data ownership. Another significant legal issue is the safeguarding of sensitive information, particularly information with strategic, commercial, or security interests. Space data can contain high-resolution images of the Earth, communications payloads, or environmental measurements, some of which may consist of classified national information. APSCO currently lacks a publicly identifiable region-wide binding data protection regime comparable to the GDPR framework. This makes it more difficult to apply standardized privacy standards across boundaries. Since every Member State implements its own level of scrutiny and confidentiality standards, which increases the threat of data leakage or abuse, this may deter the members from openly engaging in joint data-sharing initiatives. The right to access space information in APSCO is a matter of not only legal concerns but also political and operational fairness. Developing Member States are very dependent

on common facilities because they do not have their own space infrastructure. Such dependency creates tension in situations where priority access to data, like real-time satellite imagery in the case of natural disasters, is required. In the absence of clear and fair policies on access to various data, many questions will arise, such as who gets access to what data, under what timeline, and at what cost structure; if not answered, it will create suspicions of imbalance and favoritism. Although the APSCO Data Sharing Service Platform (DSSP) was created to mitigate these problems, its performance will be determined by the operational regulations it imposes and how it operates in cooperation with all the Member States (Yan, 2021). Another fundamental issue is the legal disintegration among Member States. Data retention and intellectual property rights (IPR), cybersecurity, and cross-border data flows are some of the problems that have different regulations in each country. These variations hamper the formulation of standard agreements and result in the slow implementation of joint projects, and in most cases, legal compromises are made that undermine the overall efficacy of policies. For example, a particular APSCO Member State can impose open access to environmental information, yet another Member State can categorize the same information as classified information on grounds of national security. This legal divergence can be solved only by harmonization, as well as any binding inter-governmental agreements, which are still limited under the present APSCO framework (Zhao, 2011). There is an increasing threat of cybersecurity attacks on the shared data systems of APSCO. As there is a growing interdependence of space data through digital means, space data platforms are potential targets of cyberattacks that may endanger sensitive data or manipulate datasets to serve malicious purposes. According to the ITU (2007), the Cybersecurity Guide on developing countries highlights that data-sharing models in developing countries are particularly vulnerable because of poorly developed infrastructure and irregular security standards. In APSCO, the lack of even distribution of cybersecurity standards by the Member States is a vulnerability that can potentially impact the whole network. The development of secure storage facilities, encrypted communication standards, and authentication systems is complex and expensive and is often beyond the financial means of smaller or less-developed Member States (Canton, 2021). Lastly, technological, fiscal, and structural inequalities are another hindrance to a successful and consistent data-sharing practice. Other Member States are unable to implement or even comprehend the data-sharing policies of APSCO because of the shortage of qualified staff, legal framework, or IT-supporting systems. This difference not only results in non-compliance but also establishes a two-level system in APSCO in which more developed countries can enjoy more benefits from shared data programs. Additionally, the absence of specific national agencies or centres of space data control in certain countries inhibits communication and coordination with the Secretariat and the legal division of APSCO. These limitations highlight the importance of capacity-building efforts, including training courses, legal harmonization seminars, and financial assistance by the central administration of

APSCO (Harvey, 2023; Nie, 2019). In order to cope with these issues, APSCO has undertaken joint programs that have focused on capacity-building and the improvement of legal frameworks within its Member States. It is also worth noting that the organization collaborated with the United Nations Office of the Outer Space Affairs within the project of the Space Law for New Space Actors (Isnardi, 2019). This cooperation enabled discussions on the building of national space law and internationalization, thus working in one direction towards unified space governance among the Member States. Moreover, the agreements of APSCO, such as the Agreement on China's Earth Observation Satellite Data Cooperation, are examples of striving to standardize the data-sharing practices (Borowitz, 2020). This particular agreement allows the delivery of satellite remote sensing data to Member States, which promotes the collaborative use of space-based resources.

