

The Satellite and the Individual

The Legal Resolution of Remote Sensing

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I. Introduction

International remote sensing law is built on an egalitarian set of principles that grants liberal rights for states to sense other states, but also gives sensed states claims to access to the data gathered about their territories.¹ These principles underpinned the verification mechanisms in disarmament law,² and they would later come to assist in setting up disaster management regimes.³ But these principles apply to states sensing other states, and in general ignore legal rights or claims related to the individual. In general, such claims fall to national law to address, which for much of the life of remote sensing technology has been an adequate way to manage these rules.

It goes without saying that remote sensing technologies have advanced since the time that these rules were written. Significantly, the resolution of these satellites has increased dramatically. Additionally, the data these satellites collect has become enmeshed in a large ecosystem of geographical information systems (GIS) that leverage network technology, computer processing, and big data to create data rich spatial applications. These modern GIS systems are employed ubiquitously by commercial actors, governments, and individuals. They are not limited to presenting purely geographic information as they allow for the integration of various data

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1 U.N. General Assembly, Res. 41/65: Principles relating to remote sensing of the Earth from space, U.N. Doc. A/RES/41/65 (Dec. 3, 1986). By “international remote sensing law,” I mean the body of law concerned directly with the activity of remote sensing and exclude the larger body of international space law that is concerned with the launch and operation of those satellites. It should also be noted that law is used very loosely throughout this paper and might be better understood as rules.

2 *For instance*, Anti-ballistic Missile Treaty, Art. XII (United States & U.S.S.R., 1972).

3 Beets, Josie. “The International Charter on Space and Major Disasters and International Disaster Law: The Need for Collaboration and Cooperation.” *Air & Space Lawyer* 22, no. 4 (2010): 12-15.

points. This means that GIS technologies present myriad issues for the individual, implicating individual privacy, security, and freedom.

This paper will evaluate the new challenges that are being integrated into remote sensing law as a result of its embeddedness into global networked GIS systems. This paper will use the concept of “resolution” to illustrate how the individual has become directly implicated in remote sensing technologies. It will argue that not only has the spatial resolution of remote sensing satellites increased, but their social resolution has increased as well. It will first proceed by discussing the concept of resolution and setting up the heuristic. It will then analyze the resolution of the traditional body of remote sensing law. Next, it argues that the context of remote sensing has changed as developments in the technology have allowed the social resolution of remote sensing to scale from states to individuals. This will be followed by an overview of possible legal issues raised by individualized resolution in remote sensing.

II. Resolution

No discussion of remote sensing technology can avoid questions of resolution. To the remote sensing scientist, there are three types of resolution that are important. The first is spatial resolution, which is the physical dimensions each pixel in a remote sensing image is meant to represent.⁴ The greater the spatial resolution the more fine the detail of the image, but the image will represent a smaller swath of land. The second type, is temporal resolution.⁵ This is how often the remote sensing satellite will return to and image that same portion of the Earth’s surface. Finally, there is spectral resolution, which represents the portion of the electromagnetic spectrum that the satellite imaged.⁶ Different portions of the electromagnetic spectrum can reveal different data about the sensed territory.

Each of these types of spectrum have their own interaction with the law. For instance all three can be important to satellite data used as evidence in a court of law. Spatial resolution has been of particular importance to the law. This is because as spatial resolution increases, so to does our ability to identify physical objects in the image. In other words, the blurred grey of the city resolves into buildings, streets, and cars; the solid green forest becomes treetops with leaves; and the uniform blue of the ocean becomes marked by whitecaps or the occasional whale. This has raised two principal concerns: privacy and national security. While the privacy issue has only been hinted at

4 Johnston, Shaída. “Technical Introduction to Satellite EO,” at 16 in *Evidence from Earth Observation Satellites: Emerging Legal Issues*, edited by Ray Purdy and Denise Leung, 11-42. Leiden ; Boston: Martinus Nijhoff, 2013.

5 *Id.* at 14-15.

6 *Id.* at 17.

by the law,⁷ the national security concerns can be found in national licensing regimes globally.⁸

Unfortunately, the discussion of resolution and the law is often limited to analysis of how technical resolution affects legal regimes. This however, ignores that we also perceive social resolution. The reason that spatial resolution is important is because it quite literally allows us to see things on the surface of the Earth from a unique perspective. This has not been lost in emerging research on remote sensing. Specifically, within the emerging literature on Object Based Image Analysis (OBIA).⁹ OBIA explicitly endorses moving “beyond pixels” in order to understand the image at a variety of scales that can fit the end user’s needs.¹⁰ Specifically, this literature endorses the idea that there is a “policy scale” that must be understood and addressed in order to make data useful.¹¹ Especially as these images become more data rich from user input and crowdsourcing.

