To pay or not to pay – That is the question

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Abstract – Regarding access to remote sensing data, there are a number of aspects that need to be taken into consideration such as user time limit for e.g. space scientists, what rights do the involving states have, access rights for foreign domains and archiving. But the most central aspect is perhaps the pricing of such information. The demand for remote sensing data creates a competitive market, a market driven by price and self-interest. However, unlike food or other primary needs, remote sensing data is not a life supporting product; hence if the price is perceived as too high the data will not or cannot be used by e.g. organisations and authorities. If remote sensing data would be made more accessible to users through e.g. affordable prices and international information sharing systems, it could be beneficial to mankind in terms of supporting global sustainable development.

Keywords: Sustainable development, public goods, copyleft, satellite data, GMES, GEOSS.

1. INTRODUCTION

This paper outlines the basis for my PhD thesis, and what is discussed will serve as a research plan for my further work on this topic.

In February 2005 the Intergovernmental Ad hoc Group on Earth Observations (GEO) published their final draft on Global Earth Observation Systems of Systems (GEOSS) 10-year implementation Plan. This Plan establishes the intent, operating principles and institutions relating to GEOSS.

Declaration of the Earth Observation Summit, Washington 2003, states the objective "to monitor continuously the state of the Earth, to increase understanding of the dynamic Earth process, to enhance prediction of the Earth system, and to further implement our international environmental treaty obligations." The Declaration also affirms the need for "timely, quality, long-term, global information as a basis for sound decision making" (Declaration 2003).

In order to achieve the many benefits of Earth observations it is important to realize a future wherein decisions and actions are informed by *comprehensive* (by including observations and products gathered from all components required to serve the needs of the participating members), *coordinated* (leveraging resources of individual contributing members) and *sustained* (collective and individual will and capacity of participating members) information and this is also the vision of GEOSS (GEO 2005).

GEOSS aspires to involve all countries of the world and it will cover *in situ* monitoring as well as airborne and space born observations. GEOSS will be a system-of-systems and its components will be consisting of existing and future Earth Observation systems. Through GEOSS, the participating parties will share observations and products with the system as a whole and the parties will have to take the steps necessary to ensure that that the shared observation is accessible and understandable for the users. This means that the parties have to be open and adaptive to what the users need and requests (GEO 2005).

GEOSS will aspire to international cooperation in the area of Earth Observation. Europe's contribution to the system will be with a joint project between the European Commission and the European Space agency named Global Monitoring for the Environment and Security (GMES). However, in order for GMES to be a full and important contributor to GEOSS and the international community, European data policies and access/price policies need to be made compatible to fit an international arena.

Open access to remote sensing data can provide information that could be crucial for reducing poverty, armed conflicts and environmental disasters; GEOSS can be seen as an important contribution to a global effort in this area. The objective of this paper is to give insight to the problems that arise from having restricted access (e.g. through high pricing, insufficient sharing etc.) to spatial information. The paper will also touch on the complexity that surrounds this subject with regard to 'public good', copyright and copyleft.

2. USE OF REMOTE SENSING DATA

There are a number of global areas mentioned in the GEO Final Draft that could benefit from the use of earth observations and open access to its generated data; however, this paper is limited to the areas of disaster and agriculture. With regard to the former, access to data is usually made open and shared through the incentive of goodwill while access to data in the latter area is more driven by self-interest and competitive markets (e.g. Large Crop Inventory Experiment (LACIE) project).

2.1 Reducing loss of life and property from natural and human induced disasters

According to the UN International Strategy for Disaster Reduction (ISDR) report *Living with Risk* disaster killed 500,000 people and damaged property to a value of $750 billion during the decade 1990-1999 (ISDR Report 2004). Damage can never be totally avoided, but with cooperation amongst the international community, open access to Earth Observation data and early warning systems, damages can be reduced. GEO states that one major lesson learned from the tsunami catastrophe in December 2004 is that an international observation system together with a prediction system is needed in order for the national emergency services and the public to receive timely warnings. GEOSS architecture could be used to implement warning technology and thereby GEOSS could help nations save lives in the event of a disaster.

