The security dimension of GMES

Position Paper of the GMES Working Group on Security

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Summary

The concept of security has evolved since the end of the Cold War and the term "security" is now used in a variety of contexts. To define the scope of security within GMES (Global Monitoring for Environment and Security), the Steering Committee decided in October 2002 to create a working group to address this issue and highlight the corresponding needs. The group started its work early February, with participants from (EU and ESA) Member States, ESA, EU Council and Commission Services. Involvement of potential institutional users (such as Council, ECHO, DG-RELEX and DG-JAI) was essential to define the needs in the security domain.

The group reviewed the main policies linked to conflict prevention and crisis management: Civil Protection, Humanitarian Aid and the EU Common Foreign and Security policy. In conclusion, it appears that GMES could contribute to the monitoring needs of the following policies:

- Prevention and responses to crises related to natural and technological risks in Europe
- Humanitarian aid and international co-operation
- Conflict prevention including monitoring of compliance with treaties
- Surveillance of borders
- Common Foreign and Security Policy and European Security and Defence Policy to support the missions outlined in Article 17.2 of the Treaty of the European Union (humanitarian and rescue tasks, peace keeping tasks and tasks of combat forces in crisis management including peacemaking).

Based on this analysis, the following organisations could be considered as potential users:

- Civil protection and search-and-rescue organisations within the borders or territorial waters of Europe for management of natural and technological risks
- European institutions, government departments of EU or ESA Member States, international organisations and non-governmental organisations engaged in co-operation, humanitarian and development aid, as well as civilian crisis management outside Europe
- The Council and, under the mandate of the Council, entities involved in the planning and conduct of civil and military crisis management operations.

Once GMES services are in place, we can expect that they will benefit additional users. In particular GMES could be useful in the domain of justice and home affairs. The GMES requirements for these tasks at European level are currently under development.

Analysis of inputs from the Council and Commission services involved in the group, suggests a number of common needs in support of security: improved access to earth observation data and to background data (on population, infrastructure, resources); improved production of information and response to users' needs; improved interoperability of systems for crisis management; and development of methodology and tools for forecasting and decision-making.

In response to these needs, the working group proposes several actions including: access for the European Union to earth observation data from the up-coming military and civil national satellites; development of an imagery and mapping centre in support of Commission and Council needs; creation of a database for background data; development of services supporting actions of civil protection teams and NGOs; and evolution of the International Charter on Space and Major Disasters.

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1. Introduction

Issues of security are taking an increasingly important role in a number of areas of policy at European and national level. They are relevant to the provision of humanitarian and development aid and crisis management around the globe, as well as civil protection and potentially to law enforcement in Europe. Space-based, airborne and in-situ assets can help to provide information in these areas. The Global Monitoring for Environment and Security (GMES) initiative would entail making more effective use of existing resources in crisis management and civil protection, in which the European Union (EU) and the Member States[1] already have considerable experience.

The security aspects within GMES can be distinguished from those of the environment if we consider them to be concerned with the direct protection of individuals. Thus, they relate to information services to prevent, mitigate and manage dramatic or catastrophic events that threaten human life and property. This is in contrast to the monitoring of slower, more progressive development of the environment.

However, global climate change and the consequent rise in temperature are likely to lead to changing patterns of life-threatening events (floods, forest fires, landslides etc) and create further turbulence and migratory movements in a number of regions outside Europe. Environmental degradation has an impact on poverty[2] and competition for resources may play a role in civil strife.

The concept of security has changed since the end of the Cold War. Europe faces new threats that are more diverse and less predictable[3]. The borderline between civil and military responsibilities is becoming fuzzy and the term "security" finds itself used in a variety of contexts. On 18 October 2002, in Paris, the GMES Steering Committee members decided to create a working group to define the scope of security within GMES (WG5). The group started its work early February, with participants from Member States[1], ESA, Council[4] and Commission Services. Involvement of potential institutional users (such as Council, ECHO, DG-RELEX and DG-JAI) was essential to define the needs in the security domain.

The group reviewed the main policies linked to conflict prevention and crisis management. This document gathers the work done and draws the first conclusions.

2. Civil Protection

2.1. Actions undertaken by the EU Civil Protection Unit

At Community level the Civil Protection unit in the Environment Directorate General has been involved for years in improving responses to crisis management in Europe. The Civil Protection Unit is leading the major actions described below. In addition, they are involved in international co-operation and actions outside Europe.

[1] ESA and EU Member States
[2] To ensure environmental sustainability is one of the "Millennium Development Goals" to end human poverty (UN Human Development Report 2003)
[3] A secure Europe in a better world, Javier Solana, European Council, Thessaloniki, 20/6/2003
[4] In this document, the term Council refers to the EU Council.

Community action programme in the field of civil protection

The Community Action Programme in the field of Civil Protection (2000-2004) was established by a Council decision of December 1999 (1999/847/EC), based on the Commission proposal of December 1998 (COM(1998) 768 final). It is intended to support and supplement Member States' efforts at national, regional and local levels for the protection of persons, property and in so doing environment, in the event of natural and technological disasters, without prejudice to the internal division of competence in the Member States. The aim is also to facilitate co-operation, exchange of experience and mutual assistance between Member States in this field and is due to run for the period 01/01/2000 to 31/12/2004.

Individual actions are to be selected primarily on the basis of the following criteria:

(a) contribution to preventing the risks and damage to persons, property and in so doing environment, in the event of natural and technological disasters;
(b) contribution to increasing the degree of preparedness of those involved in civil protection in the Member States, in order to increase their ability to respond to an emergency;
(c) contribution to detecting and studying causes of disasters;
(d) contribution to improving the means and methods of forecasting, techniques and methods of response and immediate aftercare after emergencies;
(e) contribution to public information, education and awareness, so as to help citizens to protect themselves more effectively.

Community mechanism to facilitate reinforced co-operation in civil protection assistance interventions

The Feira European Council of June 2000 identified Civil Protection as one of the four priority areas within the civilian aspects of crisis management where the EU undertakes to strengthen its capability. At the Göteborg European Council in June 2001, concrete targets were established in the area of civilian aspects of crisis management. The Community Mechanism for the co-ordination of civil protection intervention in the event of emergencies, was established on the basis of the Commission proposal, COM(2000)593 final.