What OBIA recognizes is that though we often represent the world in pixels on screens, we understand the world by associating those pixels with actual objects in physical space.¹² This means that when we look at an image, we see objects, and we orient those objects into our own social parameters. The resolution shifts from a technical standard into a social question. Social resolution can be understood in terms of communities and individuals instead spatial dimension. This is not new, maps have traditionally been made at the social resolution by delineating the borders of the state, city, or other political subdivision that delimited certain communities tied together by legal,

7 See generally Cho, George. “Privacy and EO: An Overview of Legal Issues.” In *Evidence from Earth Observation Satellites: Emerging Legal Issues*, edited by Ray Purdy and Denise Leung, 259-92. Leiden; Boston: Martinus Nijhoff, 2013 and Dunk, Frans G. von der. “Outer Space Law Principles and Privacy.” In *Evidence from Earth Observation Satellites: Emerging Legal Issues*, edited by Ray Purdy and Denise Leung, 243-58. Leiden; Boston: Martinus Nijhoff, 2013.

8 Blount, P. J. “Remote Sensing Law: An Overview of Its Development and Its Trajectory in the Global Context,” at 613-614 in *Remote Sensing Handbook, V. 1: Remotely Sensed Data Characterization, Classification, and Accuracies*, edited by Prasad S. Thenkabail, 605-21. Boca Raton: CRC Press, 2016.

9 See generally, Thomas Blaschke et al., “Object-Based Image Analysis: Evolution, History, State of the Art, and Future Vision,” in *Remote Sensing Handbook, V. 1: Remotely Sensed Data Characterization, Classification, and Accuracies*, edited by Prasad S. Thenkabail, 277-293. Boca Raton: CRC Press, 2016 and Stefan Lang and Dirk Tiede, “Geospatial Data Integration in OBIA: Implications of Accuracy and Validity.” in *Remote Sensing Handbook, V. 1: Remotely Sensed Data Characterization, Classification, and Accuracies*, edited by Prasad S. Thenkabail, 295-316. Boca Raton: CRC Press, 2016.

10 Blaschke et al., “Object-Based Image Analysis,” 278 and Lang & Tiede, “Geospatial Data Integration in OBIA,” 296.

11 Lang & Tiede, “Geospatial Data Integration in OBIA,” 298-299.

12 *Id.* at 302.

political, and cultural frameworks. The policy scale, referenced in OBIA, pushes us to understand remote sensing data in the context of our social environment.

Similar to the technical side of resolution, social resolution has been improving. Initially, this improvement tracked with the improvement in spatial resolution. As images got sharper it became easier to see smaller and smaller community subdivisions, in essence remote sensing data caught up with the cartographers ability to represent different levels of social organization. Modern digitization technology has led to the next advance in social resolution: the individual. This advance is not linked to a corresponding advance in spatial resolution. It is instead linked to digitization and network technology that allows an individual to situate themselves within networked Geographical Information Systems (GIS). Significantly, this map is interactive, and the user is allowed to contribute his or her own data thereby integrating themselves into a larger flow of data.¹³ Most of us do this daily when we pull out our smart phone and open an app to tell us where we are: the map load with dot indicating where we are, which is at the center of the map. In this way, digital trails of personal information have become part of the larger GIS ecosystem, which means that we can now think of social resolution scales at the individual level.

III. Legal Resolution

As noted in the previous section, law too has resolution which is most often defined in terms of jurisdiction over territory and individuals. For instance, criminal law is most often directed at an individual scale, whereas flight safety regulations are directed at an industry scale. International law has traditionally at the resolution of the state. It was only after World War II that human rights became clearly articulated as a proper subject of international law.¹⁴ Significantly, Nuremberg was the first modern use of international law to assign individual criminal responsibility for breaches of international law.¹⁵ While the body of law that draws the individual into international law has grown, it has not been an even growth in all fields of international law, as can be seen in the lingering questions about the applicability of Article VI of the Outer Space Treaty to a variety of situations. As a result, many parts of the various bodies of international law do not address the individual as a subject with rights and obligations.

13 Blaschke et al., "Object-Based Image Analysis," 285.

14 U.N Charter, Art. 1(1) & 1(2) and U.N. Gen. Assembly, Res. 217A: Universal Declaration of Human Rights (Dec. 10, 1948).

