

## HIGHRES IMAGERY – ARE WE ENTERING THE NO-MORE-SECRETS ERA?

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### ABSTRACT

With the availability of the high resolution images (presently 1m, later even sub-meter resolutions) in the commercial domain, the divide between the “free access” civilian image requirements for supporting developmental activities and the “restricted” defense requirements for national security and image intelligence applications would vanish. With the availability of these images for any part of the globe, the outlook of any nation for dissemination and use of these images will have to adjust to these technological and market-driven developments. The fundamental issues to be considered for defining the policy would be issues related to controlling Imaging and Sensing. “Shutter control” mainly exists with the satellite operator. The satellite operator decides which area to image mainly on user requests and commercial interests (US Government has imposed shutter control rights on the licensed private sector satellite operators – thus ensuring that it could “prevent” areas to be imaged within and outside US). However, with commercial considerations over-scoring, the “sensed” country/nation would not have any control on “being imaged”. Will the issue of Rights of Sensed State be a matter of intense discussion in the coming days? Will nations coordinate to address this issue? Is sovereignty directly under challenge from these systems? Will the UN Principles be called for a debate – specially considering the fact that “commercial” and “high-resolution” satellites were utopian when they were drafted and adopted?

Classified nature of data and its non-conformity for non-governmental ventures will be a major issue. It would be essential to consider all aspects of the information so that legality aspects can be avoided. However, this may have an impact on “authenticity” and “acceptability” of information of commercial nature. Dovetailing of classified nature of data and open, free access for research would be called for and a proper categorising of what is “classified” or of “national security” needs. The issue of misuse of EO data – either intentional or due to misinterpretation can also cause damage to individuals, society and nations and the unimpeded availability of high resolution images will open up a level of “transparency” that might enable such campaigns. Yet as is always the case with increases in transparency, not everyone benefits and not all uses of the resulting information are benign. Governments remain concerned about just how far this new source of transparency should be allowed to go. The provision of information shifts power from the former holders of secrets to the newly informed, which has implications for national sovereignty, for the ability of corporations to keep proprietary information secret, and for the balance of power between state and non-state actors. The paper discusses some of these issues and attempts to detail the coming scenario of a “regime” that will define how nations will “adjust” with the NO MORE SECRETS ERA.

## 1. INTRODUCTION

With the information revolution way on, by means of which huge masses of information now flow widely around the world, there is a growing acceptance of transparency, which has led some governments to relax long-held political restrictions on the gathering and dissemination of information. Quite significantly, satellite imagery have become a crucial component of an ongoing shift toward greater transparency.

Although satellites have been observing the Earth for nearly forty years, those that could provide highly detailed imagery were operated by secret military/intelligence programs. US made satellite imagery available for sale beginning in 1972, but that imagery showed broad panoramas, not fine detail. The technology trend in the field of satellite remote sensing is towards imaging at better and better resolutions – both in the panchromatic and multi-spectral domain. While the Indian IRS opened the civilian domain of highres images (highres here is meant anything better than 5 m resolution) with 5.8m resolution in 1995, today IKONOS provides images at 1m resolution and there are planned missions that would reach the range of 30cm resolution from satellite platforms shortly. Under US government licensing, commercial firms have begun to sell imagery that discerns objects as small as 1 meter across. Public availability of timely high-resolution imagery represents a notable break with the past. With the availability of the 1m (later maybe even sub-meter resolutions) in the commercial domain, the divide between the “free access” civilian image requirements for supporting developmental activities and the “restricted” defense requirements for national security and image intelligence applications has vanished.

Let us also note that these high resolution images would considerably enhance the scope of applications for developmental activities and would open up vistas for a number of newer applications – specifically for urban infrastructure, GIS databases, cadastral and rural mapping, geo-engineering, micro-watershed development, disaster management support etc. At the same time, the highres stereo data would also enable, to a considerable extent and upto certain scales[MR1], the process of replacing the aerial photographic surveys with the added advantage of re-visit images for monitoring changes and also obtaining digital elevation information.

