Small Satellites in Support of the Outer Space Treaty and Human Rights Protection in Emerging Countries

Dr. Annette Froehlich, LL.M., MAS a*, Claudiu Mihai Tăiătu, LL.M. b

a European Space Policy Institute (ESPI), Schwarzenbergplatz 6, Vienna, Austria, annette.froehlich@espi.or.at; German Aerospace Center (DLR); SpaceLab, Department of Electrical Engineering, University of Cape Town.
b European Space Policy Institute (ESPI), Schwarzenbergplatz 6, Vienna, Austria; International Institute of Air and Space Law, Leiden University, c.taiatu@yahoo.com.
*Corresponding Author

Abstract

The Outer Space Treaty states in Article 1 that outer space is the province of mankind, to be used for the benefit of all humankind. While the scope of, or in fact the nature of an obligation that could be derived out of article one has been the object of many, often controversial, discussions, there is a general understanding that space based applications can aid in a number of ways, especially with regard to developing countries which often lack critical infrastructure. Looking at the world today, it seems that almost every day the news are filled with reports of disasters and images of refugees fleeing war or starvation. Especially developing countries are frequently affected by such setbacks, often lacking critical infrastructure to cope with those situations. Satellite Data can provide much needed relief and has already been used numerous times in legal proceedings to support judges in finding a fair judgment. Satellite data has been used by the international court of justice to determine the evolution of a border river in its judgment on the status of the Kaskili/Sedudu Islands, thereby solving a lasting territorial dispute. Furthermore, Satellite data can be used to prove economic impacts, as shown in the “Certain Activities Carried out by Nicaragua in the Border Area” Case. The use of Satellite imagery as evidence was also crucial in the “Oil Platforms” case, as it provided prove that Iran was using off shore oil platforms as missile sites to carry out attacks against neutral ships during the Iran-Iraq war. Recently, Satellite Data has been used to prove the violation of human rights - for example to demonstrate the demolition of housings in Zimbabwe. Finally, satellite data may also provide evidence of war crimes. Based on the pre-attack and post-attack satellite images, the damage to the MGS Haskanita military base in northern Dafur and thereby the unlawful attack against peacekeepers of the African Union could be verified. Small satellites can prove to be a viable solution for developing countries, as their low mass and seize (below 500 kg) helps to reduce the economic cost for launch vehicles and the costs associated with construction – thereby turning them into an affordable solution to create much needed telecommunication infrastructure and obtain critical satellite data for developing countries to improve security, development, stability, justice and peace.

1. Introduction

Remote sensing is defined by the 1986 Principles Relating to Remote Sensing of the Earth from Outer Space as “the sensing of the Earth’s surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resources management, land use and the protection of the environment”. Gathering information by remote sensing means could be made with multiple technologies including Unmanned Aerial Vehicles (UAVs), planes, balloons and satellites. [1] Gathering raw data from satellites is a particular activity involving the use of space for sensing the Earth. Satellite remote sensing is a versatile tool capable of high-resolution imagery, which offers the advantage of viewing large sections of the Earth, at regular intervals, even in areas where is difficult to reach the remote sensed objective. Satellite remote sensing has the ability to provide important data to decision makers, including for military, environmental, meteorology, disaster management and human rights purposes. [2] This capability may become more accessible especially with the advent of large constellations of satellites in Low Earth Orbit (LEO) that would provide global coverage and the
Satellite remote sensing data could be Government owned, Quasi-Private, Private and Government. [3] But are the current policies and space-related applications sufficient and efficient to determine satellite data collection, data sharing and data processing on an international level including from commercial activities? What about using satellite imagery as evidence to courts, are there any standards to allow the images to be authenticated? What about Export Control regulations, are there any rules specific to remote sensing that could restrict information sharing or new rules are to be developed to protect what information can be shared?