This proposal supplements the existing Community Action Programme in the field of Civil Protection (2000-2004). It is the basis for the Council decision of 23rd October 2001, established a Community mechanism to facilitate reinforced co-operation in civil protection assistance interventions (2001/792/EC, Euratom). The mechanism is intended to help ensure better protection, primarily of people but also of the environment and property, including cultural heritage, in the event of major emergencies, i. e. natural, technological, radiological or environmental accidents occurring inside or outside the Community, including accidental marine pollution. The decision states that: “With a view to achieving the objectives and implementing the actions defined in Article 1, the Commission shall…stimulate and encourage the introduction and use…of new technologies, including systems for notification and alert, exchange of information, use of satellite technology and assistance to decision making in the management of emergencies.”

Community framework for co-operation in the field of accidental or deliberate marine pollution

Among other relevant initiatives is the Community framework for co-operation in the field of marine pollution (2000-2006). The actions to be implemented within this framework include training courses, pilot projects to improve clean-up techniques and the establishment of a

Community Information System[5]. The overall purpose of Community action in this field is to contribute to and support the efforts made by Member States to improve their capacity to respond to marine pollution incidents (Decision No 2850/2000/EC of the European Parliament and of the Council of 20 December 2000).

Seveso II Directive

The "Seveso II" Directive on major accident hazards is intended to prevent major-accident hazards involving dangerous substances and limit their consequences for man and the environment (Council Directive 96/82/EC of 9 Dec. 1996 and subsequent amendments). It introduced new requirements relating to safety management systems, emergency planning and land-use planning as well as provisions on inspections to be carried out by Member States.

Integrated EU Strategy on Prevention, Preparedness and Response to Natural, Man-made and Other Risks

This new initiative is aiming at improving public awareness and safety in the face of natural and man-made hazards: a working document has been published [6].

Short-term actions have been defined to improve measures to provide clear information to the general public and promote risk prevention. It concerned hazards such as floods, forest fires, earthquakes, volcanic eruption or industrial plants. The idea is to define a common methodology for identifying risk levels and to request the Member States (1) to publish and update risk maps, (2) to inform all persons likely to be affected, (3) draw up and publish emergency plans, (4) take measures to reduce the risks.

Medium term actions include legislative measures to improve reporting of major disasters and of possible hazardous sites, and practical measures such as harmonising alert levels or increasing interoperability of emergency services' equipment.

International co-operation and actions outside Europe

Inside "Circle of 31"

The Mechanism[7] is primarily intended to be used for any major disaster scenario that is in danger of overwhelming national capacities of any of the participating countries. The affected country activates the Mechanism when that country requests assistance via the (Commission) Civil Protection Response Centre by fax or e-mail. The Centre will pass the request to other participating countries, and, if necessary co-ordinate assistance, send assessment teams, or send expert teams. Typically this involves sending experts, capacities, or equipment that are not available in the affected country or reinforcing those that are available. The Mechanism complement similar mechanisms in force for nuclear and medical scenarios.

[5] http://europa.eu.int/comm/environment/civil/marpol-cis/index.htm
[6] Additional information on this on going initiative can be found at http://www.europa.eu.int/comm/environment/civil/prote/integrated_strategy_en.htm
[7] Community mechanism to facilitate reinforced co-operation in civil protection assistance interventions; Council Decision 2001/792/EC, Euratom of 23 October 2001.

"Petersberg tasks"[8]

The Mechanism can also be used as part of the Common Foreign and Security Policy for the Petersberg tasks in the field of civil crisis management, i.e. "out of area" (of the European Community). The scenario is, typically, the reestablishment of basic functions in a region after a conflict. The decision-making process concerning activation involves relevant Commission services, Council, and Presidency. The initiative could come from any of these or from a concerned participating country.

2.2. User Needs

The EU Civil Protection Unit and civil protection authorities within EU and ESA Member States are involved in risk mapping, early warning and crisis management. The origin of the disaster can be natural, accidental or deliberate (e.g. terrorist or malicious action): the same mechanisms will be used to deploy the necessary resources and help the population.

Risk mapping

To assess the risk resulting from a given hazard (flood, storm, earthquake, Seveso site...), it is necessary to determine the vulnerability of the population and of the infrastructure. For that matter, background information is essential:

- Basic geographical features
- Natural risk zones (e.g. location of "quick clay")
- Man-made alterations to the landscape (e.g. location of hardened and elevated river banks or other constrictions of the normal river flow)
- Locations and nature of economic infrastructures (e.g. road and rail, factories, offices)
- Locations of Seveso sites and other potential hazards (e.g. chemical plants), as these may themselves be the primary causes of crises, or may secondarily be hit by something else (e.g. floodwaters), causing the same crisis
- Location and size of populations; with increasing importance being attached to being able to correlate this to the time of the day, as the daily short and medium range workforce migrations will have significant effects on the impact of a disaster. Holiday season migration is also a special variant of this concern.
- Locations and population density of residential areas.

Superimposing risk information on other geographical information will allow the identification of potential incompatibilities, e.g. chemical plants or residential areas located in flood-prone zones. This is a first step towards improving information to the affected public, drawing up emergency plans, improved land use planning, and adoption of corrective measures. It would also allow the monitoring of trends, such as population changes in the identified risk area. However, characterising vulnerability and risks poses some ethical questions that should be taken into consideration (how to inform the public? what measures should be taken to avoid casualties?). Thus developing a common approach within European countries will depend strongly on political will at National level.

[8] Humanitarian and rescue tasks, peace keeping tasks and tasks of combat forces in crisis management including peacemaking (Article 17.2 of the Treaty of the European Union).

Early warning

EU and ESA Member States are developing forecasting tools for natural disasters according to their needs. At a European level, the JRC is supporting the Civil Protection Unit using its forecasting tool for river floods (LISFLOOD).

The LISFLOOD project uses terrain data combined with meteorological data (some of which is of satellite origin) to produce a flood forecast. The floods in Central Europe in August 2002 gave the opportunity to calibrate this tool and produce accurate 10-day forecasts. This tool will be developed to cover all of Europe, to handle more details and possibly to handle additional scenarios.

Predictive tools are dependent on large amounts of very diverse data and complex modelling. Single sourcing of data, e.g. space imagery alone, will not be able to meet this demand. Ideally, all available relevant data should be fused.