According to GEO, coordination and data sharing between organisations and scientists remains weak. GEO states that Earth Observation data is not used consistently or optimally for disaster management decision-making and GEOSS could build the bridge between users and communities.

If one ask disaster organisations of the western world e.g. Red Cross, how they position themselves regarding access and pricing of the necessary data, most of them believe that the user activity would increase immensely if data would be available at minimum cost. Nobody perceived it as beneficial to have the data for free (not even cost of reproduction) since the data quality then probably would be reduced. One even expressed its pragmatic side stating; "nothing is for free."[*]

If a *major* disaster occurs the International Charter on Space and Major Disasters[**] can be activated by one of the participating States. The purpose of the Charter is stated in Article II. The Charter will seek to supply periods of crisis, to States or communities whose population are exposed to an imminent risk, or already victims and data will provide a basis for critical information about the crisis. Article III in the Charter continues to outline the overall organisation of cooperation. The parties (space agencies and national or international space system operators) to the Charter shall develop their cooperation on a voluntary basis and no fund will be exchanged between them. In order for the parties to intervene, the beneficiary bodies in the disaster struck country has to put forward a request for intervention (Charter 2000).

The Charter on Space and Major Disaster is a rather interesting document to analyse. According to the Charter, the data shared is to be available for free (not even cost of reproduction), thus distributed through goodwill. However, it only activates when a disaster already has occurred, thus it cannot be used as a basis for preventive monitoring. Probably the oddest thing about the charter is that it only applies to *major* disasters and that the disaster struck country, or someone else on their behalf, has to ask for the parties' intervention. This indicates that the data will only be distributed in goodwill if it is requested for, thus disasters are clearly not seen as a common bad. If help is not asked for, nothing is done in terms of data providing and especially not in goodwill.

Even though the Charter is a good start with regard to cooperation, GEO states that more could be done. GEOSS will in this sense advocate a strengthening of the Charter to enable better response to and documentation of effects of disaster. GEO will also like to see that the Charter expands to pre-event tasking. My belief is that this Charter could have a positive effect in terms of cooperation in space; however, what we really need is cooperation and data sharing with regard to preventive monitoring. This data does not necessarily have to be shared in goodwill, but in this sense the international community could cooperate and monitor for the benefit of mankind and make *small* and *major* disasters a common bad.

2.2 Supporting agriculture

According to GEO Final Draft approximately 800 million people are exposed to hunger or malnutrition. In 1996 the World Food Summit agreed that that number should be reduced to half by 2015. Although GEOSS is perceived as global in scope, under that area of agriculture, agricultural planners and policy makers could use information for application on regional or local levels. The primary beneficiaries in this area are small scale farmers and land managers in low income countries. The vision of GEOSS is to have a global poverty and food monitoring, land use mapping and service of information to enable sustainable development within countries.

Agriculture is an area where access to data is not given in goodwill. Many states have used earth monitoring in order to gain a competitive advantage e.g. US and its LACIE project. LACIE was a joint effort between National Aeronautics and Space Administration (NASA), United States Department of Agriculture (USDA) and National Oceanic and Atmospheric Administration (NOAA), and its objective was to forecast harvests in important wheat production areas with the help of remote sensing. The experiment was set up in order for the US to gain a competitive advantage in the field of wheat export, thus LACIE was used as a tool of power. Although a rather old project, LACIE is a typical example of what we want to avoid in the future. It is important to promote open access and minimum prices regarding data, not only to reduce poverty and secure food but also to enable developing countries to compete on the international market.

3. TO PAY OR NOT TO PAY?

From the beginning there existed two opposite policy models, NASA/NOAA and Centre National d'Etudes Spatiales (CNES). The US took the position that all data produced through projects financed with government funding should be 'free' (i.e. at cost of reproduction), while CNES adopted the opposite position with their SPOT project. Through the Envisat Data Policy, which was approved in 1998, ESA adopted a middle way using a categorizing system. Category 1 use refers to "research and application development use in support of mission objectives, including research on long term issues of Earth systems science, research and development in preparation for future operational use, certification of receiving stations as part of the ESA functions and ESA internal use." This category will be charged a fixed price which will be set at or near cost of reproduction. Category 2 use refers to "all other users which do not fall into category 1 use, including operational and commercial use" (Envisat Data Policy 1998).