2. Human Rights

Human rights refer to the basic rights and freedoms to which all humans are entitled. The protection of human rights in international law dates from the end of the Second World War and the creation of the United Nations. In recent times, very often the advocacy of human rights ideas is made by non-governmental organizations. Amnesty International, Human Rights Watch, and Physicians for Human Rights, are highly active NGOs in human rights matters and generate influence and pressure at regional and international level, including for the protection of human rights. Very often, they use satellite images to investigate violations of human rights, war crimes and genocide, which are useful to support their arguments before the UN and International organizations to request further investigations and protection to civilians.

3. Data Protection and Privacy

One of the most important legal aspects in relation with the data collection is privacy. The challenges refer to what kind of data can actually be collected and distributed and who can have access to it. The matter is complex as the regulations may or may not be in place. Regarding the term of “privacy” used in Article 12 UDHR (plus Article 17 ICCPR – International Covenant of Civil and Political Rights) or “private life” (Article 8 of ECHR) is not explicitly mentioning the aspects of privacy, but merely represents a general term, an “umbrella” notion that is so broad created as it offers protection to aspects of privacy not mentioned or not even foreseen during the codification process. [4] “Privacy is not an absolute right” and itself could be limited in some cases. [5] Intrusions on privacy have to be legal, meaning in the proportion to the benefit the society as a whole. Otherwise, the provisions of Article 12 UDHR are very clear in limiting arbitrary interference to privacy, family, home or correspondence. [6]

The right of privacy in the digital age could raise problems, especially when it is expected the high resolution to become available to a wide range of commercial players. The technology of satellite remote sensing will become increasingly accessible to private companies or even individuals and without specific rules to be applied to data collection, data processing and data sharing, the intrusion would be dangerous. The U.S. recent actions to reform the licensing and the regulatory process for remote sensing takes into consideration the imminent commercial development in LEO, the opportunity for the satellite operators to expand their services and data protection. The European Union Legal Framework on Privacy and Data Protection is currently represented by the General Data Protection Regulation (GDPR) addresses several privacy issues, without pointing out directly to UAVs or satellites for remote sensing.

4. Remote sensing and digital processing

Satellite remote sensing data require different procedures for processing the data until providing the final product in form of satellite images. Satellite data require additional influencing factors than when using traditional imagery with optical-electronic scanners characterized by sub-meter spatial resolution. [7]

The digital image processing is a very complex procedure involving: (a) Remote sensing data import; (b) Radiometric correction; (c) Geometric correction; (d) Image enhancement; (e) Image classification; (f) Map generation (for output of maps). Each satellite has its own orthorectification characteristics. It is thus very important to acknowledge that human factors play an important role in image interpretation, the final products are always provided upon a digital alteration. The digital processing is in direct relation with the certification of space data and the burden of proof means to provide evidence before the Courts that such images have probative values, reflective the real situations on the ground.

5. Space Law

The Outer Space Treaty of 1967 (OST) provides the basic framework on international space law. [8] The OST is the treaty containing principles from which
some could be reasonable referred as “the accepted body of customary law principles regarding space”. [1] While the Outer Space Treaty is a treaty on principles containing only rules of a general nature, the remaining four treaties include more detailed provisions. The use of satellites for remote sensing including surveillance by governments of private entities for different state or commercial purposes (for defense and intelligence related activities for national security or other purposes) are considered authorized under the provisions of OST Art. I, requiring no authorization from the sensed state. Regarding the provision of OST Art. I that space to be used for the benefit of all, remote sensing can provide benefit through the interpretation of the data from satellites, appropriate action in case of disaster management and humanitarian assistance. The provisions of OST Art. III which state that “State Parties to the Treaty shall carry on activities (…) in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security (…)” prohibits activities in violation of international law. Article III OST is inclusive about the relation of space law with international law and all obligations under the OST must be interpreted in light of the UN Charter.[9] As underlined by Diederiks-Verschoor, various links exist between space law and human rights based on several provisions in basic space law.[10] International law principles are applicable in outer space and the reference to the Charter of the United Nations (UN) implies that human rights are also included in this provision.