With the availability of these images for any part of the globe, the outlook of any nation for dissemination and use of these images will have to adjust to these technological and market-driven developments. We are moving from an era in which only a handful of governments had access to high-resolution imagery to one in which every government and businesses, nongovernmental organizations, and public groups will have such access. Non-state actors will be able to peer behind the walls of national sovereignty, accelerating a shift in power that is already under way (1). Mishandling the technologies and the policies that make such transparency possible would impose heavy costs in missed opportunities and potential threats. But if handled right, the new transparency could offer enormous benefits for nations and peoples around the world. Yet governments throughout the world are woefully unprepared for the coming era of global transparency.

As the Carnegie Endowment for International Peace organised a Conference in 1999 - “No More Secrets? Policy Implications of Commercial Remote Sensing Satellites” and raised issues on the policy and public trans-

parency issues of the availability of high-resolution images, many nations were already addressing the issue in their own manner and prepared to cope with the "image onslaught".

Are we really into the No More Secrets era?

A delicate balance, which was achieved after years of debate prior to the adoption of the UN Resolution in 1986, on the question of prior consent vis-à-vis protection of sovereign rights of states and access to data or information gathered from space over their territories has again come under intense debate. The trigger is the development of commercial systems providing very high quality remote sensing data worldwide. This has raised the issue of satisfaction of the legitimate rights and interests of sensed states – in terms of respecting their sovereign rights as well as implementing the principle of non-discriminatory access to data gathered over their territories as incorporated in the UN principles. It is attempted here to broadly discuss developments in policy and technological environment leading to the emergence of commercial systems and the legal issues which have currently arisen in the light of their operations.

## **2. LEGAL PRINCIPLES FOR REMOTE SENSING OF EARTH FROM SPACE**

Adoption of Resolution on Principles relating to Remote Sensing of Earth from Space by the United Nations in 1986 was a landmark development. These principles essentially reiterated the "open skies" policy and required no prior consent of sensed country for imaging from space. The resolution also stipulated that remote sensing activities from space shall not be conducted in a manner detrimental to the legitimate rights and interests of the sensed state. It established the guiding principle of non-discriminatory access by sensed state

for data concerning its territory. These principles also had the aim to promote international cooperation in the conduct of remote sensing activities, with due regard to the needs of developing countries. Although these principles were not legally binding, they enjoyed a wide acceptance and had a 'soft law' status. Indeed, these principles were taken as a basis for several international agreements between providers of remote sensing data and the recipients.

## **3. COMMERCIAL AVAILABILITY OF HIGH RESOLUTION IMAGERY**

In 1992 the US Congress enacted the Land Remote Sensing Act repealing the earlier Land Remote Sensing Commercialisation Act of 1984. Landsat was returned to government control. The act observed that development and the provision of commercial value added services should remain exclusively a function of private sector. This act partially relaxed the non-discriminatory distribution policy for private sector operators, who were no longer obliged to make their raw data available to all users on a non-discriminatory basis, but they might be required to make such data available to the Government for archiving with a view to eventual public availability (2). The Act further required that all domestic, privately owned remote sensing systems be licenced. In the new atmosphere of the post cold war era, several private companies in US applied for licences to operate remote sensing satellites. The Presidential Decision Directive in 1994 further loosened the restrictions on the sale of imageries to foreign entities, and about a dozen companies in the US received licences for operating commercial remote sensing systems.

The high resolution commercial imagery sale, started in 1986 by the French SPOT-satellite capable of providing images of 10

meter resolution, saw steady advances through Canada's Radar Sat (8 meter images) in 1995, the Indian IRS-1C satellite (5.8 meter images) in 1996 and Space Imaging's Ikonos satellite (1 meter resolution in 1999). The trend is continuing with more satellites such as Orbview, Earth Watch, EROS (Israel), Cartosat-1 (India) and several others which are on the anvil. Augmenting the products of these spacecraft are the high resolution imageries which were declassified from the archives of the US satellites of 1960's and 1970's. Similar declassified high resolution pictures of Russian satellites were also commercially made available in the public domain.