15 Pompe, Cornelis Arnold. *Aggressive War – An International Crime*. Martinus Nijhoff, 1953 at XII-XIII.

The law governing remote sensing activities is no exception. This body of law sprang from the early space race and the establishment of overflight rights in space. These rights were essential in establishing a disarmament verification regime, which protected remote sensing activities as National Technical Means (NTM). The satellites that carried remote sensing payloads fell under the international space law regime, and remote sensing data found some further legal standing in the articulation of the nonbinding Remote Sensing Principles of 1986. This international law has been updated by various national regimes such as those in the United States, Canada, and Germany.¹⁶ The purpose of this paper is not to discuss the substantive content of this law, but instead to look at the resolution of this body of law. ‘Remote Sensing Law’ as a body of law is resolved at the national level. It is concerned with the nature of borders in the international system. At its core, remote sensing law is clearly rooted in the balance of transparency at the nexus between national security and international security. Remote sensing law has been used to bolster the international system. Remote sensing as a technology posed a specific challenge to national borders, because it redirected the right of overflight in space, secured by *Sputnik I*, from a passive capability into a substantive capability. The small body of remote sensing law, then, is meant to put limits on state activities and to give rights to sensed states. For instance, the protections surrounding NTMs, were a substantive step in securing international peace and security by protecting a state’s right to remotely sense, whereas the nondiscriminatory access regime gives sensed states a right to data collected about their territory.¹⁷ Remote sensing law, at a policy scale, is primarily concerned with the territory of the state as opposed to the population therein. It governs how governments will interact and how they will exchange data.

IV. New Resolutions

The legal resolution of remote sensing law is focused on the territorial boundaries of states, but as noted earlier the spatial resolution of remote sensing has improved along with the social resolution. The question this raises is how do we readjust the legal resolution of remote sensing law? How can law deal with a social resolution at the community and the individual level?

16 See, Blount, “Remote Sensing Law,” 610-614 and Gabrynowicz, Joanne Irene. *The Land Remote Sensing Laws and Policies of National Governments: A Global Survey*. National Center for Remote Sensing, Air and Space Law, University of Mississippi School of Law, 2007. <http://www.olemiss.edu/programs/spacelaw/resources/pdfs/noaa.pdf>.

17 U.N.G.A., Remote Sensing Principles, Princip. XII.

To some extent these questions are problematic because remote sensing law was never intended to cope with new social resolutions. International law, which is primarily concerned with the maintenance of international peace and security through the maintenance of territorial borders. Though international law in the post 1945-era began to refocus on communities and individuals through human rights law, international law has been slow to change its focus. Indeed, the UN Charter's bare references to human rights has not resulted in a strong body of human rights law (though it has been strengthening). As a result, 'remote sensing law' naturally ignores many of the questions touched on by the changing social resolution.

Remote sensing is no longer a "highly sophisticated surveillance equipment not generally available to the public" as the United States Supreme Court referred to satellite surveillance in 1986.¹⁸ Remote sensing data is now ubiquitous and is firmly embedded in a larger GIS environment that connects individuals to this data through a number of technologies including Global Navigation Satellite Systems (GNSS). This data rich environment facilitates integration of the individual into geographic data through personal communication devices such as cell phones.¹⁹ In essence, users become an interactive part of GIS. The user is marked by a dot on the screen reflecting the location of the device, the device is increasingly a container for the individual.²⁰ Additionally, users are able to contribute data through crowd sourcing technologies leaving digital trails. Instead of remote sensing data being an esoteric art with a need for specialized training in order to interpret it, the data is now public, open, and accessible to anyone with a device.²¹ This raises concerns and opportunities.

The primary concern is one of privacy, which has "a spatial dimension and an information dimension."²² As individuals become more embedded in a data rich environment they leave digital trails that are subject to surveillance.²³ This has clearly come into focus with the revelations from the leaks from former National Security Agency contractor Edward Snowden, which revealed mass digital surveillance by the United States and its allies.²⁴ One of the early revelations from the Snowden leaks was the collection of

18 *Dow Chemical v. U.S.*, 476 U.S. 239 (1986).

19 Blaschke et al., "Object-Based Image Analysis," 285.

20 *Riley v. California*, 573 U.S. ___ (2014) (Sotomayor concurring).

21 Blaschke et al., "Object-Based Image Analysis," 285.

22 Cohen, Julie E. "Privacy, Visibility, Transparency, and Exposure." *The University of Chicago Law Review*, 2008, 181-201, 181.

23 *Id.* at 183-84.

