Enhancing Geospatial Data Protection in Africa: Lessons from Global Intellectual Property Rights Practices

The rapid advancements in geospatial technologies, including satellite systems, drones, and Geographic Information Systems (GIS), have made spatial data essential for applications like infrastructure development, resource management, and national security. As the geospatial industry shifts towards commercialization, robust Intellectual Property Rights (IPR) frameworks are crucial to protect innovations, incentivize investment and ensure fair access to data.

This paper explores the relationship between geospatial data and IPR in Africa, where regulatory frameworks are often underdeveloped. Drawing comparisons with international models, such as India's ISRO-led approach, and global legal instruments like the Berne Convention and TRIPS, the study demonstrates how strong legal frameworks can foster innovation while addressing data ownership and accessibility challenges.

By examining current practices in Ghana and other African nations, the paper highlights the challenges of unclear public-private policies, unauthorized data usage, and cross-border disputes. The study includes case studies of drone-acquired datasets from infrastructure and resource mapping projects in Liberia, Ghana, and the mining sector, illustrating the impact of weak IPR frameworks on development.

Recommendations include adopting tailored IPR regimes for Africa, building capacity among policymakers, and encouraging private-sector innovation. A balanced, context-sensitive approach to IPR governance, aligned with global standards but responsive to Africa's unique challenges, can drive economic growth and technological progress across the continent.

1. Introduction:

Geospatial data has become a critical asset for sustainable development in Africa. From mapping natural resources to planning urban infrastructure and responding to climate change, the insights derived from spatial information are essential for informed decision-making. The proliferation of geospatial technologies, including satellite imagery, drone-based data acquisition, and sophisticated GIS platforms, has unlocked

unprecedented opportunities for data collection and analysis. However, this technological progress also presents new challenges, particularly concerning the protection of intellectual property rights associated with geospatial data. In Africa, where the geospatial industry is rapidly expanding, robust IPR frameworks are crucial to incentivize innovation, attract investment, and ensure that the benefits of geospatial technology are equitably shared. Weak or non-existent IPR protection can lead to unauthorized data use, hindering the development of a vibrant geospatial sector and potentially exacerbating existing inequalities. This paper examines the intricate relationship between geospatial data and IPR in the African context, drawing lessons from global best practices and offering tailored recommendations for strengthening data protection frameworks across the continent.

Definition

Geospatial data is any data that is associated with a specific location on Earth. This type of data often includes information about the geographic coordinates (latitude and longitude) of a place, as well as details about natural or man-made features found at that location.

Types of Geospatial Data:

1. **Vector Data**: Represents geographic features using points, lines, and polygons.
    - **Points**: Locations like cities or landmarks.
    - **Lines**: Linear features like roads or rivers.
    - **Polygons**: Area features like lakes, parks, or countries.
2. **Raster Data**: Represents geographic features as a grid of cells or pixels, often used for images like satellite photos or elevation data.

Sources of Geospatial Data:

- **Maps**: Traditional maps, digital maps, and GIS (Geographic Information Systems) maps.
- **Satellite Imagery**: Images of Earth captured by satellites, used for weather forecasting, environmental monitoring, and more.

- **GPS Data**: Location data collected by GPS devices, such as the coordinates of a person's location.
- **Sensors:** Collect data on everything from air quality to traffic flow.
- **Social Media:** Can provide real-time information on events and trends, often with location data attached.

Uses of Geospatial Data:

- **Urban Planning**: Helps in designing cities and managing land use.
- **Environmental Monitoring**: Tracks changes in ecosystems, deforestation, and climate change impacts.
- **Disaster Management**: Assists in assessing damage from natural disasters and planning emergency response.
- **Navigation**: Provides directions and location information for navigation systems.
- **Public Health:** Tracking disease outbreaks, identifying health risks, and planning healthcare services

2. The Importance of Geospatial Data Protection in Africa:

Geospatial data plays a vital role in addressing Africa's development challenges. It is essential for:

Resource Management: Mapping mineral deposits, forests, and water resources for sustainable exploitation and conservation.

Infrastructure Development: Planning transportation networks, energy infrastructure, and urban development projects.

Disaster Management: Predicting and responding to natural disasters, such as floods, droughts, and earthquakes.

Agriculture and Food Security: Monitoring crop health, optimizing irrigation, and improving agricultural productivity.

Environmental Monitoring: Tracking deforestation, pollution, and other environmental changes.