#### **4. TECHNOLOGY ADVANCES AND APPLICATIONS GROWTH**

Since the time of UN Resolution on Remote Sensing, the number of countries which started owning and operating remote sensing satellites have dramatically increased. A survey carried out just prior to the Third United Nations Conference on Exploration and Peaceful Uses of Outer Space (UNISPACE-III) Conference in 1999 showed that while twenty remote sensing satellites with government funds were planned for launch during 1997-2003 period, there were plans for 25 satellite systems in the commercial domain during the same period. These satellite systems incorporated resolution capabilities ranging from 1 meter to 1 km and capable of providing data in a number of spectral regions and with varying revisit capabilities. They took advantage of advances in technology in terms of making the satellites often smaller, cheaper, and more agile. The advances in computational technologies, availability of high power computers at lower costs, use of web based technologies, developments in new software tools including Geographic Information Systems and three dimensional terrain mapping have all

contributed to enhancement in applications of satellite remote sensing. The space-based data combined with the use of these advances in technologies have created a new dimension to the spatial visualisation of information. Internet brought a paradigm shift in information access policies. Users could have access to web based earth observation data or they can link to myriad data bases and share them on a global scale, overcoming the barriers of national boundaries. Advanced sensor technologies are now more freely available for civilians and for commercial use. Data from civilian and commercial satellites are made use of in military applications, thinning the distinction between civilian and military systems.

The range of new applications unfolded by the improved quality of Remote Sensing data covers a wide spectrum of areas such as facility management, real estate transactions, monitoring taxation, land use planning, precision agriculture, location of ground water and water management, transportation, emergency services, environmental impact assessment and research. Convergence of various technologies are driving the establishment of national spatial data infrastructures – which are interlinked data bases, catering to a variety of information needs for users in government and public domain, providing user friendly access. The impacts and benefits of such activities in developing countries could be very significant. Being amenable for access by Internet, satellite imagery is tending to be fully integrated into global information network.

#### **5. IMPLICATIONS OF HIGH RESOLUTION IMAGERY AVAILABILITY**

The availability of 1 meter resolution images already in the market place and the promise for new data of similar or higher resolution data with better spectral

characteristics including hyper spectral data and even all weather radar data of improved quality are leading to an era of growing transparency. Apart from contributing to several beneficial uses, these images of one meter resolution quality can also detect vehicles and identify aircraft. Tanks can be distinguished from trucks and the roads and bridge conditions can be seen (3). In view of the potential of these for military use, the governments are concerned about the widespread dissemination of such data in public domain. Present policies of dissemination and access for data make it extremely difficult for satellite operators to specify who the ultimate users of the data are and for what purpose they will use it. As much as the data could be used for several vital contributions to society, they can also be used for not so benevolent uses such as support to terrorism, espionage by industrial competitors, and intelligence on disadvantaged regions/populations and so on. There were also a couple of instances of images being misinterpreted in media.

#### **6. RIGHT TO PRIVACY, SOVEREIGNTY AND NON- DISCRIMINATORY ACCESS**

The Principle IV of the Resolution adopted by the UN stipulated, inter-alia that remote sensing activities "shall be conducted on the basis of respect for the principle of full and permanent sovereignty of all states and peoples over their own wealth and natural resources, with due regard to the rights and interests, in accordance with international law, of other states and entities under their jurisdiction. Such activities shall not be conducted in a manner detrimental to the legitimate rights and interests of the sensed state".

The advent of commercial systems, with capabilities for worldwide dissemination of high quality remote sensing imageries, which can provide a great deal of details of the land surface and oceans has been

posing according to some direct challenge to sovereignty concerns of states. They consider that the sensed states do not have any jurisdiction over these commercial entities that carry out imaging over their territories and sell imageries to any one who pays. In light of this, the sensed states may consider that the spirit of UN Principles and their own legitimate rights and interests are compromised (i) if they have no definite means to know whether their territory is imaged by commercial operator and (ii) if they have no access to the data of their territories on a non-discriminatory basis soon after they are imaged.