6.1. Jurisdictional Challenges Due to Conflicting National Laws and Policies

Another major issue APSCO is facing is the lack of harmonization of national laws and policies on space data, which often makes them inconsistent with the spirit of cooperation as described in the APSCO Convention. Every Member State has sovereignty in its own legal definitions, classification, and areas of jurisdiction regarding space data. For example, what one state considers its sensitive information because of national security reasons might be considered by another nation as publicly available information, which poses a difficulty to the smooth flow of data. Additionally, some states have strict laws on national security, which include not sharing certain kinds of satellite imagery, particularly in areas that include valuable infrastructure, or along a border area, even in cases where this data might be beneficial to disaster management in the region or for environmental monitoring. The domestic legal restrictions usually interfere with Article 4 of the APSCO Convention, according to which cooperative projects need to be implemented jointly, and also the shared use of outcomes, such as space-derived data and technological improvements, should be shared among members. Although the Convention provides these principles, it does not interfere with national sovereignty, and therefore, there may be inconsistencies in the governance of data, including different retention periods, access controls, and cross-border sharing guidelines. For instance, a member may need to retain indefinite data archiving for national security compliance, whereas another will restrict it because of privacy legislation or storage capacity. Such gaps cause problems in jurisdiction that postpone joint operations or create a lack of confidence in intergovernmental data-sharing systems. To enhance cooperation between the regions, APSCO might seek harmonized directions or model contracts (e.g., standardized data licenses or mutual recognition contracts) to standardize the national policies of the countries on its common goals. This would reduce legal fragmentation without encroaching upon the legislative capacity of nations, so that there is seamless cooperation in space science and terrestrial observation [18].

6.2. Concerns about Data Security and Its Protection Acquired through APSCO

The security and integrity of data sharing is another critical issue in the data-sharing system of APSCO. Member States are becoming increasingly concerned that sensitive data involving satellites and Earth observation is vulnerable to different cyber threats, such as unauthorized access, interception, or manipulation by hackers and other malicious actors. In a digital ecosystem where data transfer takes place across national borders, any type of breach can be caused by the leakage of data, malware, or a phishing attack. Such a breach will not only affect the security of a particular country but also the credibility of the whole cooperative system. Moreover, there is also a real and increasing threat that shared data can be stolen for unintended political or military uses, which can violate the peaceful use principles of the Outer Space Treaty (1967). The lack of harmonized cybersecurity protocols also contributes to these risks because member states have different degrees of digital maturity, legal enforcement capacity, and technical standards. The lack of a common cybersecurity doctrine means that a single weak link is a threat to the overall infrastructure. To overcome these challenges, APSCO needs to implement effective and enforceable legal protective measures and embrace holistic cybersecurity benchmarks, which include the implementation of end-to-end encryption, role-based access control, and blockchain-based audit trails to track data integrity and usage. In addition, all data-sharing agreements ought to include legal tools like Data Protection Clauses, Non-Disclosure Agreements (NDAs), and incident response practices. The inability to implement such protective mechanisms would result in selective participation, including states limiting their data contribution, which would impair the main purpose of multilateral collaboration. The development of trust in terms of good legal and technological security systems, therefore, is a precondition for effective, transparent, and safe data sharing in APSCO.

6.3. Legal Issues Regarding Ownership of Data Generated from Joint Missions

One of the most complex areas of law with regard to space cooperation in multinational space cooperation is the ownership of data produced by a common mission. When different countries make different contributions to a project, with one providing financial support, another critical payload technology, and another with intellectual input, the question arises: which country has the right to own the data? In contrast to unilateral missions, where the rights to the data clearly belong to the sponsoring country, joint missions blur this boundary, and extensive pre-launch agreements are needed for joint missions. International space law fails to provide specific guidance on the subject of data ownership in collaborative contexts, leaving room for customary law for interpretation, bilateral or multilateral agreements, and organizational frameworks such as that of APSCO to be interpreted. Without a unified legal framework, tension might arise, such as whether

access should be given according to the contributions or distributed equally among all member states. The proportional allocation argument is based on the principles of equity and incentivization, and equal distribution is favourable to broader co-operation and capacity building. Therefore, to prevent conflicts and to build long-term trust, it should be ensured that data ownership, access rights, and use limitations will be codified by binding Project Implementation Plans (PIPs) or Memoranda of Understanding (MoUs) before the mission's execution. These documents should define custodianship, the terms of licensing, and whether space data is permitted for commercial use or not, because the scientific and economic value of space data may be critical. Ultimately, in joint missions, the resulting data must become a shared resource, where the access and use of data are transparent to reflect the principle of contribution as well as the collective benefit principle, expressed in the international cooperation framework.