Geospatial technologies can play a crucial role in enhancing cybersecurity measures and protecting against threats. For example, organizations can use geospatial platforms and map infrastructure to visualize the location of users and identify the origin of cyber-attacks. This can help in understanding attack patterns, identifying vulnerabilities, and implementing appropriate security measures to prevent data breaches and protect critical infrastructure.

Effective IPR protection is crucial to:

Incentivize Investment: Companies are more likely to invest in geospatial technology and data acquisition if they are confident that their innovations will be protected.

Promote Innovation: Strong IPR frameworks encourage the development of new geospatial tools and applications.

Ensure Fair Access: Clear rules regarding data ownership and usage promote transparency and prevent exploitation.

Facilitate Data Sharing: Well-defined IPR regimes can facilitate data sharing for public good applications while protecting the rights of data creators.

3. Current IPR Landscape in Africa:

As of January 2024, 35 out of 55 African countries have passed data protection laws, with three more having draft laws under consideration. Many African countries lack specific legal frameworks for protecting geospatial data.

For instance, Rwanda's Data Protection Law (DPP Law) defines personal data as any information relating to an identified or identifiable natural person, including location data.

A key continental initiative related to data protection is the Malabo Convention, adopted by the African Union in 2014. This convention requires countries to implement

domestic laws for personal data protection that comply with its rights-based standards. It provides a framework for harmonizing data protection legislation across Africa and promoting cooperation on cybersecurity and data protection matters.

In South Africa, the South African Spatial Data Infrastructure (SASDI) aims to regulate the collection, management, maintenance, integration, distribution, and utilization of spatial information 5. This national-level initiative provides an example of a more targeted approach to managing geospatial data, which can be examined for best practices and potential adaptation by other African countries.

In South Africa, unauthorized municipal expenditure has been a persistent issue. Spatial analysis techniques have been used to identify hot spots of unauthorized expenditure, highlighting areas where financial mismanagement is concentrated and informing interventions to curb such practices.

Furthermore, the DS-I Africa Initiative, established in 2021, focuses on leveraging data science technologies to transform biomedical and behavioral research and develop solutions to improve individual and population health 6. A key activity of this research involves the sharing of health data, including genetic data, which requires careful navigation of pertinent data protection legislation. The DS-I Africa Law project specifically addresses the legal dimensions of using data science for health discovery and innovation in Africa, providing scientists with guidance on how to be legally compliant when sharing and using sensitive data.

Existing intellectual property laws may not adequately address the unique characteristics of spatial information. This often results in:

Unclear Ownership: Disputes arise regarding who owns geospatial data, particularly when it is derived from multiple sources or involves public-private partnerships.

Unauthorized Use: Data is copied, distributed, or used without permission, undermining the value of data assets.

Cross-Border Disputes: The lack of harmonized IPR frameworks across countries complicates the resolution of data-related disputes.

Data Exploitation: Foreign entities may exploit the lack of clear regulations to acquire and use African geospatial data without providing adequate compensation or benefit-sharing.

4. Lessons from Global Best Practices:

India's ISRO Model: The Indian Space Research Organisation (ISRO) provides a valuable example of how a government agency can manage and disseminate geospatial data while protecting intellectual property rights. ISRO's data policy balances the need for open access with the protection of commercial interests.

India's ISRO-led approach offers a compelling example. The Indian Space Research Organization (ISRO) has developed the Bhuvan platform, a geospatial data platform that provides high-resolution satellite imagery and detailed mapping data for various applications, including infrastructure monitoring. Bhuvan's data is highly localized, catering to specific needs and challenges at the ground level, and is designed with a privacy-centric approach, ensuring that user data is not sold or used for advertising purposes. This contrasts with the approach of companies like Google, which often monetize user data through targeted advertising, highlighting the importance of considering privacy implications in the design of geospatial data platforms.

India's National Geospatial Policy, introduced in December 2022, further strengthens the country's geospatial sector by fostering a more liberalized approach to geospatial data handling and encouraging private sector involvement. This policy emphasizes innovation and the development of national and sub-national systems for managing geospatial information.

Another important aspect of international geospatial data management is the role of the Open Geospatial Consortium (OGC). The OGC is an international voluntary consensus standards organization that develops and maintains international standards for geospatial content and services. By advocating for standardized geospatial data formats, the OGC promotes interoperability, enabling seamless data sharing and collaboration across different platforms and systems.