Management of ongoing crises

The information requirements of civil protection during an ongoing crisis will in principle be similar to the requirements of tactical military intelligence during an operational situation. In particular, speed of delivery is very important, along with accuracy and detail. Traditionally produced cartographic maps are the basic tools for operational teams with additional information on the location of risks and of possible victims. Satellite imagery could be an added value to existing mapping.

If we take the Prestige tanker incident beginning late 2002, the significant information input can be broken down into several categories, some of the most important being:

- Maps and charts in existence prior to the incident, which forms the backbone that most other information is related to
- Marine registry information concerning the ship Prestige
- Human observations of all phases of the event, from vessels, aircraft, and from the shore; to the extent that these have been reported and acted upon
- Airborne observations from specially equipped aircraft (SLAR[9] and optical)
- Synthetic aperture radar (SAR) satellites

Of these, if we disregard the background information, the airborne observations appear to have been the most efficient, as significant and useful amounts of data have been collected over large areas and in a timely fashion, allowing effective and timely deployments of other assets to combat the oil spills.

Satellite data during this incident, while being a useful complement to other information, has suffered from some limitations, in particular

- The delay in getting interpreted images to the potential users (measured in days)
- The presentation of the data that did not always lead to an intuitive understanding of the situation
- Varying confidence levels, meaning that the information needs to be confirmed by other means
- Satellite technology limitations (resolution) and availability problems

[9] Sideways-looking airborne radar

In this incident, satellite observations has been particularly useful in suggesting areas that could most profitably be followed up by airborne and other observations.

International Charter on Space and Major Disasters[10]

In case of major crises, the civil protection authorities of the affected country (or the EU Civil Protection Unit) can invoke the Charter. The advantage of this procedure is that there is only one entry point and an officer is in charge of following the request up to completion. The main strength is that through the Charter the requesting party obtains easy and free of charge access to satellite data, with top priority in satellite tasking. Weaknesses of this system are due to:

- technical limitations (insufficient revisit time, does not cover all regions)
- the fact that it can be used only for crisis linked to natural or technological disasters (not for long-term humanitarian actions or for crises due to conflicts)
- lack of services for data interpretation (to give the information needed by the user).

The Charter is a good starting point to deal with disaster management but should be improved and extended[11]. This system, which is currently implemented on a voluntary basis by the data providers, can be developed further to be fully user-driven and supplemented by the required services for data interpretation as well as assistance for users. In the longer run, the Charter could be replaced by a user-driven system using a GMES infrastructure.

The way forward

The added value of GMES services will lie in the ability to:

- make the best use of all available data in a timely fashion
- fuse them in a useful manner (different layers of information)
- communicate in a way that allows crucial information to be intuitively grasped

In short, bridging the gap between raw data and insight and making the most of available data. GIS[12] compatibility will be a major requirement, as any new information should be overlaid on existing risk maps and presented as such to field operatives.

[10] Charter on co-operation to achieve the co-ordinated use of space facilities in the event of natural or technological disasters http://www.disasterscharter.org

[11] This request has been also clearly expressed by organisations dealing with humanitarian relief and disaster mitigation (see http://www.dfd.dlr.de/dfd/workshop/bruessel/Conclusion-fin.pdf the conclusions of a workshop held in Brussels on 23-24 October 2002).

[12] geographic information system

3. Humanitarian Aid

3.1. Background

According to the UN Human Development Report 2001[13], there are in developing countries:

- 968 million people in the developing world without access to improved water sources,
- 2.4 billion people without access to basic sanitation,
- 34 million people living with HIV/AIDS,
- 2.2 million people dying annually from indoor air pollution,
- 854 million illiterate adults, 543 million of them women,
- 325 million children out of school at the primary and secondary levels, 183 million of them girls
- 1.2 billion people living on less than $1 a day, 2.8 billion on less than $2 a day,
- 163 million underweight children under age five
- 11 million children under five dying annually from preventable causes.

For these reasons the impact of disasters - whether abnormal natural events such as a floods or hurricanes, human-induced events such as armed conflicts or simply poor harvests - is much greater in the developing world than in the developed one. According to the World Disaster Report 2001 on average, 22.5 people die per reported disaster in highly developed nations, 145 die per disaster in nations of medium human development, while each disaster in low human development countries claims an average of 1,052 people.

Europe is at the forefront of efforts to meet this challenge. In 2002, the Commission provided € 540 millions and Member States € 670 millions for humanitarian aid[14] – much of it channelled through Europe's non-governmental organisations who are also supported by contributions from the public.

To improve the effectiveness of aid requires increasing the quality and quantity of information available on regions outside Europe, both for those who need to decide rapidly whether to deploy resources and for those operating on the ground in remote areas with limited communications and poor infrastructure. In this context, satellite based imagery plays an increasing role, especially to provide a rapid update when existing maps are obsolete. However, it should be borne in mind that satellite imagery has to be complemented by other topographic, socio-economic and statistical data in order to meet specific information demands.

3.2. ECHO

The Humanitarian Aid Office (ECHO) is the service of the European Commission responsible for managing humanitarian aid funds given by the Community.

The European Union's mandate to ECHO [Regulation (CE) n° 1257/96] is to provide emergency assistance and relief to the victims of natural disasters or armed conflict outside

[13] http://hdr.undp.org/reports

[14] The budget spent by the EU and Member States altogether represents about 50 % of all official humanitarian aid distributed world-wide. The numbers given refer to EU Member States, however ESA Member States are also involved in humanitarian aid.

the European Union. The aid is intended to go directly to those in distress, irrespective of race, religion or political convictions. Around 80% of the aid goes on conflict-driven crises.

ECHO's task is to ensure goods and services get to crisis zones fast. Goods may include essential supplies, specific foodstuffs, medical equipment, medicines and fuel. Services may include medical teams, water purification teams and logistical support. Goods and services reach disaster areas via ECHO partners.

ECHO is also in charge of the following tasks:

- It carries out feasibility studies for its humanitarian operations.
- It monitors humanitarian projects and sets up coordination arrangements.
- It promotes and co-ordinates disaster prevention measures by training specialists, strengthening institutions and running pilot micro-projects.
- It gives its partners technical assistance.
- It raises public awareness about humanitarian issues in Europe and elsewhere, through actions carried out directly or by call for proposals by ECHO in order to promote the awareness of humanitarian aid).
- It finances network and training study initiatives in the humanitarian field.

3.3. Priorities and Needs

Since 1992, ECHO has funded humanitarian aid in more than 85 countries. In terms of geography, ECHO main priorities are given below.