As data availability will be purely driven by market considerations, the affordability for accessing such data will be another major issue for a large number of states. As there are concerns about governments losing some degree of control over information about their territory, there could be tensions, particularly when a state considers that entities abroad have exploited information about its territory, even as it had no fair and affordable access to the same – due to commercially driven policies. There are real threats to the Rights to privacy – due to possibilities of industrial espionage, and potential use of imagery by anti-social groups. Commercial corporations from one country could gather information on exploitable natural resources in another country without the knowledge of its government and could possibly gain strategic advantage in negotiations.

There are, however, significant benefits of transparency created by the availability of high quality images including their use by NGO's, media, environmental groups and governments. These benefits cannot fully fructify unless international community develops means to harmonise the policies and legal measures. National regulations to restrict physical flow of information products in the age of Internet are

ultimately not going to be very productive. Hence there is a need for evolving acceptable legal norms for the operations of commercial operators – taking into account the basic needs of civil societies' rights for information and the legitimate concerns of the governments to maintain the rule of law in the territories under their jurisdiction.

## 7. POLICY OPTIONS

Some of the issues to be considered for defining a policy are:

- Recognise that satellite images, including high-resolution images, are essential to support development activities. As has been mentioned earlier, a large number of developmental activities depend critically on the availability of satellite images. The 1m images would be most useful for a large number of civilian applications - large-scale mapping of various themes; for planning and managing urban facilities/ infrastructure; rural development; cadastral mapping; national infrastructure development – roads/ highways, telecom, power; disaster management support – cyclone damage assessment and rehabilitation planning, flood damage assessment etc.
- Any nation's security interests will have to be fully taken into consideration to ensure that nation's defense/intelligence interests are not compromised. Possibilities of necessary guarantees for non-disclosure and second-order dissemination could be built-in to the mechanism.
- Recognise that imposing any control on foreign private satellites for "imaging" over any region is truly not possible. With the highres satellites,

images of any region would be acquired and made available to any user in any country – especially when commercial considerations and demand will drive data sales. While shutter-control is available to the country licensing the satellite (like, say USA can regulate imaging/dissemination/use of images over its or a specified territory), the "sensed state" will not be able to regulate any control on the commercial satellite for imaging over its territory.

- However, international discussions/ consensus needs to be built on the role/privileges of "sensed state" for imaging over its territory. It may be appropriate to move for atleast a consensus that satellite operators must intimate "sensed states" of data sales happening for their territory to users outside the "sensed state".
- Ensure that access of highres data to genuine, civilian users is not denied. As the highres data would anyway be available to global users, a "restrictive" policy of denial of such data to genuine civilian users would not be appropriate as it would limit the opportunity for users to benefit and use it in support of development activities.

The unimpeded observations and distribution of data gathered from space, particularly in the high resolution range, through commercial channels have thus raised policy questions on the rights of the sensed state for access to data and also its ability to safeguard the right of privacy. Concerns are also expressed on proper use of images to meet national security needs and ensuring friendly relations among nations. The United States has responded to this situation by "Shutter Control" policy – which allows the US government to limit collection or distribution of data by the US commercial satellites during specific periods when national security or

foreign policy interests could be compromised. This policy balances the goals between promoting commercial interests of industry on the one hand and meeting national security and foreign policy interests of the US on the other hand. The US government imposes on its licenses certain conditions to protect interests of sensed states and also to secure its interests for national security or foreign policy angle. The licensees in US are obliged to make available to the government of any country (including the US) unenhanced data concerning the territory under the jurisdiction of such government as soon as such data are available and on reasonable cost terms and conditions subject to all other conditions of the license. The US government has also stipulated that its licensees shall use a down link format that allows US government access and use of data during the periods when national security and international obligations may be compromised. Further, the licensees are required to maintain all satellite tasking operations for the previous year and shall make this available to the US government, as requested. Thus the US government has ensured a fair degree of control over the operations of its licensees besides access to the information gathered by them.