The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) has adopted 14 Global Fundamental Geospatial Data Themes. These themes provide a valuable framework for organizing and standardizing geospatial data, which can be relevant for African countries developing their data protection strategies. They cover a wide range of topics, including addresses, buildings and settlements, elevation and depth, and population distribution, offering a

comprehensive framework for countries to consider when developing their geospatial data strategies, including aspects of data protection.

The United States offers an example of how existing trademark systems can be leveraged to protect certain types of geospatial data, such as geographical indications. The US protects geographical indications through its trademark system, usually as certification and collective marks. This approach allows for administrative trademark structures to be used for geographical indications, providing a clear legal framework for their protection and enforcement.

International Legal Instruments: The Berne Convention and the TRIPS Agreement provide a framework for international cooperation on intellectual property rights. These agreements can serve as a foundation for developing regional or national IPR frameworks for geospatial data in Africa.

The Berne Convention for the Protection of Literary and Artistic Works, first adopted in 1886, establishes international standards for copyright protection. It aims to safeguard the rights of authors and creators over their literary and artistic works, ensuring they have control over how their works are used and disseminated. While geospatial data may not always fit neatly into traditional copyright categories, the Berne Convention's principles can be applied to certain aspects of geospatial data, such as maps and databases, particularly concerning originality and unauthorized reproduction.

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement), which came into effect in 1995, sets minimum standards for the protection of various forms of intellectual property, including copyrights, geographical indications, and trade secrets. It explicitly mentions that software and databases are protected by copyright, subject to originality requirements. This provision can be relevant for protecting geospatial databases that meet the criteria for copyright protection.

The WIPO Copyright Treaty, a special agreement under the Berne Convention, focuses on addressing the challenges posed by digital technologies to copyright protection. It aims to harmonize solutions for deficiencies in existing copyright law caused by the advent of software, databases, and the digital environment, providing a more robust framework for protecting intellectual property in the digital age.

5. Case Studies:

Liberia: Drone-acquired datasets for infrastructure mapping faced challenges regarding data ownership and usage rights, hindering project implementation and attracting further investment.

Data Involved

In Liberia, drone-acquired datasets are used for infrastructure mapping, which includes high-resolution imagery and geospatial data. These datasets provide detailed information about the physical infrastructure, such as roads, buildings, and utilities, which are crucial for urban planning and development.

Challenges Faced

1. **Data Ownership**: There is a lack of clear policies and regulations regarding the ownership of drone-acquired data. This creates uncertainties about who has the rights to use and distribute the data.
2. **Usage Rights**: Without well-defined usage rights, there are disputes over how the data can be used, who can access it, and for what purposes.
3. **Data Governance**: Weak data governance frameworks lead to issues in managing, sharing, and protecting the data.

Consequences of Weak IPR Protection

1. **Project Implementation**: Unclear data ownership and usage rights hinder the implementation of infrastructure projects, as stakeholders are unsure about the legal implications of using the data.
2. **Investment**: Potential investors are deterred by the lack of clear data governance, as it increases the risk of legal disputes and financial losses.
3. **Development Delays**: The uncertainty surrounding data ownership and usage rights leads to delays in project planning and execution, affecting overall development progress.

Ghana: Resource mapping projects in the mining sector experienced issues with unauthorized data sharing, leading to disputes and potential loss of revenue.

In Ghana, resource mapping projects in the mining sector involve geospatial data that maps mineral resources, mining activities, and environmental impacts. This data is essential for managing mining operations, ensuring regulatory compliance, and assessing environmental sustainability.

Challenges Faced

1. **Unauthorized Data Sharing**: There are instances of unauthorized sharing of sensitive geospatial data, leading to disputes over data ownership and usage.
2. **Data Security**: Weak data security measures result in the unauthorized access and distribution of valuable geospatial data.
3. **Regulatory Compliance**: Inadequate enforcement of data protection regulations allows unauthorized data sharing to persist.

Consequences of Weak IPR Protection

1. **Disputes**: Unauthorized data sharing leads to disputes between stakeholders, including mining companies, government agencies, and local communities.
2. **Revenue Loss**: The unauthorized distribution of geospatial data can result in significant revenue losses for mining companies, as competitors gain access to valuable information.
3. **Environmental Impact**: Weak IPR protection undermines efforts to monitor and mitigate the environmental impacts of mining activities, leading to potential environmental degradation.

These case studies highlight the importance of robust data governance frameworks and clear intellectual property rights to ensure the effective use and protection of geospatial data in various sectors.