- Africa:
  - Great Lakes region (conflicts in DR Congo, Burundi, Tanzania)
  - Horn of Africa (conflict and drought in Ethiopia, Eritrea, Sudan)
  - West Africa (conflicts in Guinea, Sierra Leone, Liberia, Ivory Coast)
  - Southern Africa (food crisis Zimbabwe, Malawi)
- Middle East/North Africa: Iraq, Palestinian Territories, Western Sahara
- Asia: Afghanistan, Iran, Pakistan (conflict) and North Korea
- Latin America: Colombia
- Europe: Northern Caucasus (Chechnya conflict)

In terms of disaster types, the main areas of interest are

- earthquakes: Central America, Mexico, Iran, Armenia, Afghanistan, Pakistan, Indonesia
- tropical storms: Caribbean, Central America (Nicaragua, Guatemala, Honduras), Bangladesh, Vietnam,
- floods: Bangladesh, Mozambique, Madagascar
- droughts: Horn of Africa, Central Asia
- volcanoes: Central America, Indonesia
- conflicts: Chechnya, Middle East, Afghanistan/Pakistan/India, North Korea, DR Congo

In terms of time-line, the following needs can be expressed:

- early warning: methologies and alert tools for rapidly onset disasters (earthquakes, tropical storms, flash floods, epidemics)
- rapid damage assessment: methodologies for decision support tools (earthquakes, tropical storms, floods)
- long-term planning instruments (vulnerability analysis).

There is a need for improved methodology for risk assessment and damage assessment (forecasting and planning tools). For earthquake, ECHO is using with some success an event reporting tool with damage assessment that still needs some improvement but covers the entire world (tool developed by the JRC). ECHO would like to have this type of tools for other hazards; for example they are interested in extending the existing model for flooding in Europe to countries outside Europe. For damage assessment, ECHO needs information on the state of infrastructure, the population living in the area and its coping capacity.

Space-based information can provide greatest value for areas that are disaster or crisis prone, highly vulnerable and poorly mapped. Several regions in Africa, parts of Asia and Latin America have been identified as foci for such efforts and should be given priority for future actions.

4. Common Foreign and Security Policy

4.1. Background

The EU has established a Common and Foreign Security Policy (CFSP), through which the EU expresses its position on the international stage and acts in a consistent manner where there is common interest from Member States. The Council of the EU plays a vital role in the implementation of this policy, in which the European Commission is fully involved.

As part of the CFSP, the Union is developing a common security policy that embraces all issues relating to its security, including the gradual definition of a common defence policy - this is the European Security and Defence Policy (ESDP).

The EU is acquiring the necessary resources to undertake crisis management operations. Tasks include humanitarian and rescue tasks, peacekeeping tasks and tasks of combat forces in crisis management including peacemaking[15]. Resources for these tasks can be entrusted to either the EU's military or civil instruments by decision of the Council. The EU's approach to crisis management is comprehensive, aimed at making best use of the synergies between the two types of instruments.

As stated in the GMES Action Plan[16], GMES will contribute to CFSP, in line with the so-called "Petersberg tasks".

The nature of certain crisis response tasks such as the initial response to man-made or natural disasters, post-conflict re-construction, de-mining activities may lead to the deployment of military assets and resources alongside civilian assets. The support from military assets may range from providing a secure environment to facilitate the delivery of humanitarian aid to the

[15] Article 17.2 of the Treaty of the European Union – the so-called "Petersberg Tasks" (a WEU term). Within the terms of Article 17.2, operations are considered on a case by case basis including where NATO as a whole is not engaged.
[16] COM(2001)609, "GMES EC Action Plan (Initial Period: 2001-2003)", 23rd October 2001

re-building of critical infrastructure and restoring essential services in the immediate post-disaster or post-conflict situation.

Added to this is the new threat of nuclear, biological, chemical and radiological (NBCR) attacks or incidents, where military assets and expertise has its place alongside civilian and response mechanisms. An efficient and effective response to such scenarios necessitates quick and decisive action to best target limited resources and close civil-military co-ordination.

4.2. Broad information requirements

The linchpin of ESDP is the Political and Security Committee (PSC), which keeps track of the international situation in areas of interest falling within its remit. In support of its decision-making, this committee may call upon its instruments such as the Policy Unit, the Joint Situation Centre, the EU Military Committee, the EU Military Staff and the EU Satellite Centre (EUSC) for their respective inputs. There is a common requirement for all these bodies to have accurate and timely information to support early warning, situation analysis and assessment.

By providing accurate and timely information, earth observation assets can support decision making from the routine situation monitoring, through the build-up to a potential crisis, to support for a crisis management operation. Space-based observation assets are mostly free from the restrictions of geography and sovereignty, and are therefore particularly useful in this context.

Such space-based and airborne systems would best support decision-makers if they are capable of large area surveillance, detection, reconnaissance and identification of objects or targets of interest world-wide, day and night and in all weather conditions. These system attributes must be supported by re-visit times appropriate to the mission. Sensors covering the different bands of the electromagnetic spectrum (electro-optical and radar), sufficiently robust to counter possible countermeasures such as deception, camouflage and jamming could all provide useful information to decisions-makers. These systems must be supported by a comprehensive ground exploitation capability.

4.3. Present resources and initiatives

EU Satellite Centre

The EUSC, dedicated to the support of CFSP and in particular ESDP, undertakes the production of imagery analysis reports and geospatial products such as geographic information systems (GIS). The Centre has access to a wide range of commercial imagery including high-resolution imagery (0.6m) and it is planned to have access to some national satellite systems in the future, which would further enhance the support that the EUSC gives at present (see Annex A).

Joint Research Centre

In addition, JRC is engaged in practical and scientific studies to improve knowledge and techniques to provide information related to civil protection (natural and man-made hazards) and foreign policy (e.g. humanitarian and development aid, de-mining, conflict prevention and crisis management). A cooperation agreement has been signed with the EUSC.

Headline Goal

Based on the Helsinki Headline Goal and the Petersberg tasks, Member States have identified a set of EU requirements necessary to undertake EU-led operations and are committed to providing them through a voluntary process. This had led to the identification of a number of shortfalls with strategic imagery being one of them. In order to remedy these residual shortfalls, a European Capabilities Action Plan (ECAP), based on a bottom up approach, was launched following the Capabilities Improvement Conference in 2001. The ECAP is designed to enhance effectiveness and efficiency of European military capability efforts. Recently, a new group has been formed to deal with space issues inside the 2nd pillar.