The “Principles Relating to Remote Sensing of the Earth from Outer Space” were adopted in 1986 as General Assembly Resolution. [11] The Principles do not cover all remote sensing and are not exhaustive of the potentialities of the techniques. [2] Raw information from satellites is referred as “primary data”. After processing this information through various digital means, it becomes “processed data” and finally, after interpretation could be referred as “analyzed information”. It was underlined the lack of provisions from the international space law regarding the application of satellite imagery and geolocation information as evidence before the mechanisms of international courts. However, the use of satellite data as evidence in courts is increasingly commonplace, the parties providing satellite imagery from different commercial sources. Recent cases of the International Court of Justice, of the International Tribunal for the Law of the Sea and of the International Criminal Court, are clear examples of this trend. [12]

6. Practical use of satellite data in support of human rights

The use of satellite imagery can play an important role for updating and extracting land related information, can provide valuable evidence such as a historical record of the areas that are subject to changes over time and prevent conflicts over boundaries which imply also violations to human rights for cross-movement. Satellite imagery is useful to be analyzed for boundary purposes, when two types of data could be analyzed, namely ortho-images from satellites and field data including ground control points (GCPs).

Satellite imagery also proved to be useful for the environmental protection and support the indigenous communities to prevent violation of human rights, deforestation, mining and water pollution. For example, through the use of satellite data, the indigenous communities could locate their ancestral territories and identify which lands have already been legalized and which are the territories they claim.

In addition to basic geological interpretation, assessment and seismic planning, the energy companies regularly monitor sites for oil spills and leaks. The costs associated with conventional monitoring techniques could be significantly reduced if more of such observations would be made using satellites and interpretation of satellite-based imagery.

The Human Rights Watch used multiple means of information including satellite imagery, witness statements and video and photographic evidence to identify more than 400 locations in rebel-held towns and villages in Daraa, and more than 1,000 in Aleppo, where the regime used large air-dropped munitions including the so-called barrel bombs. [13]

The UNHCR acknowledged the technological assistance of satellite images and global navigation satellite systems (GNSS) for the monitoring of the refugee and refugee-affected regions mainly for environmental components around camps. In a particular situation, data was gathered on the origin of refugees, as well as the number and location of different ethnic groups within the camp, which was useful for camp planning and management. [14] The European Association of Remote Sensing Companies (EARSC) has underlined that satellite observation technologies will play an increasingly important role in monitoring the movement of migrants and refugees. [15]
The UN Camp in Mali for the Multidimensional Integrated Stabilization Mission (MINUSMA) was attacked in January 2019 by unidentified attackers and resulted in more than 25 injured and 10 killed United Nations peacekeepers. Satellite images show refugee camp attacks and could become useful in identifying and/or preventing future attacks. [16]

The United Nations Office on Drugs and Crime (UNODC) acknowledged that in general there is a weak preventive, regulatory and security measures in place to control weapons and their movements. The difficulties also include prevention, detection, investigation and prosecution of these crimes. Thus, international arms flows monitoring through satellite images could be included as part of the new innovative tools for assessing arms flows. Limitations include the significant resources needed for the large-scale collection and processing of such data. [17] Satellite imagery has become cheaper and thus more accessible.

Monitoring weather from space can provide timely and accurate data which can then be used for monitoring Earth Weather and analyzing Climate studies. Different information such as the atmospheric temperature profiles, the relative humidity profiles, fractional cloud cover, cloud pressure and temperature; total ozone burden; mapping of the distribution of atmospheric gases; sea surface temperature; surface albedo; snow and ice cover; outgoing long wave radiation; precipitation index can all be measured from space.[18] Observations from satellites have become indispensable for forecasting the weather. A better understanding of the impact of climate change could be provided to Governments and decision makers from space. Meteorological satellite programs are an invaluable asset for climate monitoring and their role will grow. Satellites can provide a trustful source of highly accurate global measurements of the physical and biological state of the ocean including sea level, ocean current, sea surface temperature, ocean color and sea ice. air pollution is responsible for a broad range of adverse health effects. The operational monitoring and forecasting of atmospheric composition could be made through remote sensing from space.