6. Recommendations:

Develop Tailored IPR Regimes: African nations should develop specific legislation addressing the unique characteristics of geospatial data. This should include clear definitions of data ownership, usage rights, and enforcement mechanisms.

Capacity Building: Training programs for policymakers, legal professionals, and data managers are essential to ensure effective implementation of IPR frameworks.

Promote Private Sector Innovation: Incentives should be provided to encourage private sector investment in geospatial technology and data acquisition.

Balance IPR with Open Data Principles: IPR frameworks should be designed to facilitate data sharing for public good applications while protecting the rights of data creators. Explore the concept of tiered access to data, where some data is freely available while other data requires licensing.

Foster Regional Collaboration: Regional organizations like the African Union can play a crucial role in promoting harmonized IPR frameworks across the continent. This will facilitate cross-border data sharing and investment.

Address Data Security: Integrate data security measures into IPR frameworks to protect geospatial data from unauthorized access and misuse.

Utilize existing Intellectual Property frameworks

1. Copyright:

- **What it protects:** The creative expression in a geospatial dataset, such as the way data is selected, arranged, and presented (e.g., in maps, visualizations, or databases).
- **How it applies:**
    - **Maps:** Copyright can protect the design and layout of maps, including the choice of symbols, colors, and labels.
    - **Databases:** Copyright can protect the structure and organization of a geospatial database, even if the underlying data itself is not protected.
    - **Software:** Copyright protects the code of software used to create or process geospatial data.
- **Limitations:** Copyright does not protect the underlying facts or ideas contained in the data. For example, you can't copyright the location of a mountain, but you can copyright a unique artistic rendering of it on a map.

2. Patents:

- **What it protects:** New and inventive methods or systems for collecting, processing, analyzing, or visualizing geospatial data.
- **How it applies:**
    - **Novel Sensors:** Patents can protect new types of sensors or data collection techniques (e.g., a new type of LiDAR system).
    - **Algorithms:** Patents can protect innovative algorithms used to process or analyze geospatial data (e.g., a new method for image classification).
    - **Software:** Patents can protect software that implements unique geospatial functions (e.g., a new routing algorithm for navigation apps).
- **Requirements:** To be patentable, the invention must be new, non-obvious, and have industrial applicability.

3. Trade Secrets:

- **What it protects:** Confidential information that gives a business a competitive advantage in the geospatial field.
- **How it applies:**
    - **Proprietary Data:** A company might have a unique dataset that it keeps secret to maintain a competitive edge (e.g., a detailed map of mineral deposits).
    - **Methods and Techniques:** A company might have developed unique methods for processing or analyzing geospatial data that it keeps confidential.
- **Requirements:** To be protected as a trade secret, the information must be confidential, have commercial value, and be subject to reasonable efforts to maintain secrecy.

4. Database Rights:

- **What it protects:** In some jurisdictions, there are specific rights that protect the substantial investment in obtaining, verifying, or presenting the contents of a database, including geospatial databases.
- **How it applies:** This right can prevent others from extracting or re-utilizing a substantial part of the database without permission.

5. Sui Generis Rights ("Special Rights"): for example geographical indication in Ghana

- **What it protects:** Some countries are exploring or have implemented special rights to protect geospatial data, recognizing its unique characteristics and value.

- **How it applies:** These rights might provide broader protection than copyright, covering the data itself and not just its creative expression.

6. Data Governance Policies

What It Covers: Data governance policies establish guidelines for managing, sharing, and protecting geospatial data.

How It Works: Implementing robust data governance policies ensures that geospatial data is handled responsibly and securely, reducing the risk of unauthorized access or misuse.

7. Industrial Designs – Protects the appearance of products (e.g., the shape of a Coca-Cola bottle).

8. **PlanVariety Protection** – Safeguards rights for new plant breeds.

7. Conclusion:

Strengthening IPR frameworks for geospatial data is essential for unlocking the full potential of this valuable resource in Africa. By adopting tailored legal regimes, building capacity, and promoting regional collaboration, African nations can create an environment that fosters innovation, attracts investment, and ensures that geospatial data contributes to sustainable development across the continent. Balancing IPR protection with the principles of open data and fair access is crucial for maximizing the benefits of geospatial technology for all. The recommendations outlined in this paper provide a roadmap for African governments and stakeholders to create a robust and equitable system for managing and protecting geospatial data in the 21st century.

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