National/multi-national systems

Whilst not part of EU policy, several Member States[17], with an interest in strategic imagery, have signed a joint document on the "Common Operational Requirements for a European Global Earth Observation System by Satellites"[18]. This document aims to explain why and how at European level, there could be an eventual autonomous European capacity in strategic imagery aimed at supporting all the information requirements necessary to undertake the so-called "Petersberg tasks".

In addition, bilateral and multilateral arrangements exist between Member States for access to data from existing and planned satellite systems[19].

The forthcoming launch of HELIOS 2 (FR), SAR-LUPE (DE), PLEIADES (FR) and COSMO-SKYMED (IT) could present the EU with further observational capabilities. It might be useful for the European Union to consider participation in corresponding military and civilian programmes.

4.4. Added value of GMES

An important "added value" feature of GMES is to improve the gathering and integrating of many different types of information. For example, standardised mapping, an essential element for planning crisis management, are not readily available in up-to-date digital form for many of the EU's area of interest or areas of crisis. Updating of traditional, hardcopy maps is very costly and requires highly trained cartographers. Photo-maps, on the other hand, can provide a cost-effective and relatively fast alternative, and commercial satellite imagery is well suited to the production of such items.

Geographic information systems combined with a wide range of attribute data such as data on population density, age distribution, health, infrastructure, land use, etc are extremely useful to planners and decision-makers who need to have a global picture of the situation as it develops.

At present, the Commission, the Council and ESA all have separate imagery databases and imagery analysis and photo-mapping facilities, albeit working in separate subject areas. The GMES initiative could assist in funding the coalescence of these assets to form an analysis and production facility through which a larger, more effective pool of multi-use analysis expertise could access imagery and products databases. This would bring benefits in the forms of economies of scale and the reduction of duplication of effort where it can be avoided.

[17] Up to now: Belgium, France, Germany, Greece, Italy and Spain
[18] also known as BOC, Besoin Opérationnel Commun
[19] Examples include the use by Italy and Spain of the French-lead Helios I system, the Franco-Italian Pleiades/Cosmo-Skymed co-operation and the Anglo-German Infoterra/TerraSAR programme. The German SAR-Lupe system is understood to be open to other European partners, primarily military or security organisations.

GMES should facilitate the easy access to the multitude of databases or meta-databases relevant to crisis management. This information could be pooled in response to Commission and Council needs.

5. Conflict Prevention

During the last European Council in Thessaloniki, Mr. Solana[20] emphasised the European willingness to be present on the global scene and in particular in conflict prevention. "We should be ready to act before a crisis occurs. Conflict prevention and threat prevention cannot start too early"[21].

In a Communication on conflict prevention[22], the Commission highlighted the work done in this domain by the EU through different instruments including development co-operation and external assistance, economic co-operation and trade policy, humanitarian aid, social and environmental policies, diplomatic actions, information gathering for anticipating potential crisis and monitoring international agreements (these last two tasks being part of CFSP).

A challenge of conflict prevention is finding effective and appropriate ways to address the causes of tension and violent conflict. One aspect is to examine specific factors in play such as drugs, small arms, access and management to natural resources, environmental degradation, communicable disease, massive population flows, human rights and private-sector interest in unstable areas.

Earth observation data play a role in addressing some of these crosscutting issues:

- drugs: possibility to use satellite imagery to detect illicit crops and to fight against trafficking through border surveillance
- access to and management of natural resources (in particular water) and assessing environmental degradation: information gathered through GMES in the context of global environmental policies can be used as background data
- massive population flows, illegal immigration and human trafficking: possibility to use EO data to follow the displacement of large groups of persons and to enhance border surveillance

Most users' needs in these domains are similar to those provided by ECHO for humanitarian aid and by the Council for the aspects linked to Common Foreign and Security Policy. There may be additional and more specific needs linked to border surveillance and the fight against trafficking[23] but they have not been expressed yet.

6. Dual-use aspects

There is a range of environmental risks, the monitoring and management of which can be considered to be largely or entirely a civil activity. These are associated with global climate change and longer-term environmental degradation, such as deterioration of the ozone layer, sea level rises, long-term changes in weather patterns and desertification. However, for

[20] Present High Representative for CFSP/ESDP
[21] A secure Europe in a better world, Javier Solana, European Council, Thessaloniki, 20/6/2003, p.12
[22] COM(2001)211, "Communication from the Commission on Conflict Prevention", 11th April 2001
[23] These activities are part of the general policy defined under the Chapter of "Area of Freedom, Security and Justice" in the Convention (Part III, Title III, Chapter IV).

activities requiring direct and immediate intervention during natural or man-made disasters, the distinction is less clear. The observation and information needs associated with relief efforts for floods, forest fires, earthquakes, industrial disasters or terrorist actions against civilians may have significant commonality with more classic defence operations.

For example, in the field of satellite meteorology, it is well established that many requirements are the same for military and civilian purposes. Similarly, humanitarian aid and crisis management tasks may require rapid production and delivery of information using high-resolution satellite imagery, whether used by civilian or defence agencies.

This concept as been expressed by the interim European Security and Defence Assembly of the Western European Union (WEU) Assembly resolution "The development of a European earth observation capacity for European security needs"[24]. Among its draft recommendations, it noted that space applications, in complement to other means, could help to provide civil and military authorities with the necessary elements to conduct a European security and defence policy. Furthermore, it welcomed the GMES initiative and urged – in the interest of cost reduction – all possible civil/military synergies to be pursued.

Satellite systems are dual by nature and defence departments use information obtained by civil systems (see meteorology for example). In the domain of earth observation, they purchase regularly images from commercial satellites. Similarly we can expect military staff using GMES to access EO data and to combine relevant information. However use of military satellite imagery for civil applications is not yet possible.

"Real" dual use is about civil and military users sharing capabilities. For the first time it is foreseen by the Italian COSMO-SKYMED programme: civil and military users will have to agree on the amount of data each group will receive. They will also establish security rules and define priorities for satellite tasking. Technically, this implies additional costs for the ground segment, where civil and military systems will be distinct. A co-operation agreement is being prepared between France and Italy to share information gathered by COSMO-SKYMED and PLEIADES. Thus French and Italian civilian users will have special access conditions, other EU Member States and EU institutions will have access as commercial users.