The illegal activities flourished by exploiting the high costs of legal waste management and disposal and evading tax and other costs associated with disposing waste. The satellite imagery could represent a useful tool in waste management. ESA Business application underlined that space added value implies using Earth Observation data for monitoring and GNSS for tracking illegal dumping activities. [19]

In case of fraudulent water management, the pollution of oceans is increasingly becoming a global problem, with direct consequence of damaging the marine environment and indirectly humans which depend on the fish consumption. The effectiveness of satellites for oil spill surveillance has been proven many times. The radar imaging satellites are also used to see the surface during all weather conditions, day and night, particularly useful in cloudy locations or high altitudes. [20] Detecting illegal fishing and support transparent transshipment with satellite data is a business that could be further developed with the advent of small satellites and constellations in LEO.

Real time deforestation detection through satellite images could become necessary to save the Amazon Rainforest. In August 2019, the satellite images revealed the Brazilian Amazon burning at a record rate. These are the worst events in recent history showing burning fires destroying Amazon and tearing across Brazil at a record pace. When observing the wildfires in the Amazon rainforest from space, satellite imagery revealed the areas where the smoke spread across South America. The Brazilian Instituto Nacional de Pesquisas Espaciais (INPE) revealed with the help of satellite images that 9,500 forest fires took place in August 2019. Satellite imagery from NASA and the National Oceanic and Atmospheric Administration (NOAA) provided satellite images which underlined the areas coated in dark smoke. NOAA/NASA provided satellite images using the Visible Infrared Imaging Radiometer Suite (VIIRS) instruments showing smoke above the Brazilian states of Amazons, Para, Mato Grosso and Rondonia. Fires and the most affected areas were also detected as part of the Sentinel-3 World Fires Atlas, Copernicus Sentinel-3 data. As part of the Copernicus Atmosphere Monitoring System (CAMS).

7. Evidence to courts

The International Court of Justice (ICJ) and the International Criminal Court (ICC), are increasingly relying on satellite data. Satellite imagery is also considered in relation to human rights violations. The use of satellite remote sensing data represents a trend that promises to continue as the range and accuracy of space-derived data improves and the courts are becoming more knowledgeable with the processing and certification of satellite data.
7.1. Judgment on the status of the Kasikili/Sedudu Islands solving a territorial dispute.

The case concerned the boundary between the Republic of Botswana (“Botswana”) and the Republic of Namibia (“Namibia”) around Kasikili/Sedudu Island located in Chobe River (In Namibia is known as Kasikili and in Botswana as Sedudu). The International Court of Justice was asked to determine the boundary and the legal status of the island on the basis of the Anglo-German treaty of 1 July 1890 and the principles of international law. In the Court’s opinion, “the real dispute between the Parties concerns the location of that main channel where the boundary lies”. [21] Botswana is contending that it was the channel running north of Kasikili/Sedudu Island and Namibia that is the channel running south of the island. Thus, the Court proceeded in determining which was the main channel of the Chobe river around the island in question.

Botswana provided satellite imagery to prove the main channel was the northern channel because is wider and deeper than the southern channel. A comparison was made using satellite images from June 1975, March 1995 and June 1996, both during the dry and rainy seasons. [21] Satellite imagery was not directly mentioned in the final judgement but satellite data was reasonably useful to complement the evidence and support the court judgement which decided that “the boundary (...) follows the line of deepest soundings in the northern channel of the Chobe River around Kasikili/Sedudu Island” and also that “Kasikili/Sedudu Island forms part of the territory of the Republic of Botswana”. [21] Because there were no available satellite images from the beginning of the agreement in question, the Court used images that prove relevant in relation to the question whether Kasikili Island was occupied or cultivated. [21]

