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Geographic Information:
a Vital and Rapidly Changing Asset

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The ongoing digitalization of society means that anyone will soon be able to acquire detailed geographic data. This is a complicating factor in Swedish crisis- and defence-related planning that needs to be properly addressed and calls for new approaches. As the data available to the public increases, so does the importance of, for example, maintaining control of classified information. The antagonist's perspective should also be taken into account in technical development, in an attempt to prevent future unpleasant surprises and ill-informed decisions. Geographic information is a vital resource in transition. A new strategy and way to relate to it are therefore required.

A revolution in geographic information

Reliable geographic information is a prerequisite for efficient crisis management and vital to military activities. The information is used for planning, exercises and the execution of operations. Historically, geographic information concerning territory, such as topographic maps, has been a strategic and meticulously protected asset. Knowledge of local conditions, intended to offer advantages vis-à-vis potential opponents, has been used for defence planning and subject to restricted distribution.

A minor revolution in geographic information is currently in progress. With the digitalization of the society have come novel technical systems for data acquisition, as well as improved infrastructure for the storage, processing and distribution of data, and the presentation of results. There has been a sudden increase in the use and distribution of detailed geographic information, which countries are no longer in control of or have exclusive access to. The increased availability of individual data sets does not necessarily mean increased security risks, but a completely different situation could arise if several sources of information were brought together or interpreted using the right background knowledge.

Digital geographic information for everyone

Detailed geographic information is no longer reserved for certain groups and its distribution is not as meticulously controlled as it once was. In the ongoing digitalization of society, the trend is for increased use and distribution of detailed geographic information, and an increasing number of voices can be heard demanding free access, usage and distribution. One example is the entrepreneurship that promotes the exploitation of this type of data, the development of which has in most cases been publicly financed.

Behind the above trends are strong technical developments. Modern sensor equipment can collect substantial amounts of detailed data with ease. Digital cameras produce sharp images, radar sensors measure over large distances and see through clouds, while positioning systems make it easy to associate acquired data with geographic locations. Moreover, sensors are constantly getting cheaper and can now be found extensively in modern devices such as mobile phones, drones and vehicles. Several large commercial companies, as well as the more niche, high-tech firms in Sweden and abroad, are compiling huge amounts of publicly available geographic information. There are also initiatives in which users team up to gather and organize geographic data and make it available free of charge. One such example is OpenStreetMap, a crowd-sourced initiative that offers free map data to anyone.

IT infrastructure is also currently undergoing rapid development, such as new, powerful systems for handling vast amounts of data. Systems based on artificial intelligence learn to recognize objects and events, find patterns and instantly adapt information according to our wishes. Furthermore, novel presentation systems are being developed that allow quick and simple visualizations of results. A modern example of this is Virtual Reality (VR) glasses, which provide the user with a new way of viewing 3D representations of the environment.

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Geographic information is beneficial for society

We can only speculate about what constant access to up-to-date national geographic data will mean in terms of new services in the future. Detailed data, such as new elevation data from the Swedish National Land Survey (*Lantmäteriet*), acquired through the processing of aerial imagery, could become a key component of new applications in numerous areas. These might be used for forestry planning, optimizing the placement of solar panels or analysing how various different environmental indicators change over time. They could also, of course, be used for defence-related purposes. Many new products and services will also benefit from the ever improving and increasingly detailed data, which can then be used to improve everyday life. Data could be used to navigate self-driving cars or to visualize construction projects using so-called augmented reality.

Technical developments provide many new opportunities for innovative applications, but they are dependent on the availability of data. Among developers and end-users, there is increased interest in so-called open data, or data that is free to use, reuse and distribute. There is also a strong drive to promote economic growth, both regionally and nationally, through innovation and entrepreneurship. This could have significant socio-economic benefits, in terms of new products and services as well as an increase in the efficiency of existing businesses.

The municipality of Helsingborg recently made a large part of its data available to the public. In addition to basic geographic data, this included information on security-, police- and fire service-related events, as well as maintenance issues and comments from local people. The data is accessible on the Internet and available to download. Several applications – or apps – have already emerged from this initiative. Helsingborg is not unique in this respect and many other municipalities are already working on similar projects.

Similar developments are also in progress at the national level. The Swedish National Land Survey has promoted the idea for several years, and today part of its data can be downloaded and used freely, including detailed road and terrain maps. Various other authorities have made parts of their data archives publicly available. The Swedish National Land Survey wants to take things further, but is currently hampered by a business model that requires a significant proportion of its budget to be covered by fees for using the information. The authority has presented cost-benefit analyses regarding open geographic data and made requests to the Ministry of Enterprise and Innovation, concerning changes to its business model. Large parts of the Land Survey's national geographic information may soon be available as a free and easily accessible resource.