While these measures may satisfy some governments, they have no universal appeal because of lack of multilateral framework in their application. Vagaries of unilateral policies could also affect realisation of full commercial potential. Thus the remedies which exist currently are not satisfactory. The policies adopted by the US are applicable to its licensees only. What would happen when there are more players from other countries? Each country may follow its own regulations and there could be conflicts of interests, to the detriment of healthy development of commercial sector. More over common global needs such as monitoring and protecting global environment, tracking

illicit activities; promoting public health and responding to natural disasters can be satisfied only with a broader international understanding and consensus. Pending development of such common norms, states could develop means to live with the new era. They would negotiate with satellite operator's conditions to satisfy their concerns, as they provide access to their markets. Some countries could also try to camouflage the sensitive targets or take recourse to counter measures, (which in extreme cases would constitute a hostile step, triggering confrontation).

Hence a solution to overcome this problem is to develop an understanding in a multilateral framework. The UN Principles could be further reviewed taking into account the new challenges of this era and with an aim to evolve legal principles for orderly development of commerce in this field, respecting the right of governments to receive certain information from commercial entities when their territories are imaged. The review could also aim at evolving a criteria for access by sensed states, to data and information over their territories and ensure a system for information flow to meet humanitarian needs. The UN-COPUOS which spearheaded the development of international law for Outer Space could endeavor to resolve these issues and develop a consensus on how to harmonise the principles of non-discriminatory access, the public right for information, safeguarding the legitimate right to privacy and promotion of commerce.

## **8. THE INDIAN REMOTE SENSING DATA POLICY**

India has recognized that Remote Sensing data is an important source of information for managing the nation's natural resources, supporting and monitoring developmental activities at the local level, supporting disaster management activities, ocean state and weather forecasting and

environmental monitoring. Today, the Indian IRS series provide an immense imaging capability to the national and global user community. As per defined guidelines, IRS data is acquired and distributed to government, private and academia for a variety of operational applications and the data is also marketed all over the world. India has also recognized that with the availability of high resolution (1m resolution) images from commercial US satellites, images of any part of the world, including Indian regions, are available and these have immense potential to support local level development and cadastral applications. India also has plans for having such high resolution imaging satellites in the near future. These high resolution images also have strategic value and thus a regulated distribution of such high resolution images can not only take care of the user community requirements but also the national security interests. With this in mind, the Government has approved and adopted a comprehensive Remote Sensing Data Policy (RSDP) for the acquisition and distribution of satellite remote sensing data – from Indian and foreign satellites for civilian users in India. The Policy comprehensively covers guidelines for satellite data acquisition and distribution in the country and also for licensing the IRS capacities to other countries. Department of Space will be the nodal agency for implementing the Policy. In particular, the Policy streamlines the distribution of high-resolution data to Government users; private users involved in developmental activities with government and other private/academic/foreign users. The RSDP is envisaged to be a step towards making transparent the procedures of satellite data distribution, including those from high resolution imaging systems, and, without being restrictive, would help regulate the process of image distribution so that Indian users are not denied access to this valuable tool – which has become a main-

stay in the developmental and natural resources management activities of the country (4).

## **9. CONCLUSION**

The era of commercial high-resolution satellite imagery has become a reality. This has brought in new challenges for respecting the legitimate right to privacy and also maintaining the principles of non-discriminatory access to data by sensed state. This era of transparency however, can also enable significant benefits to society by the use of imagery for environmental, humanitarian and other applications including check on compliances to the international agreements. There are also risks from misuse of such data by anti-social elements. The ultimate solution for this situation is to develop a broader international understanding in a multilateral forum (like UN COPUOS; CEOS; IAF; ISPRS and so on) on principles relating to access to data in an affordable and timely fashion, meeting the legitimate concerns of sensed state.

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## **REFERENCES**

- 1) Secrets for Sale – How Commercial Satellite will change the world – Yahya A Dehqazida and Ann M Florini. A Carnegie Endowment for International Peace publication of 2000.



- 2) John F Hall Jr., Esq, United States Laws, Regulations and Policies Concerning Commercial Remote Sensing Activities, Project 2001: Legal Framework for the Commercial Use of Outer Space; Workshop on Legal Remote Sensing Issues – Toulouse, France, 28 October 1998.
- 3) SPYING For dummies, IEEE SPECTRUM, NOVEMBER 1999
- 4) Statement on the Indian Remote Sensing Data Policy. As released on ISRO web-site – [www.isro.org](http://www.isro.org)

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