7.2. “Certain Activities Carried out by Nicaragua in the Border Area” Case

The case concerns the supposed territorial breaches and unlawful acts by Nicaragua as claimed by Costa Rica. In particular, Costa Rica requested the ICJ (Court) to decide that Nicaragua breached its international obligations as regards the incursion into and occupation of the Costa Rican territory in the area of Isla Portillos. It was also requested to investigate if Nicaragua breached international obligations under international environmental law when decided to dredge a 42 km length of the San Juan from the river’s outlet in the Caribbean Sea to a site known as “Punta Chingo Petaca”. [22] The Court decided in favor of Costa Rica finding that Nicaragua has violated the territorial sovereignty of Costa Rica and has the obligation to compensate for material damages. [23]

Satellite images complimented the evidence before the Court and were recognized as useful tools for Costa Rica. The Court decided that Costa Rica is entitled to compensation for purchase of satellite images used for the monitoring of the northern part of the Isla Portillos following the withdrawal of Nicaragua’s military personnel and for the cost of obtaining a report from UNITAR/UNOSAT containing a technical evaluation of the damage as provided by satellite images. [24]

7.3. Oil Platform (Islamic Republic of Iran v. United States of America)

In 1992 the Islamic Republic of Iran (Iran) filed an application against the United States of America (U.S.) in regard of the destruction of Iranian oil platforms. In its counter-Memorial, the U.S. also requested the Court to decide that Iran breached its obligations by attacking vessels in the Persian Gulf and engaging in military actions detrimental to commerce and navigation.

The use of Satellite imagery as evidence was crucial in the “Oil Platforms” case. In supporting its argument that that Iran was using off shore oil platforms as missile sites to carry out attacks against neutral ships during the Iran-Iraq war, the U.S. provided satellite imagery of the Fao area and other four alleged missiles sites under Iranian control at the time of the attack. Iran claimed that the satellite images prove in fact the installations bear no resemblance to a normal Silkworm missile site. The U.S. mentioned that this evidence indicated an Iranian land-launched missile. The Court did not however find the satellite images to be sufficiently clear to decide that Iranian missile-firing equipment was present there, especially if analyzed together with the testimony from the Kuwaiti military officer which was given 10 years after the reported incidents and with a discrepancy between the English and the Arabic version which “lacks any indication of the bearing on which the observed missile was travelling”. [25]

The Court also found that the U.S. presented its claim in a generic sense while it was necessary to prove an actual impediment to commerce or navigation between the territories of the two High Contracting
Parties. Thus, the Court concluded that it is no need for it to consider under this case the contested issues of attributions of those incidents to Iran. [25] The Court found that the U.S. had not breached its obligations and rejected Iran’s claim. Also, the Court found that there was no impediment to commerce or navigation between the territories of Iran and the U.S. and rejected the U.S. counter-claim for reparation.[25]

7.4. Violation of human rights - the demolition of housings in Zimbabwe

According to Human Rights Watch (HRW), the Government of Zimbabwe launched in May 2005 Operation Murambatsvina (Restore Order). This was a program of forcible eviction and demolition of hundreds of houses or building structures in Zimbabwe, made on an unprecedented scale. The Government acted “so forcibly and brutally displacing so many of its own citizens in peacetime”, the victims being the poor and vulnerable, many of households already devastated by pandemic viruses.[26] The UN estimated that nearly 700,000 people were evicted while 2.4 million people have been directly or indirectly affected. Humanitarian consequences were described as catastrophic, with many people living without shelter. HRW condemned the mass evictions and demolitions and called for an UN commission of inquiry to investigate these violations of human rights. By using satellite imagery, the Zimbabwe Government; the Southern African Development Community; the African Union; the African Commission on Human and Peoples Rights (ACHPR); the International Humanitarian agencies; the United Nations were announced to intervene to stop the human rights violations. The brutal policy of evictions and forced displacement were described by then Secretary General Kofi Annan who was briefed by the Tibajuka Report, as “profoundly distressing”, discussion being also at the UN security Council.[27]