6.4. Issues of Equity and Fairness in Access to Data among Member States

Although APSCO strives to ensure equal benefits for all members, there are some countries that have better resources, expertise, and infrastructure. As APSCO was founded on the principles of equality and mutual benefit, in reality, the differences in technological capacity, economic development, and human resources between member states have led to challenges in achieving truly equitable access to and utilization of space-derived data (*Asia-Pacific Space Cooperation Organization, 2022*). Some countries are also better positioned to process, interpret, and use satellite data for national development, research, and disaster management because they have developed space programs and institutional infrastructure, such as China and Iran. Conversely, less advanced or emerging space countries can get the same data but lack the ground systems and people with the knowledge or analytics needed to derive valuable insights from it (*Asia-Pacific Space Cooperation Organization, 2025*). In an effort to address this imbalance, APSCO needs to move beyond the uniform data distribution model and formulate a differentiated support system that matches the specialized requirements of its members. A possible solution would be to adopt a tiered capacity development framework, which would categorize the countries according to their degrees of readiness and provide them with support accordingly. This may include projects such as remote-sensing fellowship programs, technology internships, and mobile satellite training laboratories deployed in under-resourced areas. Also, APSCO may invest in regional data interpretation facilities in which experts from different member states work in a common environment, which leads to inclusivity and skill transfer. In addition, institutionalizing fairness through entrenching these principles in a Data Equity Charter in the legal and policymaking structure of APSCO would contribute to the enforcement of fairness. A charter like this might require all joint projects to evaluate the equity impact of data sharing and require accompanying training or technology packages to ensure usability. Another innovation may be the devel-

opment of AI-assisted platforms to simplify the data to enable countries with lower numbers of technical experts to obtain processed visualizations and predictive models, particularly in climate response or agriculture. Importantly, there must be trust and transparency, as these are essential. The proposed solution would help APSCO to be accountable and demonstrate improvement by publishing the yearly equity evaluation and member-specific capacity-building reports. Such efforts would not just enhance fairness but strengthen cohesion, loyalty, and cooperation among the member states. Such practice aligns with the best international practices, as seen in the UN Office for Outer Space Affairs (UNOOSA) recommendation on inclusive data policies and the OECD emphasis on bridging technological gaps in multilateral space collaboration. Therefore, APSCO has both the ethical obligation and the practical opportunity to lead by example in building an equal, inclusive, and efficient regional model of data sharing.

7. Legal Gaps, Institutional Weaknesses, and Reform Proposals for Data Sharing

The framework for space data sharing within APSCO, while grounded in legal principles and institutional structures, exhibits several significant shortcomings that hinder its effective implementation. Ambiguities in the legal provisions, such as the unclear definition of “reasonable cost” and the exact interpretation of “non-discriminatory access”, provide considerable leeway to individual member states, leading to inconsistent application of the Convention’s rules. This flexibility enables states to enforce unilateral limitations on data access, often justified by security or proprietary interests, which can compromise APSCO’s cooperative objectives. Member states with developing space capabilities, in particular, may encounter delays or exclusion from critical space-based information, exposing inequities in the system. Moreover, the current legal framework does not include well-defined enforcement mechanisms, leaving limited avenues for states to address or contest disputes arising from unequal access to data (Nasution et al., 2018).

Institutional constraints further amplify these difficulties. The lack of standardized protocols, limited transparency in decision-making processes, and insufficient coordination among APSCO’s organs undermine predictability and trust, both of which are essential for effective collaboration. To address these challenges, several reform measures have been proposed, including the establishment of explicit procedural guidelines, clearly defined criteria for cost-sharing and equitable access, and the creation of comprehensive oversight and dispute resolution mechanisms. By remedying both legal and institutional gaps, these reforms seek to bring APSCO’s operational practices in line with its cooperative mandate, ensuring that all member states, irrespective of technological capabilities, can fully engage in regional space initiatives and derive fair benefits from shared space-derived data.

7.1. Absence of a Dedicated Data-Sharing Policy within APSCO

The most fundamental legal gap is the total absence of a comprehensive, Council-

adopted Data-Sharing Policy. Article 21 is a provision, not a policy. A policy would translate the principle into actionable rules, defining: the types of data covered; the roles and responsibilities of data providers, the Secretariat, and users; access rights and restrictions; metadata and quality standards; licensing terms; privacy and security protocols; procedures for contribution and withdrawal of data; and mechanisms for review and update. The current reliance on Secretariat guidelines and ad hoc practices means there is no stable, predictable, and legitimate legal framework that members can rely on. This gap is the root cause of most other challenges identified in this chapter, as it leaves every operational question to be resolved through power dynamics or improvisation rather than by the pre-agreed rule of law (Jakhu et al., 2018).