Open data could become a security threat

What are the consequences from a defence and crisis management perspective of the increased availability of and demand for geographic information? What might happen if anyone can combine and analyse completely new combinations of data sets? Is it possible – or even desirable from a societal development point of view – to try to restrict the trend for geographic data to become increasingly accessible? These are difficult questions that should be addressed at the national level. By tradition, Sweden is a technologically advanced and innovation-friendly country. Technological advances are quickly adopted and neither legislation nor risk management tend to be able to keep up with the drive to exploit and capitalize on new technologies. This situation can lead to overreactions and demands for prohibitions or restrictions on the use of new technologies. In the case of the rapid development of unmanned aerial vehicles and the possibilities they offer, for instance, when the risks of such platforms became apparent, and the use of cameras was seen as in conflict with laws on personal privacy, a court ruling stopped companies using them in their businesses. By considering possible problems in the development phase, preventive measures can be taken that avoid the need for legislation or prohibition.

Free and easily access to geographic information does not just bring advantages. It will be just as easily available to antagonists or opponents, and it is not difficult to imagine scenarios where it would prove useful in the planning of hostile acts. Possible paths for invasion could be analysed, locations suitable for disembarkation or airdrops identified and target coordinates for precision-guided weapons determined with a high degree of accuracy. In a worst-case scenario, a person or a group with hostile intentions could perform all the necessary planning of an action without

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physically visiting the location in question, which would risk attracting attention that might reveal its plans. In the near future, attacks may also be conducted using autonomous vehicles, programmed to act completely or partially on their own. Their movements to their final destination could be controlled with precision using detailed geographic information.

These new circumstances raise the need to consider our stance with regard to the new playing field that is emerging from a defence and crisis management perspective. In a military scenario, an opponent could have access to the same detailed information that we do and the means to use it just as efficiently. We must analyse the risks this involves and how it affects defence and crisis planning. In this context, both the protection and the use of the information must be addressed.

Open and private data in the wrong hands

It is important to note that technical developments are continuing and the situation may become even more intractable. Where this concerns open geographic information, or other types of publicly available data and services, it is possible to know what a potential opponent might have access to. A new problem arises when new applications are developed in which various actors combine publicly existing information with their own data and intelligence gathering. Countries with substantial resources have always gathered their own data and intelligence. The difference today is that increasing numbers of commercial businesses are becoming involved. Access to and the use of data are increasingly beyond the control of governments. Thus, the need to control information that is worth protecting is likely to increase.

One concrete example is the rapid development of self-driving cars. A vital component in this development will be a highly detailed and up-to-date database of geographic information. Every vehicle will have multiple sensors on board that sense and analyse its immediate surroundings and combine the results with information in the database on the current traffic situation to ensure that the car arrives at its final destination as safely as possible. The sensor data collected is also used to update the database with the latest information from along the route. With contributions from hundreds of thousands of cars, the database will quickly become a dynamic, incredibly detailed, up-to-date 3D map of the road network infrastructure and its surroundings, while also providing information on the current traffic situation. All this information will probably also ensure a smoother flow of traffic. Traffic jams will automatically and quickly be detected and road users given help to plan their routes to minimize delays.

However, questions should also be asked such as how a criminal might be prevented from using the system to assist their system escape. If the police were to shut down public transport and block roads, this would immediately affect the traffic flow. A system programmed to maintain a smooth flow of traffic and help road users would now be used to provide that individual with information about current road blocks and to suggest alternative routes that would allow an escape.

A national strategy is needed

In the example of self-driving cars, a scenario emerges where whoever controls the database has access to more up-to-date and detailed information than the municipalities and authorities. Geographic data will also be gathered for various other purposes and stored in databases in other countries. Who will own the rights to this data? Will a private consortium of car manufacturers be able to sell and distribute information about Swedish infrastructure to anyone willing to pay? Would this mean that we have no idea who has access to up-to-date, detailed geographic information about our own territory? What degree of control would we have over this kind of data? Today, mobile phone operators are obliged to provide communications-related information in investigations of serious crimes. Issues regarding the legislation and regulatory framework concerning geographic data should be examined in a similar way.

The pace of developments raises a number of complicated questions that need answers. Geographic information is a vital and rapidly changing asset. A new strategy will be an important part of building a free and open, but safe and secure society.

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