For category 2 users, ESA will set a fixed price for Envisat products and services which it provides to the distributing entities. The distributing entities will then be allowed to set prices above or below the price level charged by ESA from the entities. (Envisat Data Policy 1998)

GEOSS is said to be driven by user needs, thus this seems to be the core of the system. However, in order to give the users what they want and to ensure their need for observation information, it is of utmost importance that all

[*] Quote from Frederic Zanetta, Web information Officer, Operations Support Department. International Federation of the Red Cross/Red Crescent Societies.

[**] Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disaster.

governments and institutions at all levels cooperate and obtain knowledge about the benefits with shared and 'free' data. Another important aspect that needs to be mentioned with regard to knowledge is *capacity building*. It is important that developing countries obtain knowledge on how to use data for information products tailored after their regional and/or local needs. If data is 'thrown in their lap', not only could the data be inadequate for their needs, it could also make the developing countries even more dependant on rich developed countries.

3.1 Access to data

Large amounts of data and information have been made available as national public goods in the US. This approach is said to generate a general benefit for all citizens. (Onsrud 1998) There are several laws defining or influencing the access of data e.g. antitrust laws, freedom of information and intellectual property. All these laws have a common denominator in that they allow greater access to government information. It is a common knowledge that passing national legislation is easier than adopting international agreements or passing international treaties. The question is if the US strategy could be applied on the international scene?

The term public good is often found in the area of economy. Standard economic texts define public and private goods in terms of their position, described by qualities of rivalry and excludability (Groot and Georgiadou). Ownership is clearly a right connected with private good, thus excludable. These rights can and will be distributed according to demand within the market. The rights belonging to private good are also considered to be rival in consumption, which means that the enjoyment of the good by one person may reduce or empty out the good's value for others.

Public goods are considered to be the opposite of private goods. Public goods are non-rival and non-excludable. Few goods qualify as purely public or purely private, but fall somewhere in-between. Public goods have been a national focus for many years; however, as the world rapidly globalises, public national goods generate spill-overs across borders and disciplines. Through remote sensing we are becoming more and more aware of the existence of global public goods. Global public goods (or bads) are considered universal in the sense that they benefit (or damage) all countries and examples to be mentioned are global warming, water resource management and basic research (Groot and Georgiadou).

In order to analyse if the US strategy would be feasible in a global perspective it is important to determine if data and information is considered to be a global good. As mentioned, global public goods/bads are often referred to areas such as global warming or water resource management. Data and information is not to be compared with natural resources, such as water, but can rather be seen as a knowledge-based resource. Through analysis of data and spatial information, mankind can obtain knowledge which will lead to more efficiency in daily life e.g. less costs, better agricultural planning etc. Like other goods (public or private) data and information is consumed, but not in a rival way, since consumption of data does not lead to depletion of the resource. It will still be there after you give it away (Onsrud 1998).

Harlan J. Onsrud argue that to ensure public information resources availability for future generations, public information should be duplicated and transferred through as many channels as possible (Onsrud 1998). The question is of course if remote sensing data can be viewed as public information?

We have concluded that data is non-rival, but what about excludability? Can data and information be seen as non-excludable? Non-excludability means that once the goods are produced no one can be excluded from consuming it. As mentioned below, a good that possess non-rival and non-excludability are considered to be pure public goods. There are however many hybrid goods that fall somewhere in-between private and public goods. These goods are commonly referred to as *impure* public goods. (Sandler 1998) Once they are produced everyone can use them without depletion for others but in some instances there are ways of excluding users from using the good. This could be done e.g. through high pricing. Many European data policies endorse a high price to be paid by the users (mainly commercial users); however, high prices limit the access to data and therefore exclude countries from the benefits generated by the information.