7.2. Legal Consequences of Unstructured Data Rights Governance

The absence of a clear framework for allocating data rights, including access, use, and licensing, represents a significant legal vulnerability in collaborative projects. This uncertainty discourages both innovation and investment, as private entities within member states may be reluctant to develop business models dependent on APSCO data when their rights to use, modify, or commercialize derived products are not clearly defined. Similarly, academic and research collaborations are constrained by unclear rules on publication, attribution, and data citation. In practice, this legal vagueness disproportionately benefits dominant actors, typically the original data providers, who can unilaterally determine the terms of use. Establishing a well-defined data access, usage, and licensing framework is therefore crucial to maximizing the economic and scientific potential of shared data and to ensuring that all stakeholders can participate equitably in the resulting value chain (Rognstad, 2024).

7.3. Tension between National Security and Collective Access

The persistent tension between national security imperatives and the goal of collective data access represents a core institutional vulnerability within the regional space-sharing framework. Although international law encourages peaceful uses of outer space and equitable sharing of benefits, it simultaneously recognizes the right of states to restrict information perceived as critical to national defense or strategic interests. Within a data-sharing consortium, this means that when a state unilaterally restricts access to certain datasets on security grounds, it effectively acts as both the gatekeeper and judge of its own restriction, a structural conflict of interest. These unilateral security-based restrictions not only limit data access to other member states but also generate mistrust and uncertainty. If restrictions are viewed as arbitrary or motivated by political advantage, affected states may respond by imposing reciprocal limitations, leading to a spiral of data protectionism. Such dynamics can degrade the spirit of cooperation, discourage joint projects, and stifle long-term investment in shared mission infrastructure (Mahmoudi & Moradinasab, 2024). A major institutional gap lies in the absence of formal

mechanisms to mediate and review security claims. There is, as yet, no internal procedure to evaluate the legitimacy, necessity, or proportionality of security-based restrictions, nor is there a harmonized classification scheme for sensitive data across member states. There is similarly no agreed process to enable secure, controlled access to sensitive datasets for cleared individuals or institutions—access which might be needed for cooperative security-related projects such as maritime domain awareness or environmental monitoring. In practice, restrictions are imposed in a fragmented, opaque, ad hoc manner, often through bilateral deals rather than through institutionalized policy frameworks (Zhang et al., 2020). This lack of institutional safeguards and transparent, standardized procedures increases transaction costs, undermines trust, and risks fragmenting the consortium's data-sharing ecosystem, potentially creating unequal tiers of access based on political relationships or strategic trust rather than technical need or scientific merit. To mitigate these risks, the consortium needs to adopt common classification protocols, an independent review or arbitration body, and secure data-sharing channels for sensitive data, thereby balancing legitimate security concerns with the collective interest in shared data access (Oduntan, 2019).

7.4. Limited Enforcement and Dispute Resolution Provisions

Although Article 21 of the APSCO Convention promotes the exchange of scientific and technical information among Member States (Asia-Pacific Space Cooperation Organization, 2005f), the treaty does not provide any robust mechanism to enforce compliance or adjudicate disagreements over data access or interpretation. If one state withholds data, others have no effective way to compel release; there is no sanction regime, no oversight body, and no standardized enforcement procedure. In practice, the absence of detailed enforcement procedures may limit the practical effectiveness of Article 21 obligations relating to information exchange. When a member suspects another of non-compliance, the only formal route is via Article 19, which offers consultation and optional arbitration (Asia-Pacific Space Cooperation Organization, 2005e). Yet this avenue is highly inadequate for routine or technical data-sharing disputes: it is slow, resource-intensive, and typically suited only for major, high-stakes disagreements rather than everyday operational issues. There is no provision for intermediate dispute-resolution stages such as Secretariat-led mediation, technical review panels, or a specialized data-sharing committee that could offer a faster, more pragmatic means of resolving conflicts. Because of this enforcement void, legal rights and obligations under Article 21 are often subordinated to political bargaining power. States with greater influence or leverage may effectively dictate access, while smaller or less powerful members have little recourse. The result is a governance structure where political considerations may at times influence the practical implementation of data-sharing arrangements, undermining trust, transparency, and predictability in APSCO's data-sharing regime. To remedy this, APSCO would need to establish a dedicated, internal dispute-resolution framework: perhaps a Data Dispute Com-

mittee, an independent arbitration or mediation board, or technical review panels empowered to adjudicate access or data-quality disputes. Such an institutionalized procedure would make data-sharing obligations more enforceable and credible, transform Article 21 from a discretionary commitment into a predictable institutional norm, and enhance the rule of law within the organization.