The Amnesty International investigated these serious violations of human rights, concluding that even with all the international support, none of the victims received assistance from the Zimbabwe’s Government, which also impeded the UN efforts.[28] In its investigation, the NGO released satellite data to provide irrefutable evidence for the devastating impact to human rights as a consequence of brutal house demolitions. The satellite images were analyzed by the American Association for the Advancement of Science, with funding from the MacArthur Foundation in the US. [29]

7.5. Evidence of war crimes

Because of severe government restrictions for journalists, independent human rights monitors, and United Nations (UN)/ African Union (AU) peacekeepers (UNAMID) many of the security forces abuses may remain unreported without the satellite imagery. Based on the pre-attack and post-attack satellite images, the damage to the MGS Haskanita military base in northern Dafur and thereby the unlawful attack against peacekeepers of the African Union could be verified.[30] The Amnesty International succeeded in documenting attacks from July 2018 to February 2019 with satellite images and testimonies, including destruction of entire villages, unlawful killings, sexual violence, systematic looting and force displacement. Amnesty International distributed in 2019 new satellite imagery, showing war crimes and human rights violations in Darfur, Sudan.[31] Discussions are underway that due to the increased risk, the AU and UN might consider withdrawing the peacekeepers from Darfur by June 2020 which could makes the satellite imagery essential as the only means for surveillance in remote and restricted areas for documenting human rights violations. The Human Rights Watch also used satellite imagery to document the Rapid Support Forces (RSF) war crimes. [32]

8. Conclusions

The perspective of satellite remote sensing was analysed in relation to the worrying scale and intensity of conflicts, humanitarian crises, and human rights violations. Besides the direct and severe consequences of such violations in the region they occurred, there is also an indirect relevance for Europe given large-scale migration. Thus, it may become imperative to use space remote sensing technologies to contribute to upholding human rights and monitoring violations. From a regional and global perspective, it is of the utmost interest to recognize satellite imagery as a necessary support for the implementation and monitoring of the observance of human rights, thus contributing to more security and sustainable development.

This paper provided practical examples of how satellite remote sensing can contribute to: the historical record of large areas and boundary purposes; environmental protection such as deforestation, mining and water pollution; land protection for the indigenous communities; energy companies; document the case of barrel bombs; monitor the refugee and refugee-affected regions mainly for environmental components around camps;
used for refugee camp attack investigations; used for large-scale collection and processing of data in relation to illegal traffic of weapons and their movements; monitoring weather and analyzing climate studies; waste management and illegal dumping activities and pollution of oceans. Satellite imagery was also analyzed as evidence in courts for the following cases: judgment on the status of the Kasikili/Sedudu Islands solving a territorial dispute; "Certain Activities Carried out by Nicaragua in the Border Area" Case; Oil Platform (Islamic Republic of Iran v. United States of America); Violation of human rights - the demolition of housing in Zimbabwe; Evidence of war crimes.

The use of satellite imagery has proved useful to detect and investigate various cases of human rights violations. The satellite imagery also supported evidence in courts at international level and was the basis for damage compensation. This is a strong argument for the developing countries to use satellite imagery to perform investigations and detect violations of human rights. Small satellites could be a viable solution for developing countries, providing an affordable solution to create much needed telecommunication infrastructure and obtain critical satellite data for developing countries to improve security, development, stability, justice and peace.

Finally, improvements are necessary to specifically deal with satellite imagery from private entities. Legislative solutions could restrict the use of satellite imagery, but would this be sufficient for future development and expansion of private entities in space? This question should be further analyzed by policy makers and regulators and provide solutions. Also, using satellite imagery as evidence in courts raises some issues with technical and scientific value. Currently there is no standard for such technical support, only a limited number of experts, at UN level and not only, could provide analysis of satellite imagery. Courts could be reluctant to give such evidence the needed value without understanding how useful such evidence is, how it resulted from satellites and how much availability is to gather such information.

List of references

[6] UN General Assembly, Universal Declaration of Human Rights, 10 December 1948, 217 A (III), Article 12 UDHR “No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks”.
[12] A.-S. Martin, Satellite Data as Evidences Before the Mechanism of International Courts,