While developing GMES, we will have to take into account dual use of certain assets and the corresponding requirements: access control, confidentiality agreements, securing data transmission and data access, securing space assets and corresponding ground infrastructure. These requirements should be taken into consideration at an early stage to minimise the corresponding costs.

7. Conclusions

7.1. Scope

In the domain of Security, GMES could contribute to the following policies:

- Prevention and responses to crises related to natural and technological risks in Europe
- Humanitarian aid and international co-operation
- Conflict prevention including monitoring of compliance with treaties

[24] document C/1789 from its 48th session, June 2002

- Surveillance of borders
- Common Foreign and Security Policy and European Security and Defence Policy to support the missions outlined in Article 17.2 of the Treaty of the European Union (humanitarian and rescue tasks, peace keeping tasks and tasks of combat forces in crisis management including peacemaking)[25].

GMES support would include the provision of information for risk mapping, risk mitigation, conflict prevention, early warning, and management of on-going crises including operational use in the field.

7.2. Potential users

Based on this analysis, the following organisations could be considered as potential users:

- Civil protection and search-and-rescue organisations within the borders or territorial waters of Europe for management of natural and technological risks
- European institutions, government departments of EU or ESA Member States, international organisations (e.g. UN) and NGOs engaged in co-operation, humanitarian and development aid, as well as civilian crisis management outside Europe
- The Council and, under the mandate of the Council, entities involved in the planning and conduct of civil and military crisis management operations.

Once GMES services are in place, we can expect that they will benefit additional users. In particular, GMES could be useful in the domain of justice and home affairs. The GMES requirements for these tasks at European level are currently under development.

7.3. Needs in support of security policies

- Improved performance of EO data: need for
    - world-wide coverage
    - high image quality, including high to very high (one meter or better) spatial resolution electro-optical and radar imagery where appropriate
    - all weather night and day observations
    - adequate acquisition and revisit times
- Improved access to EO data:
    - better interface between users and data providers
    - improved access to existing databases

[25] The missions under CFSP/ESDP may be extended, as proposed by the Convention (Article III-210) to: joint disarmament operations, military advice and assistance tasks, conflict prevention and post-conflict stabilisation.

- Improved collection of non-EO data:
    - population (location of people, health statistics, poverty index...)
    - infrastructure (road, train, hospitals...)
    - resources (oil, water, food...)
- Improved production of information and response to user' needs:
    - integration of data from different sources, images combined with GIS-generated background data
    - more rapid data interpretation and better presentation of the information
    - off-the-shelf applications to meet users' priority needs
    - further analysis of users' needs
    - better knowledge, on the user side, regarding EO technology and related tools
- Improved interoperability of systems used by various organisations and rescue services in different countries.
- For medium to long term actions (e.g. for risk assessment, risk mitigation, early warning and conflict prevention):
    - financial resources for sustainable data collection, up-dated databases
    - methodology and tools for forecasting and planning (impact of climate change and environment degradation on population, risk of migration and conflict, evaluation of human hazards from risk assessment)
    - methodology and alert tools for main natural disasters inside and outside Europe.
- For short term actions (e.g. crisis management inc. support to operations):
    - up-dated maps and geospatial products (crucial for regions outside Europe)
    - knowledge of users needs to provide on time the right information
    - improved models for a quick interpretation of data (including rapid damage assessment)
    - tools for decision-making
    - adequate communication infrastructure

7.4. What is specific to security?

There are some specific needs for Security within GMES linked to:

- crisis management because it means timeliness, requires transfer of high volumes of data in a short time
- use of sensitive data implying the need to secure data and information
- missions accomplished in regions where satellite data may be the only one available and where it may be difficult to have access to data on infrastructure and population

- actions outside Europe done in collaboration with international organisations such as the United Nations.

Many needs in terms of observation are common to civilian and military organisations. It is clear that military staff will not solely rely on a civilian system such as GMES. However we should anticipate the fact that they will use it and take into account the dual use requirements of some of the capabilities.

Copyright and dissemination rights of information products, given the multinational aspects of humanitarian aid or of Petersberg tasks, will be particularly important issues to take into consideration.

7.5. Proposed recommendations

There is a cost associated to the recommendations established below, however no estimation has been made by the working group.

Improved performance of EO data and ensure sustainability of EO data

This problem should be taken into consideration by the future Space Policy. We recommend to:

- support co-operation agreements to give access to EU organisations (Council, DG-RELEX, ECHO...) to military imagery (through the EU Satellite Centre for example), or to information derived therefrom with appropriate security regulations and agreements
- start negotiation to give to EU organisations access rights to archived data and possibility of ordering data with:
    - Italy and France for COSMO-SKYMED/PLEIADES (both for military and civilian missions)
    - Germany for SAR-LUPE (for military missions)
    - other national authorities as it may be deemed appropriate
- establish a partnership between the EU and Member States (on a voluntary basis)[26], in order to share investments and thus obtain tasking rights for the next generation of EO satellites for civil and military security.

Improved access to EO data

The EU should develop its capability and create a centre to meet the collective needs for imagery and mapping for security in support of Commission and Council needs. The EUSC already undertakes these activities and could be developed to meet the wider European requirements. In this context, to serve EU policies linked to security, GMES could support the creation of an imagery and product database (or meta-database) with centralised access. In addition, a programme could be established to archive earth observation data in support of conflict prevention and in preparation to crisis management. Appropriate security rules and mechanisms to control access to sensitive data should be established.

[26] could be based on the common needs for EO data (BOC) as signed by several EU Member States

Improved access to non-EO data

Creation of a database to respond to Commission (DG-RELEX, ECHO…) and Council needs in terms of background data on population and infrastructure, and access to resources. Such a database should be complementary to what is accessible via the UN.

Maintenance and update of the database should be ensured in the long run.

The database would be part of the GMES information system, with access restricted to specific users. Mechanisms for external requests (from Member States, NGOs...) could be established.

Improved production of information and response to user' needs

Improved production of the information should also be a result of GMES actions, thanks to a better access to data. Operational services should be developed for civil protection teams and NGOs, to support their actions in and outside Europe.

GMES should support research activities to improve interpretation tools. Specific topics related to civil security should be envisaged.

Improved knowledge of users' needs is a continuous process that will be taken into account by the overall GMES initiative ("dialogue with users"). In the domain of security, we recommend to set-up a network of experts (including representatives of the research community, industry, service providers and users) to exchange good practices and to improve responses to users' needs.