7.5. Recommendations

To address the institutional and legal gaps identified earlier, APSCO should embark on a structured reform process aimed at building a comprehensive data governance framework.

a) Develop an APSCO framework for data rights negotiation: This Framework would not stipulate or standardize ownership. Instead, it would function as a modular legal toolkit to facilitate the case-by-case negotiations recommended by the experts. It would provide member states with a pre-vetted menu of equitable options, which would include:

1. Standardized Access Tiers (e.g., Full, Limited, Research-Only).
2. Model Usage Licenses (e.g., Non-commercial, Commercial with royalty-sharing formulas).
3. Benefit-sharing mechanisms (e.g., co-authorship, capacity-building support).
4. A Process for Amending Rights to Address Future Claims.

This transforms APSCO's role from a passive holder of ambiguous principles to an active facilitator of structured, transparent, and fair project-specific agreements.

b) Develop a Common Data-Protection and Access Standard: APSCO should establish a technical regulatory standard governing data protection and access control across all shared datasets. This standard would include:

1. A Data Classification Scheme (e.g., Open, Sensitive, Restricted) with clearly defined categories and access rules.
2. Protocols for secure data transfer and storage, compliant with international best practices for data security and privacy.
3. A unified Identity and Access Management (IAM) system within the DSSP to enable role-based and data-level access control.
4. Guidelines for data anonymization or deidentification for datasets that may contain personal or sensitive information.

By implementing such a standard, APSCO would embed security and access protocols directly into its governance infrastructure, aligning with globally accepted principles such as the TRUST Principles for data repositories, which emphasize transparency, responsibility, sustainability, and technology-driven governance (Huber et al., 2022). This would foster trust among member states and lower barriers to collaboration.

c) Encourage Open-Data Collaboration Consistent with OST Principles: For nonsensitive datasets, especially those related to environmental monitoring, disaster response, climate change, or scientific research, APSCO should formally

adopt an Open Data Policy that reflects the principle of equitable benefit-sharing enshrined in space law and global data governance norms. Under this policy, such data would be released via the DSSP under a permissive license (e.g., open attribution license), accessible not only to member states but also to the wider global research community and public. Such an open-data approach has been shown to accelerate scientific discovery, foster innovation, and democratize access, particularly benefiting under-resourced or developing states (Carvalho et al., 2025). By doing so, APSCO could enhance its regional and international standing, encourage cross-border cooperation and external partnerships, and embody the principle of peaceful space use and benefit-sharing.

8. Conclusion

APSCO may further strengthen its legal, institutional, and technical challenges to enhance cooperation and improve the effectiveness of space data sharing among Member States. The suggestions are intended to establish a safer, more equitable, and more effective data-sharing platform. To strengthen its legal and institutional foundation, APSCO needs to encourage its members to align their national space and data legislation with the overarching standards and principles of the organization. This alignment may be achieved by bringing in a model policy framework, which countries may tailor to their national context, and this will help to establish consistent legal standards in the region. A clear definition of legal provisions on data ownership, usage rights, and access rights is an important issue in joint space projects. Equity and incentive could be balanced with a tiered system of access in which those countries that contribute more are given higher access, but a minimum amount of data is available to everyone. Another critical risk is data security, in particular, to protect systems such as the DSSP. To address the risk of unauthorized access or misuse of data, APSCO could consider an integrated system of cybersecurity with regular audits, development of technical skills, and improvement of infrastructure to reduce the risk. In order to maintain uniformity in rule enforcement and transparency, APSCO might set up an independent monitoring entity. This group would monitor the compliance, dispute resolution, and annual reports on data-sharing practices to establish mutual trust. Moreover, the capacity building of the member states should be supported, especially in such countries that have scarce resources. To bridge the technical gap, a possible reform mechanism would involve starting targeted training programmes, promoting the exchange of technologies, and promoting the collaboration of experts. Simultaneously, the organization must encourage the responsible open access of non-sensitive data, such as environmental monitoring-related or disaster-response-related data, and retain the sensitive information in controlled, licensed databases. And lastly, to be flexible, APSCO needs to implement flexible legal instruments such as template contracts and updatable protocols that can be adapted to changes in technology, global legal standards, as well as the different demands of its member states.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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