24 *See generally*, Greenwald, Glenn, and Ewen MacAskill. "NSA PRISM Program Taps in to User Data of Apple, Google and Others." *The Guardian*, June 7, 2013. <http://www.theguardian.com/world/2013/jun/06/us-tech-giants-nsa-data> & Greenwald, Glenn. *No Place To Hide : Edward Snowden, the NSA, and the U.S. Surveillance State*. New York: Metropolitan Books, 2014.

metadata, which among other things includes location data.²⁵ This was especially problematic because this surveillance system was global in nature, meaning that the United States and its allies were reaching beyond their territory and mediating the privacy rights of individuals elsewhere.²⁶ This is particularly interesting in light of the *US v. Jones* decision which ruled that law enforcement needs a search warrant to conduct GPS surveillance of suspects.²⁷ As individuals become part of remote sensing data privacy becomes harder to maintain. Remote sensing law does not function at this resolution and there are no agreed international standards protecting individuals as they move through the data rich environment. There are European Union measures such as the INSPIRE directive²⁸ and the new General Data Protection Regulation (GDPR).²⁹

Despite the fact that privacy raises concerns for individuals, the data rich GIS environment makes for numerous opportunities for securing human rights and protecting individuals and communities. A prominent example of this is the Satellite Sentinel Project, which seeks to use remote sensing data to document mass atrocities in Sudan.³⁰ This project though is only the first step as crowdsourcing apps make it possible for users to document their environment and contribute it to a GIS system.³¹ This means that remote sensing data combined with user data can become a potent weapon in compiling information about the dangers within a particular community. Remote sensing law is certainly permissive of these types of uses, but it does not in any way operationalize these uses, nor does human rights law give clear mechanisms through which this data can be considered. The verification aspects of of disarmament have not been extended into other areas of

25 Foreign Intelligence Surveillance Intelligence Court, Secondary Order, <https://www.theguardian.com/world/interactive/2013/jun/06/verizon-telephone-data-court-order> (July 19, 2013).

26 The U.S. legal framework creating this system is explicitly focused at gathering intelligence of “foreign persons,” but does not exclude incidental communications of “U.S. persons.” United States Department of Justice. “Exhibit A: Procedures Used by the National Security Agency for Targeting Non-United States Persons Reasonably Believed to Be Located Outside the United States to Acquire Foreign Intelligence Information Pursuant to Section 702 of the Foreign Intelligence Surveillance Act of 1978, as Amended,” July 28, 2009. <http://library.blountsfolly.com/space/items/show/116>.

27 *US v. Jones*, 132 S. Ct. 945 (2012).

28 Directive 2007/2/EC: Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) (14 March 2007).

29 Reg. 2016/679: General Data Protection Regulation (GDPR) (Apr. 27, 2016).

30 <http://www.satsentinel.org/>.

31 Gaurav Sinha et al., “Democratization of Geographic Information: GIS, Remote Sensing, and GNSS Applications in Everyday Life,” at 440-441 in *Remote Sensing Handbook, V. 1: Remotely Sensed Data Characterization, Classification, and Accuracies*, edited by Prasad S. Thenkabail, 423-444. Boca Raton: CRC Press, 2016.

international law and specifically that of human rights laws. Though there may be ample evidence of mass atrocities, remote sensing law gives us no guidance on how to value and use that data to advance human rights. As a result states deal with such information in an ad hoc nature.

What is obvious is that the legal resolution of remote sensing law has been outpaced not just by its spatial resolution, but by its social resolution as well. This is problematic innovation in GIS technology is advancing, and is being implemented globally not just within states. Where location data was once only a question that pertained to the space within borders, it has become a cross border concern. Remote sensing law does not have the tools to respond to the difficult questions that arise as remote sensing data is embedded into big data technology. Specifically, it tells us very little about cross border privacy rights and the value of that data in protecting human rights.

This means we must begin to think about remote sensing law through new legal resolutions. This does not necessarily mean that the established body of remote sensing law is faulty, but instead, since it is already a patchwork of norms, that we must begin to look into new sources for those norms. Specifically, the realm of human rights law is ripe for the elaboration of the next generation of remote sensing law. Human rights law and its concern with the protection of individual dignity and community self-determination is a natural place to look in a rapidly digitizing world for the development of remote sensing law. In fact, it can be seen as a failure on the part of states to actively operationalize remote sensing in human rights. These norms should actively engage on two axes. First, human rights law needs to address the protection of the individual in a data rich environment with a particular emphasis on location data as it reveals a great deal about the individual, but also creates vulnerabilities for the individual's safety. Second, human rights law needs to elaborate standards on the value of remote sensing data in effectuating the protection of communities. Such standards would need to address the evidentiary functions of this data.

V. Conclusion

Remote sensing law was an effective body of law when the social resolution of remote sensing data existed at the level of the territorial state. However, digitization has changed the way in which this data is used by society. Remote Sensing data has converged with personal data and the individual has become networked into a global, real-time GIS environment. The change in social resolution creates unique social issues, which means that human rights law is may very well be a new node for growth of the new international norms that govern the collection and use of remote sensing data.