Training activities to inform potential users of the tools developed through GMES should also be undertaken to improve the dialogue between users and service providers.

Improved interoperability of systems

Use the work done by INSPIRE to establish commons standards, formats and mechanisms for sharing information at a European level. Define requirements to improve interoperability of systems used during crisis management (better coordination at European level).

The work done through the Open GIS Consortium or the UN Geographic Information Networking Group should be considered in this context.

Development of methods and tools (Research & Development)

Use the EU Research Framework Programme to develop methodology and tools for forecasting, planning, alert or other related needs, in close cooperation with potential users.

Improved crisis management

Currently many organisations involved in crisis disaster relief and crisis management benefit from the International Charter on Space and Major Disasters, which guarantees quick access to the available data and top tasking priorities for the satellites of the signatories of the Charter. In the near term, it is recommended to set up a mechanism to discuss how the Charter could be improved and/or extended to better support additional activities covering crises due to conflict as well as medium and longer term activities such as reconstruction.

In the longer term, we recommend to transform the current supplier-driven approach to a fully user driven approach which could also include coordination of requirements and common procurement. Such activities could be developed, building on the already existing experience of bulk procurements at the EUSC.

In addition to improving capabilities for measurement, observation and data interpretation, the working group recognises the strategic importance of efficient data dissemination. Although it is not in the focus of GMES, it is recommended to develop mechanisms for stable and efficient communication and data dissemination, specifically in cases of disasters or crises where timely delivery of services, information and data generated by GMES might be difficult due to limited communication capabilities. Such capabilities can be developed through the Space White Paper and could also include the development of communication satellites.

International Cooperation

Establish links with relevant UN organisations to harmonise the development of tools and the set-up of databases.

GMES Partnership

Any Memorandum of Understanding (MoU) linking GMES partners should include on the European Union side both the Commission and the Council.

Glossary

BOC	Besoin Opérationnel Commun
CFSP	Common Foreign and Security Policy
COM	Commission Communication
CSI	Commercial Satellite Imagery
DGI	Digital Geographic Information
DG-JAI	Justice and Home Affairs Directorate General
DG-RELEX	External Relations Directorate General
EC	European Community
ECAP	European Capabilities Action Plan
ECHO	European Humanitarian Aid Office
EO	Earth Observation
ESA	European Space Agency
ESDP	European Security and Defence Policy
EU	European Union
EUSC	European Satellite Centre (also called SATCEN)
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
IMINT	Imagery Intelligence
INSPIRE	Infrastructure for Spatial Information in Europe
JRC	Joint Research Centre
LOI	Location of Interest
MOU	Memorandum of Understanding
NGO	Non-Governmental Organisation
PSC	Political and Security Committee
SAR	Synthetic Aperture Radar
SLAR	Sideways-Looking Airborne Radar
UN	United Nations
WG5	GMES working group on security
WEU	Western European Union

Annex A

GMES REQUIREMENTS – EU Satellite Centre Assessment

The EUSC mission is to support the decision-makers, in the area of Common Foreign and Security Policy (CFSP) and European Security and Defence Policy (ESDP). Therefore, its primary work is in the domain of imagery intelligence analysis (IMINT) and generating Digital Geographic Information (DGI) systems. The areas covered for a task can range from pinpoint locations of interest (LOI) of perhaps several sq kms for an IMINT task to complete nation-wide cover in the case of DGI products.

To support this extremely wide range of tasks, the EUSC mainly uses commercial satellite imagery (CSI) supplemented by Collateral data and other imagery systems where appropriate.

The main CSI systems currently used include, but are not limited to:

Optical	Landsat	30 – 15m
	SPOT	10 – 5 or 2.5m
	EROS	2m
	Ikonos	1m
	Quickbird	0.61m
Thermal	Landsat	60m
Radar	ERS	12.5 – 25m
	Radarsat	8 – 100m

Forthcoming systems include, but are not limited to:

Optical	Helios
	Pleiades
	Rapid-Eye
Radar	Envisat
	Cosmo-SkyMed
	SAR-Lupe
	TerraSAR

RECENT EXPERIENCE

Imagery Denial

Use of imagery can be denied for many factors. Classified national-sourced imagery may not be useable for certain tasks due to restrictions on dissemination. In practice, access to CSI has also been denied to the Satellite Centre as follows:

Access Control. Applied by the Russians during the Kosovo and East Timor campaigns

Exclusive Rights. Users can buy the exclusive rights to imagery, preventing its inclusion in archive and use by others. This effect was noted during the Afghan War and affects EROS imagery for much of the Middle East.

Preventive Tasking. With relatively few systems in orbit, it is possible to prevent imaging of a location by purchasing high priority programmation rights in the orbit sectors covering the LOI. By tasking the sensor to look away from the LOI the time taken to manoeuvre, acquire and then manoeuvre back can prevent another user from acquiring imagery of a sensitive LOI.

Low Priority. Although strictly speaking, not imagery denial, the effect has been the same. For a CFSP Indicators and Warnings task requiring a weekly status report based on high-resolution imagery, acquisition windows of potentially 4 months due to "competition from other users" rendered the task impossible.

Commercial Dispute. A legal dispute between a satellite operator and a franchisee blocked access to archive imagery in the relevant cone of operation.

Maintenance Downtime. For much of a major oil spill incident, one of the main radar sensors was unavailable due to routine maintenance work.

Acquisition Windows

Compared to military systems, especially airborne assets, CSI suffers from a relative lack of timeliness. This is less critical for planning tasks, where time is a less important factor; although some acquisition windows quoted of up to 4mths are clearly unacceptable. For some suppliers, however, recent improvements have led to acquisition windows of 1 to 3 weeks, or even several days in some cases. These are acceptable for over 90% of the EUSC´s current tasks, but do not meet the potential requirement for near real-time support of crisis management, which would be required for some CFSP operations. The same would hold good for many NGO operations in crisis zones as well.

The windows quoted above are based on satellite revisit times and priority for acquisition. Added to that, however, account must be taken of weather conditions, since most imagery used is optical. Radar systems are virtually immune from meteorological limitations and have more frequent revisits as they are day/night, ascending/descending pass sensors, but generally are of lesser resolution than equivalent optical sensors.