It can be concluded that high price on remote sensing data is not preferable in a global perspective, but at what level should the price be set, should the users even have to pay for data that could generate global benefits?

3.2 Pricing of data

Data obtained from projects financed with US government funding is available for free (i.e. cost of reproduction) for everyone in the world, regardless of purpose. In Europe, however, the opposite have been adopted. The question now is which of the two systems are preferable?

GEO Final Draft states that in order to obtain societal benefits of Earth Observations it is of utmost importance that data is shared and the Draft outlines three principles relating to this:

- Full and open access of metadata, data and products that are shared within the GEOSS project is needed.
- All this data should be made available with minimum time, delay and at minimum cost.
- All data for use in education, and research will be encouraged to made available free of charge or at cost of reproduction.

One interesting point to notice in the above list of principles is that GEO states that data should be available at minimum cost. Minimum cost indicates that the pricing should be set by the providers of the data e.g. private owners, agencies etc. However, since GEOSS is said to be driven by user needs it could be argued that it would be more preferable to examine what users are willing to pay for the data, thus changing minimum cost to affordable cost. Introducing this change would, however, generate other problems. Different users are willing to and able to pay different amounts for the data. To be able to uphold affordable cost, one would have to decide the price of the data on a case by case basis, which could lead to loss in incentives for the providers and sky high administration costs. There are pros and cons with free data and the same goes for costly data. The problem is however which is preferred. Should data be accessed for

free or should it be priced? In order to produce an answer to this question one has to analyse the right to information.

3.3 The right to information

The right to creativity and innovation is regulated by laws of intellectual property (IP). These laws allow people to be rewarded for its use. IP consists of four main types; patents, copyright, trade marks and designs. The types that are most interesting to analyse with regard to the topic of this paper is copyright and patent. Patent is issued for a limited number of years to an inventor. The legal aspect of the patent is that the right stops others from making, using or selling the intervention. Foremost, patent is used on technical and functional aspects of a product.

Copyright allows the creator of e.g. music, literature and broadcasting to gain economic rewards for their creativity. Copyright is an automatic right, hence no official registration or form need to be filled in. With regard to information, there are some authors that perceive information as falling under the amusing backformation of the term copyright, namely copyleft.

Copyleft is a concept created by Richard Stallman. It is described as a group of licenses which are applied to works such as software, documents and art. If copyright is used as a mean to restrict the right to make copies and redistribute the original work, copyleft licenses uses the copyright law to enable every person who receives a copy to change and redistribute the original work and the modified work. A similar approach can be used on patent. (Wikipedia 2005)

There are many problems with the term copyleft. Some are definitional and some are ideological. However, the question is how to look upon information. Regarding satellite data, it is produced through a technique that could be patented or copyrighted. However, the data is obtained in an area which is perceived as a *global common*, where all activities should be performed for the benefit of mankind. UN Outer Space Treaty Article 1 clearly states that "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind". (Outer Space Treaty 1967) If the data is obtained in a global common should not the data then be used for the benefit of all mankind, thus be provided for free?

4. CONCLUSION

Limited access to satellite data can produce a number of problems and inequality amongst the countries of the world. Western states are often accused to contribute to the uneven global societal systems. However, in the case of access to satellite data one of the most accused countries has also been the most liberal one. The US has made information available as national public goods; hence can be accessed for 'free' (i.e. cost of reproduction). But is access for free really the best solution? GEO Final Draft states that all data should be made available at minimum cost and that data use in education, and research will be encouraged to made available free of charge or at cost of reproduction.

It is clear that the question to pay or not to pay really *is* the question. On the one hand the data is obtained in a global common, thus should be used for the benefit of mankind. In order for mankind to benefit, people, as many as possible should have access to the data and free means more access. On the other hand, to continue produce new technique and improve the quality of the data, incentives are needed. In today's capitalist world, money equals incentives.

This paper has touched upon the complexity surrounding access to remote sensing data and its pay or not to pay. It is the author's intention to elaborate on this topic in a PhD thesis over the next coming years; hence results and/or best strategy is yet to be investigated.

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