Image Delivery

Once acquired, or if ordered from archive, there is the delay in delivery to the EUSC. For high priority tasks, FTP is an option, but it is only effective for relatively small files. For larger files or multiple images the transfer times become excessive and with increased time comes an increased risk of interruption during transmission.

Courier delivery is used for most imagery, but this can take a week or more. Some suppliers seem to require several weeks to despatch imagery from archive, unless a rush premium (sometimes excessive e.g. 50%) is paid.

Product Dispatch

Once completed, the results are dispatched to the users, usually in softcopy format, but by courier. This can take a couple of days to get to the Point of Contact, but then often several weeks to get from there to the real end-user.

EUSC Requirements

Priority Access. This can be achieved through ownership/partnership rights, but requires a very significant level of investment. Alternatively, premium payments can be made to increase access rights. This is less expensive, but still a significant investment. Within the EU, a centralised procurement option would significantly increase the leverage on suppliers to improve performance.

Programmation. The ability to request acquisition is a basic requirement. However, for some tasks, there is also a need to request acquisition within a specified time period. For example, imagery may be required of a particular event taking place on a specific day, or flood monitoring may be required at a predicted time of peak surge.

Faster Acquisition. An increase in the number of sensors will reduce revisit times and increase acquisition opportunities. It would also reduce the effect of maintenance downtime. Greater use of radar systems will also help due to their day/night all-weather capability. For the bulk of CFSP tasking, however, improvements in radar resolution will be essential.

Imagery Characteristics. Optical, Infrared and Radar imagery of low, medium, high and potentially decimetric resolution would be required. A table indicating requirements against sample task types is given hereafter. It should be understood, however, that tasks are very variable, even within discrete categories, so the figures quoted are not absolutes, but only average values for typical tasks.

Faster Receipt. Electronic delivery via guaranteed, high capacity data links between the providers and the EUSC are essential. These could range from broadband Internet to a direct-receive groundstation, depending on the CFSP requirements and investment available.

Faster Exploitation. Improvements in the areas above can lead to Data Deluge, i.e. more data is received than can be processed in the time available before it looses its value. The EUSC resources, technical and human, would have to match the processing requirement defined under CFSP.

Faster Delivery. High capacity, secure data links that reach out to the end-users should be provided. The systems might include wireless links to deliver appropriate data to elements deployed in the field.

SAMPLE IMAGERY REQUIREMENTS

Task	Main Sensor(s)	Resolution (m)	Revisit Time	Delivery Time	Specific Date Programmation	Supporting Data
Industrial plant analysis	Optical, Thermal Multispectral	0.5 - 2 2 - 10 1 - 4	Mthly, Qtly	Critical	Unlikely	Collateral
Airfield analysis	Optical	1 - 2	Possibly	Not critical	Unlikely	
Barracks analysis	Optical	1	Possibly	Not critical	Unlikely	
Port analysis	Optical	1 - 5	Possibly	Not critical	Unlikely	Collateral
Aircraft identification	Optical	1	Not necessary	Not critical	Unlikely	
Missile identification	Optical	0.7	Not necessary	Not critical	Unlikely	
Radar identification	Optical	0.4	Not necessary	Not critical	Unlikely	
Treaty verification	Optical, Multispectral	0.5 - 2 1 - 4	Possibly	Critical	Yes	Collateral, Maps
Crisis management	Optical, Radar	1 - 5 1 - 5	Frequent	Critical	Yes	Collateral, Maps
Flood analysis	Radar, Optical	2 - 15 2 - 10	Frequent	Critical	Yes	Maps, DEM
I&W monitoring	Optical, Radar	0.5 - 1 1 - 3	Frequent	Critical	Yes	Collateral
Camouflage detection	Multispectral	1 - 2	Not necessary	Not critical	Unlikely	
Terrain analysis	Optical, Multispectral	3 – 10 5 - 15	Not necessary	Not critical	Unlikely	Collateral, Maps
Coastal monitoring	Radar, Optical	2 - 15 2 - 10	Frequent	Critical	Yes	Maps
Route study	Optical	0.7 - 5	Not necessary	Not critical	Unlikely	Maps, DEM
Evacuation planning	Optical	0.7 - 5	Not necessary	Not critical	Unlikely	Collateral, Maps
Humanitarian intervention	Optical	1 - 5	Frequent	Critical	Yes	Collateral, Maps
Damage assessment	Optical, Multispectral	0.5 - 2 1 - 4	Frequent	Critical	Yes	Collateral
Oill spill monitoring	Radar Optical, Multispectral	2 - 15 2 - 10 2 - 10	Frequent	Critical	Yes	Collateral
Peace keeping	Optical, Radar	0.5 - 2 1 - 8	Frequent	Critical	Yes	Collateral, Maps
Peace enforcing	Optical, Radar	0.5 - 1 1 - 8	Very frequent	Critical	Yes	Collateral, Maps
Point Location DGI	Optical	0.7 - 1	Not necessary	Not critical	Not necessary	Maps
Local DGI	Optical	1 - 2	Not necessary	Not critical	Not necessary	Maps, DEM
Regional DGI	Optical	5 – 10	Not necessary	Not critical	Not necessary	Maps, DEM
Wide Area DGI	Optical	10 – 30	Not necessary	Not critical	Not necessary	Maps, DEM
Technical intelligence	Optical Hyperspectral	0.10 – 0.30 1 - 3	Required	Not critical	Unlikely	Collateral

Table Notes:

For optical imagery, the colour component of multispectral bands is desirable, but not essential unless mentioned separately.

Multispectral imagery includes hyperspectral.

Collateral, Maps, DEMs are desirable for all tasks, but not essential, unless specifically mentioned.

Definitions

FTP - File Transfer Protocol. An Internet transmission method used for "pulling" image files from the provider's file server.

I&W - Indicators and Warnings. The monitoring of specific locations at which changes may be seen that give forewarning of a subsequent event. For example, at times of international tension, an airfield may be monitored as a change in the numbers or type of aircraft present may be an indicator that military action is about to take place.

Collateral - any data other than the primary image data required for a task. Typically, traditional maps in hard or softcopy, reports etc.

Maps - Traditional maps in hard or softcopy.

DEMs - Digital Elevation Model. A softcopy model of the 3D relief of an area. DEMs are used to correct displacement errors that occur for points on the imagery. This displacement error increases with elevation. Imagery can also be "draped" over the DEM to give a 3D view of the terrain.